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KIAWAH RIVER

DEVELOPMENT AGREEMENT

BY AND AMONG

KIAWAH RIVER PLANTATION, LP;

OCEAN BOULEVARD PROPERTIES, A

SOUTH CAROLINA LIMITED PARTNERSHIP;

AND

CHARLESTON COUNTY,

SOUTH CAROLINA

Kiawah River Development Agreement
By and Among Kiawah River Plantation, LP;
Ocean Boulevard Properties, a South Carolina Limited Partnership; and
Charleston County, South Carolina

THIS DEVELOPMENT AGREEMENT is entered into this 22nd day of December, 2009 and is effective on the 1st day of January 2010, by and among Kiawah River Plantation, LP, a Delaware limited partnership; Ocean Boulevard Properties, a South Carolina Limited Partnership; and Charleston County, a political subdivision of the State of South Carolina (the "*County*"). This Development Agreement, together with the Kiawah River Planned Development District Plan, the recitals herein, and all exhibits and appendices attached hereto, shall be hereinafter referred to as the "*Agreement*." The date upon which this *Agreement* becomes effective shall be hereinafter referred to as the "*Effective Date*."

RECITALS

This *Agreement* is predicated upon the following:

1. Due to market variability and other factors, the *Property Owner* desires flexibility in its ability to develop the *Real Property*, as well as stability in the local *Laws* and regulations affecting the development of the *Real Property*.

2. The *County* desires an increased tax base, greater job opportunities for current and future residents of the *County*, certain infrastructure improvements designated more fully herein, and the protection or enhancement of certain natural resources, as explained more fully herein.

3. The South Carolina Local Government Development Agreement Act (the "*Act*"), codified at sections 6-31-10 to -160 of the South Carolina Code, enables counties to enter into binding development agreements with persons or entities having a legal or equitable interest in land intending to undertake any development, provided the land has certain minimum acreages of highland, and the development agreement and its approval complies with certain other conditions set forth in the *Act*.

4. The *Act* recognizes: "The lack of certainty in the approval of Development can result in a waste of economic and land resources, can discourage sound capital improvement planning and financing, can cause the cost of housing and Development to escalate, and can discourage commitment to comprehensive planning." S.C. Code Ann. § 6-31-10(B)(1).

5. The *Act* recognizes: "Development Agreements will encourage the vesting of property rights by protecting such rights from the effect of subsequently enacted local legislation or from the effects of changing policies and procedures of local government agencies which may conflict with any term or provision of the Development Agreement or in any way hinder, restrict, or prevent the Development of the project." S.C. Code Ann. § 6-31-10(B)(6).

6. This *Agreement* shall be read and interpreted in coordination with the Kiawah River Plantation Planned Development District Plan (the "*Plan*"), which has been submitted

simultaneously herewith, attached hereto as Appendix A, and incorporated herein by reference. This *Agreement*, together with the *Plan*, facilitates flexibility for the *Property Owner* in the development of the *Real Property*, while providing the *County* with an increased tax base, job opportunities, recreational facilities, and other infrastructure, as set forth more fully herein.

7. Pursuant to section 6-31-30 of the South Carolina Code, *County Council* has adopted Article 3.16 of the *ZLDR*, incorporating the procedures and requirements for considering and entering into development agreements set forth in sections 6-31-10 to -160 of the South Carolina Code.

8. In satisfaction of section 6-31-50 of the South Carolina Code and any other notice requirements, the *County* conducted public hearings regarding its consideration of this *Agreement* on November 17, 2009 and December 3, 2009, after timely publishing and announcing notice of its intent to consider this *Agreement*.

9. The *Real Property* subject to this *Agreement* is approximately 1427.81 acres, including 1083.2 acres of highland, 187.41 acres of freshwater wetland, and 157.2 acres of OCRM critical area. A portion of the *Real Property*, being approximately 810.22 acres of highland and freshwater wetland, is currently zoned AG-8 (agricultural preservation district). A second portion of the *Real Property*, being approximately 460.39 acres of highland and freshwater wetland, is currently zoned R-4 (single family residential 4). The *Real Property* is simultaneously herewith being rezoned to planned development (PD), with the *Plan* constituting the development plan for the *Real Property*, in accordance with the terms and conditions of this *Agreement*.

10. Pursuant to section 6-31-60(A)(7) of the South Carolina Code, on December 22, 2009, *County Council* found this *Agreement* to be consistent with the *Act*, the *Comprehensive Plan*, and the *ZLDR*, as more particularly described in the *Plan* and the Executive Summary submitted with this *Agreement*.

11. Pursuant to section 6-31-60(A)(8) of the South Carolina Code, in approving this *Agreement*, *County Council* has determined that, with respect to the *Project*, this *Agreement*, in conjunction with the *Plan* and applicable *Laws*, sufficiently provides for the public health, safety, and welfare of its citizens and that no additional conditions, terms, restrictions, or other requirements are necessary.

12. On December 22, 2009, *County Council* adopted Ordinance Number [insert ordinance number], amending its zoning ordinance and zoning map to rezone the *Real Property* to PD and adopting the *Plan* as the planned development district plan for the *Real Property*.

13. On December 22, 2009, *County Council* adopted Ordinance Number [insert ordinance number], approving this *Agreement*.

14. After the *Effective Date* of this *Agreement*, Kiawah River Investment, LLC acquired all right, title, and interest of Kiawah River Plantation, LP, and Ocean Boulevard Properties, LP in and to the *Real Property* and has become the *Property Owner*.

NOW THEREFORE, in consideration of the premises of this *Agreement* and the mutual benefits to the *Parties*, the *Parties* agree as follows:

1. Definitions

In this *Agreement*, italicized words or phrases are as defined in Exhibit 1.1. The definitions set forth in Exhibit 1.1 shall control the development of the *Real Property* in lieu of any contrary definitions in the *ZLDR,* the *Plan*, or other *Laws*. The definitions in Chapter 12 of the *ZLDR* on the *Effective Date* shall otherwise apply.

2. *Parties*

The *Parties* to this *Agreement* are the *Property Owner* and the *County*. When used herein with reference to a specific *Tract*, *Development Parcel*, *Lot*, or other portion of the *Real Property*, *Parties* shall mean and refer to the *County* and that specific person or entity that has legal title to such *Tract*, *Development Parcel*, *Lot*, or other portion of the *Real Property*. If portions of this *Agreement* apply to one or more, but not all, of the entities or persons comprising the *Property Owner*, those particular parties may be separately referred to herein.

3. Relationship of the *Parties*

This *Agreement* creates a contractual relationship between the *Parties*. This *Agreement* is not intended to create, and does not create, the relationship of master/servant, principal/agent, independent contractor/employer, partnership, joint venture, or any other relationship in which the *County* or *Property Owner* may be held responsible for the acts of the other party. Further, this *Agreement* is not intended to create, nor does it create, a relationship in which the conduct of the *Property Owner* constitutes "state action" for any purpose. This *Agreement* is not intended to grant to the *County* any authority over property lying beyond its corporate limits.

4. The *Real Property*

A. Legal Description/Plat: The *Real Property* is approximately 1427.81 acres, including 1083.2 acres of highland, 187.41 acres of freshwater wetland, and 157.2 acres of OCRM critical area. The *Real Property* is fully described in the legal description and plat attached hereto as Exhibits 4.1 and 4.2, respectively. Exhibit 4.2 contains a minor mathematical error. In the acreage table on the first page, under the column entitled "Ponds," the total amount should be 235.94, and not 234.94. The total amount of the *Real Property* platted and recorded in Exhibit 4.2 is therefore 1427.81 acres, not 1426.81 acres. This error is mathematical only, as the maps delineate 235.94 acres of "Ponds" and 1427.81 total acres. An acreage breakdown of the *Real Property* pursuant to Exhibit 4.2 is attached hereto as Exhibit 4.3. The *Real Property* is a portion of Charleston County Tax Map Number 212-00-00-001.

B. Deed History/Unplatted Areas: The deeds reflecting the grant of the *Real Property*, together with approximately 576.65 acres of unplatted marshlands and small islands, to the *Property Owner* are attached hereto as Exhibits 4.4, 4.5, and 4.6. Although not included within the *Plan*, the *Property Owner* intends to preserve or enhance this unplatted area as open space.

Further, this unplatted area will be platted and recorded in compliance with the *ZLDR* prior to any *Development* or conveyance thereof, if any. This *Agreement* and the *Plan* do not and shall not interfere with the easement agreement by and between the Charleston County Park and Recreation Commission and W.L. Limehouse and Julian Limehouse, III, as Co-Personal Representatives of the Estate of Julian S. Limehouse, Jr., William Lawton Limehouse, Peggy K. Limehouse, Linda Anne L. McMurphy, a/k/a Anne Limehouse MacMurphy, Mary Ruth L. Schneider, J. Sidi Limehouse, III, a/k/a Julian S. Limehouse, III, Peggy Jo Gray, and Anne Limehouse MacMurphy, Trustee for Michael Linar Limehouse, dated June 7, 1994, and recorded in Book Z243 at Page 402 in the Charleston County RMC Office. Furthermore, this *Agreement* and the *Plan* do not and shall not interfere with the underground right-of-way easement granted by W.L. Limehouse to Berkeley Electric Cooperative, Inc., dated February 25, 1993, in Book K229 at Page 594 in the Charleston County RMC Office. These easement agreement are attached hereto and incorporated herein by reference as Exhibits 4.7 and 4.8, respectively.

C. Wetland Survey: A wetland survey of the *Real Property* is attached hereto as Exhibit 4.9. Exhibit 4.9 has been submitted to, but not yet approved by, *OCRM* and the *Corps* with respect to the current acreages of highland, freshwater wetland, and *OCRM* critical area on the *Real Property*. A letter from the *Corps* confirming receipt and on-going review of the wetland survey is attached hereto as Appendix N. The *Property Owner* will obtain an approved wetland survey from *OCRM* and the *Corps*, in compliance with the *ZLDR*, prior to obtaining development approvals or permits for the *Development* of a portion of the *Real Property* to which the survey applies.

D. Addition of Real Property: The *Property Owner* may notify the *County* from time to time of property proposed to be added to the legal description of *Real Property* by the filing of a legal description of subsequently acquired properties with the clerk of *County Council* and the *Planning Director*; provided, however, that no other property shall be added to the *Agreement* unless the *Agreement* and the *Plan* are duly amended to include the new land.

5. The *Property Owner*

"*Property Owner*" means Kiawah River Investment, LLC, a limited liability company, together with all subsidiaries thereof and other entities, which may have a legal interest on the date of execution hereof in any of the *Real Property* described in Paragraph 4 and includes their successors in interest, successors in title (as to any portion of the *Real Property*), and/or assigns by virtue of assignment or other instrument compliant with this *Agreement*. When used herein with reference to a specific *Tract*, *Development Parcel*, *Lot*, or other portion of the *Real Property*, "*Property Owner*" shall mean and refer to that specific person or entity that has legal title to such *Tract*, *Development Parcel*, *Lot*, or other portion of the *Real Property*. The *Property Owner* warrants that there are no other legal or equitable owners of the *Real Property*.

6. Benefits and Burdens

In accordance with section 6-31-120 of the South Carolina Code, the *Parties* agree that the burdens of this *Agreement* bind, and the benefits of this *Agreement* shall inure to, each of them and to their successors in interest and, in the case of the *Property Owner*, its heirs and personal

representatives, its successors in interest, successors in title and/or assigns pursuant to this *Agreement*. The burdens and benefits shall run with the land.

7. Consistency with *Comprehensive Plan* and *Land Development Regulations*

The *County* finds this *Agreement* and the *Plan* to be consistent with the *Act*, *County Ordinances*, *Comprehensive Plan*, and *ZLDR*, as more particularly described in the *Plan* and the Executive Summary submitted with this *Agreement*.

8. Development Agreement Governs

Whenever, in the *County*'s determination, express substantive provisions of this *Agreement* are inconsistent or in conflict with the applicable standards set forth in the *County Ordinances*, *Comprehensive Plan*, *ZLDR*, or other *Laws*, the provisions and standards set forth in this *Agreement* shall govern. This rule of interpretation shall replace any contrary rule set forth in the *Comprehensive Plan*, *County Ordinances*, *ZLDR*, or other *Laws*. Whenever express substantive provisions of this *Agreement* are inconsistent or in conflict with the substantive provisions of the *Plan*, the more restrictive provision shall apply.

9. Legislative Act

Any change in the standards established by this *Agreement* or to the *Laws* pertaining to the same shall require the approval of *County Council*, subject to compliance with applicable statutory procedures and consistent with Paragraph 10.A of this *Agreement*. This *Agreement* constitutes a legislative act of *County Council*. *County Council* adopted this *Agreement* only after following the statutory procedures required by sections 6-31-10 to -160 of the South Carolina Code and Article 3.16 of the *ZLDR*. This *Agreement* shall not be construed to create a debt of the *County* as referenced in section 6-31-145 of the South Carolina Code.

10. Applicable *Land Development Regulations*

A. Applicable *Laws* and *Land Development Regulations*: Pursuant to section 6-31-80 of the South Carolina Code, except as limited by state or federal law, including section 6-31-140 of the South Carolina Code, the *Laws* applicable to *Development* of the *Real Property* shall be those in force on the *Effective Date*, as supplemented or modified by this *Agreement*. The *County* shall not apply subsequently adopted *Laws* or *Land Development Regulations* to the *Real Property* or the *Project* unless the *County* has held a properly noticed public hearing and has determined: (1) the proposed subsequent *Laws* or *Land Development Regulations* are not in conflict with the *Laws* or *Land Development Regulations* governing the *Agreement* and do not prevent the *Development* set forth in this *Agreement*; (2) the proposed subsequent *Laws* or *Land Development Regulations* are essential to the public health, safety, or welfare and the proposed subsequent *Laws* or *Land Development Regulations* expressly state that they apply to a *Development* that is subject to this *Agreement*; (3) the proposed subsequent *Laws* or *Land Development Regulations* are specifically anticipated and provided for in this *Agreement*; (4) substantial changes have occurred in pertinent conditions existing at the time of approval of this *Agreement* which changes, if not addressed by the *County*, would pose a serious threat to the public health, safety, or welfare; or (5) this

Agreement is based on substantially and materially inaccurate information supplied by the *Property Owner*. Nothing herein shall preclude the *Property Owner* from agreeing to abide by such new *Laws*, regulations, or ordinances subsequently passed by the *County* which the *Property Owner* deems appropriate.

B. Land Development Regulations: The Kiawah River Planned Development District Plan (the "*Plan*"), attached hereto and incorporated herein by reference as Appendix A, shall constitute the development plan applicable to the *Real Property*. Furthermore, the *County*'s *ZLDR*, as amended by this *Agreement*, is attached hereto as Appendix B. Appendix B shall apply except as expressly set forth in the *Plan*. As reflected in Appendix B, chapters 1, 2, 3, 10, and 11 of the *ZLDR* and the appendices to the *ZLDR*, as these chapters and appendices exist on the *Effective Date*, shall apply to the *Real Property* unless otherwise expressly stated herein.

C. Building Codes and *Laws* and Other *Land Development Regulations*: Notwithstanding any provision in this *Agreement* which may be construed to the contrary, the *Property Owner* must comply with any applicable flood, building, housing, electrical, plumbing and gas codes now existing or subsequently adopted by the *County* or other governmental entity, as authorized by Chapter 9 of Title 6 of the South Carolina Code. This *Agreement* shall not be construed to supersede or contravene the requirements of any flood, building, housing, electrical, plumbing or gas codes subsequently adopted by the *County* or other governmental entity, as authorized by Chapter 9 of Title 6 of the South Carolina Code. The provisions of this *Agreement* are not intended, nor should they be construed in any way, to alter or amend the rights, duties and privileges of the *County* to exercise governmental powers and pass *Laws* not applicable to *Development* of the *Real Property* including, but not limited to, the power of eminent domain and the power to levy and collect taxes; provided, however, that *Laws* applicable to the *Development* of the *Real Property* shall be subject to Paragraph 10.A of this *Agreement*.

11. The Kiawah River Planned Development District Plan: The Kiawah River Planned Development District Plan (the "*Plan*") is attached hereto and incorporated herein by reference as Appendix A. Appendix A shall constitute the zoning and development plan for the *Real Property*. For the purpose of illustrating the development the *Property Owner* may institute on the *Real Property* pursuant to the *Agreement* and the *Plan*, an Illustrative Master Plan is attached to the *Plan* as Exhibit 1.1. While the Illustrative Master Plan may be used by the *County* and the *Property Owner* as a general guide for the overall development of the *Real Property*, the *Lots*, *Development Parcels*, *Thoroughfares*, green space, recreational areas, *Community Ways*, and other elements illustrated thereon are not intended to represent the exact configuration and location of the development that will occur on the *Real Property*. The more specific elements of the *Agreement* and the *Plan* should be used by the *County* and the *Property Owner* to help guide the precise configuration and location of the different aspects of development as the *Project* progresses. The remainder of this Paragraph 11 of the *Agreement* addresses each item required for planned development application submittals, including planned development stipulations and sketch plans.

1. Planned Development Name: The name of the planned development shall be Kiawah River; provided, however, the *Property Owner* may provide written notice to the *County* at any time before commencement of construction on the *Real Property* pursuant to the *Agreement* of a different name for the planned development which does not duplicate

the name of any other planned development or subdivision, the final plat of which has been recorded in the RMC Office for Charleston County, South Carolina at the time of such notice.

2. Statement of Objectives: The objectives of the *Plan* are set forth in Part 2, Intent and Results, of the *Plan*, and/or as follows:

A. Current Number of Dwelling Units/Density: The *Real Property* includes 1,270.61 acres of highland and freshwater wetland, which is currently "split-zoned." A portion of the *Real Property*, being approximately 810.22 acres of highland and freshwater wetland, is currently zoned Agricultural Preservation District (AG-8). The residential density requirements of the base zoning standards applicable to this portion of the *Real Property* would therefore facilitate the development of 101 *Dwelling Units*. A second portion of the *Real Property*, being approximately 460.39 acres of highland and freshwater wetland, is currently zoned Single Family Residential 4 (R-4). The residential density requirements of the base zoning standards applicable to this portion of the *Real Property* would therefore facilitate the development of 1,841 Dwelling Units. Accordingly, the combined density standards of the base zoning districts would facilitate the development of 1,942 *Dwelling Units* on the *Real Property*. Furthermore, the use regulations of the underlying zoning districts would prohibit the *Property Owner* from developing multi-family dwellings on the *Real Property* and permit single-family attached dwellings only on the portion of the *Real Property* currently zoned R-4 and only pursuant to a special exception. Moreover, many of the commercial, office, lodging, and retail uses necessary to serve the future residents of the *Real Property* would not be permitted in either district, necessitating that residents seek these amenities off-site.

B. Permitted Dwelling Units/Densities under the *Comprehensive Plan*/Rezoning to PD: The gross density requirements in the *Comprehensive Plan* would permit the development of up to 2,043 *Dwelling Units* on the *Real Property*. The *ZLDR* would further permit a density bonus of up to 25% in the Urban/Suburban portion of the *Real Property* for the provision of *Affordable Housing*.

C. Proposed *Dwelling Units*/Densities under the *Plan*: Pursuant to the *Plan*, the *Property Owner* may develop up to 1,285 *Dwelling Units* on the *Real Property* not including those *Dwelling Units* that are *Retirement Housing Units*. Furthermore, 117 of these *Dwelling Units* will be designed as *Housing for the Workforce*, 18 of which will constitute *Affordable Housing*. In addition, the *Property Owner* may develop up to 80,000 square feet of *GLA*, which includes those commercial, institutional, and similar uses designated as such in the *Plan*. The *Property Owner* may also develop a *Golf Course* or *Golf Courses*, consisting up to 36 total holes, and up to 450 *Guest Rooms* on the *Real Property*. The *Guest Rooms* may be dispersed among *Villas*, *Inns*, *Bed and Breakfasts*,

and/or up to two (2) *Hotels*. Finally, the *Property Owner* will develop or preserve at least fifty percent (50%) of the *Real Property*, exclusive of *OCRM* critical area, as open space (which may include the above-referenced *Golf Course(s)*, provided, however, that the *Golf Course(s)* shall not comprise the entire area designated as open space).

3. Site Information: The *Real Property* subject to the *Plan* consists of 1427.81 acres, including 1083.2 acres of highland, 187.41 acres of freshwater wetland, and 157.2 acres of saltwater wetland, or marsh. This area is platted in Exhibit 4.2.

4. Table of Proposed Land Uses: Table 5.1 illustrates the proposed maximum and average residential densities for each residential use; the maximum total acreage of each residential use; the maximum allowable number of each type of residential unit requested; and the maximum proposed floor area ratios (% of *Lot* in relation to building floor area) for each non-residential use. All dimensional and lot standards requested, including the maximum *Building Coverage*, for each land use type designated, are addressed in section 6 of the *Plan*.

Table 5.1: Table of Proposed Land Uses

Permitted Uses	Not to Exceed ("nte")	Minimum Acreage	Maximum Acreage	Maximum Density	Maximum Floor Area Ratio
Single Family Detached	nte 1285		550	4/acre	
Single Family-Attached	nte 320		50	10/acre	
Multi-Family	nte 320		50	20/acre	
Housing for the Work Force	up to 117		40	20/acre	
Retirement Housing	nte 160		50	Note 6	
All Residential	nte 1285 excluding *Retirement Housing*		600	1.01/acre	
Commercial	nte 80,000 square feet		12		2
Self-Service Storage/Mini-Warehousing, Boat/RV Storage	50% of the floor area shall count against *GLA*			Subject to 12 acre maximum for Commercial	
Accommodations	nte 450 *Guest Rooms* or *Villas*		50		2
Open Space		635.31			

The following standards shall apply to Table 5.1 and the location of densities within the *Development:*

1. As used in Table 5.1, "Density" refers to the number of *Dwelling Units* per unit of land area. Density is calculated by dividing the number of *Dwelling Units* on a site by the gross area (in acres) of highland (including freshwater wetlands) of the site on which the *Dwelling Units* are located, provided that all other requirements of the *Plan* are met.
2. The *Property Owner* may not exceed 50,000 square feet of *GLA* on the portion of the *Real Property* delineated in the *Plan* as the Bohicket Station.
3. The *Property Owner* may not exceed 80 *Dwelling Units* on the portion of the *Real Property* delineated in the *Plan* as the Bohicket Station.
4. The *Property Owner* may not exceed 580 *Dwelling Units* on the portion of the *Real Property* formerly zoned AG-8 which is also designated in the *Plan* as Rural Residential.
5. *Retirement Housing Units* shall count against the cap of 450 *Guest Rooms* with 2.0 *Retirement Housing Units* being equivalent to one (1) *Guest Room*, or stated differently, each *Retirement Housing Unit* equals .5 *Guest Room*. This conversion factor for *Retirement Housing* is based on accepted national standards for traffic counts that demonstrate that the vehicle trips per day for a *Retirement Housing Unit* are fewer than 50% of those for a *Guest Room*. The total number of *Retirement Housing Units* shall be rounded up to the nearest whole number of *Guest Rooms* for purposes of the nte cap above. *Retirement Housing Units* may be located only in the River Village and not in the Rural Residential or Bohicket Station.
6. The maximum density for *Retirement Housing* shall depend on the housing type and be subject to the same maximum density limitations for that particular residential housing type shown in Table 5.1.
7. The uses of Self-Service Storage/Mini-Warehousing, Boat/RV Storage must be exclusively for the use of the owners and tenants of any portion of the *Real Property* and of the contractors working on the *Real Property*. Only 50% of the floor area devoted to these uses shall count against *GLA*.
8. Commercial is limited to no more than 80,000 SF of GLA situated on no more than 12 acres.

5. Maximum Density/Open Space: The maximum residential densities set forth herein do not exceed the maximum densities permitted in the *Comprehensive Plan.* Density and lot area calculations within the *Plan* comply with the requirements contained in Article 4.2 of the *ZLDR*, Measurements, Computations and Exceptions.

6. Affordable Dwelling Units/*Housing for the Workforce*: "*Housing for the Workforce Unit*" means any residential unit designed to accommodate persons employed on the *Real Property*, persons employed on Kiawah Island, persons employed on Seabrook Island, persons employed within a ten (10) mile radius of the *Real Property*, and any residential unit meeting the definition of *Affordable Housing*. The *Property Owner* or its designated assignee shall design, build, and market up to 117 *Housing for the Workforce* units on the *Real Property* as part of the *Project*. Further, 18 of these *Housing for the Workforce* units shall constitute *Affordable Housing*. *Housing for the Workforce* units and *Affordable Housing* units may be developed anywhere on the *Real Property*. Moreover, any or all of these units may consist of accessory dwellings, single-family detached dwellings, single-family attached dwellings, or multi-family units. On or before the

Property Owner's development of 200 residential *Dwelling Units* on the *Real Property*, the *Property Owner* or its designated assignee shall design and market (for sale or rent) at least twenty (20) *Housing for the Workforce* units on the *Real Property*. On or before the development of every additional 200 residential *Dwelling Units* on the *Real Property* (not including *Dwelling Units* reserved or used for *Housing for the Workforce*), the *Property Owner* or its designated assignee shall design and market (for sale or rent) at least twenty (20) additional *Housing for the Workforce* units up to the maximum of 117 *Housing for the Workforce* units.

7. Impact Assessment/Analysis: An analysis of the impact of the proposed development on existing public facilities and services (e.g. roads and streets, water, sewer, etc.) is attached hereto and incorporated herein by reference as Appendix C. Furthermore, a Capital Improvements Program/Fiscal Impact Analysis is attached hereto as Exhibit D. Exhibits C and D include proposed future improvements to these facilities and services to be made as part of the planned development. These exhibits are addressed more fully in Paragraph 16 of this *Agreement*.

8. Traffic Study: A traffic study and mitigation plan that meets the requirements of Article 9.9 of the *ZLDR* is attached hereto and incorporated herein by reference as Appendix E. This traffic study and the proposed mitigation plan are addressed more fully in Paragraph 16 of this *Agreement*.

9. Development Schedule: The development schedule for the *Project* is included in section 7 of the *Plan*, as well as Paragraph 18 of this *Agreement*.

10. Open Space: Open space and common open space shall be provided and managed in accordance with Section 8 of the *Plan*.

11. Streets: All streets intended for dedication to the public shall comply with the *County's* Road Construction Standards (unless otherwise approved by the Charleston *County* Public Works Director), notwithstanding any other provision contained herein. Any and all streets and roads, curb cuts, and streetscape designed and constructed by the *Property Owner* may (1) be owned and maintained as *Common Areas*; (2) be owned and maintained by the *Property Owner* or a related entity; or (3) be dedicated to the public. The *Property Owner*, a related entity, and/or a duly constituted *Association* shall perform the maintenance and upkeep on any and all streets and roads on the *Real Property* or any portion thereof unless they have been dedicated to and accepted by the public. Upon tender of a deed from the *Property Owner* approved by the *County* attorney, the public may accept any and all streets and roads (including related infrastructure) tendered for dedication by the *Property Owner* provided they comply with the *County*'s Road Construction Standards described in the *ZLDR*. All alleys shall be maintained and owned by the *Property Owner*, a related entity, or an *Association* as *Common Areas*.

12. Compliance with *ZLDR*:

a. The *Property Owner* shall comply with the processes in the *ZLDR*, as it exists on the *Effective Date* and as may be expressly amended herein.

b. The *Property Owner* intends to proceed with the proposed *Development* in accordance with the provisions of the *Agreement*, the *ZLDR*, applicable provisions of the *Comprehensive Plan*, and with such conditions as are included in the *Plan*.

c. The provisions of Article 3.10 of the *ZLDR*, Variances, shall apply to the planned development with respect to zoning-related dimensional, design or performance standards on individual *Lots*. Variance applications for trees, *Setbacks*, buffers, height, and maximum Lot/building coverage for individual *Lots* shall be processed pursuant to *ZLDR* Article 3.10, Zoning Variances. All other proposed changes to the Development Agreement and/or Planned Development must be processed as Development Agreement and Planned Development amendment applications. Variances from the tree regulations in the Plan may be granted in accordance with the processes in the Plan.

13. Letters of Coordination: Letters of coordination from all agencies from which the *Property Owner* must either (1) obtain permits or (2) obtain services and/or facilities are collectively attached hereto and incorporated herein by reference as Appendix F.

14. Dimensional Standards:

a. Waterfront Development: The *Property Owner* may develop up to 227 residential *Lots,* excluding *Lots* that have *Villas* or *Bed and Breakfasts* that are *Guest Rooms,* on the portion of the *Real Property* directly abutting the *OCRM Critical Line*. Moreover, the *Property Owner* shall enhance or preserve at least three (3) miles of the portion of the *Real Property* directly abutting the *OCRM Critical Line* as open space. Further, the *Property Owner* will limit, through restrictive covenants or a conservation easement, the number of private use (use for one person or family), joint, or community *Docks* developed on the *Real Property* to eighteen (18). In addition, the *Property Owner* shall adopt restrictive covenants with respect to single-family detached *Lots* on portion of the *Real Property* designated in the *Plan* as Rural Residential requiring that 50% of each *Lot* be preserved in its natural condition. In consideration of the foregoing, notwithstanding Article 4.27.6.B.1 of the *ZLDR*, the waterfront development standards set forth in section 6 of the *Plan*, and no others, shall apply to the *Real Property*. The waterfront development standards set forth therein shall apply to the *Real Property* in lieu of Articles 4.26, 4.27.6.B.1, and 9.7 of the *ZLDR*.

b. Pursuant to section 8 of the *Plan*, the *Property Owner* shall generally provide a 25-foot vegetative buffer between the perimeter of the *Real Property* and an adjacent property titled to an unrelated third party on the *Effective Date* (unless otherwise specified in the *Plan*). Rear *Setbacks* shall be as set forth in Table 6.1 in

the *Plan*. Article 4.27.6.B.2 of the *ZLDR* shall not apply to the planned development of the *Real Property*.

15. Architectural Guidelines: The Architectural and Landscaping Design requirements of the *ZLDR* do not apply. The *ARB* shall develop and administer the architectural and landscaping requirements for the *Real Property* as provided in the *Covenants*. The *Property Owner* shall provide the *Planning Director* a copy of the *ARB* approval of the architectural and landscaping design as part of each *Development* application. Architectural guidelines set forth in Article 9.6 of the *ZLDR* shall not apply to the *Real Property*.

16. Lots to Abut Common Open Space: Pursuant to section 8 of the *Plan,* residential parcels shall be designed to maximize orientation toward common open space or similar areas.

17. Access:

a. The *Property Owner* shall use best efforts to facilitate a connection with adjacent parcels at the approximate locations illustrated in Exhibit 4.1 to the *Plan*. The *Property Owner*'s obligation under this section shall not require that the *Property Owner* purchase or otherwise finance the acquisition of any right, title, or interest in and to these adjoining properties. The *County* recognizes the *Property Owner*'s abilities under this section are highly dependent upon and constricted by the actions or inactions of third parties.

b. Areas between structures shall be covered by easements where necessary for access and to provide for maintenance and utility service.

c. Primary vehicular access to office, commercial, or industrial development shall be through limited access roads.

18. Commercial Areas:

a. Commercial areas and adjacent residential, office, and industrial areas shall be directly connected through paved sidewalks, unpaved trails, or other pedestrian infrastructure.

b. Commercial areas shall be planned as groups having common parking areas and common ingress and egress points.

19. Industrial Areas:

a. A minimum vegetative buffer of forty (40) feet shall be required where industrial uses, if any, abut residential uses.

b. All intervening space between the right-of-way line and project building line and intervening spaces between buildings, drives, parking areas and improved areas shall be landscaped with trees and plantings and properly maintained at all times.

20. Areas Designated for Future Uses: All areas designated for future expansion or not intended for immediate improvement or development shall remain in a natural state until such time as development permits are approved; provided, however, with respect to this provision, the "natural state" of the property shall include those uses permitted under base zoning. The *County* agrees that undeveloped portions of the *Real Property* shall be held by the *Property Owner*, or its successors, for agricultural/silvi-cultural/forestry purposes or similar permitted uses until *Development* on that portion of the *Real Property*. The *County* agrees that it will permit said agricultural uses to continue on these undeveloped lands.

21. Signs: The *Property Owner* shall provide a master signage plan to the *ARB*, for review and approval, for each phase of the *Project* and must provide the *ARB*'s written approval of that phase's master signage plan to the Planning Director prior to obtaining a certificate of occupancy for any portion of that phase of the *Project*. Notwithstanding the foregoing, the standards contained within Article 9.11 of the *ZLDR* shall apply to signs visible from Betsy Kerrison Parkway and Mullet Hall Road.

22. Parking: The parking and loading regulations in Article 9.3 of the *ZLDR*, as modified in Appendix B, and no others, shall apply to the *Real Property* or any portion thereof; provided, however, the amendments set forth in section 10 of the *Plan* shall apply.

23. Tree Protection: The tree regulations in Article 9.4 of the *ZLDR,* as modified in Appendix B, and no others, shall apply to the *Real Property* or any portion thereof.

24. Resource Areas: The *Plan* protects the resources determined significant by the *Planning Director*, as set forth more fully in section 14 of the *Plan.*

25. Common Open Space: Common open space and open space is located to preserve any significant resources on the *Real Property*. The standards applicable to common open space and open space on the *Real Property* are set forth in section 8 of the *Plan*. Article 4.27.7 of the *ZLDR* shall apply to the *Real Property* only to the extent set forth in section 8 of the *Plan.*

26. Affordable Dwelling Units: Affordable dwelling units and *Housing for the Workforce* shall be provided in accordance with this *Agreement*. Article 4.27.8 of the *ZLDR* shall not apply because the *Property Owner* is NOT requesting a density bonus from the maximum range in the *Comprehensive Plan* on the Urban/Suburban portion of the *Real Property.*

27. Land Use Sketch Plan: The general location and amount of land proposed for each land use, including single-family residential, multi-family residential, institutional,

office, commercial, industrial, common open space/recreation, street use, etc., is conceptually delineated in Exhibit 4.1 to the *Plan*. Moreover, the amount of land proposed for each such land use is set forth in Table 5.1 to the *Plan*.

28. Conceptual Lot Lines: The conceptual lines of the *Lots* proposed to be developed on the *Real Property* are delineated in Exhibit 1.2 to the *Plan*.

29. Pedestrian and Motor Traffic Circulation: The conceptual proposed pedestrian and motor traffic circulation for the proposed development is delineated in Exhibits 4.1 and 11.4 to the *Plan*.

30. Wetlands Survey: A wetland survey of the *Real Property* is attached hereto as Exhibit 4.9. Exhibit 4.9 has been submitted to, but not yet approved by, *OCRM* and the *Corps* with respect to the current acreages of highland, freshwater wetland, and *OCRM* critical area on the *Real Property*. A letter from the *Corps* confirming receipt and review of this survey is attached hereto as Appendix N. The *Property Owner* has no intention to develop upon any of these natural areas; provided, however, the *Property Owner* may construct portions of roads and/or utilities on these natural areas only after obtaining all applicable permits and approvals from *OCRM* and the *Corps* for such *Development* and obtaining site plan approval from the *County* pursuant to the *ZLDR*.

31. Tree Survey: The *Property Owner* has provided the *County* with a high-resolution aerial photograph of the *Real Property* in lieu of a tree survey. A tree survey showing all *Grand Trees* on proposed residential *Lots* of one acre or less and in road rights-of-way and easements on a portion of the *Real Property* proposed to be developed pursuant to the *Plan* shall be submitted as part of a site plan or preliminary plat application for that portion of the *Real Property*. Tree surveys for non-residential uses and lots greater than one acre shall conform to the standards in section 9 of the *Plan*. Article 4.27.9.C.1.b.v of the *ZLDR*, requiring a tree survey as part of a PD application, shall not apply.

32. Architectural Elevations: Architectural elevations for each type of residential and non-residential unit are attached to the *Plan* as Exhibit 12.1.

33. Phasing Schedule: A general delineation of the areas to be included in each phase of the proposed development is attached to the *Plan* as Exhibit 7.1. Notwithstanding Article 4.27.9.C.1.b.viii of the *ZLDR*, the location of common open space areas and/or affordable housing units to be included in each phase shall not be required at this time. The location of common open space areas and/or affordable housing units to be included within a phase of development shall be set forth as part of a site plan or preliminary plat application for that phase. Common open space and *Housing for the Workforce* shall be provided throughout the *Project* in conformity with this *Agreement*.

34. Construction Entrance: The location of the construction entrance is set forth in Exhibit 14.1 to the *Plan*.

35. Landscaping Sketch Plan: Notwithstanding Article 4.27.9.C.1.b.x of the *ZLDR*, a landscaping sketch plan shall not be required at this time. A landscaping sketch plan for each phase of the proposed development shall be submitted as part of a site plan or preliminary plat application for that phase.

36. Utility Sketch Plan: Notwithstanding Article 4.27.9.C.1.b.xi of the *ZLDR*, a utility sketch plan with the location of any on-site natural areas, buffers, trees and sidewalks that may be impacted by utility facilities including the existing and proposed location of any easements or rights-of-way shall not be required at this time. In lieu thereof, the *Property Owner* has submitted a series of conceptual plans for the provision of utilities and facilities, attached to the *Plan* as Exhibits 14.1 through 14.2. A more detailed utility sketch plan, in compliance with Article 4.27.9.C.1.b.xi of the *ZLDR*, for each phase of the proposed development shall be submitted as part of a site plan or preliminary plat application for that phase.

37. Current Aerial/Sketch Plan Overlay: An aerial of the *Real Property* with an overlay of the proposed Illustrative Master Plan is attached to the *Plan* as Exhibit 1.1.

12. Local Development Permits and Other Permits Needed

Pursuant to section 6-31-60(A)(6) of the South Carolina Code, the *Parties* anticipate that the following local *Development Permits*, approvals, and other regulatory permits will be needed to complete the *Project*:

> *County* plat approvals; *County* infrastructure permits; *County* land disturbance permits; *County* zoning, building, business license, stormwater/drainage, and contracting permits; *County* certificates of occupancy; applicable *DHEC* permits; and any other required local, state or federal approvals or permits.

The *County* will make a determination on the *Property Owner*'s complete applications for approvals and permits within a reasonable time. The failure of this *Agreement* to address a particular permit, condition, term, or restriction does not relieve the *Property Owner* of the necessity of complying with the law governing permit requirements, conditions, terms, or restrictions.

13. Vested Rights Governing the Development of the *Real Property*

A. Generally: Subject to Paragraph 10.A of this *Agreement*, all rights and prerogatives accorded to the *Property Owner* by this *Agreement* and the *Plan* shall immediately constitute vested rights for the *Development* of the *Real Property*. Nothing in this *Agreement*, including but not limited to Paragraph 10.A, is intended to abrogate and shall not abrogate or diminish rights conferred under sections 6-31-140 of the South Carolina Code, the "Vested Rights Act" (codified at sections 6-29-1510 to -1560 of the South Carolina Code), any provision of the *County Ordinances* adopted pursuant to the Vested Rights Act, or any rights that may have vested pursuant to common law or otherwise in the absence of a *Development Agreement*.

B. Vested Rights to Complete Development in Progress: Any permits or approvals granted to the *Property Owner* prior to the adoption of this *Agreement* shall continue to be valid, vested rights.

C. Vested Rights in the *Plan*: All permitted, conditional, accessory, and temporary uses set forth in the *Plan* shall constitute vested rights on the *Effective Date*. In addition, all *Building Development Standards* and other *Development* regulations, including but not limited to waterfront development standards, tree regulations, parking and loading regulations, open space and common open space regulations, architectural regulations, landscaping regulations, and buffer and screening regulations set forth in the *Plan* shall constitute vested rights on the *Effective Date*.

D. Entitlement Densities: The *Property Owner* shall have a vested right to the following entitlement densities on the *Effective Date*:

1. *Dwelling Units*: The *Property Owner* shall have the vested right to develop up to 1,285 *Dwelling Units* on the *Real Property,* not including those *Dwelling Units* that are *Retirement Housing Units,* and may determine the precise type, configuration and location of *Dwelling Units*, provided that:

- The *Property Owner* may not develop more than 580 *Dwelling Units* on the portion of the *Real Property* formerly zoned AG-8 which is designated as Rural Residential in the *Plan; and*
- The *Property Owner* may not develop more than 80 Dwelling Units on the portion of the *Real Property* delineated in the *Plan* as the Bohicket Station.

2. *Retirement Housing*. The *Property Owner* shall have a vested right to develop up to 160 *Retirement Housing Units*. These *Retirement Housing Units* shall be in addition to the other 1,285 *Dwelling Units* vested for the *Real Property*. *Retirement Housing Units* shall count against the cap of 450 *Guest Rooms* at the equivalence of 2.0 *Retirement Housing Units* for each *Guest Room*, with any fractions rounded up to the next whole number of *Guest Rooms*. *Retirement Housing Units* may be located only in the River Village and not in the Rural Residential or Bohicket Station.

3. *Housing for the Workforce*: Of the 1,285 total *Dwelling Units*, 117 shall constitute *Housing for the Workforce* units. Further, 18 of the *Housing for the Workforce* units shall constitute *Affordable Housing*. The *Property Owner* may determine the precise type, configuration and location of *Housing for the Workforce* and *Affordable Housing* on the *Real Property*, in compliance with the *Agreement* and the *Plan*; provided, however, that the *Housing for the Workforce* units and *Affordable Housing* units shall be located throughout the *Real Property* and the *Dwelling Unit* caps described in number 1, above, are not exceeded.

4. Commercial and Institutional Entitlement Densities: "*Gross Leasable Area*" or "*GLA*" means total floor area devoted to a use designated as such in Table 4.1 of the *Plan*. *GLA* does not include public or common areas, such as parking lots, utility rooms and stairwells, in a building or on a *Lot* otherwise devoted to a use designated as *GLA* in the *Plan*. For the purpose of this provision, the term "floor area" shall have the definition specified in Chapter 12 of the *ZLDR* on the *Effective Date*. The *Property Owner* shall have

the vested right to develop up to 80,000 square feet of *GLA* on the *Real Property*. This *GLA* shall constitute a vested right on the *Effective Date*. The *Property Owner* may determine the precise configuration and location of *GLA* on the *Real Property*, in compliance with the *Agreement* and the *Plan*.

5. Lodging: The *Property Owner* shall have a vested right to develop up to 450 *Guest Rooms* on the *Real Property,* which may be dispersed among *Villas*, *Inns*, *Bed and Breakfasts*, and/or up to two (2) *Hotels*. The *Property Owner* shall have a vested right to develop up to two (2) *Hotels* on the *Real Property*; provided, however, the total number of *Guest Rooms* on the *Real Property* may not exceed 450. The *Property Owner* may determine the precise type, configuration and location of *Guest Rooms* on the *Real Property*, in compliance with the *Agreement* and the *Plan*. *Guest Rooms* shall not count against any of the other entitlement densities in the *Agreement*.

6. Golf Course: "*Golf Course*" means a tract or tracts of land laid out for up to thirty-six (36) holes for playing the game of golf and improved with tees, greens, fairways, and hazards, and that may include club houses, driving ranges, training facilities, maintenance facilities, and shelters. *Golf Courses* shall constitute *Active Recreation Areas*. The *Property Owner* shall have the right to develop a portion of the *Real Property* for use as a *Golf Course* or *Golf Courses*, including up to 36 holes, any or all of which the *Property Owner* may develop as public or private, provided, however, that the *Golf Course(s)* shall not comprise the entire area designated as open space. The *Property Owner* shall have the right to build full-service club houses, practice ranges, training facilities and maintenance facilities accessory to the *Golf Course(s)* on the *Real Property* in any location the *Property Owner* deems appropriate, in compliance with the *Agreement* and the *Plan*. The *Property Owner* may determine the precise configuration and location of the *Golf Course(s)* and its/their accessory uses, in compliance with the *Agreement* and the *Plan*. The *Golf Course(s)*, including club houses and other accessory uses, shall not count against any of the other entitlement densities in this *Agreement*.

14. Intentionally Omitted.

15. Configuration and Location

The standards set forth in the Kiawah River Planned Development District Plan, attached hereto and incorporated herein by reference as Appendix A, shall control the configuration and location of vested rights and uses on the *Real Property* or any portion thereof. The conceptual illustrations or maps included in or attached as exhibits to this *Agreement* or the *Plan* are provided as examples only and shall not affirmatively bind the *Property Owner*. The planned *Development* is subject to change within the legal guidelines of this *Agreement* and the *Plan*, and the conceptual illustrations and maps included herein and attached hereto are therefore not commitments or representations to the *County* or any third party. The *Property Owner* may determine the precise configuration, names, acreage, amounts and location of any vested rights and uses in compliance with this *Agreement* and the *Plan*.

16. Facilities and Services

A. Generally: This section addresses the *Facilities*, including public infrastructure improvements, which are necessary to support the *Development.* The *Property Owner* shall only be responsible for those specific *Facilities* that the *Property Owner* expressly undertakes to install and maintain herein. The remainder of the *Facilities* listed herein shall be installed and maintained by the applicable service providers. Accordingly, letters of coordination with each of these service providers are included in Appendix F.

B. Certification of Completion Concurrent with Impact: Although the nature of this long term *Project* prevents the *Property Owner* from now providing exact completion dates, the *Property Owner* certifies that the specific services and *Facilities*, including public infrastructure improvements, that the *Property Owner* expressly undertakes to install will be in place, or if not fully in place, the cost of their construction fully bonded or letter of credit posted at a sufficient time to ensure availability concurrent with the impacts of the *Development* and consistent with the Schedule of *Development* set forth herein. Subject to compliance with applicable law and with all provisions of the *Agreement*, the *County* hereby authorizes the *Property Owner* to install all *Facilities* which the *Property Owner* has undertaken to provide herein.

C. Economic Impact Analysis: The *Property Owner* has procured an extensive economic and fiscal impact analysis of the proposed *Development*, prepared by The Regional Dynamics and Economic Modeling Laboratory at the Strom Thurmond Institute of Government at Clemson University and attached hereto as Appendix C. Further, a more detailed analysis of the fiscal impact of the *Project* on governmental services and infrastructure, as well as a capital improvements program designed to implement necessary infrastructure improvements as the *Project* progresses, is attached hereto as Appendix D (The Fiscal Impact of Kiawah River Plantation on Charleston County, dated December 18, 2009). Both of these analyses project a positive net fiscal impact for the *County*, with additional revenue received by the *County* as a result of the *Development* more than sufficient to cover the additional expenditure burden for the *County* generated by the *Development.*

D. Traffic Considerations

1. Traffic Study and Mitigation Plan: The *Property Owner* has procured a Traffic Impact Analysis and Mitigation Plan prepared by Kubilins Transportation Group, Inc., a copy of which is attached hereto as Appendix E. This study analyzes the traffic operations within the area of influence and provides recommended access management for the site and intersection improvements needed for mitigating traffic impacts .A proof-of-coordination letter with *DOT* is also included in Appendix F, attached hereto.

2. Scope of Study: The area of influence of the study site, as indicated by *DOT*, includes the following four (4) existing and one (1) proposed intersections:

a. Maybank Highway (SC 700) and River Road (S-10-91) (signalized);

b. Maybank Highway (SC 700) and Bohicket Road/Main Road (S-10-20) (signalized);

c. Bohicket Road/Betsy Kerrison Parkway and River Road (S-10-20) (signalized);

d. River Road (S-10-91) and Mullet Hall Road/Site Access (unsignalized); and

e. Betsy Kerrison Parkway and Village Site Access (proposed signal)

3. Site Access: The *Development* will be served by two (2) full-movement access points. The primary access point for the *Development* will be located at Betsy Kerrison Parkway. The secondary access point for the *Development* will be located at Mullet Hall Road. There are no recommended improvements to Mullet Hall Road. However, the following improvements are recommended to ensure proper site access at Betsy Kerrison Parkway:

a. Construct a full-movement access drive with one (1) ingress lane and two (2) egress lanes. The egress lanes should be configured as a separate left turn lane with 150 feet of storage and the through lane shall terminate as a right turn lane. 150 feet of internal protected storage should also be provided.

b. Construct a dedicated left-turn lane on the southbound approach of Betsy Kerrison Parkway with 150 feet of storage with appropriate tapers.

c. Construct a dedicated right-turn lane on the northbound approach of Betsy Kerrison Parkway with 100 feet of storage with appropriate tapers

d. Install traffic signal control upon meeting the appropriate MUTCD and SCDOT traffic signal control warrants.

The *Property Owner* shall construct or finance the construction of the above-stated improvements (or such other improvements as shall be recommended in consultation with *DOT*) after obtaining all applicable permits and approvals from *DOT* as these improvements are deemed necessary by *DOT*. The *Property Owner* shall complete the first three (a-c) of the above-stated improvements concurrently with the completion of Phase 1 construction. The *Property Owner* shall complete the final recommended improvement (d) when required in coordination with *DOT*. The *Property Owner* will dedicate any applicable public improvements associated with this primary access point to the public for maintenance in accordance with applicable law and provide any applicable maintenance bond in coordination with *DOT*.

4. Initial Development Capacity: The study analyzed the amount of development and resultant traffic that can be handled without operational impacts to the major facilities and intersections on Johns Island. The analysis determined that the following amount of development could be constructed over the next several years without any significant impact to the intersections or roadway network that would require improvements:

- 105 single family homes
- 315 recreational homes
- 40 workforce apartments
- 350 guest rooms
- 35,000 square feet of *GLA* in the Bohicket Station Tract, as delineated in Exhibit 4.1 of the *Plan*
- 20,000 square feet of *GLA* within the River Village Tract, as delineated in Exhibit 4.1 of the *Plan*
- An 18-hole golf course

Further, Kublins Transportation Group, Inc. has prepared a land-use equivalency matrix, attached hereto as Appendix E-1, which permits a ready conversion of the traffic impact (number of peak hour trips generated) from one proposed use to another. The *Property Owner* shall fund an independent supplemental traffic study (the cost of which shall not exceed $20,000.00) and provide a proposed mitigation and implementation plan for the *County's* review and approval after the *Development* has reached 2/3 of the "Initial Development Capacity" set forth in the initial traffic impact analysis, prepared as part of this *Agreement*, as such "Initial Development Capacity" may be converted by Appendix E-1.

E. The Project's Thoroughfares:

1. Definition: "*Thoroughfare*" means a way for use by vehicular and pedestrian traffic and to provide access to *Lots* and open space, consisting of vehicular lanes and their adjacent rights-of-way.

2. *County* Road Construction Standards: Notwithstanding any provision in the *Agreement* or the *Plan* which may be construed to the contrary, the *Property Owner* shall comply with the standards for public roads set forth in the *County* Road Construction Standards, described in the *ZLDR*, with respect to any *Thoroughfares* the *Property Owner* intends to dedicate to the public. The *Agreement* and the *Plan* shall not be construed to supersede or contravene the *County* Road Construction Standards described in the *ZLDR* with respect to any *Thoroughfares* the *Property Owner* intends to dedicate to the public.

3. Design and Installation: The *Property Owner* shall develop and install *Thoroughfares* and their related infrastructure on the *Real Property*. The *Property Owner* may develop any or all of the *Thoroughfares* on the *Real Property* as public or private; provided, however, any *Thoroughfares* to be offered for dedication to the public will comply with the *County* Road Construction Standards described in the *ZLDR*.

4. Private *Thoroughfares*: Exhibits 11.1 and 11.2 to the *Plan* provide an illustration of the typical private *Thoroughfare* sections which may be implemented on the *Real Property*, including typical utility placements within private *Thoroughfares*. Exhibit 11.3 to the *Plan* shows the vehicular lanes and parking assemblies which may be utilized for private *Thoroughfares* on the *Real Property* or designated portions thereof. Exhibit 11.4

to the *Plan* shows the conceptual road framework which may be implemented for private *Thoroughfares* on the *Real Property*. Notwithstanding those exhibits, the *Property Owner* may determine the precise configuration and location of any and all private *Thoroughfares* on the *Real Property*; provided, however, the *Property Owner* has a qualified engineer determine that their configuration and location does not present a significant safety hazard.

5. Ownership and Maintenance: The *Property Owner*, a related entity, and/or a duly constituted *Association* shall perform the maintenance and upkeep on any and all *Thoroughfares* on the *Real Property* or any portion thereof unless they have been dedicated to and accepted by the public in conformity with the *County* Road Construction Standards described in the *ZLDR*. All alleys shall be maintained and owned by the *Property Owner*, a related entity, or an *Association.*

6. Paving: Any and all public *Thoroughfares* installed on the *Real Property* shall be paved in accordance with the *County* Road Construction Standards, described in the *ZLDR*. To preserve the existing rural character of the *Real Property* or portions thereof, the *Property Owner* may retain existing unpaved, private *Thoroughfares* and/or install other unpaved, private *Thoroughfares* on the *Real Property* or portions thereof.

7. Internal Access: The *Property Owner* may limit access to private *Thoroughfares* on the *Real Property* or portions thereof through the use of a security gate or other similar method. Access to public *Thoroughfares* may NOT be similarly limited. All *Thoroughfares* on the *Real Property*, whether public or private, shall have direct or indirect access to Betsy Kerrison Parkway and Mullet Hall Road.

8. Construction Access: Construction traffic will be routed along Mullet Hall Road, at the location illustrated in Exhibit 14.1 to the *Plan*. Prior to construction of Phase 1, the *Property Owner* shall finance an inspection of Mullet Hall Road to determine and record its current condition. The *Property Owner* will provide a report defining the base line condition of Mullet Hall Road and providing an ultimate road section recommendation to accommodate projected traffic for build-out of the *Project*. This report will be submitted to *DOT* for review and approval. The *Property Owner* will then provide *DOT* with an engineer-certified construction cost estimate for any repairs and other improvements needed as specified in the report, as well as a letter of credit or bond ensuring the work will take place within a mutually agreeable time frame. The *Property Owner* will continue to coordinate any improvements or maintenance of Mullet Hall Road with *DOT* during the *Project*. The Charleston County Parks and Recreation Commission, which uses Mullet Hall Road for primary access to the Johns Island County Park and Mullet Hall Equestrian Center, has consented to this procedure via letter of coordination attached to the *Plan* as Exhibit 11.5.

9. Connections with Adjacent Properties: The *Property Owner* shall use best efforts to facilitate a connection with adjacent parcels at the approximate locations illustrated in Exhibit 4.1 to the *Plan*. The *Property Owner*'s obligation under this section shall not require that the *Property Owner* purchase or otherwise finance the acquisition of any right, title, or interest in and to these adjoining properties. The *County* recognizes the *Property*

Owner's abilities under this section are highly dependent upon and constricted by the actions or inactions of third parties.

F. Community Ways: As used herein, a "*Community Way*" means a walkway of any surface type (paved or unpaved), a bicycle lane, bicycle route, bicycle trail, leisure trail, or walking trail designed for pedestrian or bicycle traffic. The *Property Owner* shall install an interconnected system of *Community Ways* on the *Real Property*. The *Property Owner* may determine the configuration, location, type, number, size, location, lighting and path surfaces of private *Community Ways* on the *Real Property*. However, any and all public *Community Ways* shall comply with the *County*'s Improvement Standards, as they exist on the *Effective Date*. The *Property Owner* shall use best efforts to facilitate a connection with adjacent parcels at the approximate locations delineated in Exhibit 4.1 to the *Plan*. The *Property Owner*'s obligation under this section shall not require that the *Property Owner* purchase or otherwise finance the acquisition of any right, title, or interest in and to these adjoining properties. The *County* recognizes the *Property Owner*'s abilities under this section are highly dependent upon and constricted by the actions or inactions of third parties. Any and all *Community Ways* designed and constructed by the *Property Owner* may (1) be owned and maintained as *Common Areas*; (2) be owned and maintained by the *Property Owner* or a related entity; or (3) be dedicated to the public. The *Property Owner*, a related entity, and/or a duly constituted *Association* shall perform the maintenance and upkeep of the *Community Ways* on the *Real Property* or any portion thereof unless they have been dedicated to and accepted by the public. Upon tender of a deed from the *Property Owner* approved by the *County* attorney, the public may accept any and all *Community Ways* tendered for dedication by the *Property Owner* provided they comply with the *County*'s Improvement Standards, as they exist on the *Effective Date*.

G. Golf Carts and Personal Transportation Vehicles: Golf carts and personal transportation vehicles may be used on any *Thoroughfares*, causeways, *Community Ways*, and parking areas of the *Real Property* or any portion thereof that the *Property Owner* may designate, if consistent with state law.

H. Wastewater Treatment: The *Property Owner* will provide suitable wastewater treatment or septic to all *Lots* and *Dwelling Units* on the *Real Property* pursuant to the *Agreement* after obtaining all applicable permits and approvals from regulatory agencies and governmental entities. Any wastewater treatment system shall be subject to best management practices. The proposed wastewater treatment facility will comply with the Charleston County 208 Water Quality Management Plan and all BCDCOG and SCDHEC requirements, including the SCDHEC permitting requirements that the *Property Owner* provide financial protections for the continued economic viability of the system and that the system be managed by a class A licensed operator.

I. Potable Water: St. John's Water Company will provide potable water to all *Lots* and *Dwelling Units* on the *Real Property* pursuant to the *Agreement* after obtaining all applicable permits and approvals from regulatory agencies. Water supply for the *Development* will be via two (2) connections: (1) an existing, twenty-four-inch (24") diameter water transmission main on Betsy Kerrison Boulevard; and (2) an existing six-inch (6") diameter water main on Mullet Hall Road. The existing water main on Mullet Hall Road will likely need to be upsized in the future to supply sufficient fire-flow. The new system will be designed and constructed to supply sufficient fire suppressing flow based on the requirements of the Insurance Services Office (ISO), as well as

the Charleston County Building Department. A Preliminary Master Water Plan is attached to the *Plan* as Exhibit 14.1. Prior to the construction of Phase 1, a more in-depth water model will be created in order to properly size all mains. The new water distribution system will be designed to meet the requirements of the St. Johns Water Company and *DHEC*. Applicable impact fees will be paid to St. Johns Water Company in order to offset any capital improvement upgrades that will be needed for the system. A proof-of-coordination letter with St. Johns Water Company is included in Appendix F. Unless otherwise provided with respect to *Lots* served by a well, the *Property Owner* shall design and construct facilities necessary for the transmission and distribution of potable water to all *Lots* and *Dwelling Units* on the *Real Property*. The *Property Owner* shall transfer facilities for the transmission and distribution of potable water, including necessary easements, to St. Johns Water Co.

J. Drainage:

1. Stormwater Master Plan: A Stormwater Master Plan for the *Real Property* is attached hereto as Appendix H. The *Property Owner* shall provide sufficient drainage for the *Development* of the *Real Property*. The *Property Owner* shall not impair or diminish the drainage currently flowing through the *Real Property*. The *Property Owner* shall not impede such drainage during construction or during land disturbance activities on the *Real Property* and shall provide comparable drainage at a substitute location, if necessary.

2. *County* Stormwater Ordinance: Notwithstanding any provision in the *Agreement* or the *Plan* which may be construed to the contrary, the *Property Owner* shall comply with the standards for drainage set forth in the *County* Stormwater Ordinance. The *Agreement* and the *Plan* shall not be construed to supersede or contravene the *County* Stormwater Ordinance.

3. Coordination with *County* Public Works Department: The *Property Owner* will continue to coordinate with the Stormwater Division of the *County's* Public Works Department to ensure that all publicly dedicated, constructed and accepted drainage-related capital improvements (or portions thereof) and operating expenses directly attributable to the *Project* and the *Development* are paid for through property tax revenue or other revenues generated from the *Development* during the build-out of the *Project* and concurrent with impacts from the *Development*, as well as to ensure that all improvements constructed on the *Real Property* comply with the *County's* Stormwater Ordinance. The *Property Owner* shall obtain all applicable permits and approvals relating to drainage before beginning each phase of the *Project.*

4. Maintenance: Any and all drainage infrastructure designed and constructed by the *Property Owner* may (1) be owned and maintained as *Common Areas*; (2) be owned and maintained by the *Property Owner* or a related entity; or (3) be dedicated to the public. The *Property Owner*, a related entity, and/or a duly constituted *Association* shall perform the maintenance and upkeep of the drainage infrastructure and facilities on the *Real Property* or any portion thereof unless they have been dedicated to and accepted by the public.

K. Septic Tanks and Wells: The *Property Owner* may install septic systems and/or wells for drinking water to service *Lots* and *Dwelling Units* on the *Real Property* or portions thereof provided the septic systems and/or wells for drinking water meet state regulatory requirements. The number of *Lots* or *Dwelling Units* on the *Real Property* serviced by wells and/or septic systems shall not exceed any applicable state regulatory requirements. Any such *Lots* and *Dwelling Units* on the *Real Property* that are serviced by a septic system or well meeting applicable regulatory requirements shall not be considered non-conforming under the *County*'s *Laws* because of such septic system or well.

L. Streetlights: The *Property Owner* shall have the right to decide the location, design and number of streetlights, if any, on the *Real Property*. Any and all streetlights designed and installed on the *Real Property* may (1) be owned and maintained as *Common Areas* or (2) be owned and maintained by the *Property Owner* or a related entity. If the location of any streetlight is to be in a public right-of-way, the location must be approved by the *County*'s Director of Public Works.

M. Stoplights, Traffic Control, and Other Street Signage: The *Property Owner* may determine the configuration and location of all street and traffic control signs on the *Real Property*, the standards of which shall be determined in consultation with *DOT*. All traffic control devices within a public or private right-of-way must meet the requirements of the Manual on Uniform Traffic Control Devices.

N. Parks, Common Spaces and Buffers on the *Real Property*: Certain portions of the *Real Property* may contain parks, common spaces, and buffers. The *Property Owner* reserves the right to limit access and use of these to select owners, tenants or lessees on the *Real Property*, their guests, and others who may be their invitees.

O. Solid Waste Collection: Trash collection will be provided by the *Property Owner* for all residential, commercial, institutional, retail and office parcels on the *Real Property*. Trash collection for single-family parcels will be curb-side. Trash collection will be from a central location, such as a Dumpster, for each separate multi-family, commercial, institutional, retail, or office site on the *Real Property*. These Dumpsters (or other containers) will be located out-of-sight in approved areas with appropriate access and screening. A proof-of-coordination letter with Suburban Disposal Services is included in Appendix F. The *Property Owner* will continue to work with the Charleston County Environmental Management Department to coordinate solid-waste related activities.

P. Education: The *Development* will be served by the Charleston County School District and area private schools. The *Development* is planned to be similar in scope and nature to the Kiawah Island and Seabrook communities. The *Development* is expected to generate 39 new students who attend school in the district by the time of full build-out at year 20. A proof-of-coordination letter was received from the Charleston County School District stating that "all of the referenced schools currently have capacity on site to serve students in their attendance zones." A copy of this letter is included in Appendix F.

Q. Police: All access drives and parking areas will be lighted to improve security and reduce vehicle thefts. The proposed *Development* will foster community involvement, which will

aid in the prevention of crime through citizen activism. Also, the proposed traffic improvements referenced in Appendix E should maintain or improve current response times to this and adjacent sites. A proof-of-coordination letter with the Charleston County Sheriff's Office is included in Appendix F.

R. Fire Protection: All access roads and parking areas will be constructed to facilitate fire equipment access. Representatives of the *Property Owner* have coordinated with the St. John's Fire Department to discuss the *Development*, including proposed road sections. The *Property Owner* will continue to coordinate with St. Johns Fire Department through the life of this *Agreement*. The *Property Owner* will provide capital items as stated in Section 16(X) of this *Agreement*.

S. Emergency Medical Services: Charleston County EMS provides emergency medical services to the citizens of Charleston County. A proof-of-coordination letter with Charleston County EMS is included in Appendix F.

T. Utilities: Utilities, such as electrical and gas services, cable television, high speed internet access, and telephone service, shall be made available and maintained by the appropriate service providers. All utilities shall be installed underground. The *Property Owner* shall furnish necessary easements to utility providers for water, sewer, gas, electricity, telephone, cable television, and other utilities. Adequate easements for utilities shall be reserved by the *Property Owner* in conveyances of *Lots*, *Dwelling Units*, and *Development Parcels*. The location and size of such easements shall be determined by the *Property Owner* in consultation with the applicable service provider. Letters of coordination from Berkeley Electric Cooperative, Inc., Comcast, and Bellsouth are included in Appendix F.

U. *Common Area* Maintenance: Any *Association* established with respect to the *Real Property* or any portion thereof shall be responsible for maintaining the *Common Areas*, as described in any applicable *Covenants* and/or the *Agreement*.

V. Hurricane Preparedness Plan: The *Property Owner* has procured a Hurricane Evacuation Plan, which is attached hereto as Appendix I. The *Property Owner* will coordinate with the Charleston County Emergency Preparedness Division and the South Carolina Emergency Management Division to ensure that the *Development* complies with applicable laws and regulations.

W. Town of Kiawah Island: The *Property Owner* has conferred with the Town of Kiawah Island, the only municipality adjacent to the *Real Property*, which supports the *Project*. Furthermore, the *Property Owner* has conferred with the nearby municipality of Seabrook Island. Proof-of-coordination letters with the Town of Kiawah Island and Seabrook Island are included in Appendix F.

X. Mitigation Provided Directly by the *Property Owner* to the *County*: The *Property Owner* shall provide the following amounts to mitigate the impact of the Development:

1. Ladder Truck: The *Property Owner* will pay $800,000 or the actual cost, whichever is lesser, towards the purchase of a ladder truck to service the *Real Property* for

St. John's Fire District on or before obtaining a building permit for the construction of any building on the *Real Property* requiring a ladder truck according to National Fire Prevention Association requirements.

2. Dedication of Land: During the term of this *Agreement*, the *Property Owner* shall set aside three (3) highland acres of the *Real* Property at a mutually agreeable location(s). At such time as the *County* requests the use of any or all of this acreage for the construction of a substation(s) for the use of St. John's Fire District, the Charleston County Sheriff's Office, the Charleston County Magistrate's Office, Charleston County EMS, and/or any other police, fire or EMS service which may acquire jurisdiction over the *Real Property* after the *Effective Date* (provided, however, the site(s) shall not be used solely by the Charleston County Magistrate's Office), the *Property Owner* shall dedicate the such acreage to the *County* as necessary for such use(s). If the *County* does not construct a substation on the dedicated site(s) within three (3) years of the dedication, the dedicated site(s) shall revert back to the *Property Owner*; provided, however, the *Property Owner* shall continue to hold the site(s) as set forth in this Paragraph 16.X.2 and all of the *County's* rights in this Paragraph 16.X.2 shall continue until the termination of this *Agreement.* The *County* may not request such dedication until after a certificate of occupancy has been issued for the 200th *Dwelling Unit*, unless otherwise agreed by the *Parties.*

17. Natural Resource Protection and Preservation

A. Cultural Resources Survey: The *Property Owner* has procured a Cultural Resources Survey of Mullet Hall Plantation, Johns Island, Charleston County, South Carolina, prepared by the Chicora Foundation, Inc., attached hereto as Appendix J. The study examined archaeological sites and cultural resources found on the *Real Property*.

1. Cemeteries: Three (3) cemeteries, designated in the study as 38CH1540, 38CH1548, and 38CH1549, will not be developed except as provided herein. Additionally, as recommended in the study, 38CH1540 will have a fifty foot (50') minimum buffer, 38CH1548 will have a twenty-five foot (25') minimum buffer, and 38CH1549 will have a fifty foot (50') minimum buffer. All three cemetery sites will have construction fences erected for their protection during all phases of construction activity. As further recommended in the study, the *Property Owner* will remove all trees in the cemeteries of 5-inches DBH or less in diameter. The remaining trees will be pruned for crown cleaning and overall restoration. No tree survey or other *County* permits shall be required for such clearing and restoration.

2. Archaeological Resources: Upon review and approval by the State Historic Preservation Office ("SHPO"), eligible and potentially eligible archaeological resources may be either green spaced (preserved in place) or subjected to additional investigation (data recovery in the case of eligible sites or additional testing in the case of potentially eligible sites). With additional testing, the potentially eligible sites may be designated as either eligible or not eligible. Contractors shall be advised to report the discovery of any archaeological remains encountered during construction activities to the *Project* engineer, who should, in turn, report the find to SHPO. No further land-altering activities shall take

place in the area of the discovery until they have been examined by an archaeologist and, if necessary, processed.

B. Memorandum of Agreement: The *Property Owner* will enter into a Memorandum of Agreement with *DHEC* and SHPO, a proposed draft of which is attached hereto as Appendix K, to certify the consistency of the *Development* with the Coastal Zone Management Plan and to mitigate potential impacts of the *Development* on sites which are eligible for, potentially eligible for, or currently listed in the National Register of Historic Places. The *Property Owner* will continue to coordinate with *DHEC* and SHPO to ensure that applicable natural and cultural resource areas on the *Real Property* are investigated, preserved and protected pursuant to state and federal law.

C. Threatened and Endangered Species Assessment: The *Property Owner* has procured a Threatened and Endangered Species Assessment, prepared by Newkirk Environmental, Inc., which, together with a May 21, 2009, update of this assessment, is attached hereto as Appendix L. The assessment was conducted to determine the occurrence of, or potential for, animal and plant species federally listed as endangered or threatened to exist within the *Real Property*. Completion of this survey complied with current state and federal regulations, including the Federal Endangered Species Act, the Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act, and the South Carolina Non-Game and Endangered Species Conservation Act. Field surveys have documented the presence of two (2) bald eagle nests within the boundaries of the *Real Property*. As a result, coordination with the Department of Natural Resources and the United States Fish & Wildlife Service is on-going in an attempt to establish guidelines for activities near the active nests. The proposed *Development* shall comply with these guidelines.

D. Flora and Fauna: The *Property Owner* will use best efforts to maintain and enhance the native plant material on the *Real Property*. Additional considerations in *Lot* configurations will be made to maintain wildlife corridors that connect this property with the surrounding natural environment.

18. Development Schedule for the *Project*

A. Commencement Date: The *Project* will be deemed to commence *Development* upon the *Effective Date*.

B. Interim Completion Dates: The *Property Owner* estimates that during the years after the *Effective Date*, the following percentages of the undeveloped highland within the *Real Property* will be developed pursuant to the *Plan*:

Year	Percentage Complete
5	0-25%
10	26-50%
15	51-75%
20	76-100%

As such, a generalized phasing plan for the *Real Property*, showing a conceptual illustration of the *Development* which may be implemented on the *Real Property* 5 years, 10 years, 15 years, and 20 years after the *Effective Date* of the *Agreement* is attached to the *Plan* as Exhibit 7.1.

C. Completion Date: The *Property Owner* projects that the *Project* should be substantially completed (i.e. essentially all structures erected and/or all necessary infrastructure in place to serve the intended uses) twenty (20) years from the *Effective Date*.

D. Modification of Commencement or Completion Date: The *County* recognizes the *Development* on the *Real Property* will include a variety of uses and that demand, cost, environmental factors, and other pertinent financial and feasibility considerations fluctuate. Accordingly, the commencement date and schedule of completion set forth in this *Agreement* are estimates only. The timing of the actual *Development* of the *Project* will likely differ because of the multiple variables influencing it. The *Parties* agree that the commencement date, interim completion dates, and completion date are therefore subject to modification and that the *Property Owner* may provide to the *County* updated schedules which shall not constitute an amendment of this *Agreement* triggering the process for approval of amendments set forth in this *Agreement*.

E. Failure to Meet Commencement or Completion Date: The *Property Owner*'s failure to meet the commencement date, an interim completion date, or the completion date shall not, in and of itself, constitute a material breach of this *Agreement* pursuant to section 6-31-90 of the South Carolina Code, but must be judged based on the totality of circumstances.

19. Term of the *Agreement*

A. Term: Pursuant to section 6-31-40 of the South Carolina Code, this *Agreement* shall expire twenty (20) years from the *Effective Date* unless extended pursuant to the remaining provisions of this Paragraph. The date of the expiration of the term of this *Agreement* is the termination date.

B. Extension of Term: If the *Property Owner* provides to the *County* a written certification during the initial or the first extension term of this *Agreement* but no later than ninety (90) days prior to the termination date that the gross highland acres within the *Real Property* then owned by the *Property Owner*, and/or an entity or entities that have substantially the same ownership as the *Property Owner*, is twenty-five acres or more, the *County*, the *Property Owner*, and/or such entity or entities shall enter an amendment to this *Agreement* extending the term for an additional five (5) year term from the date of certification; provided, however, the *Property Owner* is not in material breach of the *Agreement*. The *Property Owner* may exercise up to two such five-year extensions. Nothing in this *Agreement* shall be interpreted to preclude the *Parties* from extending the termination date by mutual *Agreement* or from entering into subsequent Development Agreements.

20. Intentionally Omitted.

21. Submission List

The following package of documents, exhibits, and appendices has been submitted simultaneously with this *Agreement* and is incorporated herein:

Development Agreement
- Exhibit 1.1-Definitions
- Exhibit 4.1-Legal Description
- Exhibit 4.2-Plat
- Exhibit 4.3-Acreage Breakdown
- Exhibit 4.4-Deed No. 1
- Exhibit 4.5-Deed No. 2
- Exhibit 4.6-Deed No. 3
- Exhibit 4.7-CCPRC Easement Agreement
- Exhibit 4.8-Berkeley Electric Easement Agreement
- Exhibit 4.9-Wetland Survey

Appendices
- Appendix A-The Kiawah River Planned Development District Plan (with exhibits)
- Appendix B-ZLDR, as modified
- Appendix C-Economic Impact Analysis
- Appendix D-Capital Improvements Program/Fiscal Impact Analysis
- Appendix E-Traffic Impact Analysis and Mitigation Plan
- Appendix E-1-Land Use Equivalency Matrix
- Appendix F-Letters of Coordination with Local Government Entities
  - 1-DOT
  - 2-BCDCOG
  - 3-St. John's Water Co.
  - 4-Suburban Disposal Services
  - 5-Charleston County School District
  - 6-Charleston County Sherriff's Office
  - 7-St. John's Fire Department
  - 8-Charleston County EMS
  - 9-Berkeley County Electric Cooperative, Inc.
  - 10-Comcast
  - 11-BellSouth
  - 12-Town of Kiawah Island
  - 13-Charleston County Parks and Recreation Commission
  - 14-Town of Seabrook
- Appendix G-Intentionally Omitted
- Appendix H-Stormwater Master Plan
- Appendix I-Hurricane Evacuation Plan
- Appendix J-Cultural Resource Survey
- Appendix K-Proposed Memorandum of Agreement with DHEC and SHPO
- Appendix L-Threatened and Endangered Species Assessment with May 21, 2009 Addendum
- Appendix M-Intentionally Omitted
- Appendix N-Letter of Receipt from the Corps

22. Amending or Canceling the *Agreement*

Subject to the provisions of section 6-31-100 of the South Carolina Code, this *Agreement* may be amended or canceled in whole or in part only by mutual written consent of the *Parties* or their successors in interest and, in the case of the *Property Owner*, its successors in legal title. Any amendment to this *Agreement* shall comply with the provisions of section 6-31-100. If an amendment affects less than all the persons and entities comprising the *Property Owner*, then only the *County* and those affected persons or entities who are *Property Owner*s need to sign such written amendment for it to be effective. Any provision of this *Agreement* requiring consent or approval of one of the *Parties* shall not require amendment of this *Agreement*, unless the text expressly requires amendment. Wherever said consent or approval is required, the same shall not be unreasonably withheld. Pursuant to section 6-31-60(B) of the South Carolina Code, a major modification of this *Agreement* shall occur only after public notice and a public hearing by the *County*.

23. Modifying or Suspending the *Agreement*

Pursuant to section 6-31-130 of the South Carolina Code, in the event state or federal laws or regulations, including state or federal laws or regulations enacted after the *Effective Date*, prevent or preclude compliance with one or more provisions of this *Agreement*, the pertinent provisions of this *Agreement* shall be modified or suspended as may be necessary to comply with such state or federal laws or regulations.

24. Periodic Review

Pursuant to sections 6-31-40 and 6-31-90(a) of the South Carolina Code, the *County*'s *Planning Director* shall review the *Project* and this *Agreement* every twelve months to determine the *Property Owner*'s good faith compliance with the terms of this *Agreement*. If, as a result of its periodic review, the *County* finds and determines that the *Property Owner* has committed a material breach of the terms or conditions of this *Agreement*, the *County* shall serve notice in writing upon the *Property Owner* setting forth with reasonable particularity the nature of the breach and the evidence supporting the finding and determination, and providing the *Property Owner* a reasonable time in which to cure the material breach. If the *Property Owner* fails to cure any material breach within the time given, then the *County* unilaterally may terminate or modify this *Agreement*; provided, that the *County* has first given the *Property Owner* the opportunity: (1) to rebut the *County*'s finding and determination; or (2) to consent to amend this *Agreement* to meet the concerns of the *County* with respect to the findings and determinations.

25. Severability

Subject to the provisions of section 6-31-150 of the South Carolina Code, if any word, phrase, sentence, paragraph or provision of this *Agreement* shall be finally adjudicated to be invalid, void, or illegal, it shall be deleted and in no way affect, impair, or invalidate any other provision hereof.

26. Merger

This *Agreement*, coupled with its exhibits, which are incorporated herein by reference, shall state the final and complete expression of the *Parties*' intentions. All prior negotiations and representations are superseded and merged herein.

27. Contingencies

This *Agreement* and the *Plan* are contingent upon (1) their execution and approval in this form by the *Parties*; and (2) the *County*'s zoning of the *Real Property* as a planned development district (with this Appendix A to this *Agreement* constituting the development plan).

28. Cooperation

The *Parties* hereto agree to cooperate with each other to effectuate the provisions of this *Agreement* and to act reasonably and expeditiously in all performances required under the *Agreement*. In the event of any legal action instituted by a third party or other governmental entity or official challenging the validity of any provision of this *Agreement*, the *Parties* hereby agree to cooperate in defending such action. Such cooperation does not require, in the event of such challenge, that a party to this *Agreement* shall pay for the expense of litigation for any other party.

29. Governing Law

This *Agreement* shall be construed and enforced in accordance with the laws of the State of South Carolina.

30. Remedies/Non-Binding Arbitration

A. Remedies: If there is a material breach of this *Agreement*, the non-breaching party may pursue all available legal and equitable remedies. Each party recognizes that the other party may suffer irreparable harm from a material breach of this *Agreement* and that no adequate remedy at law may exist to enforce this *Agreement*. Consequently, the *Parties* agree that any non-breaching party who seeks enforcement of the *Agreement* may seek the equitable remedies of injunction and specific performance. The *County* will look solely to the *Property Owner* as to any rights it may have against the *Property Owner* under this *Agreement*, and hereby waives any right to assert claims against members, officers, managers, employees, agents, and contractors of the *Property Owner*, and further agrees that no member, officer, manager, employee, agent, and contractor of the *Property Owner* has any personal, joint, or several liability under this *Agreement*. Likewise, the *Property Owner* agrees to look solely to the *County*'s assets as to any rights it may have against the *County* under this *Agreement*, and hereby waives any right to assert claims for personal liability against individuals acting on behalf of the *County*, its *County Council* members, officers, agencies, boards, or commissions.

B. Non-Binding Arbitration: If there is a dispute between the *County* and the *Property Owner* concerning the terms, meaning, interpretation, rights or obligations under this *Agreement*, the *Parties* agree to submit such issue(s) to prompt non-binding arbitration before invoking legal proceedings. This non-binding arbitration shall be initiated by one party's notifying the other in

writing of the dispute and that party's request for non-binding arbitration as described herein. Each side shall within five (5) days of receipt of such notice pick an arbitrator and these two (2) arbitrators shall pick the third. The *Parties* shall then promptly convene a conference with the arbitration panel and present their positions. In this conference, the rules of evidence and other legal formalities shall not apply; positions may be stated and need not be presented through testimony, exhibits, or evidence. The majority of the arbitrators shall promptly render their decision. Upon the rendering of the arbitration panel's decision, either side may then immediately pursue proceedings for legal or equitable remedies. The *Parties* shall each bear the cost of its appointed arbitrator and equally share the cost of the third arbitrator and any separate expenses associated with the arbitration conference.

31. Recording

Within fourteen (14) days after execution of this *Agreement*, the *Property Owner* shall record the *Agreement* with the Charleston County Register of Mesne Conveyances against the *Real Property* described in Paragraph 4 of this *Agreement*. The provisions contained herein shall be deemed to run with the land. The burdens of this *Agreement* are binding upon, and the benefits of this *Agreement* shall inure to, all successors in interest, successors in title, and assigns of the *Parties* to this *Agreement*.

32. Third Parties

Notwithstanding any provision herein to the contrary, this *Agreement* shall not be interpreted to create or bestow any rights, remedies, or obligations on persons or entities that are not *Parties* or successors or assigns to this *Agreement* under Paragraph 33 of this *Agreement*.

33. Successors and Assigns

A. Binding Effect: This *Agreement* shall be binding on the personal representatives, successors in interest, successors in title, and assigns of the *Property Owner* in the ownership or *Development* of any portion of the *Real Property* or the *Project*. A purchaser or other successor in title of any portion of the *Real Property* shall be responsible for performance of the *Property Owner*'s obligations hereunder as to the portion of the *Real Property* so transferred and shall have the rights afforded to the *Property Owner* hereunder with respect to the portion of the *Real Property* conveyed. The *Property Owner* shall be released from obligations under this *Agreement* upon the sale of *Tracts, Lots* or *Development Parcels* as to the property conveyed, and the purchaser shall become the responsible party with regard to this *Agreement* as to the *Tract*, *Lot* or *Development Parcel* so conveyed. This *Agreement* shall also be binding on the *County* and all future *County Council*s for the duration of this *Agreement*, even if the *County Council* members change.

B. Transfer of *Real Property*: The *Property Owner* shall be entitled to transfer any portion or all of the *Real Property* to a purchaser(s) and assign its rights and obligations under this *Agreement*. If the *Property Owner* transfers to an unrelated third party a *Lot* or *Development Parcel* within the *Real Property* on which the *Property Owner* is required to provide and/or construct certain *Facilities*, then the *Property Owner* shall be required to obtain a written

Agreement from the purchaser expressly assuming all such separate responsibilities and obligations with regard to the *Lot* or *Development Parcel* conveyed and the *Property Owner* shall provide a copy of such *Agreement* to the *County*. Notwithstanding anything to the contrary contained herein, the exceptions and restrictions to transfer contained in this Paragraph shall not apply: (i) to any mortgage lender either as the result of foreclosure of any mortgage secured by any portion of the *Real Property* or any other transfer in lieu of foreclosure; (ii) to any third party purchaser at such a foreclosure; or (iii) to any third party purchaser of such mortgage lender's interest subsequent to the mortgage lender's acquiring ownership of any portion of the *Real Property* as set forth above. Furthermore, nothing contained herein shall prevent, hinder or delay any transfer of any portion of the *Real Property* to any such mortgage lender or subsequent purchaser. Except as set forth herein, any such mortgage lender or subsequent purchaser shall be bound by and shall receive the benefits from this *Agreement* as the successor in title to the *Property Owner* in accordance with this *Agreement*.

C. Release of *Property Owner*: In the event of the sale or other conveyance of all or a portion of the *Real Property* and compliance with the conditions set forth herein, the *Property Owner* shall be released from any further obligations with respect to this *Agreement* as to the portion of the *Real Property* so transferred, and the transferee shall be considered as substituted as the *Property Owner* under the *Agreement* as to the portion of the *Real Property* so transferred.

D. Estoppel Certificate: Upon request in writing from the *Property Owner* (or its successors or assigns) to the *County*, sent by certified or registered mail or publicly licensed message carrier, return receipt requested, the *County* will provide a certificate in recordable form that, solely with respect to the portion of the *Real Property* described in the request, there are no violations or breaches of this *Agreement*, except as otherwise described in the certificate. The *County* will respond to such a request and may employ such professional consultants, municipal, *County* and state agencies and staff as may be necessary to assure the truth and completeness of the statements in the certificate. The reasonable costs and disbursements of private consultants will be paid by the party making the request.

34. General Terms and Conditions

A. No Waiver: Failure of a party hereto to exercise any right hereunder shall not be deemed a waiver of any such right and shall not affect the right of such party to exercise at some future time said right or any other right it may have hereunder. Unless this *Agreement* is amended by vote of *County Council* taken with the same formality as the vote approving this *Agreement*, no officer, official or agent of the *County* has the power to amend, modify or alter this *Agreement* or waive any of its conditions as to bind the *County* by making any promise or representation not contained herein. Any amendments are subject to Paragraph 22 of this *Agreement*.

B. Entire *Agreement*: This *Agreement* constitutes the entire *Agreement* between the *Parties* and supersedes all prior *Agreements*, whether oral or written, covering the same subject matter. This *Agreement* may not be modified or amended except in writing mutually agreed to and accepted by both *Parties* to this *Agreement*.

C. Intentionally Omitted.

D. Notices: All notices hereunder shall be given in writing by certified mail, postage prepaid, at the following addresses:

1. Notice to the *Property Owner*:

c/o
Kiawah River Investment, LLC
Attention: John Darby
Post Office Box 242
Charleston, South Carolina 29402

With Copy to:

G. Trenholm Walker
Walker Gressette Freeman & Linton, LLC
Post Office Drawer 22167
Charleston, South Carolina 29413-2167

2. Notice to the *County*:

County of Charleston
Attention: Planning Director
Lonnie Hamilton, III Public Services Building
4045 Bridge View Drive, Suite A-314
Charleston, SC 29405-7464

With Copy to:

County of Charleston
Attention: County Attorney
Lonnie Hamilton, III Public Services Building
4045 Bridge View Drive, Suite B-314
Charleston, SC 29405-7464

The address for any party or person may be changed by proper notice to the other parties or persons involved.

E. Execution of *Agreement*: This *Agreement* may be executed in multiple parts as originals or by facsimile copies of executed originals; provided, however, if executed and evidence of execution is made by facsimile copy, then an original shall be provided to the other *Party* within seven (7) days of receipt of said facsimile copy.

IN WITNESS WHEREOF this *Agreement* has been executed, delivered, and sealed by the *Parties* on the day and year first above written.

WITNESSES:

COUNTY OF CHARLESTON

By: _____
Elliott Summey
Chairman, County Council

Attest: _____
Kristen Salisbury
Clerk to Council

WITNESSES:

KIAWAH RIVER INVESTMENT, LLC
By: Beach O'Hear Pointe, LLC
Its: Managing Member

By: The Beach Company
Its: Manager

By: _____
John C.L. Darby
Its: President and CEO

By: _____

Its: _____
Tyler E. Cooper
Vice President

STATE OF SOUTH CAROLINA)
COUNTY OF CHARLESTON)

ACKNOWLEDGMENT

THE FOREGOING INSTRUMENT was acknowledged before me by CHARLESTON COUNTY, SOUTH CAROLINA, by Elliott Summey, its Council Chairman, and Kristen Salisbury, its Clerk of Council, this 23rd day of March, 2020.

_____ (SEAL)

Kristen Brame
Notary Public for South Carolina
My Commission Expires: 5/7/24

K. BRAME NOTARY PUBLIC SOUTH CAROLINA My Comm. Exp. 05-07-2024

STATE OF SOUTH CAROLINA)
COUNTY OF CHARLESTON)

ACKNOWLEDGMENT

THE FOREGOING INSTRUMENT was acknowledged before me by KIAWAH RIVER INVESTMENT, LLC, by Beach O'Hear Pointe, LLC, its Managing Member, by The Beach Company, its Manager, by John C.L. Darby, its President and Chief Executive Officer, and TYLER E. COOPER, its VICE PRESIDENT, this 20th day of MARCH, 2020.

_____ (SEAL)

ELIZABETH W. KENNEDY
Notary Public for South Carolina
My Commission Expires: JUNE 10, 2021

ELIZABETH W KENNEDY NOTARY PUBLIC SOUTH CAROLINA MY COMMISSION EXPIRES JUNE 10, 2021

EXHIBIT 1.1

Definitions

The "*Act*" means the South Carolina Local Government Development Agreement Act, codified at sections 6-31-10 to -160 of the South Carolina Code.

"*Accessory Dwelling Unit*" means a dwelling unit, with no more than 800 square feet of gross floor area, that has been added to, onto, or created within, a single family house. This definition includes garage apartments. An *Accessory Dwelling Unit* may be detached from a single family house provided it complies with the conditions applicable to *Accessory Dwelling Units* in Appendix B to the *Agreement.*

"*Accessory Use*" means a use customarily incidental and subordinate to the principal use of a *Lot* or of a structure, or as allowed by the *ARB* in accordance with Article 6.5 of Appendix D, which is a red-line of the *ZLDR*. An *Accessory Use* is located on the same *Lot* as the principal use, except (i) in cases of off-street parking, temporary real estate sales office, and temporary construction facilities, and (ii) in cases of *Hotels* or *Inns* where *Accessory Uses* may be located on other *Lots*.

"*Active Recreation Area*" means any park, recreational facility, or recreational area which is not dependent upon a specific environmental or natural resource and which is developed with recreation and support facilities. An *Active Recreation Area* includes, but is not limited to, playgrounds, *Golf Courses*, bicycle trails, baseball or softball fields, football or soccer fields, basketball courts, swimming pools, clubhouses, water-dependent uses, equestrian facilities, pickle courts, racquetball courts, and tennis courts. *Active Recreation Areas* shall constitute open space.

"*Affordable Housing*" means, in the case of dwelling units for sale, housing in which mortgage, amortization, taxes, insurance, and condominium or association fees, if any, constitute no more than twenty-eight percent (28%) of the annual household income for a household earning no more than eighty percent (80%) of the area median income, by household size, for the metropolitan statistical area as published from time to time by the U.S. Department of Housing and Community Development (HUD) and, in the case of dwelling units for rent, housing for which the rent and utilities constitute no more than thirty percent (30%) of the annual household income for a household earning no more than eighty percent (80%) of the area median income, by household size for the metropolitan statistical area as published from time to time by HUD.

"*Agreement*" means this Development Agreement, including the recitals and exhibits attached hereto. The *Agreement* shall also include the *Plan*.

"*ARB*" is the Kiawah River Architectural Review Board that is currently functional under the auspices of the *Property Owner* and/or as it may later function under applicable *Covenants*. The *ARB* may promulgate, modify, and enforce development guidelines, such as architectural and landscaping guidelines, assigned to it under the *Agreement* or the *Plan* with respect to any portion of the *Real Property*.

"*Association*" means one or more non-profit association(s) or corporation(s), which will be formally constituted and made up of the property owners and/or residents of the Real *Property*,

or a particular portion or portions thereof. An *Association* may take responsibility for costs and maintenance of *Common Areas* on or affecting any portion of the *Real Property* subject to such *Association*'s jurisdiction, as delineated in any applicable *Covenants*.

"*Bed and Breakfast*" means a lodging-type building or group of buildings on one *Lot* offering two (2) to twelve (12) *Guest Rooms*, with or without meal service, on a daily, weekly, monthly, or seasonal basis. A *Bed and Breakfast* may be owner-occupied and/or staff-occupied. Whether or not owner- or staff-occupied, a *Bed and Breakfast* shall contribute to *Guest Room* entitlement densities, and no others, in the *Agreement*.

"*Building Coverage*" means the area of a *Lot* covered by principal or accessory buildings or roofed areas, as measured along the outside wall at ground level, and including all projections, other than open porches, fire escapes, canopies, and the first two feet (2') of a roof overhang. This definition shall not include pools, pool decks, or pervious drives.

"*Building Development Standards*" means any applicable dimensional standards for *Lots*, *Development Parcels*, buildings, and structures, including but not limited to any minimum standards for *Lot* area, *Lot* width, *Setbacks*, and yard requirements and any maximum standards for *Building Height* and *Building Coverage* on *Lots* or *Development Parcels*.

"*Building Height*" means elevation from *Ground Floor Level* as measured in feet. *Building Height* does not include those items specifically excluded from consideration of *Building Height* in the *Plan*.

"*Common Areas*" means "Common Areas," as defined under any *Covenants* encumbering all or portions of the *Real Property*, i.e., all real and personal properties which now or hereafter are deeded or leased to, or are the subject of a use agreement or easement with, an *Association* and wherein the property therein described is specifically denominated to be part of the *Common Areas*. The *Common Areas* may include but shall not be limited to open space; maintenance and drainage areas; *Facilities*; easements; alleys; *Thoroughfares*; parking lots; *Community Ways*; street lighting; signs; lagoons; ponds; wetlands; rights-of-way; and the area between any property line of an owner and the mean high water mark of any adjoining river tidal creek, marsh, or other water body. The designation of any land and/or improvements as a Common Area shall not mean or imply that the public at large acquires any easement of use or enjoyment therein.

"*Community Way*" means a walkway of any surface type (paved or unpaved), bike trail, leisure trail, or walking trail designed for pedestrian or bike traffic.

"*Comprehensive Plan*" means the Charleston County Comprehensive Plan, adopted pursuant to sections 6-29-510 to -540 of the South Carolina Code, as well as the official map of Charleston County, adopted pursuant to sections 6-7-1210 to -1280 of the South Carolina Code.

"*Corps*" means the United States Army Corps of Engineers.

"*County*" means Charleston County, a political subdivision of the State of South Carolina.

EXHIBIT 1.1

"*County Council*" means the County Council of Charleston County, South Carolina.

"*County Ordinances*" means the Code of Ordinances of Charleston County, South Carolina.

"*Covenants*" means and refers to one or more declaration(s) of covenants, conditions, and restrictions encumbering all or portions of the *Real Property* that have been or will be recorded by the *Property Owner*.

"*Development*" means the planning for or carry out of a building activity, demolition, reclamation of on-site materials, the making of a material change in the use or appearance of any structure or property, or the dividing of land into two or more parcels, and is intended by the *Parties* to include all further uses of, activities upon, or changes to the *Real Property* as are authorized by the *Agreement*. "*Development*," as designated in a land or *Development Permit*, includes the planning for and all other activity customarily associated with it unless otherwise specified. When appropriate to the context, "*Development*" refers to the planning for or the act of developing or to the result of *Development*. Reference to a specific operation is not intended to mean that the operation or activity, when part of other operations or activities, is not *Development*. Reference to particular operations is not intended to limit the generality of this term.

"*Development Parcel*" means any parcel of land on which *Development* may occur, including platted *Lots* and unplatted parcels, but excluding public or private street rights-of-way.

"*Development Permit*" includes a building permit, zoning permit, construction permit, subdivision or plat approval, rezoning certification, special exception, variance, certificate of occupancy or any other official action of *Local Government* having the effect of permitting or approving the *Development* or use of real property.

"*DHEC*" means the Department of Health and Environmental Control, as established pursuant to section 44-1-20 of the South Carolina Code.

"*Diameter Breast Height*" or "*DBH*" means the total diameter, in inches, of a tree trunk or trunks measured at a point four and one half feet above existing grade (at the base of the tree). In measuring *DBH*, the circumference of the tree shall be measured with a standard diameter tape, and the circumference shall be divided by 3.14.

"*District*" means the Kiawah River Planned Development District, as established in the *Plan*.

"*Dock*" or "*Pier*" means a structure built over and/or floating on water used to provide access to water and/or for the mooring of boats or other watercraft. A *Dock* or *Pier* may contain commercial uses as permitted by *DHEC* and shall constitute a water-dependent use.

"*DOT*" means the South Carolina Department of Transportation, as established in section 57-1-20 of the South Carolina Code.

EXHIBIT 1.1

"*Dwelling Unit*" means one or more rooms, designed, occupied or intended for permanent occupancy as a separate living quarter, with cooking, sleeping and sanitary facilities contained therein. The term "*Dwelling Unit*" does not include *Guest Rooms*, *Villas*, or accessory buildings or structures (including but not limited to *Accessory Dwelling Units*).

"*Facilities*" means major capital or community improvements including, but not limited to, transportation, sanitary sewer, solid waste, drainage, potable water, electrical service, cable television, high speed internet access, and telephone service.

"*Golf Course*" means a tract or tracts of land laid out for up to thirty-six (36) holes for playing the game of golf and improved with tees, greens, fairways, and hazards, and that may include club houses, driving ranges, training facilities, maintenance facilities, and shelters. *Golf Courses* shall constitute *Active Recreation Areas*.

"*Grand Tree*" means any live, healthy tree with a *DBH* of 24 inches or greater, with the exception of pine tree, laurel oak, water oak, and sweet gum tree species.

"*Gross Leasable Area*" or "*GLA*" means floor area devoted to a use designated as such in the table of uses set forth in the *Plan*. *GLA* does not include public or common areas, such as parking lots, utility rooms and stairwells, in a building or on a *Lot* otherwise devoted to a use designated as *GLA* in the *Plan*. *GLA* does not include a community amenity center, such as a fitness club/aquatic center. For the purpose of this provision, the term "floor area" shall have the definition specified in Chapter 12 of the *ZLDR* on the *Effective Date*.

"*Ground Floor Level*" means *Natural Ground* or the lowest floor elevation for structures as set forth in the County's flood management ordinance, as amended, whichever is higher; provided, however, that *Ground Floor Level* shall not exceed 14 feet above *Natural Ground*. This definition shall not be construed to prevent an owner from constructing his first finished floor higher than *Ground Floor Level*; provided, however, *Building Height* shall be measured from *Ground Floor Level*.

"*Guest Room*" means a room or suite designed for temporary occupancy by one (1) or more people in a single unit on a daily, weekly, monthly, or seasonal basis. A *Guest Room* may be individually owned or owned as a "time-share" unit without respect to other *Guest Rooms*. A *Guest Room* may be located within a *Hotel*, *Inn*, *Villa,* or *Bed and Breakfast*. A *Guest Room* shall contribute to the *Guest Room* entitlement densities, and no others, in the *Agreement*.

"*Hotel*" means a lodging-type building or group of buildings offering twenty-five (25) or more *Guest Rooms*, with or without meal service, on a daily, weekly, monthly, or seasonal basis. The *Property Owner* shall have the vested right to develop up to two (2) *Hotels* on the Real Property. The amount of *Guest Rooms* permitted in a *Hotel* shall be limited only by the total *Guest Room* entitlement densities in the *Agreement*. A *Hotel* may be owner-occupied and/or staff-occupied. Whether or not owner- or staff-occupied, a *Hotel* shall contribute to *Hotel* and *Guest Room* entitlement densities, and no others, in the *Agreement*.

EXHIBIT 1.1

"*Housing for the Workforce*" means all *Affordable Housing* and all dwelling units designed to accommodate persons employed on the *Real Property*, persons employed on Kiawah Island, persons employed on Seabrook Island, and/or persons employed within a ten (10) mile radius of the *Real Property*.

"*Inn*" means a lodging-type building or group of buildings offering thirteen (13) to twenty-four (24) *Guest Rooms*, with or without meal service, on a daily, weekly, monthly, or seasonal basis. An *Inn* may be owner-occupied and/or staff-occupied.

"*Land Development Regulations*" means ordinances and regulations enacted by the appropriate governing body for the regulation of any aspect of *Development* and includes, but is not limited to, *Local Government* zoning, rezoning, subdivision, building construction, occupancy, aesthetic, road, or sign regulations or any other regulations controlling the *Development* or use of property.

"*Laws*" means all ordinances, resolutions, regulations, comprehensive plans, *Land Development Regulations*, policies and rules, custom and usage (formal or informal) adopted by a *Local Government* affecting the *Development* of property and includes laws governing permitted uses of the property, governing density, and governing design, improvement, and construction standards and specifications, except as provided in section 6-31-140(A) of the South Carolina Code.

"*Local Government*" means any county, municipality, special district, or governmental entity of the state, county, municipality or region established pursuant to law which exercises regulatory control over, and grants *Development Permits* for land *Development* or which provides public *Facilities*. The *County* is a *Local Government*.

"*Lot*" means *Development Parcel* identified in a *Subdivision Plat* recorded in the Office of the Register of Mesne Conveyances for Charleston County, South Carolina.

"*Lot Line, Front*" means the lot line separating a *Lot* from the *Thoroughfare* that is used as the primary access point to the *Lot*. In cases where a *Lot* abuts open space, including Passive Recreation Areas, on one side, and a *Thoroughfare* that is used as the primary access on the opposite side, the Property Owner may designate the lot line abutting the open space as the *Front Lot Line* and the opposite lot line (abutting the Thoroughfare) as the Rear Lot Line. In cases where a Lot abuts more than one Thoroughfare, the Property Owner may designate the Front Lot Line pursuant to Section 6.1.c herein

"*Mixed Use*" means a use, structure, or parcel containing both residential and non-residential elements.

"*Natural Ground*" means average elevation of a *Lot* or *Development Parcel* prior to *Development* activity.

"*OCRM*" means DHEC's Office of Ocean and Coastal Resource Management.

EXHIBIT 1.1

"*OCRM Critical Line*" means the critical area line defined by *OCRM*.

"*Parties*" are the *Property Owner* and the *County*. When used herein with reference to a specific *Tract*, *Development Parcel*, *Lot*, or other portion of the *Real Property*, *Parties* shall mean and refer to the *County* and that specific person or entity that has legal title to such *Tract*, *Development Parcel*, *Lot*, or other portion of the *Real Property*. If portions of the *Agreement* apply to one or more, but not all, of the entities or persons comprising the *Property Owner*, those particular parties may be separately referred to herein.

"*Passive Recreation Area*" means areas in and located due to the presence of a particular natural or environmental setting and that may include conservation lands or waters providing for both active and passive types of resource-based outdoor recreation activities that are less formalized or program-oriented than activity-based recreation. Resource-based outdoor recreation means and refers to activities requiring a natural condition such as boating, fishing, camping, nature trails and nature study. A farm or other agricultural use shall be considered a *Passive Recreation Area*. *Passive Recreation Areas* shall constitute open space.

"*Pervious Cover*" means water bodies, as well as land that permits the absorption of storm water into the ground. *Pervious Cover* may include, but is not limited to *Community Ways*, streets, roads, alleys, parking lots and driveways which are pervious to storm water.

"*Plan*" means the Kiawah River Planned Development District Plan. The *Plan* is attached to the *Agreement* and incorporated therein by reference. The *Plan* shall constitute a vested right of the *Property Owner* during the term of the *Agreement* (including any extensions or renewals thereof).

"*Planning Commission*" means the Charleston County Planning Commission as established under Article 2.2 of the *ZLDR*.

"*Planning Director*" means the Director of the Planning Department of Charleston County or the authorized designee or representative of the Director.

"*Project*" is the *Development* that has occurred and will occur on the *Real Property*.

"*Property Owner*" means Kiawah River Investment, LLC,; together with all subsidiaries thereof and other entities, which may have a legal interest on the date of execution hereof in any of the *Real Property* described in Paragraph 4 of the *Agreement* and includes their successors in interest, successors in title (as to any portion of the *Real Property*), and/or assigns by virtue of assignment or other instrument compliant with the *Agreement*. When used herein with reference to a specific *Tract*, *Development Parcel*, *Lot*, or other portion of the *Real Property*, "*Property Owner*" shall mean and refer to that specific person or entity that has legal title to such *Tract*, *Development Parcel*, *Lot*, or other portion of the *Real Property*. The *Property Owner* warrants that there are no other legal or equitable owners of the *Real Property* on the *Effective Date*.

EXHIBIT 1.1

"Protected Trees" means any tree on a parcel with a diameter breast height of eight inches or greater prior to development and all tree within required buffers or required landscape areas. Limited removal is allowed only when specified by the provisions of this Ordinance.

"*PSC*" means the Public Service Commission, as established pursuant to section 58-3-10 of the South Carolina Code, as amended.

"*Real Property*" is the *Real Property* referred to in Paragraph 4 of the *Agreement* and includes any improvements or structures customarily regarded as part of real property.

"*Retirement Housing*" means the use of a site for housing that qualifies under The Housing for Older Persons Act (HOPA) for the senior housing exemption from the anti-discrimination provisions related to familial status of Title VIII of the Civil Rights Act of 1968 (the Federal Fair Housing Act), as amended by the Fair Housing Amendments Act of 1988 (the Fair Housing Act). No *Retirement Housing* shall be used as a *Short-Term Rental Property.*

"*Retirement Housing Unit*" means a single housing unit intended for occupancy on a site that is designated as *Retirement Housing* that may be housing comprised of single family detached, single family attached, duplex, or multifamily units or any combination of these. No *Retirement Housing Unit* shall be used as a *Short-Term Rental Property.*

"*Setback*" means any required minimum distance from a *Lot* line or street right-of-way that establishes an area within which a structure shall not be erected. Any *Laws* applicable to *Setbacks* and exceptions to *Setbacks* are set forth in the *Plan*, which shall control in lieu of *Laws* applicable to *Setbacks* and exceptions to *Setbacks* in the *ZLDR* or other *Laws*.

"*Short-Term Rental Property*" means a residential dwelling or any part thereof that is offered, advertised, or provided to short-term rental tenants (excluding family members) for a fee or any form of compensation, for intervals of 29 days or less during a calendar year.

"*Subdivision Plat*" means a recorded graphic description of property prepared and approved in compliance with the *ZLDR*, as modified by this *Agreement*.

"*Thoroughfare*" means a way for use by vehicular and pedestrian traffic and to provide access to *Lots* and open spaces, consisting of vehicular lanes and their adjacent rights-of-way.

"*Tract*" means and refers to composite parcels of the *Real Property* that have yet to be subdivided.

"*Villa*" means a lodging-style building offering one or more bedrooms and other areas (such as cooking and sanitary facilities) operating as a single unit, with or without meal service, on a daily, weekly, monthly, or seasonal basis. A *Villa* may be owned and temporarily occupied by an individual or entity without respect to ownership of other *Villas*. A *Villa* shall constitute one (1) *Guest Room* and shall contribute to *Guest Room* entitlement densities, and no others, in the *Agreement*.

EXHIBIT 1.1

"*Zoning and Land Development Regulations*" or "*ZLDR*" means and refers to the Zoning and Land Development Regulations of Charleston County, South Carolina.

Legal Description

All that certain piece, parcel or tract of land, together with all buildings and improvements presently located thereon, situate, lying and being on Johns Island, in the County of Charleston, State of South Carolina, known generally as "Mullet Hall Plantation," containing 1083.197 acres of highland (including certain small islands), 235.94 acres of ponds and creeks, 86.36 acres of impounds, and 22.313 acres between mean high water and the DHEC-OCRM Critical Line, more or less, shown on a plat by A.H. Schwacke, & Associates entitled "PLAT OF MULLET HALL & JACK ISLAND 1426.81 ACRES JOHNS ISLAND CHARLESTON COUNTY SOUTH CAROLINA," dated October 4, 1994, last revised on November 11, 1994, and recorded in Plat Book EA, at Pages 316 through 322, in the RMC Office for Charleston County, South Carolina, (the "Plat"), said property having such location, butts and bounds, metes, courses and distances as will by reference to the Plat more fully appear.

Being a portion of TMS # 212-00-00-001.

EXHIBIT 4.2 Plat

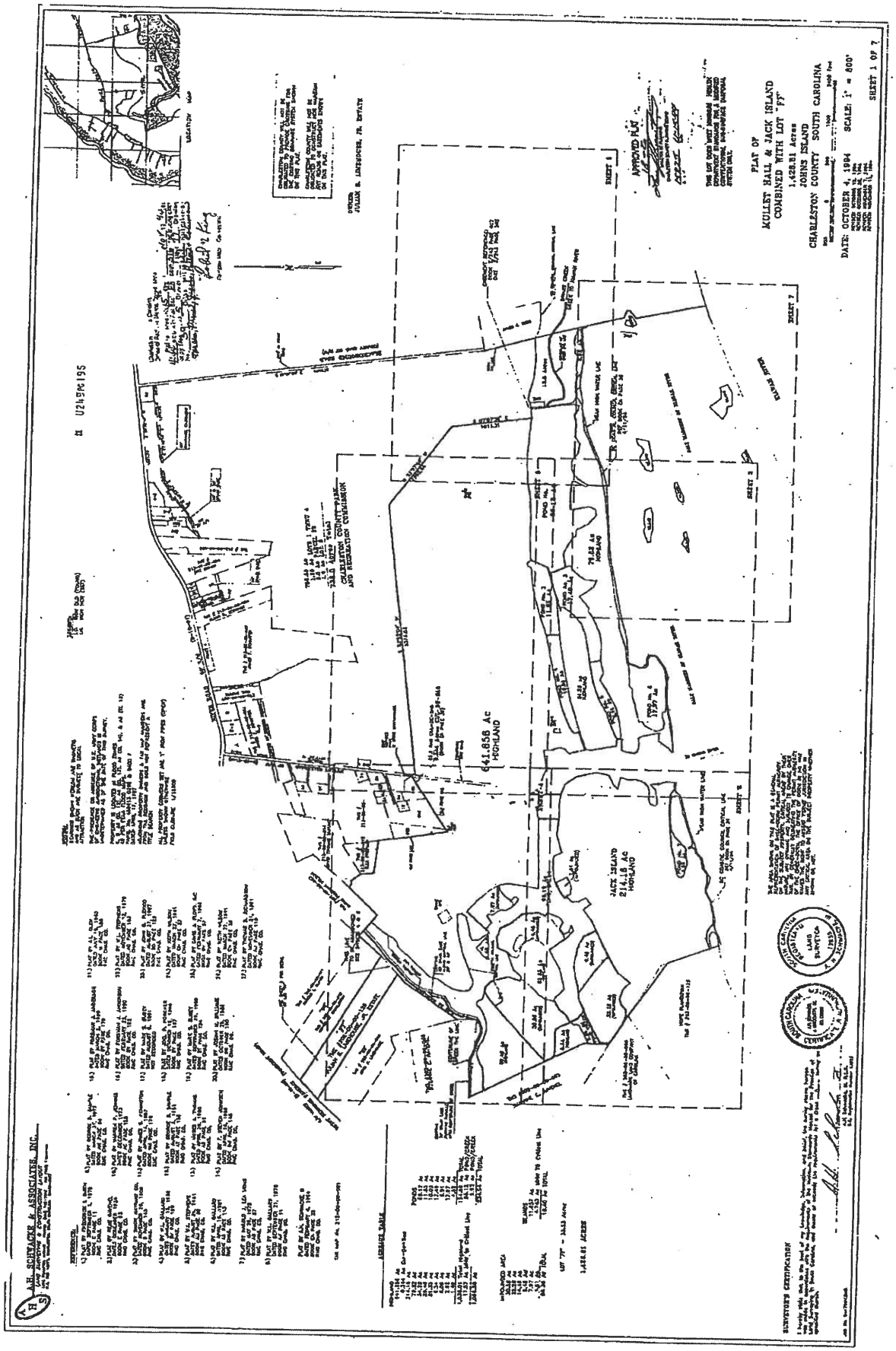


EXHIBIT 4.2 Plat

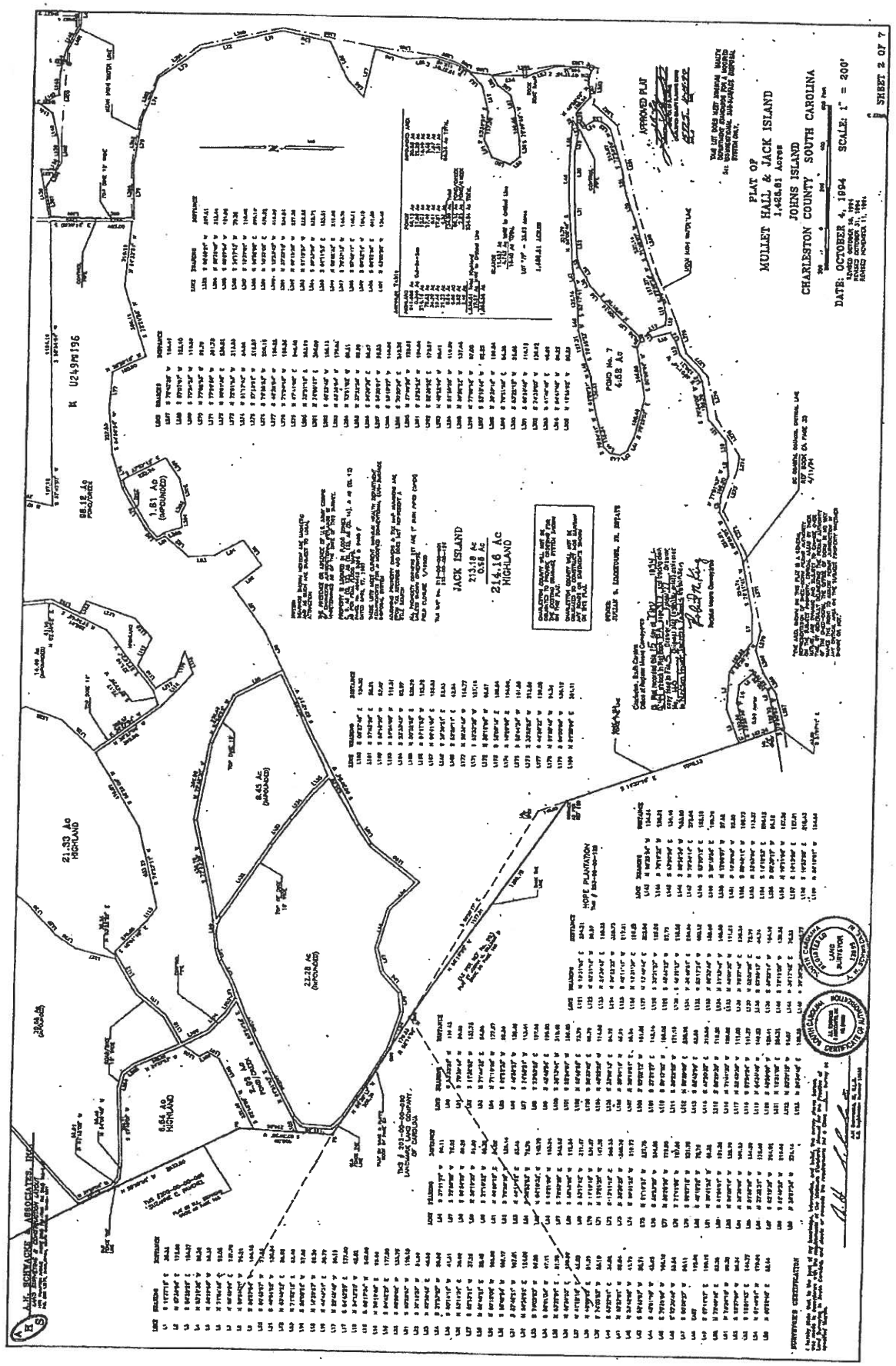


EXHIBIT 4.2 Plat

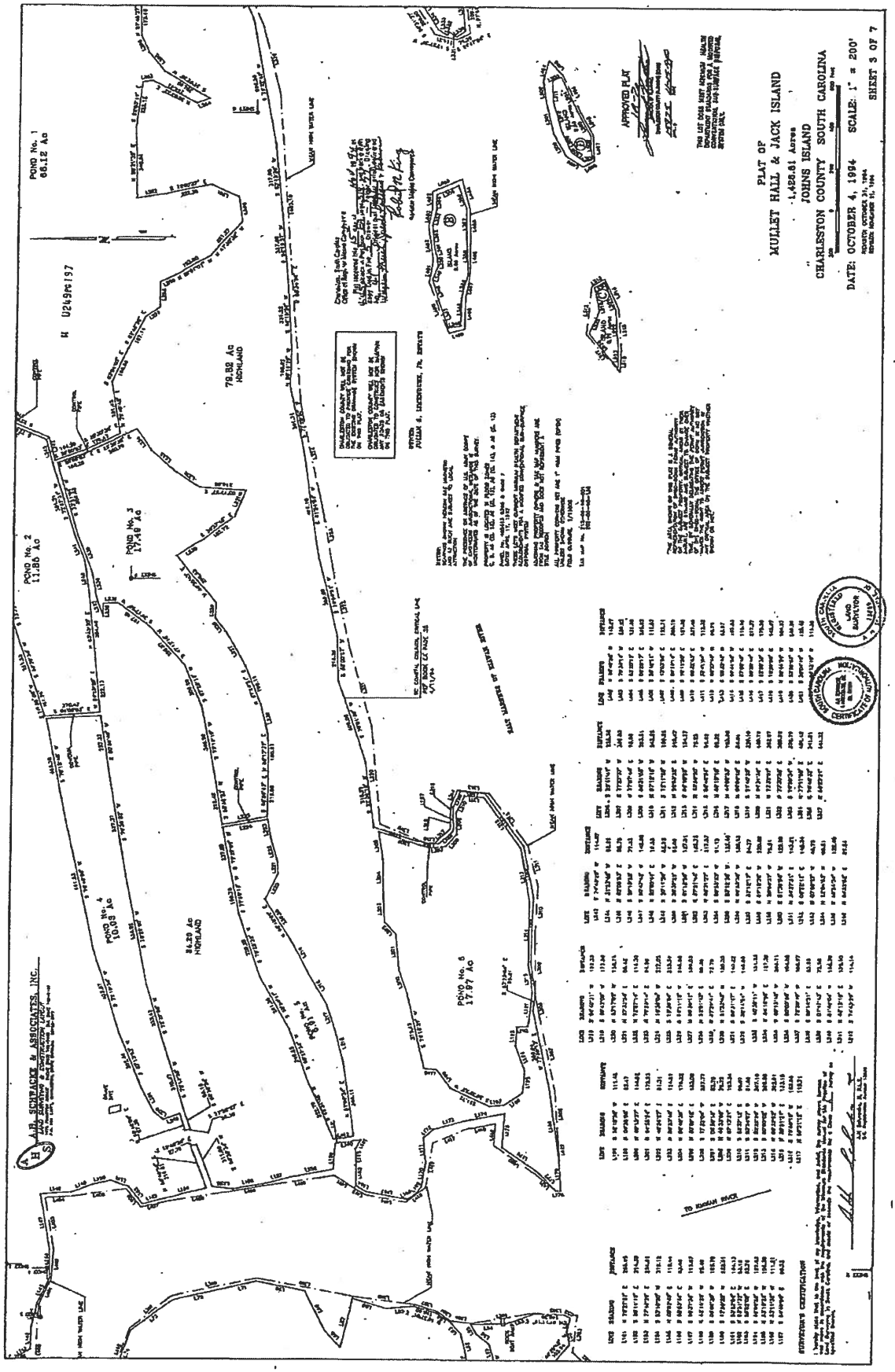
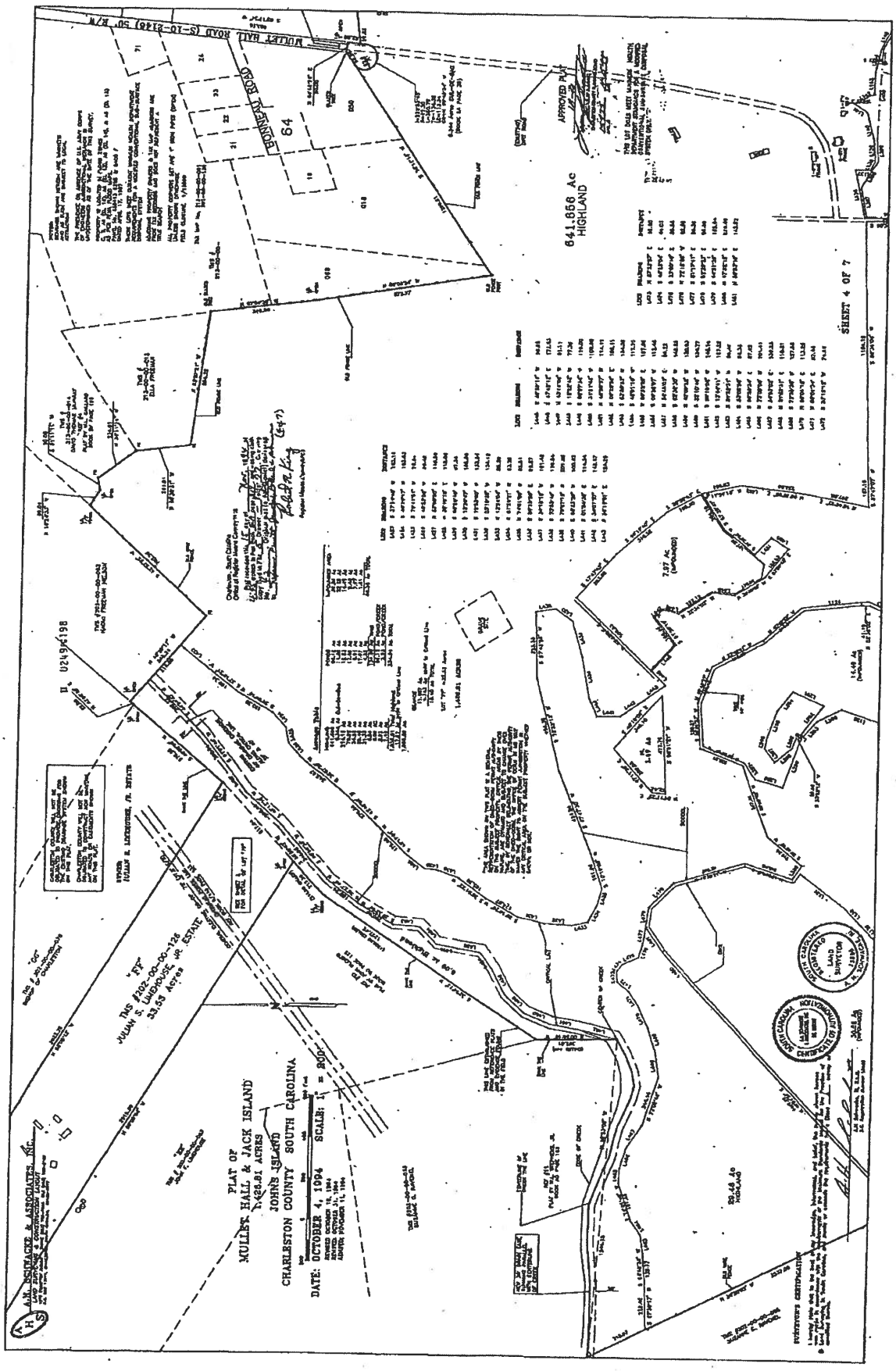


EXHIBIT 4.2 Plat



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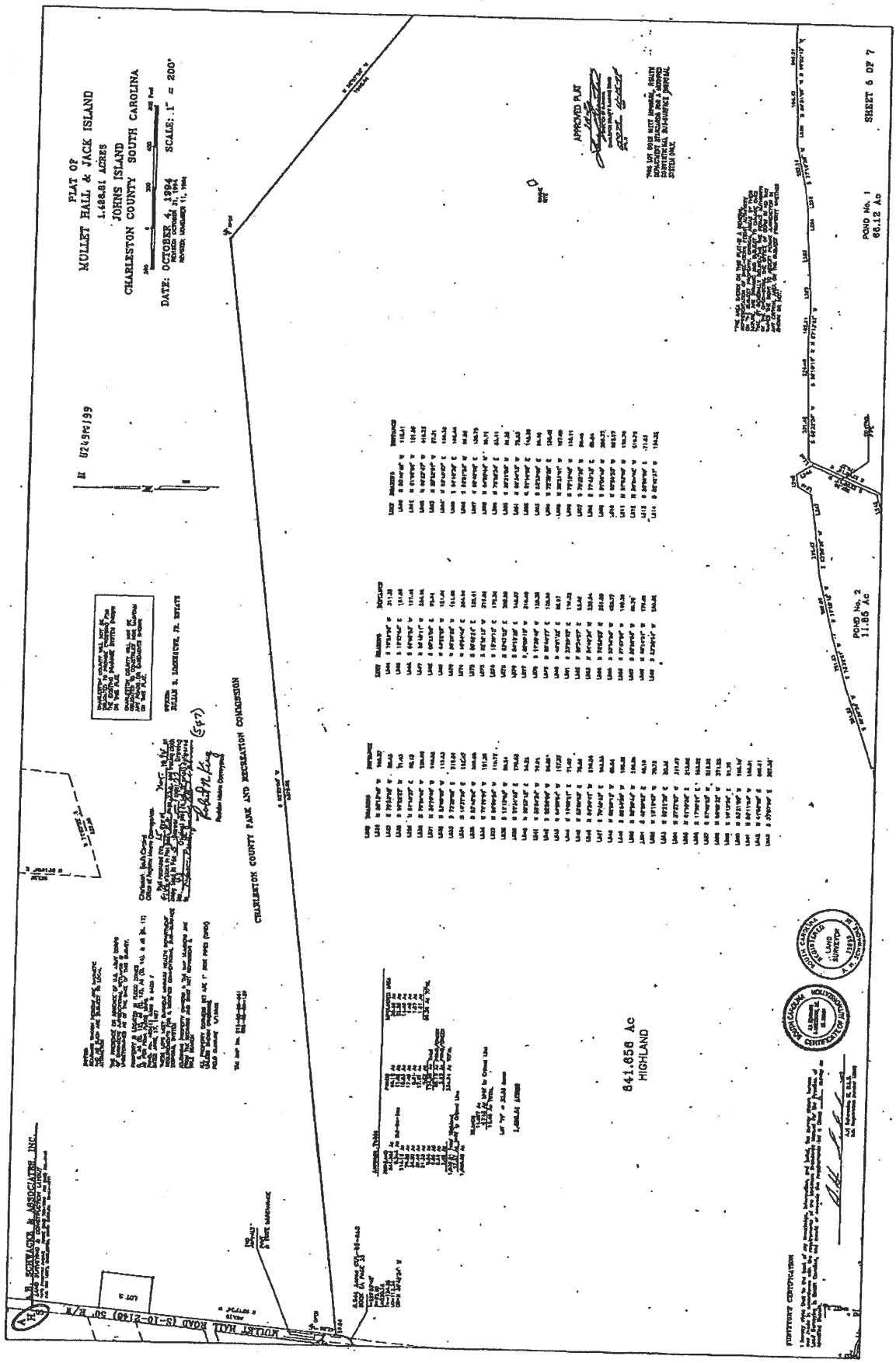
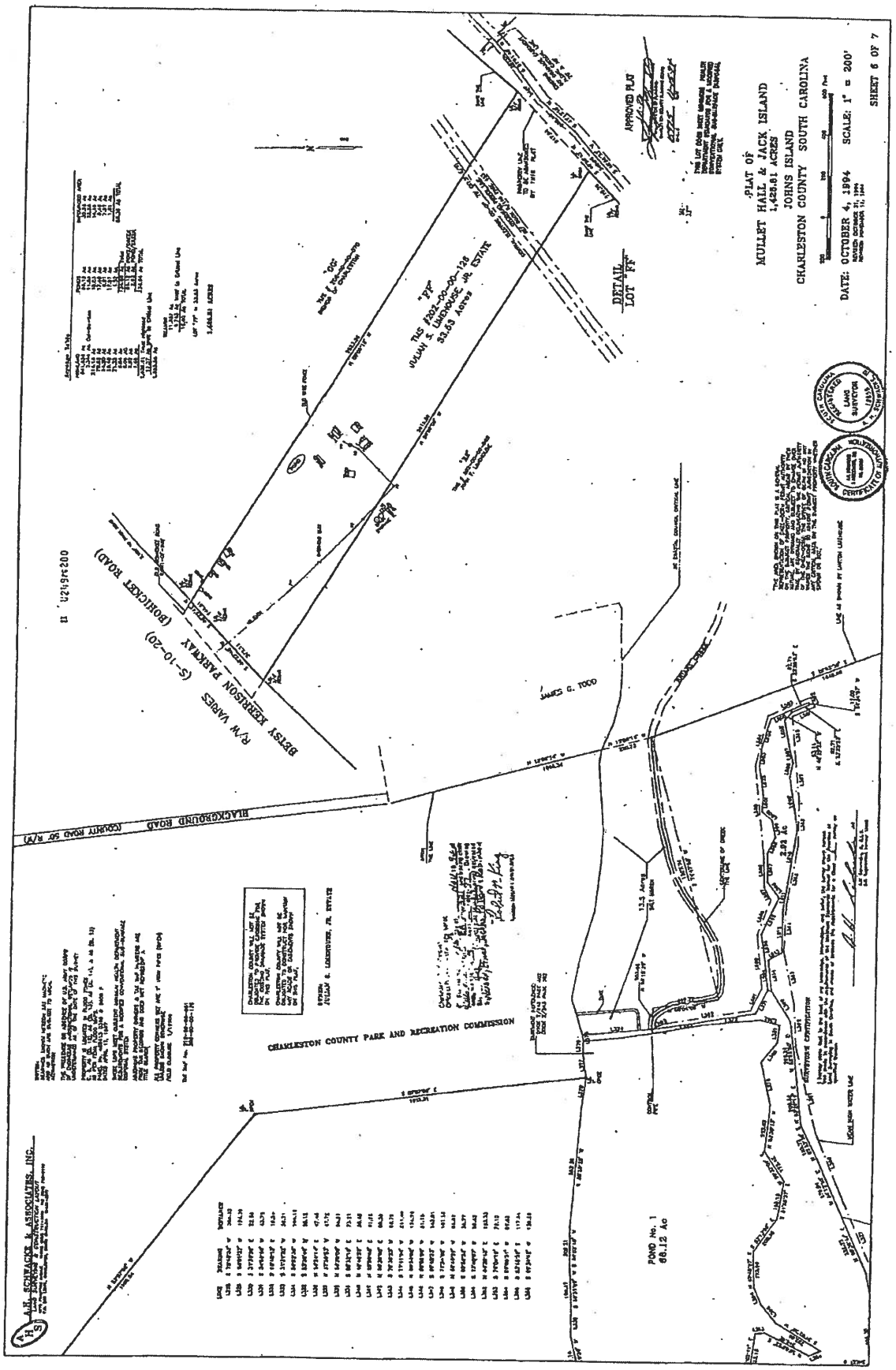


EXHIBIT 4.2 Plat



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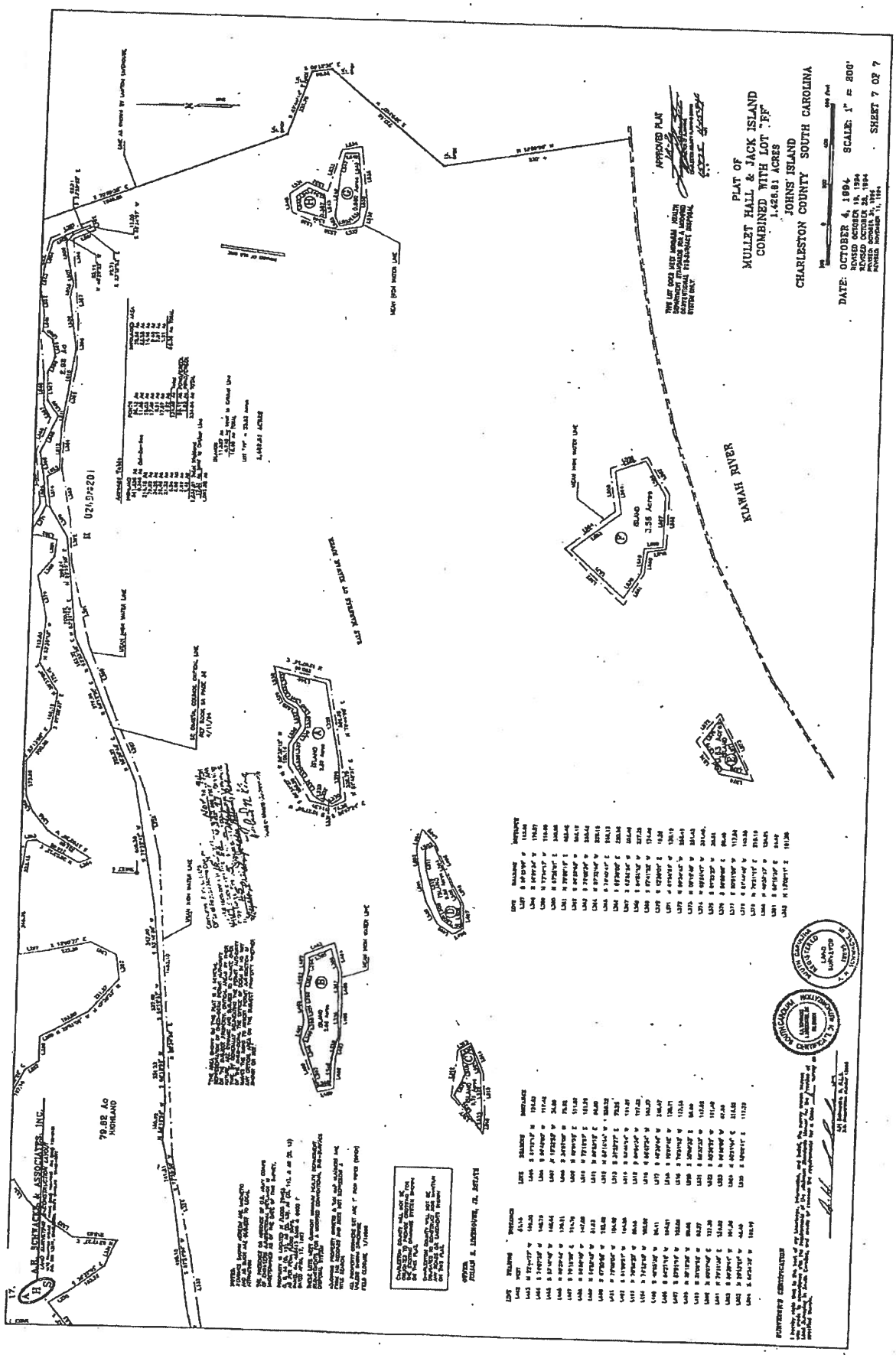


KIAWAH RIVER PLANTATION ACRES FOR DEVELOPMENT AGREEMENT

* all are from the Schwacke survey - only recorded survey, deeds relate back to it

Highland Acres = 1,038.01 ("total highland") +33.53 (Lot"FF") + 11.657 (Islands - above critical line)
= 1083.197 acres - round to 1083.20

Freshwater Wetlands = 98.12 (Pond/Creek) + 2.93 (Pond/Creek) + 86.36 (Impounded Area)
= 187.41 acres

AG 8	R-4	Saltwater wetlands
33.53	29.46	
641.656	6.54	66.12 Pond 1
6.09	21.33	11.85 Pond 2
0.344	1.49	10.03 Pond 3
34.2	214.16	17.49 Pond 4
79.82	86.36	6.91 Pond 5
2.92	2.93	17.97 Pond 6
11.657	98.12	4.52 Pond 7
810.217 total	**460.39** total	**134.89** Sub-total
		17.57 MHW to critical
		4.743 MHW to critical -islands
		22.313 total

Grand Total per Schwacke Survey:

1427.81 *Note: There is an addition error in the Schwacke Survey
It shows **1426.81** acres

BK V263PG613

dTd 12-31-95

RECORDED 01-05-96

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

TITLE TO REAL ESTATE

KNOW ALL MEN BY THESE PRESENTS, THAT KIAWAH RESORT ASSOCIATES, L.P., (a Delaware limited partnership), (hereinafter sometimes referred to as the "Grantor"), in the County and State aforesaid, for/and in consideration of the sum of One Million Seven Hundred Twenty Thousand Three Hundred Twenty-Two and 57/100 ($1,720,322.57) Dollars to it in hand paid at and before the sealing of these presents by KIAWAH RIVER PLANTATION, L.P., (a Delaware limited partnership), (hereinafter sometimes referred to as the "Grantee"), in the County and State aforesaid, the receipt whereof is hereby acknowledged, and the assumption of the mortgage hereinafter referred to, has granted, bargained, sold and released, and by these presents does grant, bargain, sell and release unto the said KIAWAH RIVER PLANTATION, L.P., an undivided seven-eights interest of, in and to the following described property, to-wit:

SEE ATTACHED EXHIBIT "A" FOR DESCRIPTION
OF PROPERTY CONVEYED

(the "Property")

TMS Number: 212-00-00-001

Tax District: 5-1

Address of Grantee: c/o The Beach Company
200 Meeting Street, Suite 401
Post Office Box 242
Charleston, SC 29402

This conveyance is made subject to that certain mortgage from Kiawah Resort Associates, L.P. to William Lawton Limehouse, a/k/a W.L. Limehouse; Linda Anne L. McMurphy, a/k/a Ann Limehouse Macmurphy, a/k/a Anne Limehouse Macmurphy, a/k/a Linda L. McMurphy, n/k/a Anne Limehouse Macmurphy Griffin; Ann Limehouse Macmurphy, a/k/a Anne Limehouse Macmurphy Griffin; Ann Limehouse Macmurphy, a/k/a Anne Limehouse Macmurphy, n/k/a Anne Limehouse Macmurphy Griffin as Trustee for Michael Linar Limehouse; and as Personal Representative of the Estate of Betty Y. Limehouse; Mary Ruth L. Schneider; Peggy Jo L. Gray, a/k/a Peggy Joe L. Gray, a/k/a Peggy Jo Gray; and Peggy K. Limehouse, dated November 15, 1994, and recorded in Book U249, page 385, in the R.M.C. Office, having an outstanding principal balance of approximately $7,175,075.00, the payment of which, together with interest thereon, is expressly assumed by the Grantee herein.

TOGETHER with all and singular, the Rights, Members, Hereditaments and Appurtenances to the said Premises belonging, or in anywise incident or appertaining.

EX Y263PG814

TO HAVE AND TO HOLD, all and singular, the said Premises before mentioned unto the said KIAWAH RIVER PLANTATION, L.P., its successors and assigns, forever.

AND THE SAID KIAWAH RESORT ASSOCIATES, L.P. does hereby bind itself and its successors and assigns, to warrant and forever defend, all and singular, the highland portion of the said premises, above the mean high water mark of abutting tidal waters, unto the said KIAWAH RIVER PLANTATION, L.P., its successors and assigns, against itself, its successors and assigns, and all other persons whomsoever lawfully claiming or to claim the same or any part thereof.

IN WITNESS WHEREOF, Kiawah Resort Associates, L.P., has caused these presents to be executed in its name by its General Partner thereunto duly authorized, and its seal to be hereunto affixed, this 31st day of December, in the year of our Lord One Thousand Nine Hundred and Ninety-Five, in the Two Hundred and Nineteenth year of the Sovereignty and Independence of the United States of America.

SIGNED, SEALED AND DELIVERED
IN THE PRESENCE OF:

KIAWAH RESORT ASSOCIATES, L.P.
(SEAL)

By: D&W Investments, Inc.,
a South Carolina corporation
(CORP.SEAL)
Its: General Partner

By: _____
Charles S. Way, Jr.
Its: President

By: _____
Charles P. Darby, III
Its: Vice President

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

THE FOREGOING INSTRUMENT was acknowledged before me by Kiawah Resort Associates, L.P., by D&W Investments, Inc., a South Carolina corporation its General Partner, by Charles S. Way, Jr., its President, and by Charles P. Darby, III, its Vice President, this 31st day of December, 1995.

_____ (SEAL)
Notary Public for South Carolina
My commission expires: 8-8-99

Exhibit "A" EX Y263PG815

Property Description

All that certain piece, parcel or tract of land, together with all buildings and improvements presently located thereon, situate, lying and being on Johns Island, in the County of Charleston, State of South Carolina, known generally as "Mullet Hall Plantation", containing 1083.197 acres of highland (including certain small islands), 234.94 acres of ponds and creeks, 86.36 acres of impounds, and 22.313 acres between mean high water and the DHEC-OCRM Critical Line, more or less, shown on a plat by A.H. Schwacke, & Associates entitled "PLAT OF MULLET HALL & JACK ISLAND 1426.81 ACRES JOHNS ISLAND CHARLESTON COUNTY SOUTH CAROLINA", dated October 4, 1994, last revised on November 11, 1994, and recorded in Plat Book EA at pages 316 through 322, in the R.M.C. Office for Charleston County, South Carolina, (the "Plat"), said property having such location, butts and bounds, metes, courses and distances as will by reference to the Plat more fully appear.

TOGETHER WITH all right, title and interest of the Grantor in and to the marshlands, lowlands, small islands, causeways, wetlands and critical areas, and dikes adjoining and/or part of said tract, and as lie between any highland areas and the mean low water mark of the Kiawah River or its tributaries, and all such areas as lie between the DHEC - Office of Ocean and Coastal Resource Management Critical Line as shown on the Plat, and (i) the centerline of Briars Creek, (ii) the mean low water mark of the Kiawah River and (iii) the mean low water mark of Hope Creek; SAVING AND EXCEPTING therefrom, however, so much of the marshlands and small islands as lie between the easternmost boundary line of the above-described property as shown on the Plat, and the low water marks of Briars Creek and the Kiawah River.

BUTTING AND BOUNDING to the north on property now or formerly of Lorraine Glover, John F. Limehouse, the Betsy Kerrison Parkway, Bishop of Charleston, Harold L. Glover, Naomi Freeman Nelson, David Thomas Murray, Nellie Freeman, Nancy A. Butler and Maybell Wright, Dorothy Green and Anna Lee Walker, Maybell Wright, et.al., Mullet Hall Road, and property of the Charleston County Park and Recreation Commission; to the east on property of the Charleston County Park and Recreation Commission, the centerline of Briars Creek, and lands now or formerly of William Lawton Limehouse, et.al.; to the south on the low water mark of the Kiawah River and Hopes Creek; and to the west on Hope Plantation and property now or formerly of "Kiawah Real Estate Company, Inc.", and Suzanne C. Ravenel.

TOGETHER WITH a non-exclusive perpetual, transferable, appendant and appurtenant commercial easement for the purpose of providing access to Grantee, its successors and assigns and duly authorized agents, for repairs and maintenance from time to time, of the dike located at the eastern end of "Pond No. 1" as shown on the Plat, which said easement is more particularly set forth in that certain Easement Agreement (Access for Dike Repair and Maintenance) dated June 7, 1994, and recorded in Book Z243, page 392, in the R.M.C. Office.

It is the intention of the Grantor to convey to the Grantee, all of its undivided seven-eighths (7/8ths) interest of, in and to the real property and any interests in real property conveyed to Grantor by deed of conveyance of William Lawton Limehouse, a/k/a W.L. Limehouse, Linda Anne L.McMurphy, a/k/a Ann Limehouse Macmurphy, Anne Limehouse Macmurphy and Linda L. McMurphy, n/k/a Anne Limehouse Macmurphy Griffin; Ann Limehouse Macmurphy, a/k/a Anne Limehouse Macmurphy, n/k/a Anne Limehouse Macmurphy Griffin, as Trustee for Michael Linar Limehouse under the Last Will and Testament of Linar H. Limehouse, a/k/a Horace Linar Limehouse, deceased, Mary Ruth L. Schneider, Peggy Jo L. Gray, a/k/a Peggy Joe L. Gray, a/k/a Peggy Jo Gray and Peggy K. Limehouse, dated the 15th day of November, 1994, and recorded in Book U249, page 207, in the R.M.C. Office.

This conveyance is made subject to the following:

1. Charleston County, S.C. ad valorem taxes for 1995, now due and payable, and ad valorem taxes for all subsequent years.

2. Roll Back taxes as provided under Title 12, South Carolina Code, as amended, including Section 12-43-220 and others.

3. Easement Agreement (Dock) executed by and between the Charleston County Park and Recreation Commission and W.L. Limehouse and Julian Limehouse, III, as Co-Personal Representatives of the Estate of Julian S. Limehouse, Jr., William Lawton Limehouse, Peggy K. Limehouse, Linda Anne L. McMurphy, a/k/a Anne Limehouse MacMurphy, Mary Ruth L. Schneider, J. Sidi Limehouse, III, a/k/a Julian S. Limehouse, III, Peggy Jo Gray, and Anne Limehouse MacMurphy, Trustee for Michael Linar Limehouse, dated June 7, 1994, and recorded in Book Z243, page 402, in the R.M.C. Office.

4. Right-of-Way Easement Underground granted by W.L. Limehouse to Berkeley Electric Cooperative, Inc., dated February 25, 1993, and recorded July 13, 1993, in Book K229, page 594, in the R.M.C. Office.

5. Any lawful, constitutional interest in either the State of South Carolina or Federal Government created, or limitations on use imposed, by the Federal Coastal Management Act or other Federal law or by S. C. Code Sections 48-39-10 through 48-39-220, as amended, and Sections 48-39-250 through 48-39-360, as amended, or any regulations promulgated pursuant to said State or Federal laws, inclusive of the DHEC -Office of Ocean and Coastal Resource Management and U. S. Army Corps of Engineers regulations, and such rights, if any, as the public may enjoy to the use of property lying below the mean high water mark of abutting tidal waters.

6. Notations, dedications, restrictions on use, easements and other matters shown on the Plat, and the DHEC-OCRM Critical Line as the same may vary from time to time.

7. All questions of accuracy, location of boundary lines, location of improvements, encroachments, area, and all other matters whatsoever which an accurate survey or inspection of the premises may reveal, subsequent to November 11, 1994, the last revision date of the Plat.

This is the same property conveyed to the Grantor herein by deed of conveyance of William Lawton Limehouse, a/k/a W.L. Limehouse, Linda Anne L.McMurphy, a/k/a Ann Limehouse Macmurphy, Anne Limehouse Macmurphy and Linda L. McMurphy, n/k/a Anne Limehouse Macmurphy Griffin; Ann Limehouse Macmurphy, a/k/a Anne Limehouse Macmurphy, n/k/a Anne Limehouse Macmurphy Griffin, as Trustee for Michael Linar Limehouse under the Last Will and Testament of Linar H. Limehouse, a/k/a Horace Linar Limehouse, deceased, Mary Ruth L. Schneider, Peggy Jo L. Gray, a/k/a Peggy Joe L. Gray, a/k/a Peggy Jo Gray, and Peggy K. Limehouse, dated the 15th day of November, 1994, and recorded in Book U249, page 297, in the R.M.C. Office.

15981-23

OX Y263PG818

Nexsen Pruet Jacobs Pollard & Robinson
POST OFFICE BOX 486
CHARLESTON, SOUTH CAROLINA 29402

RMC Verified
CTRL # 16
Init GB
1-5-96

FILED
Y263-813
96 JAN -5 PM 2:36
CHARLESTON COUNTY SC

11.00
4473.30
1892.55
6376.85 B

Recorded this 5 day of Jan Year 96
Charleston County Records Clerk

TAS VERIFIED
BAC MBM
DTD 1/9/96

EXHIBIT 4.5
Deed No. 2

BK V648PG230

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

QUIT CLAIM DEED

THIS QUITCLAIM DEED, made and entered into this 21st day of September, 2007, by and between KIAWAH RESORT ASSOCIATES, L.P., (a Delaware limited partnership hereinafter referred to as the "Grantor"), whose mailing address is 7 Beachwalker Road, Kiawah Island, South Carolina 29455, and OCEAN BOULEVARD PROPERTIES, A SOUTH CAROLINA LIMITED PARTNERSHIP (the "Grantee"), whose mailing address is c/o The Beach Co., 211 King Street, Suite 300, Charleston, SC 29401, Attn: John C.L. Darby.

WITNESSETH:

IN CONSIDERATION of the sum of Five and No/100 Dollars ($5.00) to it in hand paid, the receipt and sufficiency of which is hereby acknowledged by Grantor, Grantor does hereby remise, release and forever quitclaim unto Grantee, the following real property (the "Property"):

SEE EXHIBIT A ATTACHED HERETO AND INCORPORATED HEREIN BY REFERENCE.

TOGETHER with all and singular the rights, members, hereditaments and appurtenances to the said Property belonging, or in any wise incident or appertaining.

TO HAVE AND TO HOLD all and singular, the said Property before mentioned unto the said Grantee, its successors and assigns forever, so that neither the Grantor nor any other person or persons claiming under Grantor, its successors and assigns, shall at any time hereafter, by any way or means, have, claim or demand any right or title to the aforesaid Property or appurtenances, or any part or parcel thereof, forever.

IN WITNESS WHEREOF, Kiawah Resort Associates, L.P., has caused these presents to be executed in its name by its General Partners thereunto duly authorized and its seal to be hereunto affixed, this 21st day of September, 2007.

SIGNED, SEALED AND DELIVERED
IN THE PRESENCE OF:

KIAWAH RESORT ASSOCIATES, L.P.
(SEAL)
By: D&W Investments, Inc.,
a South Carolina corporation (CORP.SEAL)
Its: General Partner

By: Lisa C. Bryant
Lisa C. Bryant
Its: Secretary

By: TWD Investments, LLC
a South Carolina limited liability company
(SEAL)
Its: General Partner

By: Lisa C. Bryant
Lisa C. Bryant
Its: Authorized Agent

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

THE FOREGOING INSTRUMENT was acknowledged before me by Kiawah Resort Associates, L.P., by D&W Investments, Inc., a South Carolina corporation, its General Partner, by its aforesaid officer thereunto duly authorized, this 21st day of September, 2007.

(SEAL)
Notary Public for South Carolina
My commission expires: 1-19-11

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

THE FOREGOING INSTRUMENT was acknowledged before me by Kiawah Resort Associates, L.P., by TWD Investments, LLC, a South Carolina limited liability company, its General Partner, by its Authorized Agent thereunto duly authorized, this 21st day of September, 2007.

(SEAL)
Notary Public for South Carolina
My commission expires: 1-19-11

EXHIBIT A

All that certain piece, parcel or tract of land, together with all buildings and improvements presently located thereon, containing 1,427.81 acres, more or less, situate, lying and being on Johns Island, in the County of Charleston, State of South Carolina, known generally as "Mullet Hall Plantation", containing 1083.197 acres of highland (including certain small islands), 235.94 acres of ponds and creeks, 86.36 acres of impounds, and 22.313 acres between mean high water and the DHEC-OCRM Critical Line, more or less, as shown on a plat by A.H. Schwacke & Associates entitled "PLAT OF MULLET HALL & JACK ISLAND 1426.81 ACRES JOHNS ISLAND CHARLESTON COUNTY SOUTH CAROLINA", dated October 4, 1994, last revised on November 11, 1994, and recorded in Plat Book EA at Pages 316-322, in the R.M.C. Office for Charleston County, South Carolina (the "Plat"), said property having such location, butts and bounds, metes, courses and distances as will by reference to the Plat more fully appear.

TOGETHER WITH all right, title and interest of the Grantor in and to the marshlands, lowlands, small islands, causeways, wetlands and critical areas, and dikes adjoining and/or part of said tract, and as lie between and highland areas and the mean low water mark of the Kiawah River or its tributaries, and all such areas as lie between the DHEC – Office of Ocean and Coastal Resource Management Critical Line as shown on the Plat, and (i) the centerline of Briars Creek, (ii) the mean low water mark of the Kiawah River and (iii) the mean low water mark of Hope Creek; SAVING AND EXCEPTING therefrom, however, so much of the marshlands and small islands as lie between the easternmost boundary line of the above-described property as shown on the Plat, and the low water marks of Briars Creek and the Kiawah River.

TOGETHER WITH a non-exclusive, perpetual, transferable, appendant and appurtenant commercial easement for the purpose of providing access for repairs and maintenance from time to time, of the dike located at the eastern end of "Pond No. 1" as shown on the Plat, which said easement is more particularly set forth in that certain Easement Agreement (Access for Dike Repair and Maintenance) dated June 7, 1994, and recorded in Book Z243, page 392, in the R.M.C. Office.

It is the intention of the Grantor to convey to the Grantee herein all of Grantor's undivided interest in the property known generally as Mullet Hall Plantation, including but not limited to all highland, ponds, impounded areas, lagoons, creeks, islands, salt marshes, dikes, causeways, lakes, streams, critical areas, wetlands, waters and waterways and generally all property of every kind and nature whatsoever.

This is the same property conveyed to the Grantor herein by (i) deed of conveyance of William H. Goodwin, III, Molly S. Goodwin, Matthew T. Goodwin, Alice T. Goodwin as Custodian for Sarah C. Goodwin under the Virginia Uniform Transfer to Minors Act and Alice T. Goodwin as Custodian for Peter O. Goodwin under the Virginia Uniform Transfer to Minors Act dated November 6, 1995, and recorded November 9, 1995, in

Book Y261, page 539, in the R.M.C. Office for Charleston County, S.C., and (ii) deed of conveyance of William Lawton Limehouse, a/k/a W.L. Limehouse; Linda Anne L. McMurphy, a/k/a Ann Limehouse Macmurphy, Anne Limehouse Macmurphy and Linda L. McMurphy, n/k/a Anne Limehouse Macmurphy Griffin; Ann Limehouse Macmurphy, a/k/a Anne Limehouse Macmurphy, n/k/a Anne Limehouse Macmurphy Griffin, as Trustee for Michael Linar Limehouse under the Last Will and Testament of Linar H. Limehouse a/k/a/ Horace Linar Limehouse, deceased; Mary Ruth L. Schneider; Peggy Jo L. Gray, a/k/a Peggy Joe L. Gray, a/k/a Peggy Jo Gray, and Peggy K. Limehouse, Ann Limehouse Macmurphy, a/k/a Anne Limehouse Macmurphy, n/k/a Anne Limehouse Macmurphy Griffin, as Executrix of the Estates of Betty Y. Limehouse and Linar H. Limehouse (a/k/a Horace Linar Limehouse) dated the 15th day of November, 1994, and recorded in Book U249 at Page 207 in the Charleston County RMC Office.

TMS Numbers: 212-00-00-001 and 212-00-00-004

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

AFFIDAVIT FOR EXEMPT TRANSFERS

PERSONALLY appeared before me, the undersigned, who, being duly sworn, deposes and says:

1. I have read the information on the back of or following this affidavit and I understand such information.

2. The property being transferred is located on Johns Island, Charleston County, South Carolina, bearing a portion of Charleston County Tax Map Number 212-00-00-001, and was transferred by Kiawah Resort Associates, L.P. to Ocean Boulevard Properties, A South Carolina Limited Partnership on _____, 2007.

3. The deed is exempt from the deed recording fee because (See Information section of affidavit): Exemption #12

If exempt under exemption #14 as described in the Information section of this affidavit, did the agent and principal relationship exist at the time of the original sale and was the purpose of this relationship to purchase the realty? Check Yes _____ or No _____.

4. As required by Code Section 12-24-70, I state that I am a responsible person who was connected with the transaction as: ~~officer, agent, principal, or director~~ Attorney for Grantee

5. I understand that a person required to furnish this affidavit who willfully furnishes a false or fraudulent affidavit is guilty of a misdemeanor and, upon conviction, must be fined not more than one thousand dollars or ~~imprisoned~~ not more than one year, or both.

James B. Moore Jr.
Attorney for Grantee

Print Name: James B. Moore Jr.

SWORN to before me this 11th
day of Jan., 2007.
Notary Public for SC
My Commission Expires: 9-10-11

(NOTARIAL SEAL)

BK V648PG236

RECORDER'S PAGE

***NOTE*: This page MUST remain with the original document**

Filed By:

McNair Law Firm
Post Office Drawer 418
Georgetown, SC 29442

FILED

January 15, 2008
2:53:45 PM

BK V648PG230

Charlie Lybrand, Register
Charleston County, SC

Number of Pages: 7

DESCRIPTION	AMOUNT
Recording Fee	$ 12.00
State Fee	<Exempt>
County Fee	<Exempt>
Postage	
TOTAL	$ 12.00

$ Amount (in thousands):

DRAWER: C - cfb

AUDITOR STAMP HERE

RECEIVED FOR RECORD
JAN 18 2008
PEGGY A. ROSSLEY
CHARLESTON COUNTY AUDITOR

PID VERIFIED BY ASSESSOR

REP

JAN 17 2008

DATE

DO NOT STAMP BELOW THIS LINE

EXHIBIT 4.6
Deed No. 3

BK V648PG237

STATE OF SOUTH CAROLINA)
) TITLE TO REAL ESTATE
COUNTY OF CHARLESTON) (DEED)

KNOW ALL MEN BY THESE PRESENTS, KIAWAH RESORT ASSOCIATES, L.P., (a Delaware limited partnership,) whose mailing address is 7 Beachwalker Road, Kiawah Island, SC 29455 (hereinafter whether singular or plural referred to collectively as the "Grantor"), in the State aforesaid, for and in consideration of Five Dollars ($5.00) and other valuable consideration to the Grantor paid by OCEAN BOULEVARD PROPERTIES, A SOUTH CAROLINA LIMITED PARTNERSHIP, whose mailing address is c/o The Beach Co., 211 King Street, Suite 300, Charleston, SC 29401, Attn: John C.L. Darby (hereinafter whether singular or plural referred to as the "Grantee"), has granted, bargained, sold and released, and by these presents does grant, bargain, sell and release unto the Grantee, a one-eighth (1/8) undivided interest in and to the real estate together with all improvements thereon (the "Premises") described as follows:

SEE EXHIBIT A ATTACHED HERETO AND INCORPORATED HEREIN

TMS Number: 212-00-00-001

Tax District: 5-1

Address of Grantee: c/o The Beach Company
Attn: John C.L. Darby
211 King Street, Suite 300
Charleston, SC 29401

TOGETHER with all and singular, the rights, members, hereditaments and appurtenances to the Premises belonging or in any wise incident or appertaining thereto.

TO HAVE AND TO HOLD all and singular the Premises unto the Grantee, its successors and assigns forever.

And the Grantor does hereby bind itself, its successors and assigns, and other lawful representatives, to warrant and forever defend all and singular, the highland portion of the Premises, above the mean high water mark of abutting tidal waters, unto the Grantee and the Grantee's successors and assigns, against Grantor and against Grantor's successors and assigns and against every person whomsoever lawfully claiming, or to claim, the same or any part thereof.

IN WITNESS WHEREOF, Kiawah Resort Associates, L.P., has caused these presents to be executed in its name by its General Partners thereunto duly authorized and its seal to be hereunto affixed, this 21st day of September, 2007.

SIGNED, SEALED AND DELIVERED
IN THE PRESENCE OF:

KIAWAH RESORT ASSOCIATES, L.P.
(SEAL)

By: D&W Investments, Inc.,
a South Carolina corporation (CORP.SEAL)
Its: General Partner

By: Lisa C. Bryant
Lisa C. Bryant
Its: Secretary

By: TWD Investments, LLC
a South Carolina limited liability company
(SEAL)
Its: General Partner

By: Lisa C. Bryant
Lisa C. Bryant
Its: Authorized Agent

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

THE FOREGOING INSTRUMENT was acknowledged before me by Kiawah Resort Associates, L.P., by D&W Investments, Inc., a South Carolina corporation, its General Partner, by its aforesaid officer thereunto duly authorized, this 21st day of September, 2007.

(SEAL)
Notary Public for South Carolina
My commission expires: 1-19-11

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

THE FOREGOING INSTRUMENT was acknowledged before me by Kiawah Resort Associates, L.P., by TWD Investments, LLC, a South Carolina limited liability company, its General Partner, by its Authorized Agent thereunto duly authorized, this 21st day of September, 2007.

(SEAL)
Notary Public for South Carolina
My commission expires: 1-19-11

EXHIBIT A

All those pieces, parcels or tracts of land situate lying and being on Johns Island, Charleston County, South Carolina, containing **1,427.81** acres, more or less, and being shown and designated on a plat by A.H. Schwacke, III, RLS, dated October 4, 1994, (revised November 11, 1994), entitled: "Plat of Mullet Hall & Jack Island Combined With Lot 'FF' 1,426.81 acres, Johns Island, Charleston County, South Carolina," which plat consists of seven sheets and is recorded at Plat Book EA at pages 316-322 in the R.M.C. Office for Charleston County, South Carolina, and including but not limited to those parcels shown on said plat as follows: "641.656 ac highland," a 0.344 acre cul-de-sac, "Jack Island, 214.16 ac highland," "79.82 ac highland," "34.20 ac highland," "29.46 ac highland," "21.33 ac highland," "6.54 ac highland," "6.09 ac highland," "2.92 ac highland," and "1.49 HL"; also impounded areas shown as "30.56 ac (impounded)," "22.28 ac (impounded)," "14.49 ac (impounded)," "9.45 ac (impounded)," "7.97 ac (impounded)," and "1.61 ac (impounded)"; and also ponds designated as "Pond No. 1, 66.12 ac," "Pond No. 2, 11.85 ac," "Pond No. 3, 17.49 ac," "Pond No. 4, 10.03 ac," "Pond No. 5, 6.91 ac," "Pond No. 6, 17.97 ac," and Pond No. 7, 4.52 ac"; and also pond/creek areas shown as "98.12 ac Pond/Creek," and "2.93 ac Pond/Creek"; and also 8 islands designated as islands "A," "B," "C," "D," "E," "F," "G," and "H", (containing 11.657 acres highland and 4.743 acres between the critical line and the mean high water mark of abutting tidal waters as shown on said plat); Lot "FF" also shown on said plat as "TMS #202-00-00-126, Julian S. Limehouse, Jr. Estate," containing 33.53 acres; and also all property between the critical line and the mean high water mark of abutting tidal waters shown on said plat as consisting of 17.57 acres. The within described property is all of the remaining portion of Mullet Hall Plantation not conveyed by deed of J. Sidi Limehouse, III a/k/a Julian S. Limehouse, III and others to Charleston County Park and Recreation Commission by deed dated June 1, 1994, and recorded June 7, 1994, in Book Y243, page 235, in said R.M.C. Office, together with Lot "FF."

Together with all of Grantor's right, title and interest (including but not limited to any contract right) of, in and to an easement of access, ingress and egress (whether presently existing or to exist), between the within conveyed property and Blackground Road and located or to be located upon, over and across that property previously conveyed by J. Sidi Limehouse, III, a/k/a Julian S. Limehouse, III and others to Charleston County Park and Recreation Commission by deed recorded in Book Y243, page 235, in said R.M.C. Office.

Together with all right, title and interest of the Grantor pursuant to instrument entitled "Easement Agreement (Access for Dike Repair and Maintenance)" dated June 7, 1994, and recorded June 7, 1994, in Book Z243, page 392, in said R.M.C. Office.

Together with all right, title and interest of Grantor in and to any and all rights and means of access to and from the within described property and any and all streets, roads, ways and easements (whether public or private) adjacent to, butting on or benefiting the within described property, including but not limited to, Mullet Hall Road.

It is the intention of the Grantor to convey to the Grantee herein all of Grantor's undivided interest in the property known generally as Mullet Hall Plantation, including but not limited to all highland, ponds, impounded areas, lagoons, creeks, islands, salt marshes, dikes, causeways, lakes, streams, critical areas, wetlands, waters and waterways and generally all property of every kind and nature whatsoever.

This conveyance is made subject to the same covenants, conditions and restrictions as are set forth in the deed of conveyance from Grantor to Kiawah River Plantation, L.P. dated December 31, 1995, and recorded in Book Y263, page 813, in the R.M.C. Office for Charleston County, S.C.

This is the same property conveyed to the Grantor herein by deed of conveyance of William H. Goodwin, III, Molly S. Goodwin, Matthew T. Goodwin, Alice T. Goodwin as Custodian for Sarah C. Goodwin under the Virginia Uniform Transfer to Minors Act and Alice T. Goodwin as Custodian for Peter O. Goodwin under the Virginia Uniform Transfer to Minors Act dated November 6, 1995, and recorded November 9, 1995, in Book Y261, page 539, in the R.M.C. Office for Charleston County, S.C.

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

AFFIDAVIT

PERSONALLY appeared before me the undersigned, who being duly sworn, deposes and says:

1. I have read the information on this affidavit and I understand such information.

2. The property being transferred is located in Charleston County, South Carolina, bearing Charleston County Tax Map Number M009010100904, and was transferred by Kiawah Resort Associates, LP to Ocean Boulevard Properties A South Carolina Limited Partnership on _____, 2008..

3. Check one of the following: The deed is

(a) _X_ subject to the deed recording fee as a transfer for consideration paid or to be paid in money or money's worth.

(b) ____ subject to the deed recording fee as a transfer between a corporation, a partnership, or other entity and a stockholder, partner, or owner of the entity, or is a transfer to a trust or as a distribution to a trust beneficiary.

(c) ____ exempt from the deed recording fee because (See Information section of affidavit): _____ (If exempt, please skip items 4-7,and go to item 8 of this affidavit.)

4. Check one of the following if either item 3(a) or item 3(b) above has been checked (See Information section of this affidavit.):

(a) ___ The fee is computed on the consideration paid or to be paid in money or money's worth in the amount of $.0

(b) _X__ The fee is computed on the fair market value of the realty which is $5,857,143.00 for the land and improvements and $7,142,857.00 consideration paid for the settlement of a disputed claim between co-tenants..

(c) ____ The fee is computed on the fair market value of the realty as established for property tax purposes which is _____.

5. Check Yes _____ or No _X_ to the following: A lien or encumbrance existed on the land, tenement, or realty before the transfer and remained on the land, tenement, or realty after the

transfer. If "Yes," the amount of the outstanding balance of this lien or encumbrance is: _____.

6. The deed recording fee is computed as follows:

(a) Place the amount listed in item 4 above here: $5,857,143.00 (plus $7,142,857.00).

(b) Place the amount listed in item 5 above here: $0.00 (If no amount is listed, place zero here.)

(c) Subtract Line 6(b) from Line 6(a) and place result here: $13,000,000.00.

7. The deed recording fee due is based on the amount listed on Line 6(c) above and the deed recording fee due is: $48,100.00

8. As required by Code Section 12-24-70, I state that I am a responsible person who was connected with the transaction as: ~~a General Partner of Grantor~~. GRANTEE

9. I understand that a person required to furnish this affidavit who willfully furnishes a false or fraudulent affidavit is guilty of a misdemeanor and, upon conviction, must be fined not more than one thousand dollars or imprisoned not more than one year, or both.

OCEAN BOULEVARD PROPERTIES, A SC Lim. Partnership, by The Beach Co., A SC Cor.

By: John Darby
Its: President

SWORN to before me this 11th day of Jan., 2008.

Notary Public for South Carolina
My Commission Expires: 1/18/2011

(NOTARIAL SEAL)

By: J. Darryl Reyna
Its: Exe. Vice President

BK V648PG244

RECORDER'S PAGE

***NOTE*: This page MUST remain with the original document**

Filed By:

McNair Law Firm
Post Office Drawer 418
Georgetown, SC 29442

Number of Pages: 8

FILED

January 15, 2008
2:54:36 PM

BK V648PG237

Charlie Lybrand, Register
Charleston County, SC

DESCRIPTION	AMOUNT
Recording Fee	$ 13.00
State Fee	$ 33,800.00
County Fee	$ 14,300.00
Postage	
TOTAL	$ 48,113.00

$ Amount (in thousands): 13000

DRAWER: C - cfb

AUDITOR STAMP HERE

RECEIVED
JAN 18 2008
PEGGY A. TOSSEY
CHARLESTON COUNTY AUDITOR

PID VERIFIED BY ASSESSOR

REP

DATE JAN 17 2008

DO NOT STAMP BELOW THIS LINE

BK Z243PG402

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

EASEMENT AGREEMENT
(DOCK)

AGREEMENT made this 2nd day of June, 1994 by and between Charleston County Park and Recreation Commission ("Purchaser") and W.L. Limehouse and Julian Limehouse, III, as Co-Personal Representatives of the Estate of Julian S. Limehouse, Jr.; William Lawton Limehouse; Peggy K. Limehouse; Linda Anne L. McMurphy, a/k/a Anne Limehouse MacMurphy; Mary Ruth L. Schneider; J. Sidi Limehouse, III, a/k/a Julian S. Limehouse, III; Peggy Jo Gray; and Anne Limehouse MacMurphy, Trustee for Michael Linar Limehouse (collectively, the "Sellers");

WITNESSETH

WHEREAS, the Sellers and the Purchaser entered into a Purchase and Sale Agreement having an effective date of March 3, 1994 for the purchase of a parcel of property containing 738 acres (the "Property"); and

WHEREAS, Section 1.2 of the Purchase and Sale Agreement called for the conveyance by the Sellers of an easement for the extension of a crabbing and fishing dock from the Property into Pond No. 1 (66.12 acres) (the "Pond"); and

WHEREAS, the Purchaser has purchased the Property and the Sellers are now minded to grant the hereinbelow described easement to Purchaser;

NOW THEREFORE, subject to the provisions stated hereafter, for $5.00 and other valuable consideration, the Sellers and Purchaser agree as follows:

1) Grant of Easement: Sellers hereby grant, bargain, sell and convey to Purchaser, a perpetual transferable, appendant and appurtenant, non-exclusive easement over and across the eastern portion of the Pond owned by Sellers for the purpose of extending a crabbing and fishing dock from the Property into the Pond.

TO HAVE AND TO HOLD the easement described above to the Purchaser and its Successors and Assigns forever.

2) Restriction on Easement: The dock to be placed in the easement shall be of a length not to exceed 250 feet and shall be used for crabbing, fishing and other activities consistent with the use of the Property as a park. The Purchaser, however, shall not be able to use the Pond for any swimming or boating activities.

3) **Use of Property:** The Sellers reserve the right to use the Pond over which the easement runs for any uses which are not inconsistent with the terms of this Agreement. Sellers may not drain, close or fill the Pond without the written consent of the Purchaser.

4) **Running of Benefits & Burdens:** All of the provisions of this Agreement, including the benefits and the burdens, shall run with the land and shall be binding upon and inure to the Heirs, Successors and Assigns of the parties hereto.

5) **Commercial Purposes:** It is the intent of the parties hereto that the easement granted herein is for commercial purposes and is appurtenant in nature since it inheres in, is essentially necessary to and runs with the land benefited thereby.

6) **Hold Harmless:** Purchaser shall indemnify and hold harmless the Sellers, and their Heirs and Assigns, from any and all claims, liabilities, judgments, damages, penalties, fines, losses and expenses, including reasonable attorney's fees and costs, to any person on property caused wholly or in part by or during the use of the easement herein created, by Purchaser, or Purchaser's successors, assigns, agents, employees, invitees, guests or contractors.

IN WITNESS WHEREOF, the Sellers and Purchaser have executed this Agreement on the date stated above.

PURCHASER:

CHARLESTON COUNTY PARK AND RECREATION COMMISSION

By: _____

Its: Chairman

SELLERS:

W.L. LIMEHOUSE, CO-PERSONAL REPRESENTATIVE OF THE ESTATE OF JULIAN S. LIMEHOUSE, JR.

JULIAN LIMEHOUSE, III,
CO-PERSONAL REPRESENTATIVE OF
THE ESTATE OF JULIAN S.
LIMEHOUSE, JR.

WILLIAM LAWTON LIMEHOUSE

PEGGY K. LIMEHOUSE

LINDA ANNE L. McMURPHY A/K/A
ANNE LIMEHOUSE MacMURPHY

MARY RUTH L. SCHNEIDER

J. SIDI LIMEHOUSE, III, A/K/A
JULIAN S. LIMEHOUSE, III

PEGGY JO GRAY

ANNE LIMEHOUSE MacMURPHY,
TRUSTEE FOR MICHAEL LINAR
LIMEHOUSE

BK Z243PG406

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

PERSONALLY appeared before me the undersigned witness who, being duly sworn, deposes and says that (s)he saw the within named CHARLESTON COUNTY PARK AND RECREATION COMMISSION by _____, its _____, sign, seal, and as their act and deed, deliver the within written instrument, and that (s)he with the other above-subscribed witness witnessed the execution thereof.

_____

SWORN to before me this
7th day of June, 1994.

_____ (L.S.)
NOTARY PUBLIC FOR SOUTH CAROLINA
My Commission Expires: Sept 24, 2002

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

PERSONALLY appeared before me the undersigned witness who, being duly sworn, deposes and says that (s)he saw the within named W.L. LIMEHOUSE, CO-PERSONAL REPRESENTATIVE OF THE ESTATE OF JULIAN S. LIMEHOUSE, JR., sign, seal, and as their act and deed, deliver the within written instrument, and that (s)he with the other above-subscribed witness witnessed the execution thereof.

_____

SWORN to before me this
7th day of June, 1994.

_____ (L.S.)
NOTARY PUBLIC FOR SOUTH CAROLINA
My Commission Expires: 3/5/15

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

PERSONALLY appeared before me the undersigned witness who, being duly sworn, deposes and says that (s)he saw the within named JULIAN LIMEHOUSE, III, CO-PERSONAL REPRESENTATIVE OF THE ESTATE OF JULIAN S. LIMEHOUSE, JR., sign, seal, and as their act and deed, deliver the within written instrument, and that (s)he with the other above-subscribed witness witnessed the execution thereof.

SWORN to before me this
15 day of June, 1994.

(L.S.)
NOTARY PUBLIC FOR SOUTH CAROLINA
My Commission Expires: 1/5/15

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

PERSONALLY appeared before me the undersigned witness who, being duly sworn, deposes and says that (s)he saw the within named WILLIAM LAWTON LIMEHOUSE, sign, seal, and as their act and deed, deliver the within written instrument, and that (s)he with the other above-subscribed witness witnessed the execution thereof.

SWORN to before me this
15 day of June, 1994.

(L.S.)
NOTARY PUBLIC FOR SOUTH CAROLINA
My Commission Expires: 1/5/15

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

PERSONALLY appeared before me the undersigned witness who, being duly sworn, deposes and says that (s)he saw the within named PEGGY K. LIMEHOUSE, sign, seal, and as their act and deed, deliver the within written instrument, and that (s)he with the other above-subscribed witness witnessed the execution thereof.

SWORN to before me this
12th day of June, 1994.

(L.S.)
NOTARY PUBLIC FOR SOUTH CAROLINA
My Commission Expires: 1/1/1

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

PERSONALLY appeared before me the undersigned witness who, being duly sworn, deposes and says that (s)he saw the within named LINDA ANNE L. McMURPHY A/K/A ANNE LIMEHOUSE MacMURPHY, sign, seal, and as their act and deed, deliver the within written instrument, and that (s)he with the other above-subscribed witness witnessed the execution thereof.

SWORN to before me this
1st day of June, 1994.

(L.S.)
NOTARY PUBLIC FOR SOUTH CAROLINA
My Commission Expires: 11-28-99

STATE OF FLORIDA)
)
COUNTY OF Dade)

PERSONALLY appeared before me the undersigned witness who, being duly sworn, deposes and says that (s)he saw the within named MARY RUTH L. SCHNEIDER, sign, seal, and as their act and deed, deliver the within written instrument, and that (s)he with the other above-subscribed witness witnessed the execution thereof.

SWORN to before me this
27 day of May, 1994.

_____ (L.S.)
NOTARY PUBLIC FOR FLORIDA
My Commission Expires: 10/17/97

OFFICIAL NOTARY SEAL
GEORGE E THOMAS
NOTARY PUBLIC STATE OF FLORIDA
COMMISSION NO. CC329908
MY COMMISSION EXP. OCT. 17,1997

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

PERSONALLY appeared before me the undersigned witness who, being duly sworn, deposes and says that (s)he saw the within named J. SIDI LIMEHOUSE, III A/K/A JULIAN S. LIMEHOUSE, III, sign, seal, and as their act and deed, deliver the within written instrument, and that (s)he with the other above-subscribed witness witnessed the execution thereof.

SWORN to before me this
1st day of June, 1994.

_____ (L.S.)
NOTARY PUBLIC FOR SOUTH CAROLINA
My Commission Expires: 5/1/96

MARYLAND

STATE OF)
)
COUNTY OF)

PERSONALLY appeared before me the undersigned witness who, being duly sworn, deposes and says that (s)he saw the within named PEGGY JO GRAY, sign, seal, and as their act and deed, deliver the within written instrument, and that (s)he with the other above-subscribed witness witnessed the execution thereof.

SWORN to before me this
27 day of May, 1994.

Rebecta Kramer (L.S.)
NOTARY PUBLIC FOR MARYLAND
My Commission Expires: March 1, 1997

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

PERSONALLY appeared before me the undersigned witness who, being duly sworn, deposes and says that (s)he saw the within named ANNE LIMEHOUSE MacMURPHY, TRUSTEE FOR MICHAEL LINAR LIMEHOUSE, sign, seal, and as their act and deed, deliver the within written instrument, and that (s)he with the other above-subscribed witness witnessed the execution thereof.

Henry N. Griffin

SWORN to before me this
15 day of June, 1994.

Laura W. Hart (L.S.)
NOTARY PUBLIC FOR SOUTH CAROLINA
My Commission Expires: 11-28-99

[illegible]

LAW OFFICES OF C. J. MANOS
ATTORNEY AT LAW
P. O. BOX 1787
CHARLESTON, SC 29402-1787

BK Z243PG411

15.00
A

FILED

Z243-402
94 JUN -7 PM 2:07

ROBERT N. KING
REGISTER
CHARLESTON COUNTY SC

EXHIBIT 4.8
Berkeley Elec Coop Easement

BK K 229PG594

E

THE STATE OF SOUTH CAROLINA)
) Location Number 557-70
COUNTY OF Charleston) RIGHT OF WAY EASEMENT
UNDERGROUND

KNOW ALL MEN BY THESE PRESENTS that I (we) W.L. Limehouse , of the County of Charleston , State of South Carolina, hereinafter referred to as Grantor(s) for the sum of One Dollar ($1.00) and other good and valuable consideration to me (us) in hand paid, receipt of which is hereby acknowledged, does hereby grant unto BERKELEY ELECTRIC COOPERATIVE, INC., a corporation, whose Post Office Address is Moncks Corner, South Carolina, hereinafter called Cooperative, and to its Successors of Assigns, a right-of-way over route selected by Cooperative, having a width of 10 feet, ~~that is to say: feet either side of centerline~~, upon, over and across land of Grantor(s), more particularly described as follows, to-wit:

A tract of land approximately 34.6 acres in Charleston County, in or near Johns Island community and bounded as follows:

North by Bishops of Charleston
East by
South by John F. Limehouse
West by Bohicket Road

T.M.S.# 202-00-00-126 - This is a 10 foot underground easement running along the westerly property line adjacent to Bohicket Road.

together with the right to place, construct, operate, maintain, relocate, patrol and replace thereon and in or upon all streets, roads or highways abutting said lands an electric transmissions or distribution line or system and communication system, including the right to erect, install and construct, either overhead or underground, its electrical facilities and other transmission line structures, wires, cables and any necessary appurtenances and equipment deemed by the Cooperative to be necessary therefor, as well as the right to install, maintain and use anchors and guy wires on lands adjacent to the right-of-way herein granted; and to cut and trim trees and shrubbery to the extent necessary to keep them clear of said electric line or system and communication system and to cut down, from time to time, all dead, weak, leaning or dangerous trees that are tall enough to strike the wires in falling.

Together also with the right, from time to time, to redesign, rebuild or alter said lines and to install such additional lines, apparatus and equipment as the Cooperative may at any time deem necessary, and the right to remove any line or any part thereof.

Together also with all rights of ingress and egress necessary for the full and complete use, occupancy, and enjoyment of the easement hereby granted and all rights and privileges incident thereto.

Berkeley Electric Co-Op

BK K 229PG595

R/Way
10.00
B

Grantor(s) agrees that all poles, wires and other facilities, including any main service entrance equipment installed on the above described lands at the Cooperative's expense, shall remain the property of the Cooperative, removable at the option of the Cooperative upon termination of service to or on said lands.

PROVIDED, HOWEVER, any damage to the property of Grantor(s) (other than the property cleared or removed as hereinabove provided) caused by the Cooperative in the course of constructing, rebuilding or repairing said lines shall be borne by the Cooperative.

TO HAVE AND TO HOLD, all the singular the aforesaid rights and privileges unto the Cooperative, its Successors and Assigns, as aforesaid.

And Grantor(s) agree(s) to warrant and forever defend the above granted rights against himself or his heirs and against any other person lawfully claiming or to claim the same or any part thereof.

It is further understood that whenever necessary, words used in this instrument in the singular shall be construed to read in the plural and that words used in the masculine gender shall be construed to read in the feminine.

IN WITNESS WHEREOF, the undersigned has set this hand and seal this 25 day of FEB, 1993.

SIGNED, SEALED AND DELIVER
IN THE PRESENCE OF

James Cleal Jr
Robert Bradley

X W. L. Limehouse (L.S.)
(L.S.)

STATE OF SOUTH CAROLINA
COUNTY OF BERKELEY

PERSONALLY appeared before me James Cleal, Jr.
and made oath that (s)he saw the within named W.L. Limehouse
sign the within instrument, and as h__ act and deed, deliver the Right-of-Way for the uses and purposes therein mentioned, and that (s)he with Robert Bradley, In the presence of each other, witnessed the due execution thereof.

James Cleal, Jr

SWORN to and subscribed before me this 25 day of FEB, 1993.

Robert Bradley
NOTARY PUBLIC FOR SOUTH CAROLINA
My Commission Expires: 8-29-99

FILED
K229-594
93 JUL 13 AM 11:40
ROBERT M. TWINING
REGISTER
CHARLESTON COUNTY SC

RETURN TO:
BERKELEY ELECTRIC COOPERATIVE, INC.
P.O. Box 1234
Moncks Corner, S.C. 29461

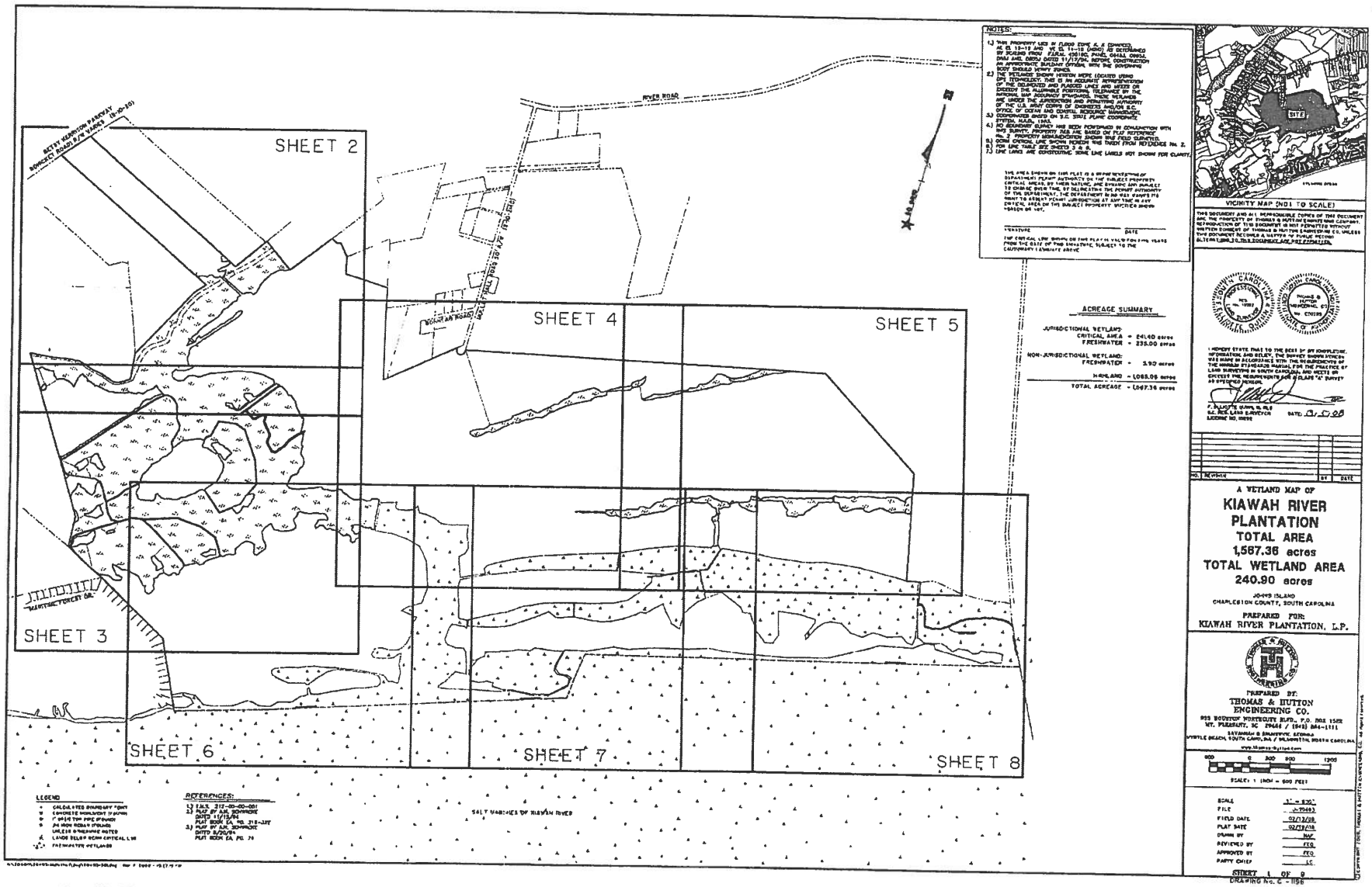
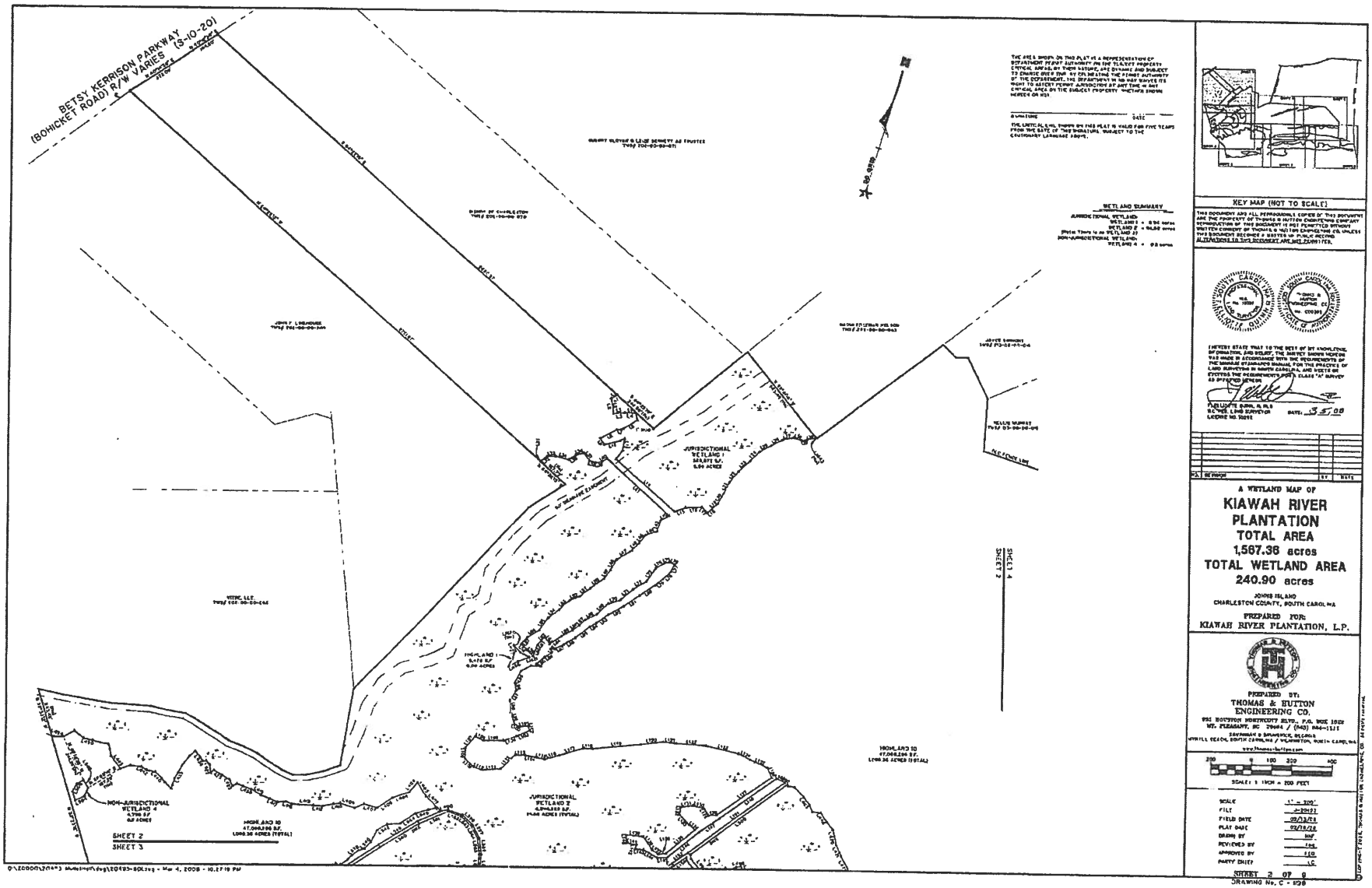


EXHIBIT 4.9
Wetland Survey



A WETLAND MAP OF

KIAWAH RIVER PLANTATION

TOTAL AREA
1,567.38 acres
TOTAL WETLAND AREA
240.90 acres

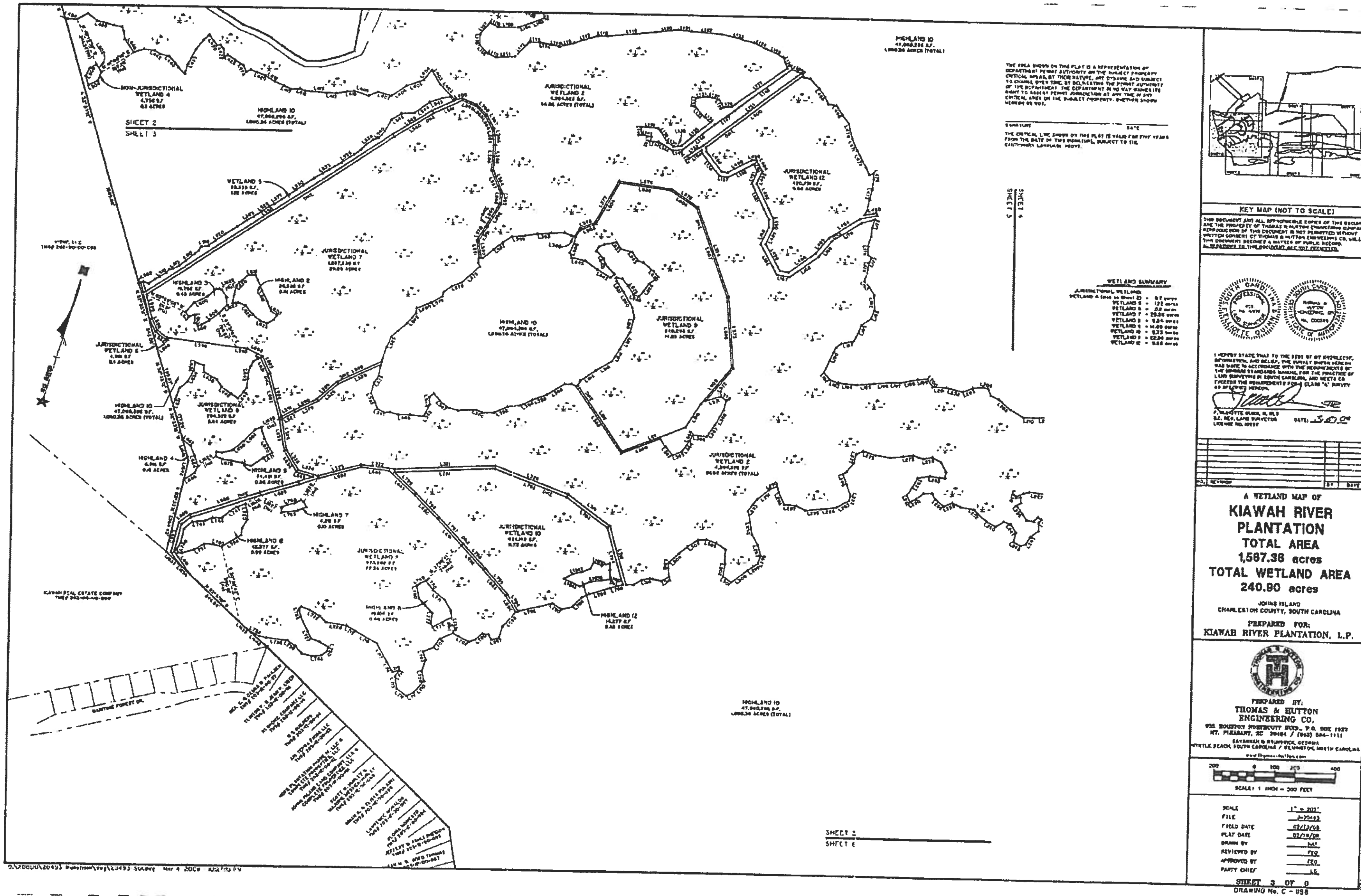
JOHNS ISLAND
CHARLESTON COUNTY, SOUTH CAROLINA

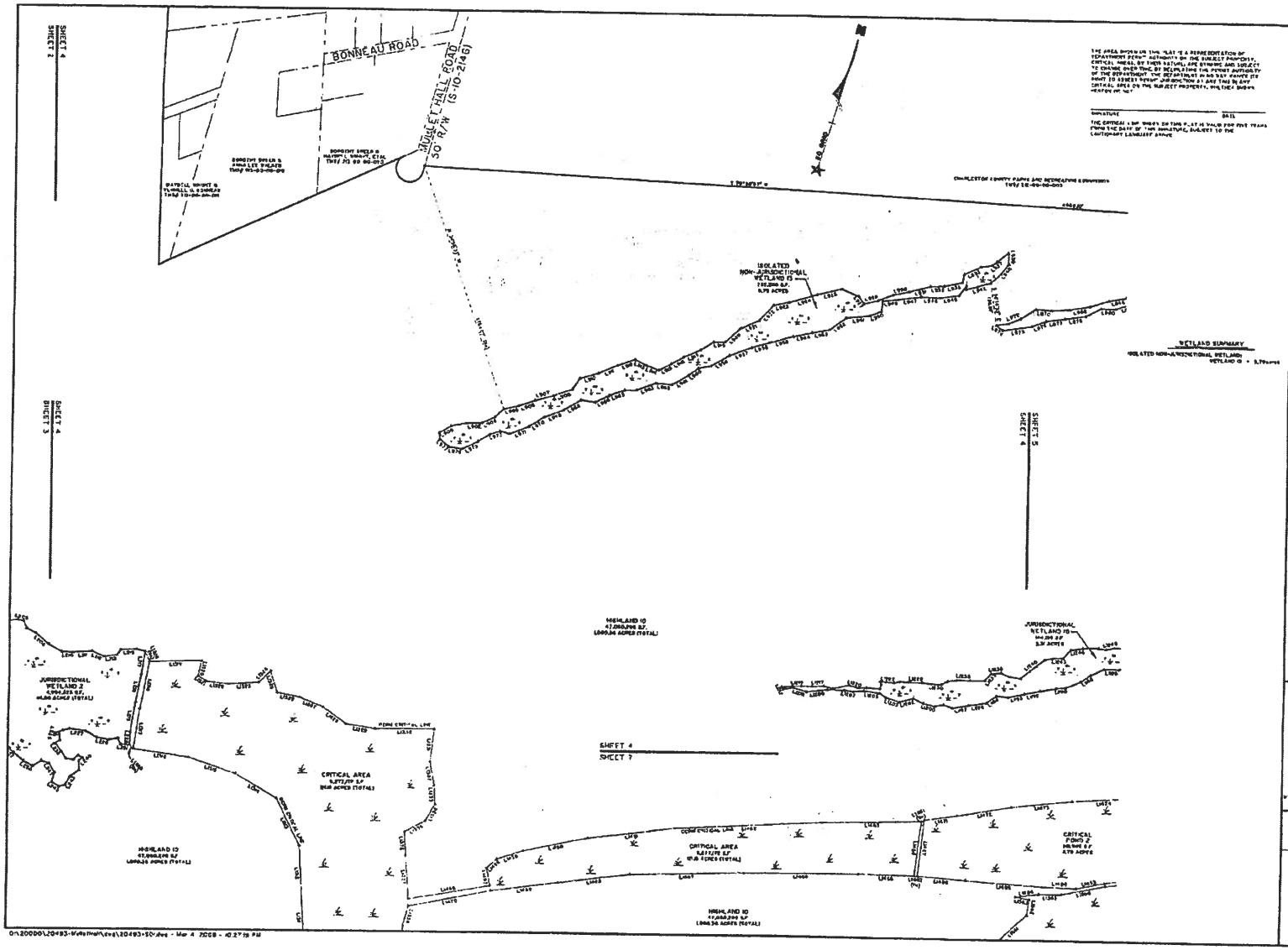
PREPARED FOR:
KIAWAH RIVER PLANTATION, L.P.

PREPARED BY:
THOMAS & HUTTON ENGINEERING CO.
954 HOUGHTON NORTHCUTT BLVD., P.O. BOX 1820
MT. PLEASANT, SC 29466 / (843) 884-1213
SAVANNAH • BRUNSWICK, GEORGIA
MYRTLE BEACH, SOUTH CAROLINA / WILMINGTON, NORTH CAROLINA
www.thomas-hutton.com

SCALE	1" = 200'
FILE	J-20401
FIELD DATE	05/13/08
PLAT DATE	05/19/08
DRAWN BY	DHF
REVIEWED BY	TMS
APPROVED BY	EJG
PARTY CHIEF	LC

SHEET 2 OF 9
DRAWING No. C - 1098


A WETLAND MAP OF
KIAWAH RIVER PLANTATION
TOTAL AREA
1,587.38 acres
TOTAL WETLAND AREA
240.80 acres
JOHNS ISLAND
CHARLESTON COUNTY, SOUTH CAROLINA
PREPARED FOR:
KIAWAH RIVER PLANTATION, L.P.
PREPARED BY:
THOMAS & HUTTON ENGINEERING CO.
KEY MAP (NOT TO SCALE)
WETLAND SUMMARY
SCALE: 1 INCH = 200 FEET
JURISDICTIONAL WETLAND 7
JURISDICTIONAL WETLAND 9
JURISDICTIONAL WETLAND 10
JURISDICTIONAL WETLAND 12
NON-JURISDICTIONAL WETLAND 4
HIGHLAND 10
SHEET 2
SHEET 3
SHEET 4
SHEET 3 OF 9
DRAWING No. C - 898



KEY MAP (NOT TO SCALE)

I HEREBY STATE THAT TO THE BEST OF MY KNOWLEDGE, INFORMATION, AND BELIEF, THE SURVEY SHOWN HEREON WAS MADE IN ACCORDANCE WITH THE REQUIREMENTS OF THE MINIMUM STANDARD MANUAL FOR THE PRACTICE OF LAND SURVEYING IN SOUTH CAROLINA, AND MEETS OR EXCEEDS THE REQUIREMENTS FOR A CLASS "A" SURVEY AS SPECIFIED HEREIN.

F. ELLIOTT DAVIS, II, P.L.S.
S.C. REGISTERED SURVEYOR
LICENSE NO. 19098
DATE 9.5.08

NO.	REVISIONS	BY	DATE

A WETLAND MAP OF

KIAWAH RIVER PLANTATION

TOTAL AREA
1,567.36 acres
TOTAL WETLAND AREA
240.90 acres

JOHNS ISLAND
CHARLESTON COUNTY, SOUTH CAROLINA

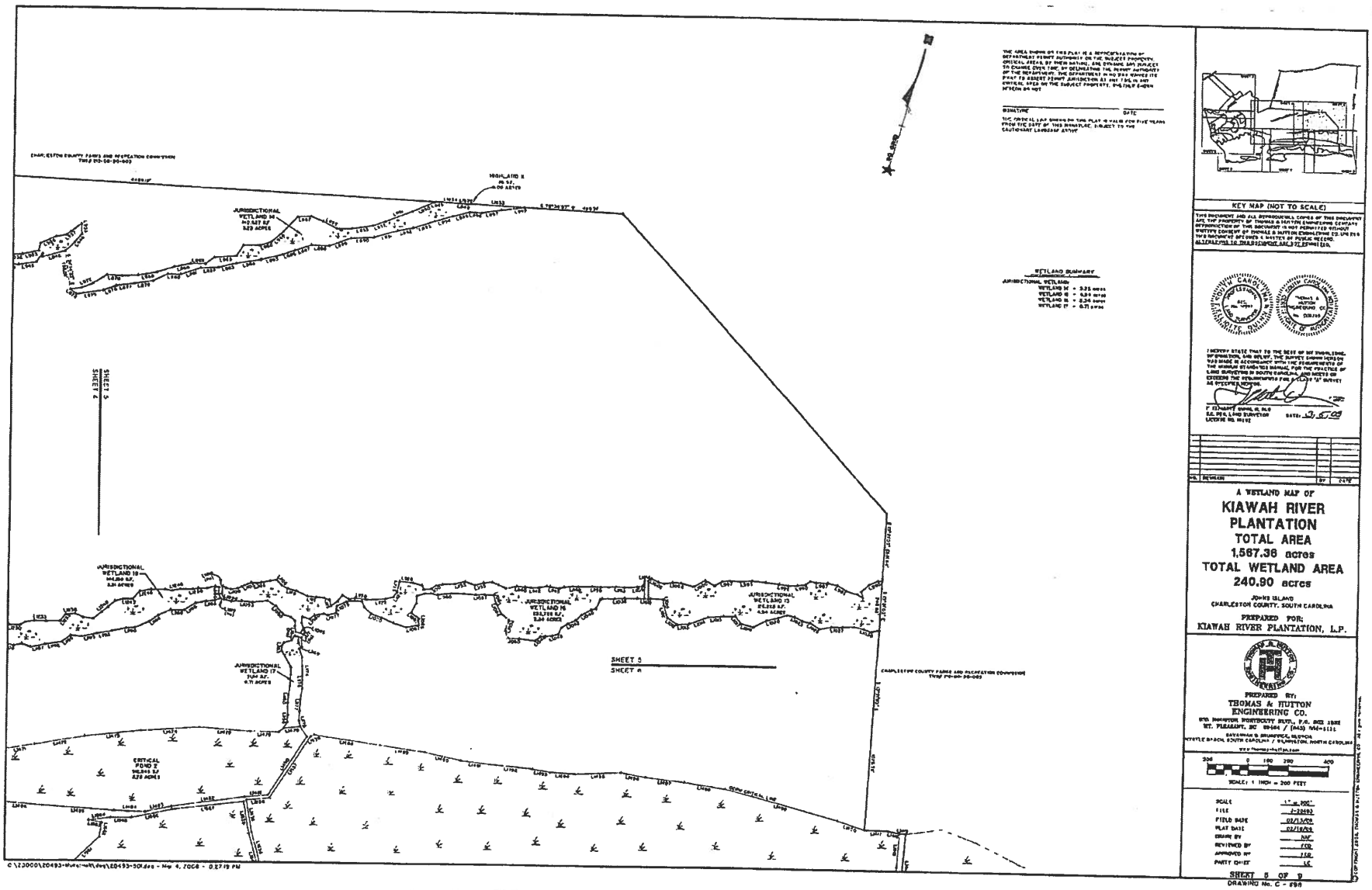
PREPARED FOR:
KIAWAH RIVER PLANTATION, L.P.

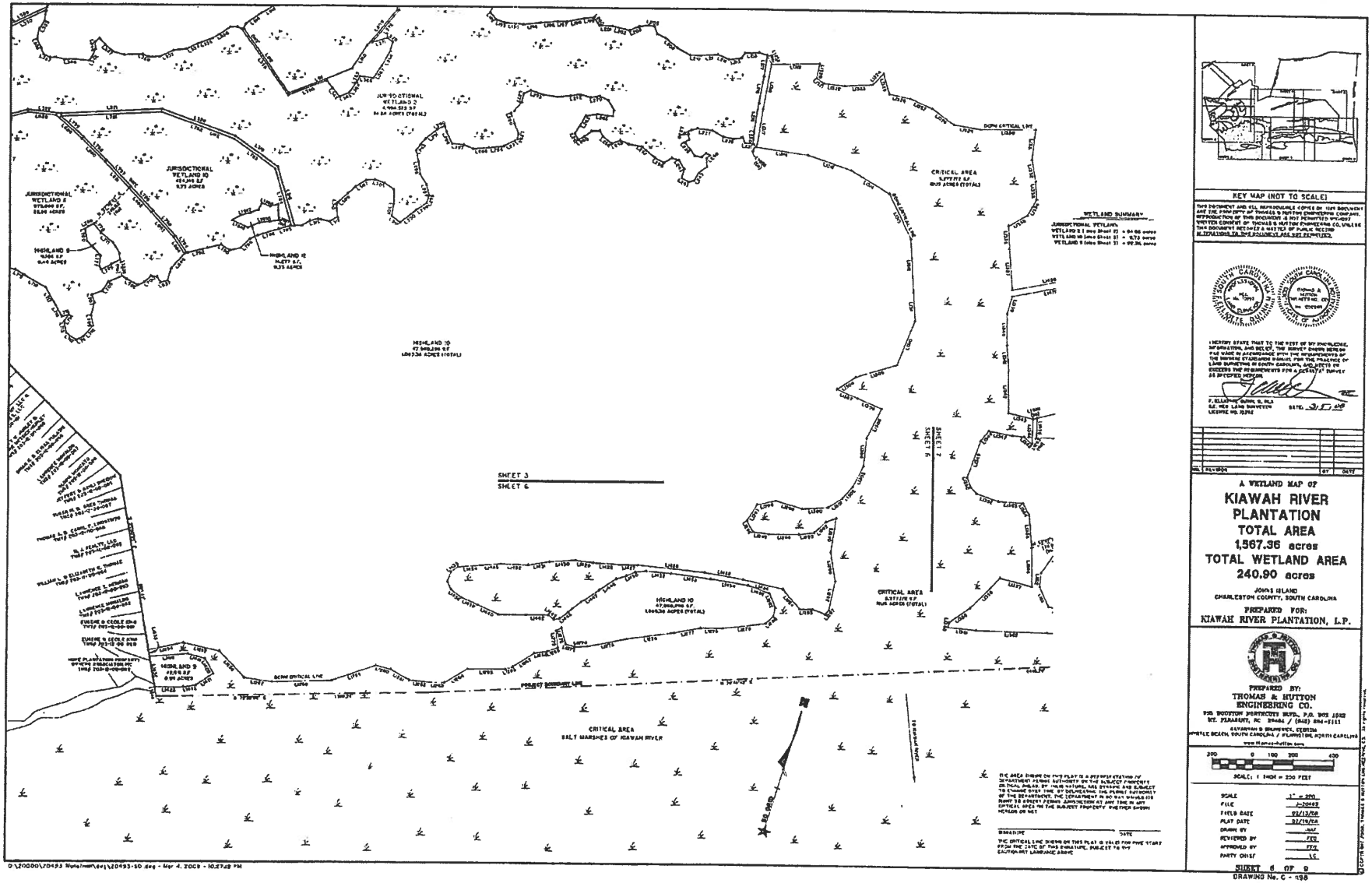
PREPARED BY:
THOMAS & HUTTON ENGINEERING CO.
225 INDUSTRY INNOVATION BLVD., P.O. BOX 1548
MT. PLEASANT, SC 29466 / (843) 884-1111
SAVANNAH & BRUNSWICK, GEORGIA
MYRTLE BEACH, SOUTH CAROLINA / WILMINGTON, NORTH CAROLINA
www.thomasandhutton.com

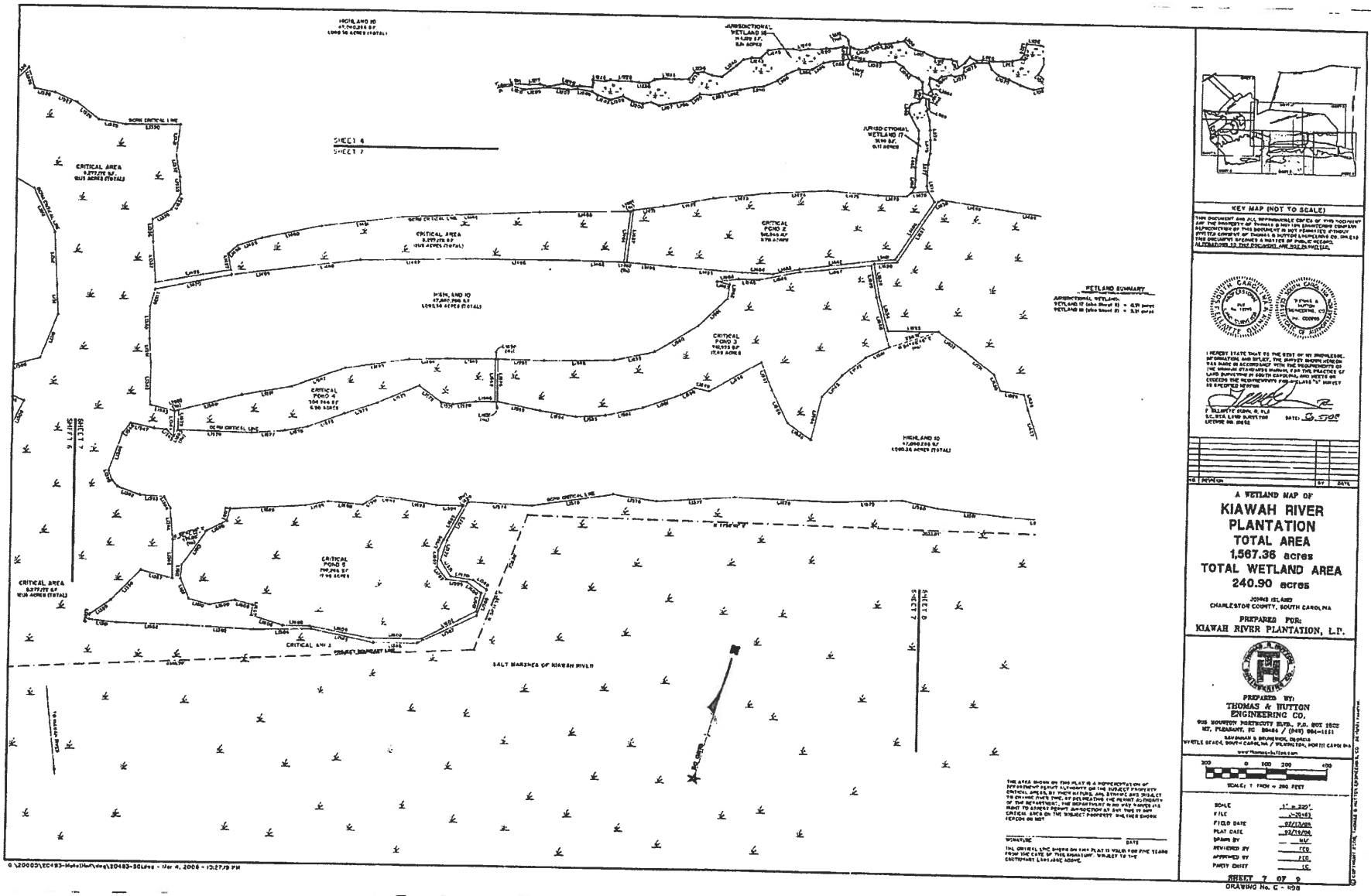
200 0 100 200 400
SCALE: 1 INCH = 200 FEET

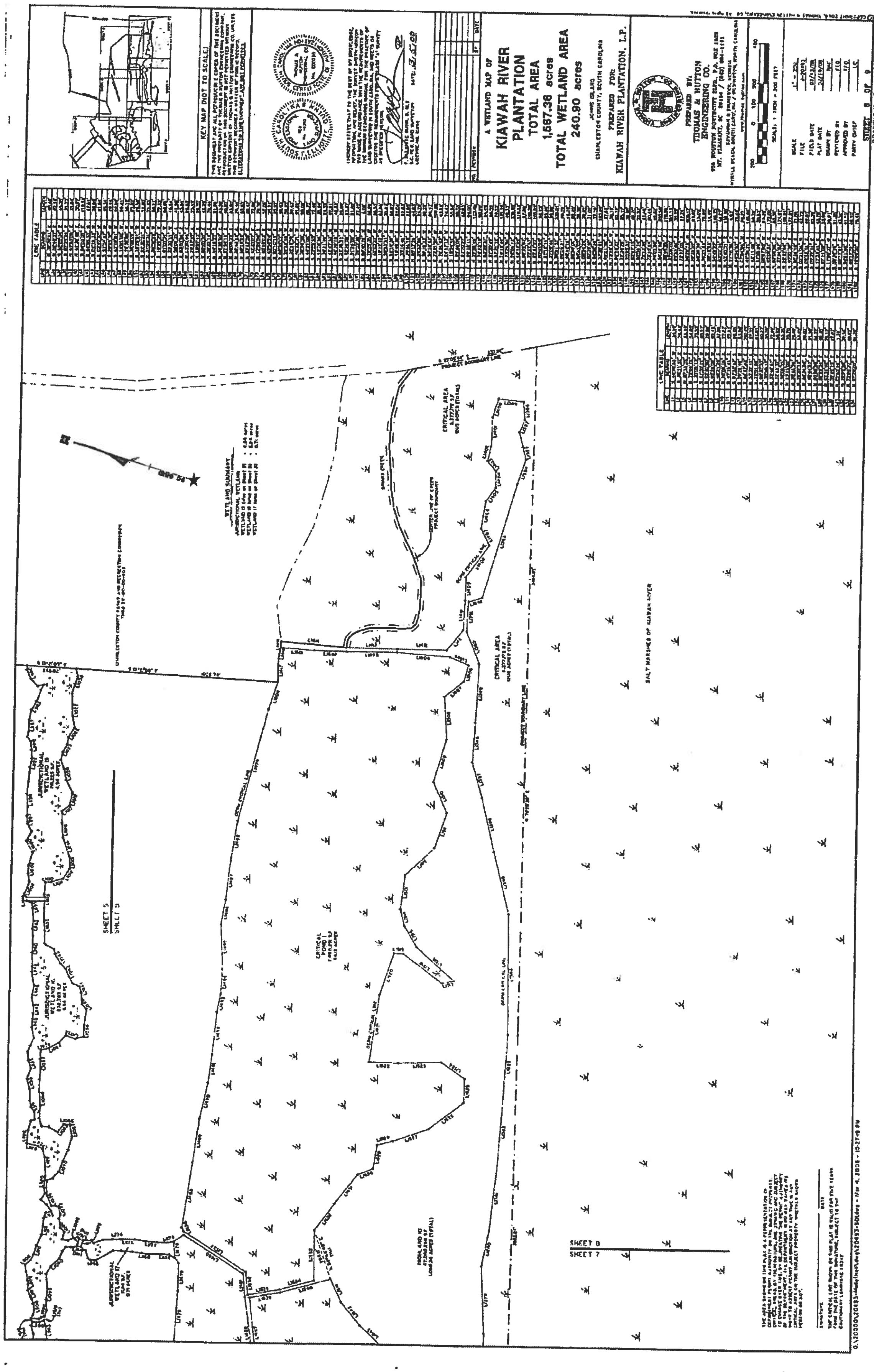
SCALE	1" = 200'
FILE	L-20493
FIELD DATE	02/13/08
PLAT DATE	02/15/08
DRAWN BY	MAF
REVIEWED BY	FEB
APPROVED BY	FEB
PARTY CHIEF	JC

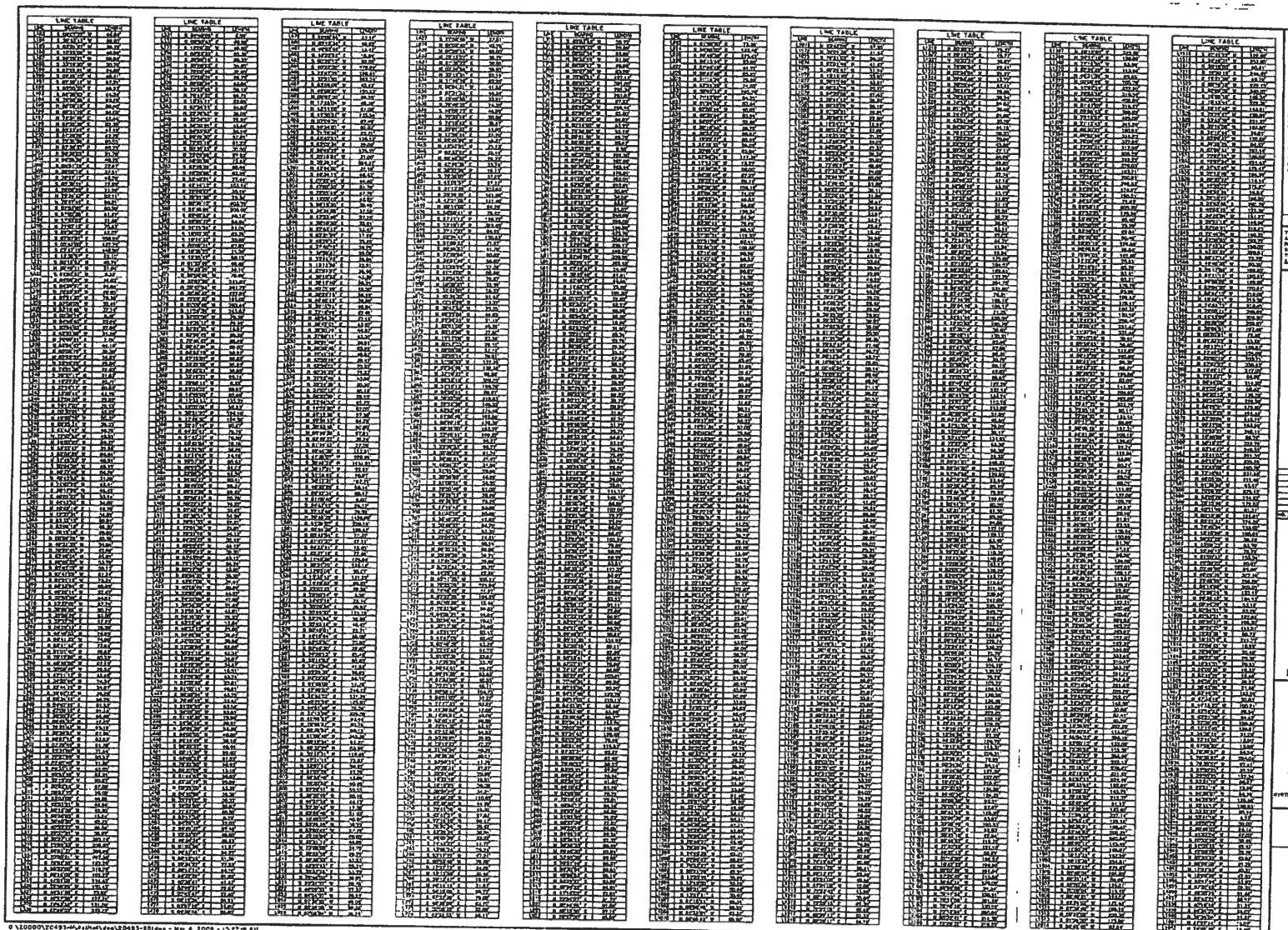
SHEET 6 OF 9
DRAWING No. C - 008


JURISDICTIONAL WETLAND 18
JURISDICTIONAL WETLAND 17
JURISDICTIONAL WETLAND 16
JURISDICTIONAL WETLAND 15
JURISDICTIONAL WETLAND 14
CRITICAL POND 2
SHEET 3
SHEET 4
SHEET 5
SHEET 6
KEY MAP (NOT TO SCALE)
WETLAND SUMMARY
JURISDICTIONAL WETLANDS
WETLAND M = 3.25 acres
WETLAND N = 6.29 acres
WETLAND O = 8.24 acres
WETLAND P = 0.71 acres
A WETLAND MAP OF
KIAWAH RIVER PLANTATION
TOTAL AREA
1,567.36 acres
TOTAL WETLAND AREA
240.90 acres
JOHNS ISLAND
CHARLESTON COUNTY, SOUTH CAROLINA
PREPARED FOR:
KIAWAH RIVER PLANTATION, L.P.
PREPARED BY:
THOMAS & HUTTON ENGINEERING CO.
SCALE: 1 INCH = 200 FEET
SHEET 5 OF 9
DRAWING No. C - 898


JURISDICTIONAL WETLAND 2
JURISDICTIONAL WETLAND 10
HIGHLAND 9
HIGHLAND 10
CRITICAL AREA
SALT MARSHES OF KIAWAH RIVER
SHEET 3
SHEET 6
SHEET 7
SHEET 4
WETLAND SUMMARY
KEY MAP (NOT TO SCALE)
A WETLAND MAP OF
KIAWAH RIVER PLANTATION
TOTAL AREA
1,567.36 acres
TOTAL WETLAND AREA
240.90 acres
JOHNS ISLAND
CHARLESTON COUNTY, SOUTH CAROLINA
PREPARED FOR:
KIAWAH RIVER PLANTATION, L.P.
PREPARED BY:
THOMAS & HUTTON ENGINEERING CO.
SCALE: 1 INCH = 200 FEET
SCALE 1" = 200'
FILE J-20493
FIELD DATE 02/15/08
PLAT DATE 02/29/08
DRAWN BY MAF
REVIEWED BY TFG
APPROVED BY TFG
PARTY CHIEF AC
SHEET 6 OF 9
DRAWING No. C - 198


JURISDICTIONAL WETLAND 16
JURISDICTIONAL WETLAND 17
CRITICAL AREA
CRITICAL POND 2
CRITICAL POND 3
CRITICAL POND 4
CRITICAL POND 5
HIGH LAND 10
HIGH LAND 20
SHEET 6
SHEET 7
SALT MARSHES OF KIAWAH RIVER
WETLAND SUMMARY
KEY MAP (NOT TO SCALE)
A WETLAND MAP OF
KIAWAH RIVER PLANTATION
TOTAL AREA
1,567.36 acres
TOTAL WETLAND AREA
240.90 acres
JOHNS ISLAND
CHARLESTON COUNTY, SOUTH CAROLINA
PREPARED FOR:
KIAWAH RIVER PLANTATION, L.P.
PREPARED BY:
THOMAS & HUTTON ENGINEERING CO.
SCALE: 1 INCH = 200 FEET
SCALE 1" = 200'
FILE S-20483
FIELD DATE 02/13/06
PLAT DATE 02/19/06
DRAWN BY MV
REVIEWED BY TCD
APPROVED BY TCD
PARTY CHIEF TC
SHEET 7 OF 9
DRAWING No. C - 408


A WETLAND MAP OF
KIAWAH RIVER
PLANTATION
TOTAL AREA
1,587.38 acres
TOTAL WETLAND AREA
240.90 acres
JOHNS ISLAND
CHARLESTON COUNTY, SOUTH CAROLINA
PREPARED FOR:
KIAWAH RIVER PLANTATION, L.P.
PREPARED BY:
THOMAS & HUTTON
ENGINEERING CO.
SCALE: 1 INCH = 200 FEET
KEY MAP (NOT TO SCALE)
LINE TABLE
SALT MARSHES OF KIAWAH RIVER
CRITICAL AREA
PROJECT BOUNDARY LINE
SHEET 5
SHEET 6
SHEET 7
SHEET 8
SHEET 8 OF 9
DRAWING No. C-198



THE DATA SHOWN ON THIS PLAT IS A REPRESENTATION BY DHEC/OCRM TO POINT AUTHORITY ON THE SUBJECT PROPERTY. CRITICAL AREAS, BY ENVIRONMENTAL AND DYNAMIC AND SUBJECT TO CHANGE OVER TIME, BUT DPC WEARING THE HIGHEST AUTHORITY POINT TO ASSERT POINT JURISDICTION AT ANY TIME IN ANY CRITICAL AREA ON THE SUBJECT PROPERTY, WHETHER SHOWN HEREON OR NOT.

SIGNATURE DATE

THE CRITICAL LINE SHOWN ON THIS PLAT IS VALID FOR FIVE YEARS FROM THE DATE OF THIS SIGNATURE EXCEPT TO THE EXTENT PARTS HAVE BEEN ALTERED.

VICINITY MAP (NOT TO SCALE)

I HEREBY STATE THAT TO THE BEST OF MY KNOWLEDGE, INFORMATION, AND BELIEF, THE SURVEY SHOWN HEREON WAS MADE IN ACCORDANCE WITH THE REQUIREMENTS OF THE MINIMUM STANDARD MANUAL FOR THE PRACTICE OF LAND SURVEYING IN SOUTH CAROLINA, AND MEETS OR EXCEEDS THE REQUIREMENTS FOR A CLASS "A" SURVEY AS SPECIFIED HEREIN.

P. BLANTON SMITH, III, PLS
S.C. REG. LAND SURVEYOR
LICENSE NO. 19757

DATED: 12 JUNE 08

NO.	REVISION	BY	DATE

A WETLAND MAP OF

KIAWAH RIVER PLANTATION

TOTAL AREA
1,567.36 acres
TOTAL WETLAND AREA
240.90 acres

JOHNS ISLAND
CHARLESTON COUNTY, SOUTH CAROLINA

PREPARED FOR:
KIAWAH RIVER PLANTATION, L.P.

PREPARED BY:
THOMAS & HUTTON ENGINEERING CO.
925 BOWMAN MONTICELLO BLVD., P.O. BOX 1820
MT. PLEASANT, SC 29466 / (843) 884-1811
SAVANNAH • BLUFFTON, GEORGIA
MYRTLE BEACH, SOUTH CAROLINA / WILMINGTON, NORTH CAROLINA
www.thomas-hutton.com

200 0 100 200 400
SCALE: 1 INCH = 200 FEET

SCALE	1" = 200'
FILE	-02-08
FIELD DATE	02/13/08
PLAT DATE	02/19/08
DRAWN BY	RM
REVIEWED BY	PSB
APPROVED BY	PSB
PARTY CHIEF	LC

SHEET 9 OF 9
DRAWING No C - 898

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EXHIBIT 1.1

Definitions

The "*Act*" means the South Carolina Local Government Development Agreement Act, codified at sections 6-31-10 to -160 of the South Carolina Code.

"*Accessory Dwelling Unit*" means a dwelling unit, with no more than 800 square feet of gross floor area, that has been added to, onto, or created within, a single family house. This definition includes garage apartments. An *Accessory Dwelling Unit* may be detached from a single family house provided it complies with the conditions applicable to *Accessory Dwelling Units* in Appendix B to the *Agreement.*

"*Accessory Use*" means a use customarily incidental and subordinate to the principal use of a *Lot* or of a structure, or as allowed by the *ARB* in accordance with Article 6.5 of Appendix D, which is a red-line of the *ZLDR*. An *Accessory Use* is located on the same *Lot* as the principal use, except (i) in cases of off-street parking, temporary real estate sales office, and temporary construction facilities, and (ii) in cases of *Hotels* or *Inns* where *Accessory Uses* may be located on other *Lots*.

"*Active Recreation Area*" means any park, recreational facility, or recreational area which is not dependent upon a specific environmental or natural resource and which is developed with recreation and support facilities. An *Active Recreation Area* includes, but is not limited to, playgrounds, *Golf Courses*, bicycle trails, baseball or softball fields, football or soccer fields, basketball courts, swimming pools, clubhouses, water-dependent uses, equestrian facilities, pickle courts, racquetball courts, and tennis courts. *Active Recreation Areas* shall constitute open space.

"*Affordable Housing*" means, in the case of dwelling units for sale, housing in which mortgage, amortization, taxes, insurance, and condominium or association fees, if any, constitute no more than twenty-eight percent (28%) of the annual household income for a household earning no more than eighty percent (80%) of the area median income, by household size, for the metropolitan statistical area as published from time to time by the U.S. Department of Housing and Community Development (HUD) and, in the case of dwelling units for rent, housing for which the rent and utilities constitute no more than thirty percent (30%) of the annual household income for a household earning no more than eighty percent (80%) of the area median income, by household size for the metropolitan statistical area as published from time to time by HUD.

"*Agreement*" means this Development Agreement, including the recitals and exhibits attached hereto. The *Agreement* shall also include the *Plan*.

"*ARB*" is the Kiawah River Architectural Review Board that is currently functional under the auspices of the *Property Owner* and/or as it may later function under applicable *Covenants*. The *ARB* may promulgate, modify, and enforce development guidelines, such as architectural and landscaping guidelines, assigned to it under the *Agreement* or the *Plan* with respect to any portion of the *Real Property*.

"*Association*" means one or more non-profit association(s) or corporation(s), which will be formally constituted and made up of the property owners and/or residents of the Real *Property*,

or a particular portion or portions thereof. An *Association* may take responsibility for costs and maintenance of *Common Areas* on or affecting any portion of the *Real Property* subject to such *Association*'s jurisdiction, as delineated in any applicable *Covenants*.

"*Bed and Breakfast*" means a lodging-type building or group of buildings on one *Lot* offering two (2) to twelve (12) *Guest Rooms*, with or without meal service, on a daily, weekly, monthly, or seasonal basis. A *Bed and Breakfast* may be owner-occupied and/or staff-occupied. Whether or not owner- or staff-occupied, a *Bed and Breakfast* shall contribute to *Guest Room* entitlement densities, and no others, in the *Agreement*.

"*Building Coverage*" means the area of a *Lot* covered by principal or accessory buildings or roofed areas, as measured along the outside wall at ground level, and including all projections, other than open porches, fire escapes, canopies, and the first two feet (2') of a roof overhang. This definition shall not include pools, pool decks, or pervious drives.

"*Building Development Standards*" means any applicable dimensional standards for *Lots*, *Development Parcels*, buildings, and structures, including but not limited to any minimum standards for *Lot* area, *Lot* width, *Setbacks*, and yard requirements and any maximum standards for *Building Height* and *Building Coverage* on *Lots* or *Development Parcels*.

"*Building Height*" means elevation from *Ground Floor Level* as measured in feet. *Building Height* does not include those items specifically excluded from consideration of *Building Height* in the *Plan*.

"*Common Areas*" means "Common Areas," as defined under any *Covenants* encumbering all or portions of the *Real Property*, i.e., all real and personal properties which now or hereafter are deeded or leased to, or are the subject of a use agreement or easement with, an *Association* and wherein the property therein described is specifically denominated to be part of the *Common Areas*. The *Common Areas* may include but shall not be limited to open space; maintenance and drainage areas; *Facilities*; easements; alleys; *Thoroughfares*; parking lots; *Community Ways*; street lighting; signs; lagoons; ponds; wetlands; rights-of-way; and the area between any property line of an owner and the mean high water mark of any adjoining river tidal creek, marsh, or other water body. The designation of any land and/or improvements as a Common Area shall not mean or imply that the public at large acquires any easement of use or enjoyment therein.

"*Community Way*" means a walkway of any surface type (paved or unpaved), bike trail, leisure trail, or walking trail designed for pedestrian or bike traffic.

"*Comprehensive Plan*" means the Charleston County Comprehensive Plan, adopted pursuant to sections 6-29-510 to -540 of the South Carolina Code, as well as the official map of Charleston County, adopted pursuant to sections 6-7-1210 to -1280 of the South Carolina Code.

"*Corps*" means the United States Army Corps of Engineers.

"*County*" means Charleston County, a political subdivision of the State of South Carolina.

EXHIBIT 1.1

"*County Council*" means the County Council of Charleston County, South Carolina.

"*County Ordinances*" means the Code of Ordinances of Charleston County, South Carolina.

"*Covenants*" means and refers to one or more declaration(s) of covenants, conditions, and restrictions encumbering all or portions of the *Real Property* that have been or will be recorded by the *Property Owner*.

"*Development*" means the planning for or carry out of a building activity, demolition, reclamation of on-site materials, the making of a material change in the use or appearance of any structure or property, or the dividing of land into two or more parcels, and is intended by the *Parties* to include all further uses of, activities upon, or changes to the *Real Property* as are authorized by the *Agreement*. "*Development*," as designated in a land or *Development Permit*, includes the planning for and all other activity customarily associated with it unless otherwise specified. When appropriate to the context, "*Development*" refers to the planning for or the act of developing or to the result of *Development*. Reference to a specific operation is not intended to mean that the operation or activity, when part of other operations or activities, is not *Development*. Reference to particular operations is not intended to limit the generality of this term.

"*Development Parcel*" means any parcel of land on which *Development* may occur, including platted *Lots* and unplatted parcels, but excluding public or private street rights-of-way.

"*Development Permit*" includes a building permit, zoning permit, construction permit, subdivision or plat approval, rezoning certification, special exception, variance, certificate of occupancy or any other official action of *Local Government* having the effect of permitting or approving the *Development* or use of real property.

"*DHEC*" means the Department of Health and Environmental Control, as established pursuant to section 44-1-20 of the South Carolina Code.

"*Diameter Breast Height*" or "*DBH*" means the total diameter, in inches, of a tree trunk or trunks measured at a point four and one half feet above existing grade (at the base of the tree). In measuring *DBH*, the circumference of the tree shall be measured with a standard diameter tape, and the circumference shall be divided by 3.14.

"*District*" means the Kiawah River Planned Development District, as established in the *Plan*.

"*Dock*" or "*Pier*" means a structure built over and/or floating on water used to provide access to water and/or for the mooring of boats or other watercraft. A *Dock* or *Pier* may contain commercial uses as permitted by *DHEC* and shall constitute a water-dependent use.

"*DOT*" means the South Carolina Department of Transportation, as established in section 57-1-20 of the South Carolina Code.

EXHIBIT 1.1

"*Dwelling Unit*" means one or more rooms, designed, occupied or intended for permanent occupancy as a separate living quarter, with cooking, sleeping and sanitary facilities contained therein. The term "*Dwelling Unit*" does not include *Guest Rooms*, *Villas*, or accessory buildings or structures (including but not limited to *Accessory Dwelling Units*).

"*Facilities*" means major capital or community improvements including, but not limited to, transportation, sanitary sewer, solid waste, drainage, potable water, electrical service, cable television, high speed internet access, and telephone service.

"*Golf Course*" means a tract or tracts of land laid out for up to thirty-six (36) holes for playing the game of golf and improved with tees, greens, fairways, and hazards, and that may include club houses, driving ranges, training facilities, maintenance facilities, and shelters. *Golf Courses* shall constitute *Active Recreation Areas*.

"*Grand Tree*" means any live, healthy tree with a *DBH* of 24 inches or greater, with the exception of pine tree, laurel oak, water oak, and sweet gum tree species.

"*Gross Leasable Area*" or "*GLA*" means floor area devoted to a use designated as such in the table of uses set forth in the *Plan*. *GLA* does not include public or common areas, such as parking lots, utility rooms and stairwells, in a building or on a *Lot* otherwise devoted to a use designated as *GLA* in the *Plan*. *GLA* does not include a community amenity center, such as a fitness club/aquatic center. For the purpose of this provision, the term "floor area" shall have the definition specified in Chapter 12 of the *ZLDR* on the *Effective Date*.

"*Ground Floor Level*" means *Natural Ground* or the lowest floor elevation for structures as set forth in the County's flood management ordinance, as amended, whichever is higher; provided, however, that *Ground Floor Level* shall not exceed 14 feet above *Natural Ground*. This definition shall not be construed to prevent an owner from constructing his first finished floor higher than *Ground Floor Level*; provided, however, *Building Height* shall be measured from *Ground Floor Level*.

"*Guest Room*" means a room or suite designed for temporary occupancy by one (1) or more people in a single unit on a daily, weekly, monthly, or seasonal basis. A *Guest Room* may be individually owned or owned as a "time-share" unit without respect to other *Guest Rooms*. A *Guest Room* may be located within a *Hotel*, *Inn*, *Villa*, or *Bed and Breakfast*. A *Guest Room* shall contribute to the *Guest Room* entitlement densities, and no others, in the *Agreement*.

"*Hotel*" means a lodging-type building or group of buildings offering twenty-five (25) or more *Guest Rooms*, with or without meal service, on a daily, weekly, monthly, or seasonal basis. The *Property Owner* shall have the vested right to develop up to two (2) *Hotels* on the Real Property. The amount of *Guest Rooms* permitted in a *Hotel* shall be limited only by the total *Guest Room* entitlement densities in the *Agreement*. A *Hotel* may be owner-occupied and/or staff-occupied. Whether or not owner- or staff-occupied, a *Hotel* shall contribute to *Hotel* and *Guest Room* entitlement densities, and no others, in the *Agreement*.

"*Housing for the Workforce*" means all *Affordable Housing* and all dwelling units designed to accommodate persons employed on the *Real Property*, persons employed on Kiawah Island, persons employed on Seabrook Island, and/or persons employed within a ten (10) mile radius of the *Real Property*.

"*Inn*" means a lodging-type building or group of buildings offering thirteen (13) to twenty-four (24) *Guest Rooms*, with or without meal service, on a daily, weekly, monthly, or seasonal basis. An *Inn* may be owner-occupied and/or staff-occupied.

"*Land Development Regulations*" means ordinances and regulations enacted by the appropriate governing body for the regulation of any aspect of *Development* and includes, but is not limited to, *Local Government* zoning, rezoning, subdivision, building construction, occupancy, aesthetic, road, or sign regulations or any other regulations controlling the *Development* or use of property.

"*Laws*" means all ordinances, resolutions, regulations, comprehensive plans, *Land Development Regulations*, policies and rules, custom and usage (formal or informal) adopted by a *Local Government* affecting the *Development* of property and includes laws governing permitted uses of the property, governing density, and governing design, improvement, and construction standards and specifications, except as provided in section 6-31-140(A) of the South Carolina Code.

"*Local Government*" means any county, municipality, special district, or governmental entity of the state, county, municipality or region established pursuant to law which exercises regulatory control over, and grants *Development Permits* for land *Development* or which provides public *Facilities*. The *County* is a *Local Government*.

"*Lot*" means *Development Parcel* identified in a *Subdivision Plat* recorded in the Office of the Register of Mesne Conveyances for Charleston County, South Carolina.

"*Lot Line, Front*" means the lot line separating a *Lot* from the *Thoroughfare* that is used as the primary access point to the *Lot*. In cases where a *Lot* abuts open space, including Passive Recreation Areas, on one side, and a *Thoroughfare* that is used as the primary access on the opposite side, the Property Owner may designate the lot line abutting the open space as the *Front Lot Line* and the opposite lot line (abutting the Thoroughfare) as the Rear Lot Line. In cases where a Lot abuts more than one Thoroughfare, the Property Owner may designate the Front Lot Line pursuant to Section 6.1.c herein

"*Mixed Use*" means a use, structure, or parcel containing both residential and non-residential elements.

"*Natural Ground*" means average elevation of a *Lot* or *Development Parcel* prior to *Development* activity.

"*OCRM*" means DHEC's Office of Ocean and Coastal Resource Management.

"*OCRM Critical Line*" means the critical area line defined by *OCRM*.

"*Parties*" are the *Property Owner* and the *County*. When used herein with reference to a specific *Tract, Development Parcel, Lot,* or other portion of the *Real Property*, *Parties* shall mean and refer to the *County* and that specific person or entity that has legal title to such *Tract, Development Parcel, Lot,* or other portion of the *Real Property*. If portions of the *Agreement* apply to one or more, but not all, of the entities or persons comprising the *Property Owner,* those particular parties may be separately referred to herein.

"*Passive Recreation Area*" means areas in and located due to the presence of a particular natural or environmental setting and that may include conservation lands or waters providing for both active and passive types of resource-based outdoor recreation activities that are less formalized or program-oriented than activity-based recreation. Resource-based outdoor recreation means and refers to activities requiring a natural condition such as boating, fishing, camping, nature trails and nature study. A farm or other agricultural use shall be considered a *Passive Recreation Area*. *Passive Recreation Areas* shall constitute open space.

"*Pervious Cover*" means water bodies, as well as land that permits the absorption of storm water into the ground. *Pervious Cover* may include, but is not limited to *Community Ways*, streets, roads, alleys, parking lots and driveways which are pervious to storm water.

"*Plan*" means the Kiawah River Planned Development District Plan. The *Plan* is attached to the *Agreement* and incorporated therein by reference. The *Plan* shall constitute a vested right of the *Property Owner* during the term of the *Agreement* (including any extensions or renewals thereof).

"*Planning Commission*" means the Charleston County Planning Commission as established under Article 2.2 of the *ZLDR*.

"*Planning Director*" means the Director of the Planning Department of Charleston County or the authorized designee or representative of the Director.

"*Project*" is the *Development* that has occurred and will occur on the *Real Property*.

"*Property Owner*" means Kiawah River Investment, LLC,; together with all subsidiaries thereof and other entities, which may have a legal interest on the date of execution hereof in any of the *Real Property* described in Paragraph 4 of the *Agreement* and includes their successors in interest, successors in title (as to any portion of the *Real Property*), and/or assigns by virtue of assignment or other instrument compliant with the *Agreement*. When used herein with reference to a specific *Tract, Development Parcel, Lot,* or other portion of the *Real Property*, "*Property Owner*" shall mean and refer to that specific person or entity that has legal title to such *Tract, Development Parcel, Lot*, or other portion of the *Real Property*. The *Property Owner* warrants that there are no other legal or equitable owners of the *Real Property* on the *Effective Date*.

EXHIBIT 1.1

"Protected Trees" means any tree on a parcel with a diameter breast height of eight inches or greater prior to development and all tree within required buffers or required landscape areas. Limited removal is allowed only when specified by the provisions of this Ordinance.

"*PSC*" means the Public Service Commission, as established pursuant to section 58-3-10 of the South Carolina Code, as amended.

"*Real Property*" is the *Real Property* referred to in Paragraph 4 of the *Agreement* and includes any improvements or structures customarily regarded as part of real property.

"*Retirement Housing*" means the use of a site for housing that qualifies under The Housing for Older Persons Act (HOPA) for the senior housing exemption from the anti-discrimination provisions related to familial status of Title VIII of the Civil Rights Act of 1968 (the Federal Fair Housing Act), as amended by the Fair Housing Amendments Act of 1988 (the Fair Housing Act). No *Retirement Housing* shall be used as a *Short-Term Rental Property.*

"*Retirement Housing Unit*" means a single housing unit intended for occupancy on a site that is designated as *Retirement Housing* that may be housing comprised of single family detached, single family attached, duplex, or multifamily units or any combination of these. No *Retirement Housing Unit* shall be used as a *Short-Term Rental Property.*

"*Setback*" means any required minimum distance from a *Lot* line or street right-of-way that establishes an area within which a structure shall not be erected. Any *Laws* applicable to *Setbacks* and exceptions to *Setbacks* are set forth in the *Plan*, which shall control in lieu of *Laws* applicable to *Setbacks* and exceptions to *Setbacks* in the *ZLDR* or other *Laws*.

"*Short-Term Rental Property*" means a residential dwelling or any part thereof that is offered, advertised, or provided to short-term rental tenants (excluding family members) for a fee or any form of compensation, for intervals of 29 days or less during a calendar year.

"*Subdivision Plat*" means a recorded graphic description of property prepared and approved in compliance with the *ZLDR*, as modified by this *Agreement*.

"*Thoroughfare*" means a way for use by vehicular and pedestrian traffic and to provide access to *Lots* and open spaces, consisting of vehicular lanes and their adjacent rights-of-way.

"*Tract*" means and refers to composite parcels of the *Real Property* that have yet to be subdivided.

"*Villa*" means a lodging-style building offering one or more bedrooms and other areas (such as cooking and sanitary facilities) operating as a single unit, with or without meal service, on a daily, weekly, monthly, or seasonal basis. A *Villa* may be owned and temporarily occupied by an individual or entity without respect to ownership of other *Villas*. A *Villa* shall constitute one (1) *Guest Room* and shall contribute to *Guest Room* entitlement densities, and no others, in the *Agreement*.

"*Zoning and Land Development Regulations*" or "*ZLDR*" means and refers to the Zoning and Land Development Regulations of Charleston County, South Carolina.

Legal Description

All that certain piece, parcel or tract of land, together with all buildings and improvements presently located thereon, situate, lying and being on Johns Island, in the County of Charleston, State of South Carolina, known generally as "Mullet Hall Plantation," containing 1083.197 acres of highland (including certain small islands), 235.94 acres of ponds and creeks, 86.36 acres of impounds, and 22.313 acres between mean high water and the DHEC-OCRM Critical Line, more or less, shown on a plat by A.H. Schwacke, & Associates entitled "PLAT OF MULLET HALL & JACK ISLAND 1426.81 ACRES JOHNS ISLAND CHARLESTON COUNTY SOUTH CAROLINA," dated October 4, 1994, last revised on November 11, 1994, and recorded in Plat Book EA, at Pages 316 through 322, in the RMC Office for Charleston County, South Carolina, (the "Plat"), said property having such location, butts and bounds, metes, courses and distances as will by reference to the Plat more fully appear.

Being a portion of TMS # 212-00-00-001.

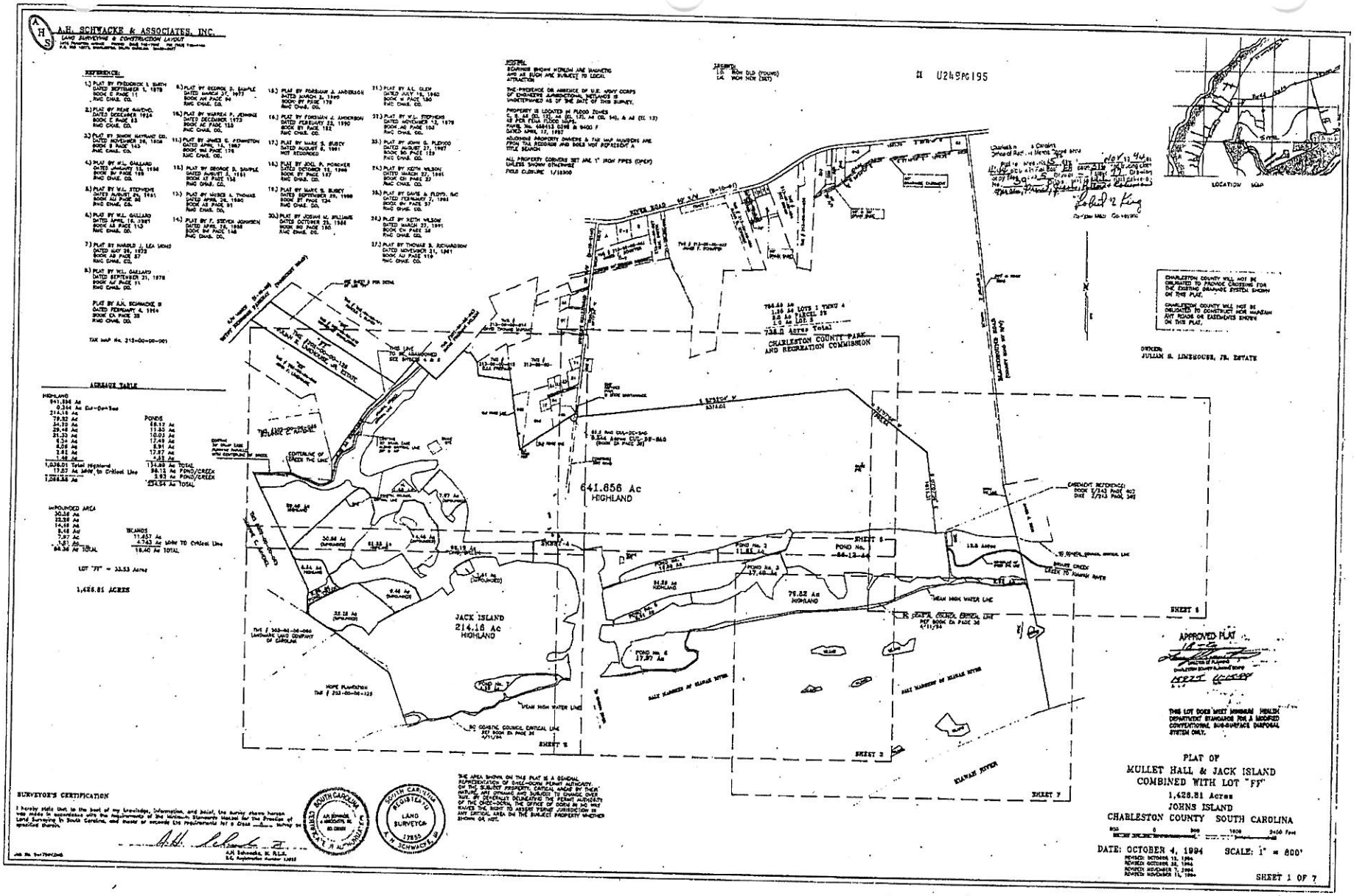

EXHIBIT 4.2 Plat

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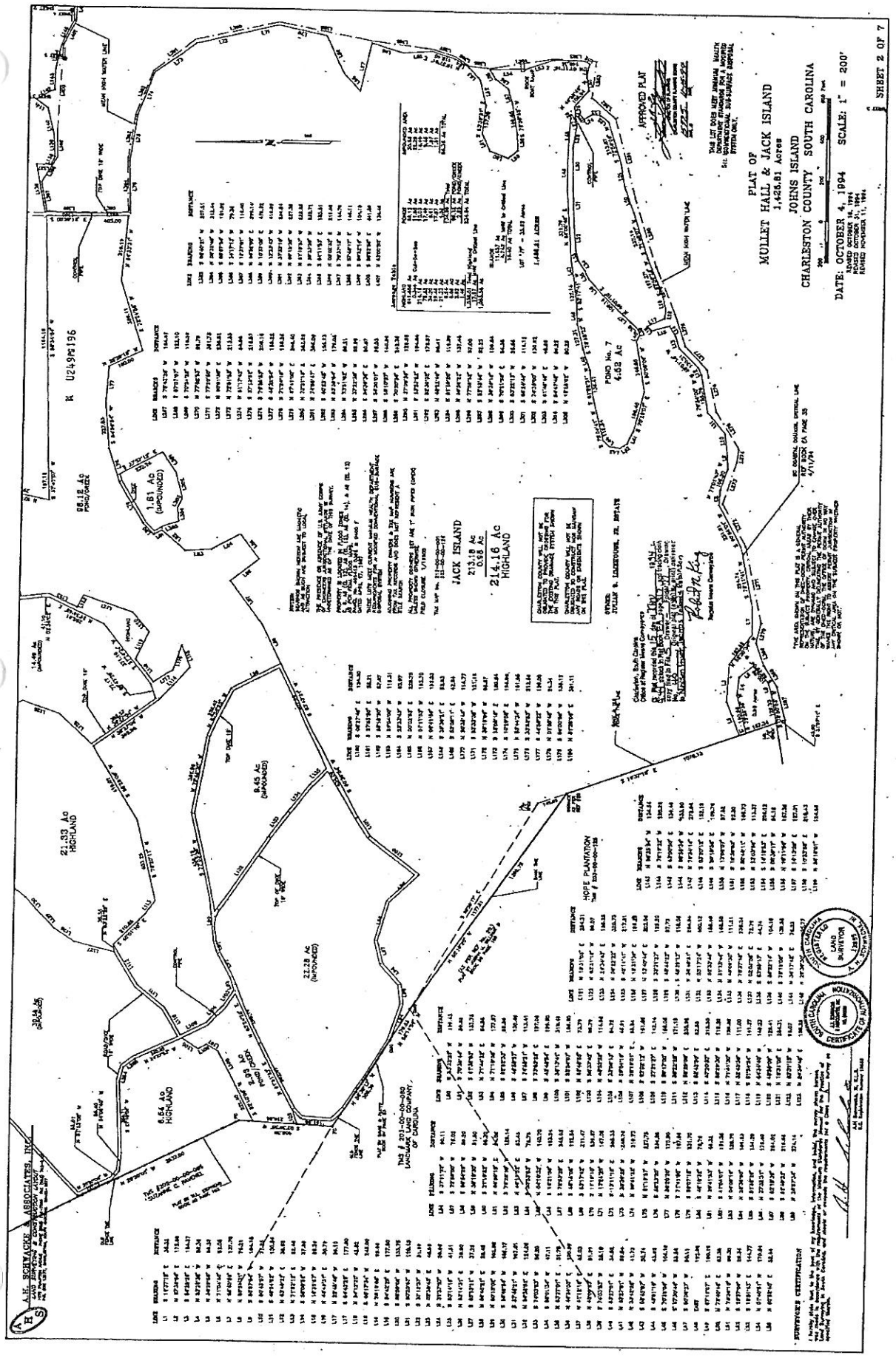

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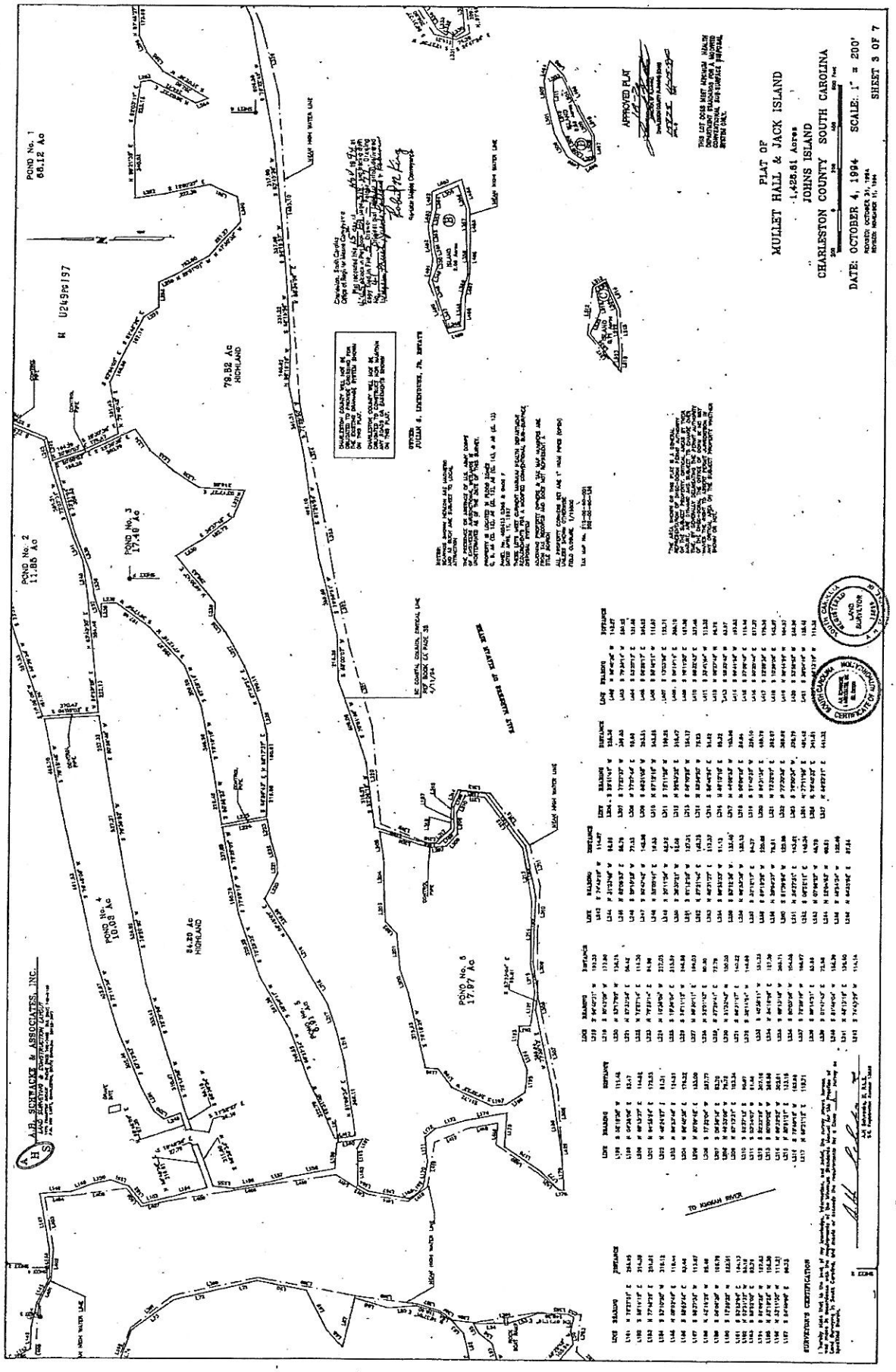

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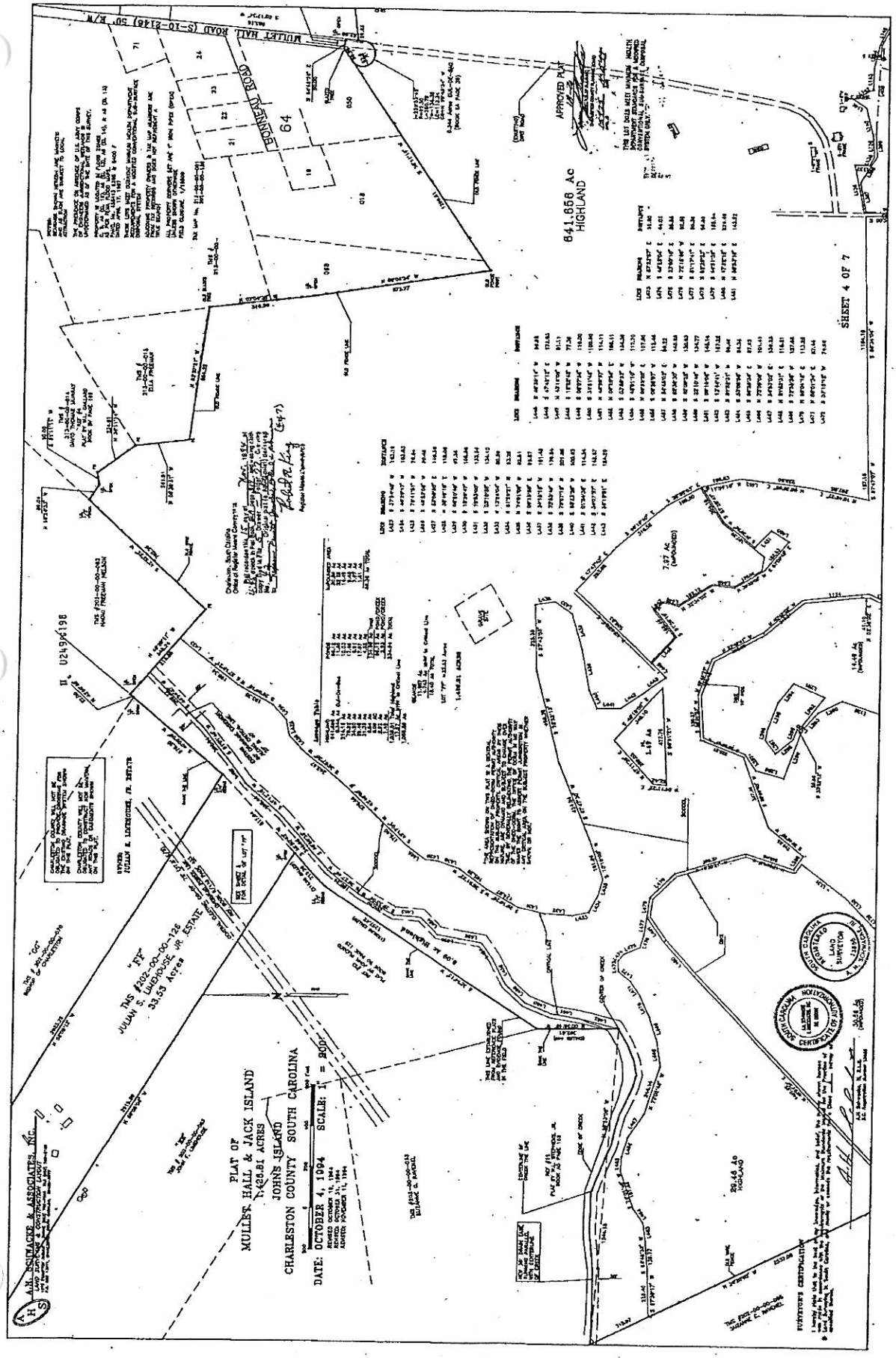

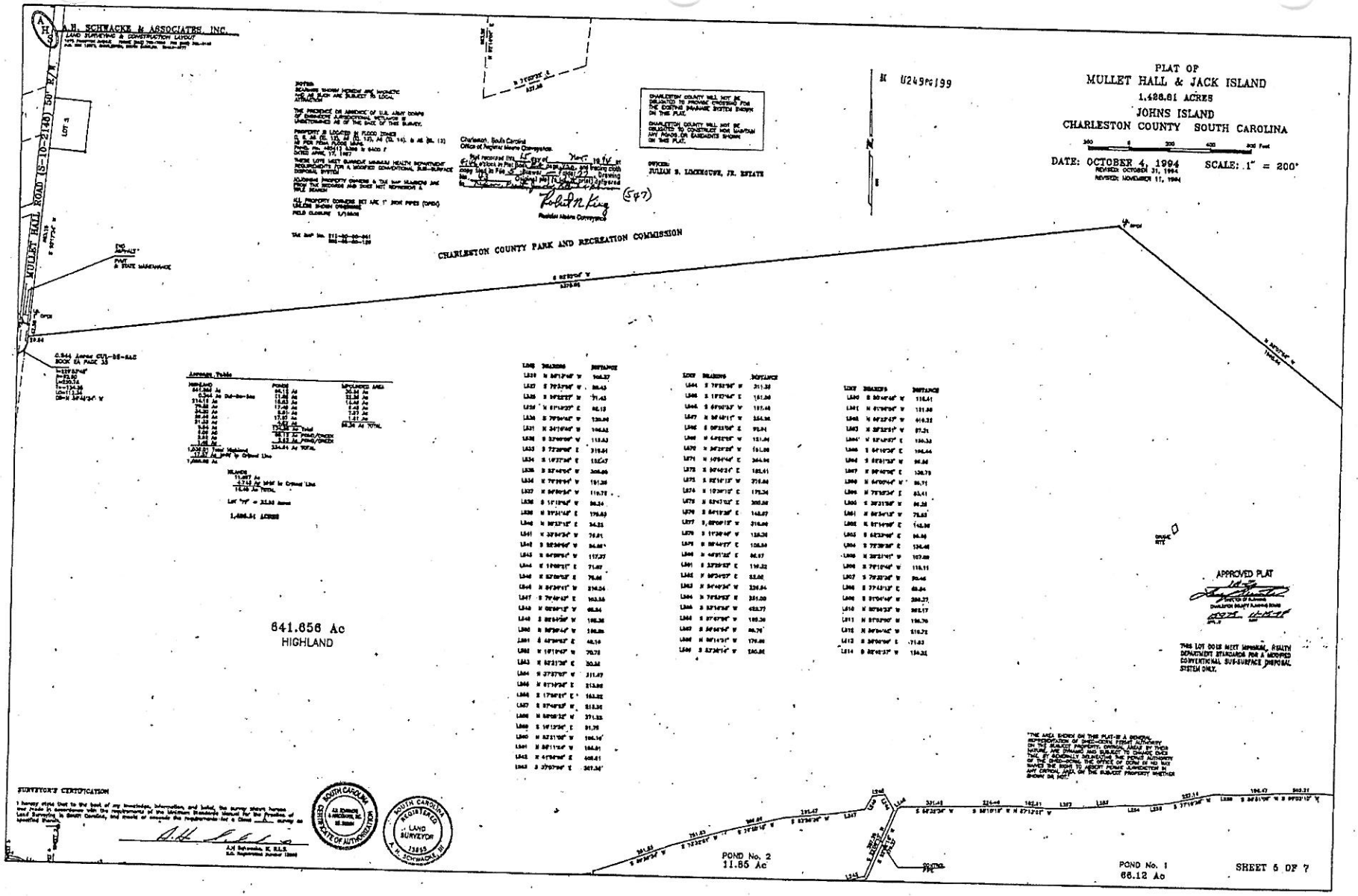

EXHIBIT 4.2 Plat

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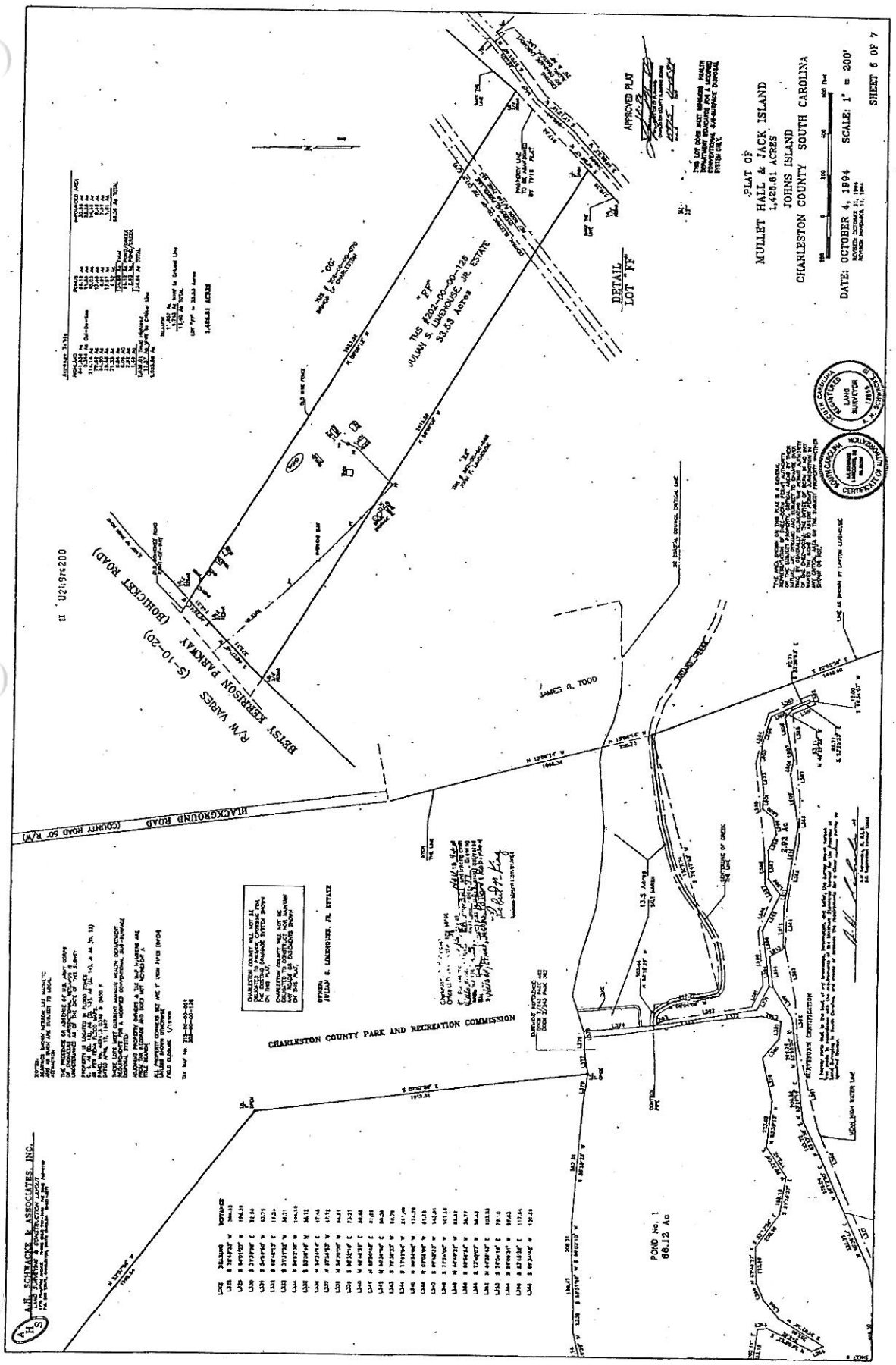


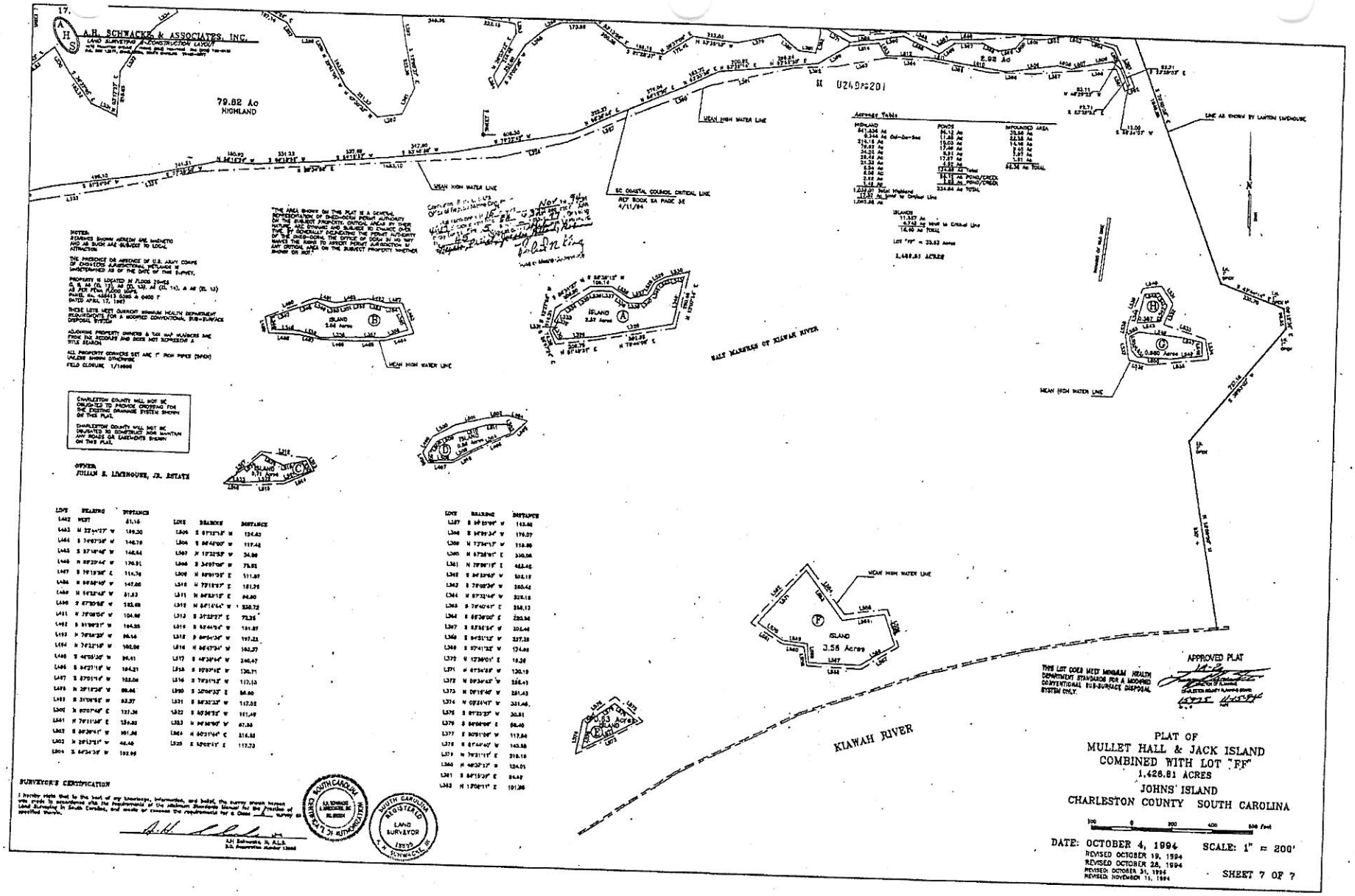


EXHIBIT 4.2 Plat

KIAWAH RIVER PLANTATION ACRES FOR DEVELOPMENT AGREEMENT

* all are from the Schwacke survey - only recorded survey, deeds relate back to it

Highland Acres = 1,038.01 ("total highland") +33.53 (Lot"FF") + 11.657 (Islands - above critical line)
= 1083.197 acres - round to 1083.20

Freshwater Wetlands = 98.12 (Pond/Creek) + 2.93 (Pond/Creek) + 86.36 (Impounded Area)
= 187.41 acres

AG 8	R-4	Saltwater wetlands	
33.53	29.46		
641.656	6.54	66.12	Pond 1
6.09	21.33	11.85	Pond 2
0.344	1.49	10.03	Pond 3
34.2	214.16	17.49	Pond 4
79.82	86.36	6.91	Pond 5
2.92	2.93	17.97	Pond 6
11.657	98.12	4.52	Pond 7
810.217 total	**460.39** total	**134.89**	Sub-total
		17.57	MHW to critical
		4.743	MHW to critical -islands
		22.313	total

Grand Total per Schwacke Survey:

1427.81 *Note: There is an addition error in the Schwacke Survey
It shows **1426.81** acres

BK Y263PG813

dTd 12-31-95

RECORDED 01-05-96

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

TITLE TO REAL ESTATE

KNOW ALL MEN BY THESE PRESENTS, THAT KIAWAH RESORT ASSOCIATES, L.P., (a Delaware limited partnership), (hereinafter sometimes referred to as the "Grantor"), in the County and State aforesaid, for/and in consideration of the sum of One Million Seven Hundred Twenty Thousand Three Hundred Twenty-Two and 57/100 ($1,720,322.57) Dollars to it in hand paid at and before the sealing of these presents by KIAWAH RIVER PLANTATION, L.P., (a Delaware limited partnership), (hereinafter sometimes referred to as the "Grantee"), in the County and State aforesaid, the receipt whereof is hereby acknowledged, and the assumption of the mortgage hereinafter referred to, has granted, bargained, sold and released, and by these presents does grant, bargain, sell and release unto the said KIAWAH RIVER PLANTATION, L.P., an undivided seven-eights interest of, in and to the following described property, to-wit:

SEE ATTACHED EXHIBIT "A" FOR DESCRIPTION
OF PROPERTY CONVEYED

(the "Property")

TMS Number: 212-00-00-001

Tax District: 5-1

Address of Grantee: c/o The Beach Company
200 Meeting Street, Suite 401
Post Office Box 242
Charleston, SC 29402

This conveyance is made subject to that certain mortgage from Kiawah Resort Associates, L.P. to William Lawton Limehouse, a/k/a W.L. Limehouse; Linda Anne L. McMurphy, a/k/a Ann Limehouse Macmurphy, a/k/a Anne Limehouse Macmurphy, a/k/a Linda L. McMurphy, n/k/a Anne Limehouse Macmurphy Griffin; Ann Limehouse Macmurphy, a/k/a Anne Limehouse Macmurphy Griffin; Ann Limehouse Macmurphy, a/k/a Anne Limehouse Macmurphy, n/k/a Anne Limehouse Macmurphy Griffin as Trustee for Michael Linar Limehouse; and as Personal Representative of the Estate of Betty Y. Limehouse; Mary Ruth L. Schneider; Peggy Jo L. Gray, a/k/a Peggy Joe L. Gray, a/k/a Peggy Jo Gray; and Peggy K. Limehouse, dated November 15, 1994, and recorded in Book U249, page 385, in the R.M.C. Office, having an outstanding principal balance of approximately $7,175,075.00, the payment of which, together with interest thereon, is expressly assumed by the Grantee herein.

TOGETHER with all and singular, the Rights, Members, Hereditaments and Appurtenances to the said Premises belonging, or in anywise incident or appertaining.

EX Y263PG814

TO HAVE AND TO HOLD, all and singular, the said Premises before mentioned unto the said KIAWAH RIVER PLANTATION, L.P., its successors and assigns, forever.

AND THE SAID KIAWAH RESORT ASSOCIATES, L.P. does hereby bind itself and its successors and assigns, to warrant and forever defend, all and singular, the highland portion of the said premises, above the mean high water mark of abutting tidal waters, unto the said KIAWAH RIVER PLANTATION, L.P., its successors and assigns, against itself, its successors and assigns, and all other persons whomsoever lawfully claiming or to claim the same or any part thereof.

IN WITNESS WHEREOF, Kiawah Resort Associates, L.P., has caused these presents to be executed in its name by its General Partner thereunto duly authorized, and its seal to be hereunto affixed, this 31st day of December, in the year of our Lord One Thousand Nine Hundred and Ninety-Five, in the Two Hundred and Nineteenth year of the Sovereignty and Independence of the United States of America.

SIGNED, SEALED AND DELIVERED
IN THE PRESENCE OF:

KIAWAH RESORT ASSOCIATES, L.P.
(SEAL)

By: D&W Investments, Inc.,
a South Carolina corporation
(CORP.SEAL)
Its: General Partner

By: _____
Charles S. Way, Jr.
Its: President

By: _____
Charles P. Darby, III
Its: Vice President

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

THE FOREGOING INSTRUMENT was acknowledged before me by Kiawah Resort Associates, L.P., by D&W Investments, Inc., a South Carolina corporation its General Partner, by Charles S. Way, Jr., its President, and by Charles P. Darby, III, its Vice President, this 31st day of December, 1995.

_____ (SEAL)
Notary Public for South Carolina
My commission expires: 8-8-99

Exhibit "A" BK Y263PG815

Property Description

All that certain piece, parcel or tract of land, together with all buildings and improvements presently located thereon, situate, lying and being on Johns Island, in the County of Charleston, State of South Carolina, known generally as "Mullet Hall Plantation", containing 1083.197 acres of highland (including certain small islands), 234.94 acres of ponds and creeks, 86.36 acres of impounds, and 22.313 acres between mean high water and the DHEC-OCRM Critical Line, more or less, shown on a plat by A.H. Schwacke, & Associates entitled "PLAT OF MULLET HALL & JACK ISLAND 1426.81 ACRES JOHNS ISLAND CHARLESTON COUNTY SOUTH CAROLINA", dated October 4, 1994, last revised on November 11, 1994, and recorded in Plat Book EA at pages 316 through 322, in the R.M.C. Office for Charleston County, South Carolina, (the "Plat"), said property having such location, butts and bounds, metes, courses and distances as will by reference to the Plat more fully appear.

TOGETHER WITH all right, title and interest of the Grantor in and to the marshlands, lowlands, small islands, causeways, wetlands and critical areas, and dikes adjoining and/or part of said tract, and as lie between any highland areas and the mean low water mark of the Kiawah River or its tributaries, and all such areas as lie between the DHEC - Office of Ocean and Coastal Resource Management Critical Line as shown on the Plat, and (i) the centerline of Briars Creek, (ii) the mean low water mark of the Kiawah River and (iii) the mean low water mark of Hope Creek; SAVING AND EXCEPTING therefrom, however, so much of the marshlands and small islands as lie between the easternmost boundary line of the above-described property as shown on the Plat, and the low water marks of Briars Creek and the Kiawah River.

BUTTING AND BOUNDING to the north on property now or formerly of Lorraine Glover, John F. Limehouse, the Betsy Kerrison Parkway, Bishop of Charleston, Harold L. Glover, Naomi Freeman Nelson, David Thomas Murray, Nellie Freeman, Nancy A. Butler and Maybell Wright, Dorothy Green and Anna Lee Walker, Maybell Wright, et.al., Mullet Hall Road, and property of the Charleston County Park and Recreation Commission; to the east on property of the Charleston County Park and Recreation Commission, the centerline of Briars Creek, and lands now or formerly of William Lawton Limehouse, et.al.; to the south on the low water mark of the Kiawah River and Hopes Creek; and to the west on Hope Plantation and property now or formerly of "Kiawah Real Estate Company, Inc.", and Suzanne C. Ravenel.

TOGETHER WITH a non-exclusive perpetual, transferable, appendant and appurtenant commercial easement for the purpose of providing access to Grantee, its successors and assigns and duly authorized agents, for repairs and maintenance from time to time, of the dike located at the eastern end of "Pond No. 1" as shown on the Plat, which said easement is more particularly set forth in that certain Easement Agreement (Access for Dike Repair and Maintenance) dated June 7, 1994, and recorded in Book Z243, page 392, in the R.M.C. Office.

It is the intention of the Grantor to convey to the Grantee, all of its undivided seven-eighths (7/8ths) interest of, in and to the real property and any interests in real property conveyed to Grantor by deed of conveyance of William Lawton Limehouse, a/k/a W.L. Limehouse, Linda Anne L.McMurphy, a/k/a Ann Limehouse Macmurphy, Anne Limehouse Macmurphy and Linda L. McMurphy, n/k/a Anne Limehouse Macmurphy Griffin; Ann Limehouse Macmurphy, a/k/a Anne Limehouse Macmurphy, n/k/a Anne Limehouse Macmurphy Griffin, as Trustee for Michael Linar Limehouse under the Last Will and Testament of Linar H. Limehouse, a/k/a Horace Linar Limehouse, deceased, Mary Ruth L. Schneider, Peggy Jo L. Gray, a/k/a Peggy Joe L. Gray, a/k/a Peggy Jo Gray and Peggy K. Limehouse, dated the 15th day of November, 1994, and recorded in Book U249, page 207, in the R.M.C. Office.

This conveyance is made subject to the following:

1. Charleston County, S.C. ad valorem taxes for 1995, now due and payable, and ad valorem taxes for all subsequent years.

2. Roll Back taxes as provided under Title 12, South Carolina Code, as amended, including Section 12-43-220 and others.

3. Easement Agreement (Dock) executed by and between the Charleston County Park and Recreation Commission and W.L. Limehouse and Julian Limehouse, III, as Co-Personal Representatives of the Estate of Julian S. Limehouse, Jr., William Lawton Limehouse, Peggy K. Limehouse, Linda Anne L. McMurphy, a/k/a Anne Limehouse MacMurphy, Mary Ruth L. Schneider, J. Sidi Limehouse, III, a/k/a Julian S. Limehouse, III, Peggy Jo Gray, and Anne Limehouse MacMurphy, Trustee for Michael Linar Limehouse, dated June 7, 1994, and recorded in Book Z243, page 402, in the R.M.C. Office.

4. Right-of-Way Easement Underground granted by W.L. Limehouse to Berkeley Electric Cooperative, Inc., dated February 25, 1993, and recorded July 13, 1993, in Book K229, page 594, in the R.M.C. Office.

5. Any lawful, constitutional interest in either the State of South Carolina or Federal Government created, or limitations on use imposed, by the Federal Coastal Management Act or other Federal law or by S. C. Code Sections 48-39-10 through 48-39-220, as amended, and Sections 48-39-250 through 48-39-360, as amended, or any regulations promulgated pursuant to said State or Federal laws, inclusive of the DHEC -Office of Ocean and Coastal Resource Management and U. S. Army Corps of Engineers regulations, and such rights, if any, as the public may enjoy to the use of property lying below the mean high water mark of abutting tidal waters.

6. Notations, dedications, restrictions on use, easements and other matters shown on the Plat, and the DHEC-OCRM Critical Line as the same may vary from time to time.

7. All questions of accuracy, location of boundary lines, location of improvements, encroachments, area, and all other matters whatsoever which an accurate survey or inspection of the premises may reveal, subsequent to November 11, 1994, the last revision date of the Plat.

This is the same property conveyed to the Grantor herein by deed of conveyance of William Lawton Limehouse, a/k/a W.L. Limehouse, Linda Anne L.McMurphy, a/k/a Ann Limehouse Macmurphy, Anne Limehouse Macmurphy and Linda L. McMurphy, n/k/a Anne Limehouse Macmurphy Griffin; Ann Limehouse Macmurphy, a/k/a Anne Limehouse Macmurphy, n/k/a Anne Limehouse Macmurphy Griffin, as Trustee for Michael Linar Limehouse under the Last Will and Testament of Linar H. Limehouse, a/k/a Horace Linar Limehouse, deceased, Mary Ruth L. Schneider, Peggy Jo L. Gray, a/k/a Peggy Joe L. Gray, a/k/a Peggy Jo Gray, and Peggy K. Limehouse, dated the 15th day of November, 1994, and recorded in Book U249, page 297, in the R.M.C. Office.

15981-23

CX Y263PG818

Nexsen Pruet Jacobs Pollard & Robinson
POST OFFICE BOX 486
CHARLESTON, SOUTH CAROLINA 29402

RMC Verified
CTRL # 16
Int 9
1-5-96

FILED
Y263-813
95 JAN -5 PM 2:36
[illegible] CENTER
CHARLESTON COUNTY SC

11.00
4473.30
1892.55
6376.85 B

Recorded this 5 day of Jan Year 96
Original Record Card

TMS VERIFIED
BAC MLM
DTD 1/9/96

EXHIBIT 4.5
Deed No. 2

BK V648PG230

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

QUIT CLAIM DEED

THIS QUITCLAIM DEED, made and entered into this 21st day of September, 2007, by and between KIAWAH RESORT ASSOCIATES, L.P., (a Delaware limited partnership hereinafter referred to as the "Grantor"), whose mailing address is 7 Beachwalker Road, Kiawah Island, South Carolina 29455, and OCEAN BOULEVARD PROPERTIES, A SOUTH CAROLINA LIMITED PARTNERSHIP (the "Grantee"), whose mailing address is c/o The Beach Co., 211 King Street, Suite 300, Charleston, SC 29401, Attn: John C.L. Darby.

WITNESSETH:

IN CONSIDERATION of the sum of Five and No/100 Dollars ($5.00) to it in hand paid, the receipt and sufficiency of which is hereby acknowledged by Grantor, Grantor does hereby remise, release and forever quitclaim unto Grantee, the following real property (the "Property"):

SEE EXHIBIT A ATTACHED HERETO AND INCORPORATED HEREIN BY REFERENCE.

TOGETHER with all and singular the rights, members, hereditaments and appurtenances to the said Property belonging, or in any wise incident or appertaining.

TO HAVE AND TO HOLD all and singular, the said Property before mentioned unto the said Grantee, its successors and assigns forever, so that neither the Grantor nor any other person or persons claiming under Grantor, its successors and assigns, shall at any time hereafter, by any way or means, have, claim or demand any right or title to the aforesaid Property or appurtenances, or any part or parcel thereof, forever.

IN WITNESS WHEREOF, Kiawah Resort Associates, L.P., has caused these presents to be executed in its name by its General Partners thereunto duly authorized and its seal to be hereunto affixed, this 21st day of September, 2007.

SIGNED, SEALED AND DELIVERED
IN THE PRESENCE OF:

D. E. Moss

Witness

D. E. Moss

Witness

KIAWAH RESORT ASSOCIATES, L.P.
(SEAL)

By: D&W Investments, Inc.,
a South Carolina corporation (CORP.SEAL)
Its: General Partner

By: Lisa C. Bryant
Lisa C. Bryant
Its: Secretary

By: TWD Investments, LLC
a South Carolina limited liability company
(SEAL)
Its: General Partner

By: Lisa C. Bryant
Lisa C. Bryant
Its: Authorized Agent

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

THE FOREGOING INSTRUMENT was acknowledged before me by Kiawah Resort Associates, L.P., by D&W Investments, Inc., a South Carolina corporation, its General Partner, by its aforesaid officer thereunto duly authorized, this 21st day of September, 2007.

(SEAL)
Notary Public for South Carolina
My commission expires: 1-19-11

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

THE FOREGOING INSTRUMENT was acknowledged before me by Kiawah Resort Associates, L.P., by TWD Investments, LLC, a South Carolina limited liability company, its General Partner, by its Authorized Agent thereunto duly authorized, this 21st day of September, 2007.

(SEAL)
Notary Public for South Carolina
My commission expires: 1-19-11

EXHIBIT A

All that certain piece, parcel or tract of land, together with all buildings and improvements presently located thereon, containing 1,427.81 acres, more or less, situate, lying and being on Johns Island, in the County of Charleston, State of South Carolina, known generally as "Mullet Hall Plantation", containing 1083.197 acres of highland (including certain small islands), 235.94 acres of ponds and creeks, 86.36 acres of impounds, and 22.313 acres between mean high water and the DHEC-OCRM Critical Line, more or less, as shown on a plat by A.H. Schwacke & Associates entitled "PLAT OF MULLET HALL & JACK ISLAND 1426.81 ACRES JOHNS ISLAND CHARLESTON COUNTY SOUTH CAROLINA", dated October 4, 1994, last revised on November 11, 1994, and recorded in Plat Book EA at Pages 316-322, in the R.M.C. Office for Charleston County, South Carolina (the "Plat"), said property having such location, butts and bounds, metes, courses and distances as will by reference to the Plat more fully appear.

TOGETHER WITH all right, title and interest of the Grantor in and to the marshlands, lowlands, small islands, causeways, wetlands and critical areas, and dikes adjoining and/or part of said tract, and as lie between and highland areas and the mean low water mark of the Kiawah River or its tributaries, and all such areas as lie between the DHEC – Office of Ocean and Coastal Resource Management Critical Line as shown on the Plat, and (i) the centerline of Briars Creek, (ii) the mean low water mark of the Kiawah River and (iii) the mean low water mark of Hope Creek; SAVING AND EXCEPTING therefrom, however, so much of the marshlands and small islands as lie between the easternmost boundary line of the above-described property as shown on the Plat, and the low water marks of Briars Creek and the Kiawah River.

TOGETHER WITH a non-exclusive, perpetual, transferable, appendant and appurtenant commercial easement for the purpose of providing access for repairs and maintenance from time to time, of the dike located at the eastern end of "Pond No. 1" as shown on the Plat, which said easement is more particularly set forth in that certain Easement Agreement (Access for Dike Repair and Maintenance) dated June 7, 1994, and recorded in Book Z243, page 392, in the R.M.C. Office.

It is the intention of the Grantor to convey to the Grantee herein all of Grantor's undivided interest in the property known generally as Mullet Hall Plantation, including but not limited to all highland, ponds, impounded areas, lagoons, creeks, islands, salt marshes, dikes, causeways, lakes, streams, critical areas, wetlands, waters and waterways and generally all property of every kind and nature whatsoever.

This is the same property conveyed to the Grantor herein by (i) deed of conveyance of William H. Goodwin, III, Molly S. Goodwin, Matthew T. Goodwin, Alice T. Goodwin as Custodian for Sarah C. Goodwin under the Virginia Uniform Transfer to Minors Act and Alice T. Goodwin as Custodian for Peter O. Goodwin under the Virginia Uniform Transfer to Minors Act dated November 6, 1995, and recorded November 9, 1995, in

Book Y261, page 539, in the R.M.C. Office for Charleston County, S.C., and (ii) deed of conveyance of William Lawton Limehouse, a/k/a W.L. Limehouse; Linda Anne L. McMurphy, a/k/a Ann Limehouse Macmurphy, Anne Limehouse Macmurphy and Linda L. McMurphy, n/k/a Anne Limehouse Macmurphy Griffin; Ann Limehouse Macmurphy, a/k/a Anne Limehouse Macmurphy, n/k/a Anne Limehouse Macmurphy Griffin, as Trustee for Michael Linar Limehouse under the Last Will and Testament of Linar H. Limehouse a/k/a/ Horace Linar Limehouse, deceased; Mary Ruth L. Schneider; Peggy Jo L. Gray, a/k/a Peggy Joe L. Gray, a/k/a Peggy Jo Gray, and Peggy K. Limehouse, Ann Limehouse Macmurphy, a/k/a Anne Limehouse Macmurphy, n/k/a Anne Limehouse Macmurphy Griffin, as Executrix of the Estates of Betty Y. Limehouse and Linar H. Limehouse (a/k/a Horace Linar Limehouse) dated the 15th day of November, 1994, and recorded in Book U249 at Page 207 in the Charleston County RMC Office.

TMS Numbers: 212-00-00-001 and 212-00-00-004

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

AFFIDAVIT FOR EXEMPT TRANSFERS

PERSONALLY appeared before me, the undersigned, who, being duly sworn, deposes and says:

1. I have read the information on the back of or following this affidavit and I understand such information.

2. The property being transferred is located on Johns Island, Charleston County, South Carolina, bearing a portion of Charleston County Tax Map Number 212-00-00-001, and was transferred by Kiawah Resort Associates, L.P. to Ocean Boulevard Properties, A South Carolina Limited Partnership on _____, 2007.

3. The deed is exempt from the deed recording fee because (See Information section of affidavit): Exemption #12

If exempt under exemption #14 as described in the Information section of this affidavit, did the agent and principal relationship exist at the time of the original sale and was the purpose of this relationship to purchase the realty? Check Yes _____ or No _____.

4. As required by Code Section 12-24-70, I state that I am a responsible person who was connected with the transaction as: ~~officer, agent, partner, member, owner~~ Attorney for Grantee

5. I understand that a person required to furnish this affidavit who willfully furnishes a false or fraudulent affidavit is guilty of a misdemeanor and, upon conviction, must be fined not more than one thousand dollars or ~~imprisoned~~ not more than one year, or both.

James B. Moore Jr.
Attorney for Grantee

Print Name: James B. Moore Jr.

SWORN to before me this 11th day of Jan., 2007.

Notary Public for SC
My Commission Expires: 9-10-11

(NOTARIAL SEAL)

GEORGETOWN 139960v1

BK V648PG236

RECORDER'S PAGE

***NOTE*: This page MUST remain with the original document**

Filed By:

McNair Law Firm
Post Office Drawer 418
Georgetown, SC 29442

Number of Pages:
7

FILED

January 15, 2008
2:53:45 PM

BK V648PG230

Charlie Lybrand, Register
Charleston County, SC

DESCRIPTION	AMOUNT
Recording Fee	$ 12.00
State Fee	<Exempt>
County Fee	<Exempt>
Postage	
TOTAL	$ 12.00

$ Amount (in thousands):

DRAWER: C - cfb

AUDITOR STAMP HERE

RECEIVED FOR RECORD
JAN 18 2008
PEGGY A. ROSELEY
CHARLESTON COUNTY AUDITOR

PID VERIFIED BY ASSESSOR

REP

JAN 17 2008
DATE

DO NOT STAMP BELOW THIS LINE

BK V648PG237

STATE OF SOUTH CAROLINA)
) TITLE TO REAL ESTATE
) (DEED)
COUNTY OF CHARLESTON)

KNOW ALL MEN BY THESE PRESENTS, KIAWAH RESORT ASSOCIATES, L.P., (a Delaware limited partnership,) whose mailing address is 7 Beachwalker Road, Kiawah Island, SC 29455 (hereinafter whether singular or plural referred to collectively as the "Grantor"), in the State aforesaid, for and in consideration of Five Dollars ($5.00) and other valuable consideration to the Grantor paid by OCEAN BOULEVARD PROPERTIES, A SOUTH CAROLINA LIMITED PARTNERSHIP, whose mailing address is c/o The Beach Co., 211 King Street, Suite 300, Charleston, SC 29401, Attn: John C.L. Darby (hereinafter whether singular or plural referred to as the "Grantee"), has granted, bargained, sold and released, and by these presents does grant, bargain, sell and release unto the Grantee, a one-eighth (1/8) undivided interest in and to the real estate together with all improvements thereon (the "Premises") described as follows:

SEE EXHIBIT A ATTACHED HERETO AND INCORPORATED HEREIN

TMS Number: 212-00-00-001

Tax District: 5-I

Address of Grantee: c/o The Beach Company
Attn: John C.L. Darby
211 King Street, Suite 300
Charleston, SC 29401

TOGETHER with all and singular, the rights, members, hereditaments and appurtenances to the Premises belonging or in any wise incident or appertaining thereto.

TO HAVE AND TO HOLD all and singular the Premises unto the Grantee, its successors and assigns forever.

And the Grantor does hereby bind itself, its successors and assigns, and other lawful representatives, to warrant and forever defend all and singular, the highland portion of the Premises, above the mean high water mark of abutting tidal waters, unto the Grantee and the Grantee's successors and assigns, against Grantor and against Grantor's successors and assigns and against every person whomsoever lawfully claiming, or to claim, the same or any part thereof.

IN WITNESS WHEREOF, Kiawah Resort Associates, L.P., has caused these presents to be executed in its name by its General Partners thereunto duly authorized and its seal to be hereunto affixed, this 21st day of September, 2007.

SIGNED, SEALED AND DELIVERED
IN THE PRESENCE OF:

J. E. Moss

Witness #1

J. E. Moss

Witness #2

KIAWAH RESORT ASSOCIATES, L.P.
(SEAL)

By: D&W Investments, Inc.,
a South Carolina corporation (CORP.SEAL)
Its: General Partner

By: Lisa C. Bryant
Lisa C. Bryant
Its: Secretary

By: TWD Investments, LLC
a South Carolina limited liability company
(SEAL)

Its: General Partner

By: Lisa C. Bryant
Lisa C. Bryant
Its: Authorized Agent

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

THE FOREGOING INSTRUMENT was acknowledged before me by Kiawah Resort Associates, L.P., by D&W Investments, Inc., a South Carolina corporation, its General Partner, by its aforesaid officer thereunto duly authorized, this 21st day of September, 2007.

(SEAL)
Notary Public for South Carolina
My commission expires: 1-19-11

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

THE FOREGOING INSTRUMENT was acknowledged before me by Kiawah Resort Associates, L.P., by TWD Investments, LLC, a South Carolina limited liability company, its General Partner, by its Authorized Agent thereunto duly authorized, this 21st day of September, 2007.

(SEAL)
Notary Public for South Carolina
My commission expires: 1-19-11

EXHIBIT A

All those pieces, parcels or tracts of land situate lying and being on Johns Island, Charleston County, South Carolina, containing **1,427.81** acres, more or less, and being shown and designated on a plat by A.H. Schwacke, III, RLS, dated October 4, 1994, (revised November 11, 1994), entitled: "Plat of Mullet Hall & Jack Island Combined With Lot 'FF' 1,426.81 acres, Johns Island, Charleston County, South Carolina," which plat consists of seven sheets and is recorded at Plat Book EA at pages 316-322 in the R.M.C. Office for Charleston County, South Carolina, and including but not limited to those parcels shown on said plat as follows: "641.656 ac highland," a 0.344 acre cul-de-sac, "Jack Island, 214.16 ac highland," "79.82 ac highland," "34.20 ac highland," "29.46 ac highland," "21.33 ac highland," "6.54 ac highland," "6.09 ac highland," "2.92 ac highland," and "1.49 HL"; also impounded areas shown as "30.56 ac (impounded)," "22.28 ac (impounded)," "14.49 ac (impounded)," "9.45 ac (impounded)," "7.97 ac (impounded)," and "1.61 ac (impounded)"; and also ponds designated as "Pond No. 1, 66.12 ac," "Pond No. 2, 11.85 ac," "Pond No. 3, 17.49 ac," "Pond No. 4, 10.03 ac," "Pond No. 5, 6.91 ac," "Pond No. 6, 17.97 ac," and Pond No. 7, 4.52 ac"; and also pond/creek areas shown as "98.12 ac Pond/Creek," and "2.93 ac Pond/Creek"; and also 8 islands designated as islands "A," "B," "C," "D," "E," "F," "G," and "H", (containing 11.657 acres highland and 4.743 acres between the critical line and the mean high water mark of abutting tidal waters as shown on said plat); Lot "FF" also shown on said plat as "TMS #202-00-00-126, Julian S. Limehouse, Jr. Estate," containing 33.53 acres; and also all property between the critical line and the mean high water mark of abutting tidal waters shown on said plat as consisting of 17.57 acres. The within described property is all of the remaining portion of Mullet Hall Plantation not conveyed by deed of J. Sidi Limehouse, III a/k/a Julian S. Limehouse, III and others to Charleston County Park and Recreation Commission by deed dated June 1, 1994, and recorded June 7, 1994, in Book Y243, page 235, in said R.M.C. Office, together with Lot "FF."

Together with all of Grantor's right, title and interest (including but not limited to any contract right) of, in and to an easement of access, ingress and egress (whether presently existing or to exist), between the within conveyed property and Blackground Road and located or to be located upon, over and across that property previously conveyed by J. Sidi Limehouse, III, a/k/a Julian S. Limehouse, III and others to Charleston County Park and Recreation Commission by deed recorded in Book Y243, page 235, in said R.M.C. Office.

Together with all right, title and interest of the Grantor pursuant to instrument entitled "Easement Agreement (Access for Dike Repair and Maintenance)" dated June 7, 1994, and recorded June 7, 1994, in Book Z243, page 392, in said R.M.C. Office.

Together with all right, title and interest of Grantor in and to any and all rights and means of access to and from the within described property and any and all streets, roads, ways and easements (whether public or private) adjacent to, butting on or benefiting the within described property, including but not limited to, Mullet Hall Road.

It is the intention of the Grantor to convey to the Grantee herein all of Grantor's undivided interest in the property known generally as Mullet Hall Plantation, including but not limited to all highland, ponds, impounded areas, lagoons, creeks, islands, salt marshes, dikes, causeways, lakes, streams, critical areas, wetlands, waters and waterways and generally all property of every kind and nature whatsoever.

This conveyance is made subject to the same covenants, conditions and restrictions as are set forth in the deed of conveyance from Grantor to Kiawah River Plantation, L.P. dated December 31, 1995, and recorded in Book Y263, page 813, in the R.M.C. Office for Charleston County, S.C.

This is the same property conveyed to the Grantor herein by deed of conveyance of William H. Goodwin, III, Molly S. Goodwin, Matthew T. Goodwin, Alice T. Goodwin as Custodian for Sarah C. Goodwin under the Virginia Uniform Transfer to Minors Act and Alice T. Goodwin as Custodian for Peter O. Goodwin under the Virginia Uniform Transfer to Minors Act dated November 6, 1995, and recorded November 9, 1995, in Book Y261, page 539, in the R.M.C. Office for Charleston County, S.C.

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

AFFIDAVIT

PERSONALLY appeared before me the undersigned, who being duly sworn, deposes and says:

1. I have read the information on this affidavit and I understand such information.

2. The property being transferred is located in Charleston County, South Carolina, bearing Charleston County Tax Map Number M009010100904, and was transferred by Kiawah Resort Associates, LP to Ocean Boulevard Properties A South Carolina Limited Partnership on _____, 2008..

3. Check one of the following: The deed is

(a) _X_ subject to the deed recording fee as a transfer for consideration paid or to be paid in money or money's worth.

(b) ____ subject to the deed recording fee as a transfer between a corporation, a partnership, or other entity and a stockholder, partner, or owner of the entity, or is a transfer to a trust or as a distribution to a trust beneficiary.

(c) ____ exempt from the deed recording fee because (See Information section of affidavit): _____ (If exempt, please skip items 4-7,and go to item 8 of this affidavit.)

4. Check one of the following if either item 3(a) or item 3(b) above has been checked (See Information section of this affidavit.):

(a) ____ The fee is computed on the consideration paid or to be paid in money or money's worth in the amount of $.0

(b) _X__ The fee is computed on the fair market value of the realty which is $5,857,143.00 for the land and improvements and $7,142,857.00 consideration paid for the settlement of a disputed claim between co-tenants..

(c) ____ The fee is computed on the fair market value of the realty as established for property tax purposes which is _____.

5. Check Yes _____ or No _X_ to the following: A lien or encumbrance existed on the land, tenement, or realty before the transfer and remained on the land, tenement, or realty after the

transfer. If "Yes," the amount of the outstanding balance of this lien or encumbrance is: _____.

6. The deed recording fee is computed as follows:

(a) Place the amount listed in item 4 above here: $5,857,143.00 (plus $7,142,857.00).

(b) Place the amount listed in item 5 above here: $0.00 (If no amount is listed, place zero here.)

(c) Subtract Line 6(b) from Line 6(a) and place result here: $13,000,000.00.

7. The deed recording fee due is based on the amount listed on Line 6(c) above and the deed recording fee due is: $48,100.00

8. As required by Code Section 12-24-70, I state that I am a responsible person who was connected with the transaction as: ~~a General Partner of Grantor~~. GRANTEE

9. I understand that a person required to furnish this affidavit who willfully furnishes a false or fraudulent affidavit is guilty of a misdemeanor and, upon conviction, must be fined not more than one thousand dollars or imprisoned not more than one year, or both.

OCEAN BOULEVARD PROPERTIES, A SC Lim. ~~Partnership~~, by The Beach Co., A SC Cor

By: John Darby
Its: President

SWORN to before me this 11th day of Jan., 2008.

Notary Public for South Carolina
My Commission Expires: 1/18/2011

(NOTARIAL SEAL)

By: J. Darryl Reyna
Its: Exe. Vice President

BK V648PG244

RECORDER'S PAGE

***NOTE*: This page MUST remain with the original document**

Filed By:

McNair Law Firm
Post Office Drawer 418
Georgetown, SC 29442

Number of Pages: 8

FILED

January 15, 2008
2:54:36 PM

BK V648PG237

Charlie Lybrand, Register
Charleston County, SC

DESCRIPTION	AMOUNT
Recording Fee	$ 13.00
State Fee	$ 33,800.00
County Fee	$ 14,300.00
Postage	
TOTAL	$ 48,113.00

$ Amount (in thousands): 13000

DRAWER: C - cfb

AUDITOR STAMP HERE

RECEIVED
JAN 18 2008
PEGGY A. T. OSBELEY
CHARLESTON COUNTY AUDITOR

PID VERIFIED BY ASSESSOR

REP

DATE JAN 17 2008

DO NOT STAMP BELOW THIS LINE

BK Z243PG402

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

EASEMENT AGREEMENT
(DOCK)

AGREEMENT made this 2nd day of June, 1994 by and between Charleston County Park and Recreation Commission ("Purchaser") and W.L. Limehouse and Julian Limehouse, III, as Co-Personal Representatives of the Estate of Julian S. Limehouse, Jr.; William Lawton Limehouse; Peggy K. Limehouse; Linda Anne L. McMurphy, a/k/a Anne Limehouse MacMurphy; Mary Ruth L. Schneider; J. Sidi Limehouse, III, a/k/a Julian S. Limehouse, III; Peggy Jo Gray; and Anne Limehouse MacMurphy, Trustee for Michael Linar Limehouse (collectively, the "Sellers");

WITNESSETH

WHEREAS, the Sellers and the Purchaser entered into a Purchase and Sale Agreement having an effective date of March 3, 1994 for the purchase of a parcel of property containing 738 acres (the "Property"); and

WHEREAS, Section 1.2 of the Purchase and Sale Agreement called for the conveyance by the Sellers of an easement for the extension of a crabbing and fishing dock from the Property into Pond No. 1 (66.12 acres) (the "Pond"); and

WHEREAS, the Purchaser has purchased the Property and the Sellers are now minded to grant the hereinbelow described easement to Purchaser;

NOW THEREFORE, subject to the provisions stated hereafter, for $5.00 and other valuable consideration, the Sellers and Purchaser agree as follows:

1) Grant of Easement: Sellers hereby grant, bargain, sell and convey to Purchaser, a perpetual transferable, appendant and appurtenant, non-exclusive easement over and across the eastern portion of the Pond owned by Sellers for the purpose of extending a crabbing and fishing dock from the Property into the Pond.

TO HAVE AND TO HOLD the easement described above to the Purchaser and its Successors and Assigns forever.

2) Restriction on Easement: The dock to be placed in the easement shall be of a length not to exceed 250 feet and shall be used for crabbing, fishing and other activities consistent with the use of the Property as a park. The Purchaser, however, shall not be able to use the Pond for any swimming or boating activities.

3) **Use of Property:** The Sellers reserve the right to use the Pond over which the easement runs for any uses which are not inconsistent with the terms of this Agreement. Sellers may not drain, close or fill the Pond without the written consent of the Purchaser.

4) **Running of Benefits & Burdens:** All of the provisions of this Agreement, including the benefits and the burdens, shall run with the land and shall be binding upon and inure to the Heirs, Successors and Assigns of the parties hereto.

5) **Commercial Purposes:** It is the intent of the parties hereto that the easement granted herein is for commercial purposes and is appurtenant in nature since it inheres in, is essentially necessary to and runs with the land benefited thereby.

6) **Hold Harmless:** Purchaser shall indemnify and hold harmless the Sellers, and their Heirs and Assigns, from any and all claims, liabilities, judgments, damages, penalties, fines, losses and expenses, including reasonable attorney's fees and costs, to any person on property caused wholly or in part by or during the use of the easement herein created, by Purchaser, or Purchaser's successors, assigns, agents, employees, invitees, guests or contractors.

IN WITNESS WHEREOF, the Sellers and Purchaser have executed this Agreement on the date stated above.

PURCHASER:

CHARLESTON COUNTY PARK AND RECREATION COMMISSION

By: _____

Its: Chairman

SELLERS:

_____

W.L. LIMEHOUSE, CO-PERSONAL REPRESENTATIVE OF THE ESTATE OF JULIAN S. LIMEHOUSE, JR.

JULIAN LIMEHOUSE, III,
CO-PERSONAL REPRESENTATIVE OF
THE ESTATE OF JULIAN S.
LIMEHOUSE, JR.

WILLIAM LAWTON LIMEHOUSE

PEGGY K. LIMEHOUSE

LINDA ANNE L. McMURPHY A/K/A
ANNE LIMEHOUSE MacMURPHY

MARY RUTH L. SCHNEIDER

J. BIDI LIMEHOUSE, III, A/K/A
JULIAN S. LIMEHOUSE, III

PEGGY JO GRAY

ANNE LIMEHOUSE MacMURPHY,
TRUSTEE FOR MICHAEL LINAR
LIMEHOUSE

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

PERSONALLY appeared before me the undersigned witness who, being duly sworn, deposes and says that (s)he saw the within named CHARLESTON COUNTY PARK AND RECREATION COMMISSION by _____, its _____, sign, seal, and as their act and deed, deliver the within written instrument, and that (s)he with the other above-subscribed witness witnessed the execution thereof.

_____

SWORN to before me this
7TH day of June, 1994.

_____ (L.S.)
NOTARY PUBLIC FOR SOUTH CAROLINA
My Commission Expires: Sept 24, 2002

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

PERSONALLY appeared before me the undersigned witness who, being duly sworn, deposes and says that (s)he saw the within named W.L. LIMEHOUSE, CO-PERSONAL REPRESENTATIVE OF THE ESTATE OF JULIAN S. LIMEHOUSE, JR., sign, seal, and as their act and deed, deliver the within written instrument, and that (s)he with the other above-subscribed witness witnessed the execution thereof.

_____

SWORN to before me this
7th day of June, 1994.

_____ (L.S.)
NOTARY PUBLIC FOR SOUTH CAROLINA
My Commission Expires: 3/5/15

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

PERSONALLY appeared before me the undersigned witness who, being duly sworn, deposes and says that (s)he saw the within named JULIAN LIMEHOUSE, III, CO-PERSONAL REPRESENTATIVE OF THE ESTATE OF JULIAN S. LIMEHOUSE, JR., sign, seal, and as their act and deed, deliver the within written instrument, and that (s)he with the other above-subscribed witness witnessed the execution thereof.

SWORN to before me this
15 day of June, 1994.

(L.S.)
NOTARY PUBLIC FOR SOUTH CAROLINA
My Commission Expires: 1/5/15

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

PERSONALLY appeared before me the undersigned witness who, being duly sworn, deposes and says that (s)he saw the within named WILLIAM LAWTON LIMEHOUSE, sign, seal, and as their act and deed, deliver the within written instrument, and that (s)he with the other above-subscribed witness witnessed the execution thereof.

SWORN to before me this
15 day of June, 1994.

(L.S.)
NOTARY PUBLIC FOR SOUTH CAROLINA
My Commission Expires: 1/5/15

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

PERSONALLY appeared before me the undersigned witness who, being duly sworn, deposes and says that (s)he saw the within named PEGGY K. LIMEHOUSE, sign, seal, and as their act and deed, deliver the within written instrument, and that (s)he with the other above-subscribed witness witnessed the execution thereof.

SWORN to before me this
12th day of July, 1994.

(L.S.)
NOTARY PUBLIC FOR SOUTH CAROLINA
My Commission Expires: 3/1/97

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

PERSONALLY appeared before me the undersigned witness who, being duly sworn, deposes and says that (s)he saw the within named LINDA ANNE L. McMURPHY A/K/A ANNE LIMEHOUSE MacMURPHY, sign, seal, and as their act and deed, deliver the within written instrument, and that (s)he with the other above-subscribed witness witnessed the execution thereof.

SWORN to before me this
7th day of July, 1994.

(L.S.)
NOTARY PUBLIC FOR SOUTH CAROLINA
My Commission Expires: 11-28-99

STATE OF FLORIDA)
)
COUNTY OF Dade)

PERSONALLY appeared before me the undersigned witness who, being duly sworn, deposes and says that (s)he saw the within named MARY RUTH L. SCHNEIDER, sign, seal, and as their act and deed, deliver the within written instrument, and that (s)he with the other above-subscribed witness witnessed the execution thereof.

SWORN to before me this
27 day of May, 1994.

_____ (L.S.)
NOTARY PUBLIC FOR FLORIDA
My Commission Expires: 10/17/97

OFFICIAL NOTARY SEAL
GEORGE E THOMAS
NOTARY PUBLIC STATE OF FLORIDA
COMMISSION NO. CC320908
MY COMMISSION EXP. OCT. 17,1997

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

PERSONALLY appeared before me the undersigned witness who, being duly sworn, deposes and says that (s)he saw the within named J. SIDI LIMEHOUSE, III A/K/A JULIAN S. LIMEHOUSE, III, sign, seal, and as their act and deed, deliver the within written instrument, and that (s)he with the other above-subscribed witness witnessed the execution thereof.

SWORN to before me this
1st day of June, 1994.

_____ (L.S.)
NOTARY PUBLIC FOR SOUTH CAROLINA
My Commission Expires: 5/4/96

MARYLAND

STATE OF)
)
COUNTY OF)

PERSONALLY appeared before me the undersigned witness who, being duly sworn, deposes and says that (s)he saw the within named PEGGY JO GRAY, sign, seal, and as their act and deed, deliver the within written instrument, and that (s)he with the other above-subscribed witness witnessed the execution thereof.

SWORN to before me this
27 day of May, 1994.

Rebecca Homer (L.S.)
NOTARY PUBLIC FOR MARYLAND
My Commission Expires: March 1, 1997

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

PERSONALLY appeared before me the undersigned witness who, being duly sworn, deposes and says that (s)he saw the within named ANNE LIMEHOUSE MacMURPHY, TRUSTEE FOR MICHAEL LINAR LIMEHOUSE, sign, seal, and as their act and deed, deliver the within written instrument, and that (s)he with the other above-subscribed witness witnessed the execution thereof.

Henry N. Gilliam

SWORN to before me this
16 day of May, 1994.

Henry N. Gilliam (L.S.)
NOTARY PUBLIC FOR SOUTH CAROLINA
My Commission Expires: 11-25-97

\71991\comment agr

BK Z243PG411

LAW OFFICES OF C. J. MANOS
ATTORNEY AT LAW
P. O. BOX 1787
CHARLESTON, SC 29402-1787

15.00
A

FILED

Z243-402
94 JUN -7 PM 2:07

ROBERT N. KING
REGISTER
CHARLESTON COUNTY SC

EXHIBIT 4.8
Berkeley Elec Coop Easement

BK K 229PG594

E

THE STATE OF SOUTH CAROLINA)
)
COUNTY OF Charleston)

Location Number 557-70
RIGHT OF WAY EASEMENT
UNDERGROUND

KNOW ALL MEN BY THESE PRESENTS that I (we) W.L. Limehouse , of the County of Charleston , State of South Carolina, hereinafter referred to as Grantor(s) for the sum of One Dollar ($1.00) and other good and valuable consideration to me (us) in hand paid, receipt of which is hereby acknowledged, does hereby grant unto BERKELEY ELECTRIC COOPERATIVE, INC., a corporation, whose Post Office Address is Moncks Corner, South Carolina, hereinafter called Cooperative, and to its Successors of Assigns, a right-of-way over route selected by Cooperative, having a width of 10 feet, ~~that is to say, xxxxxxxxxxxx feet on either side of centerline~~, upon, over and across land of Grantor(s), more particularly described as follows, to-wit:

A tract of land approximately 34.6 acres in Charleston County, in or near Johns Island community and bounded as follows:

North by Bishops of Charleston
East by
South by John F. Limehouse
West by Bohicket Road

T.M.S.# 202-00-00-126 - This is a 10 foot underground easement running along the westerly property line adjacent to Bohicket Road.

together with the right to place, construct, operate, maintain, relocate, patrol and replace thereon and in or upon all streets, roads or highways abutting said lands an electric transmissions or distribution line or system and communication system, including the right to erect, install and construct, either overhead or underground, its electrical facilities and other transmission line structures, wires, cables and any necessary appurtenances and equipment deemed by the Cooperative to be necessary therefor, as well as the right to install, maintain and use anchors and guy wires on lands adjacent to the right-of-way herein granted; and to cut and trim trees and shrubbery to the extent necessary to keep them clear of said electric line or system and communication system and to cut down, from time to time, all dead, weak, leaning or dangerous trees that are tall enough to strike the wires in falling.

Together also with the right, from time to time, to redesign, rebuild or alter said lines and to install such additional lines, apparatus and equipment as the Cooperative may at any time deem necessary, and the right to remove any line or any part thereof.

Together also with all rights of ingress and egress necessary for the full and complete use, occupancy, and enjoyment of the easement hereby granted and all rights and privileges incident thereto.

Berkeley Electric Co-Op

BK K 229PG595

R/Way
10.00
B

GPV
A.J.

Grantor(s) agrees that all poles, wires and other facilities, including any main service entrance equipment installed on the above described lands at the Cooperative's expense, shall remain the property of the Cooperative, removable at the option of the Cooperative upon termination of service to or on said lands.

PROVIDED, HOWEVER, any damage to the property of Grantor(s) (other than the property cleared or removed as hereinabove provided) caused by the Cooperative in the course of constructing, rebuilding or repairing said lines shall be borne by the Cooperative.

TO HAVE AND TO HOLD, all the singular the aforesaid rights and privileges unto the Cooperative, its Successors and Assigns, as aforesaid.

And Grantor(s) agree(s) to warrant and forever defend the above granted rights against himself or his heirs and against any other person lawfully claiming or to claim the same or any part thereof.

It is further understood that whenever necessary, words used in this instrument in the singular shall be construed to read in the plural and that words used in the masculine gender shall be construed to read in the feminine.

IN WITNESS WHEREOF, the undersigned has set this hand and seal this 25 day of FEB, 1993.

SIGNED, SEALED AND DELIVER
IN THE PRESENCE OF

James Elwood Jr
Robert Bradley

X W.L. Limehouse (L.S.)
(L.S.)

STATE OF SOUTH CAROLINA
COUNTY OF BERKELEY

PERSONALLY appeared before me James Elwood Jr
and made oath that (s)he saw the within named W.L. Limehouse
sign the within instrument, and as h__ act and deed, deliver the Right-of-Way for the uses and purposes therein mentioned, and that (s)he with Robert Bradley, in the presence of each other, witnessed the due execution thereof.

James Elwood Jr

SWORN to and subscribed before me this 25 day of FEB, 1993.

Robert Bradley
NOTARY PUBLIC FOR SOUTH CAROLINA
My Commission Expires: 8-29-99

FILED
K229-594
93 JUL 13 AM 11:40
ROBERT N. ...
REGISTER
CHARLESTON COUNTY SC

RETURN TO:
BERKELEY ELECTRIC COOPERATIVE, INC.
P.O. Box 1234
Moncks Corner, S.C. 29461

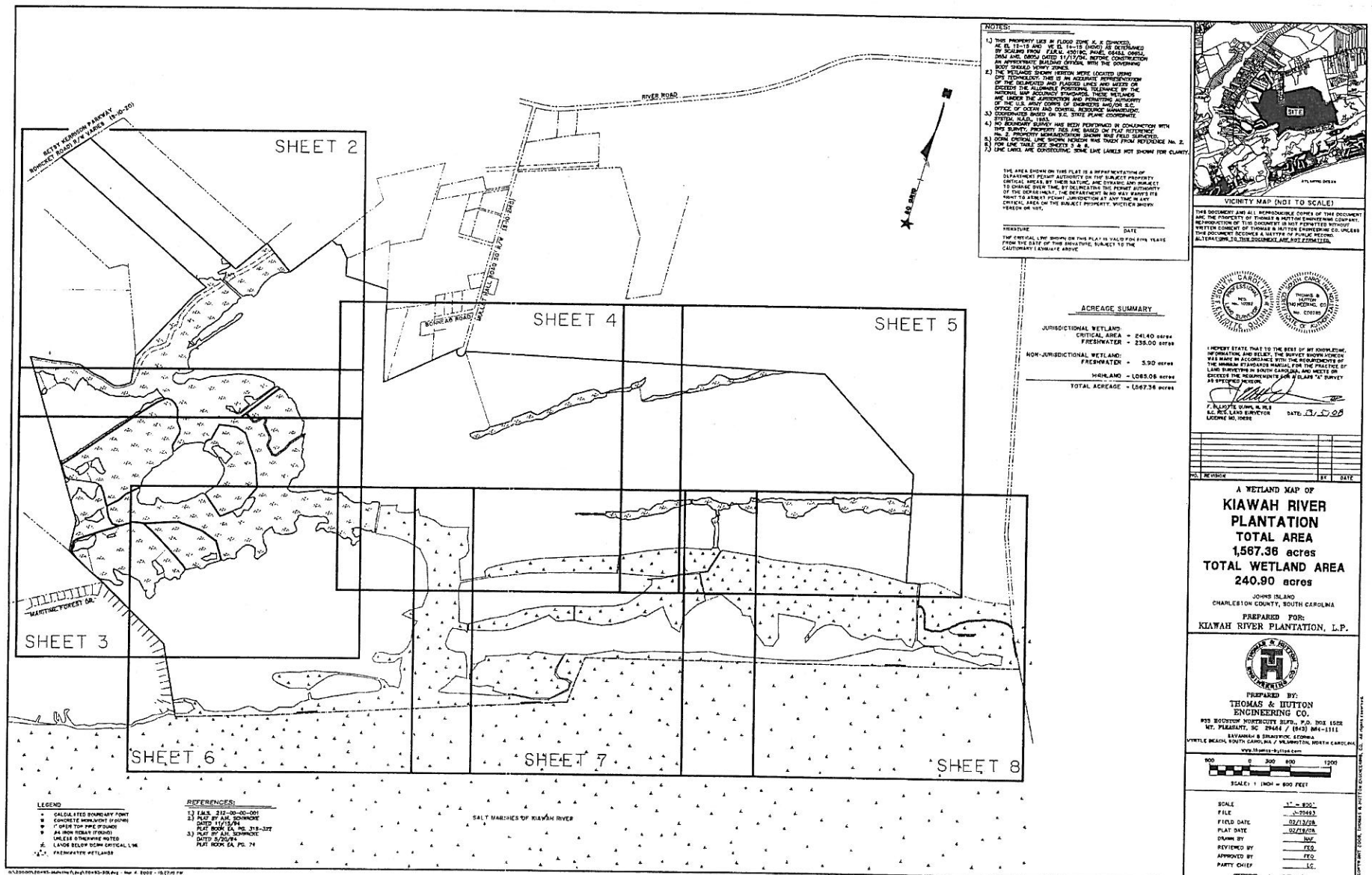
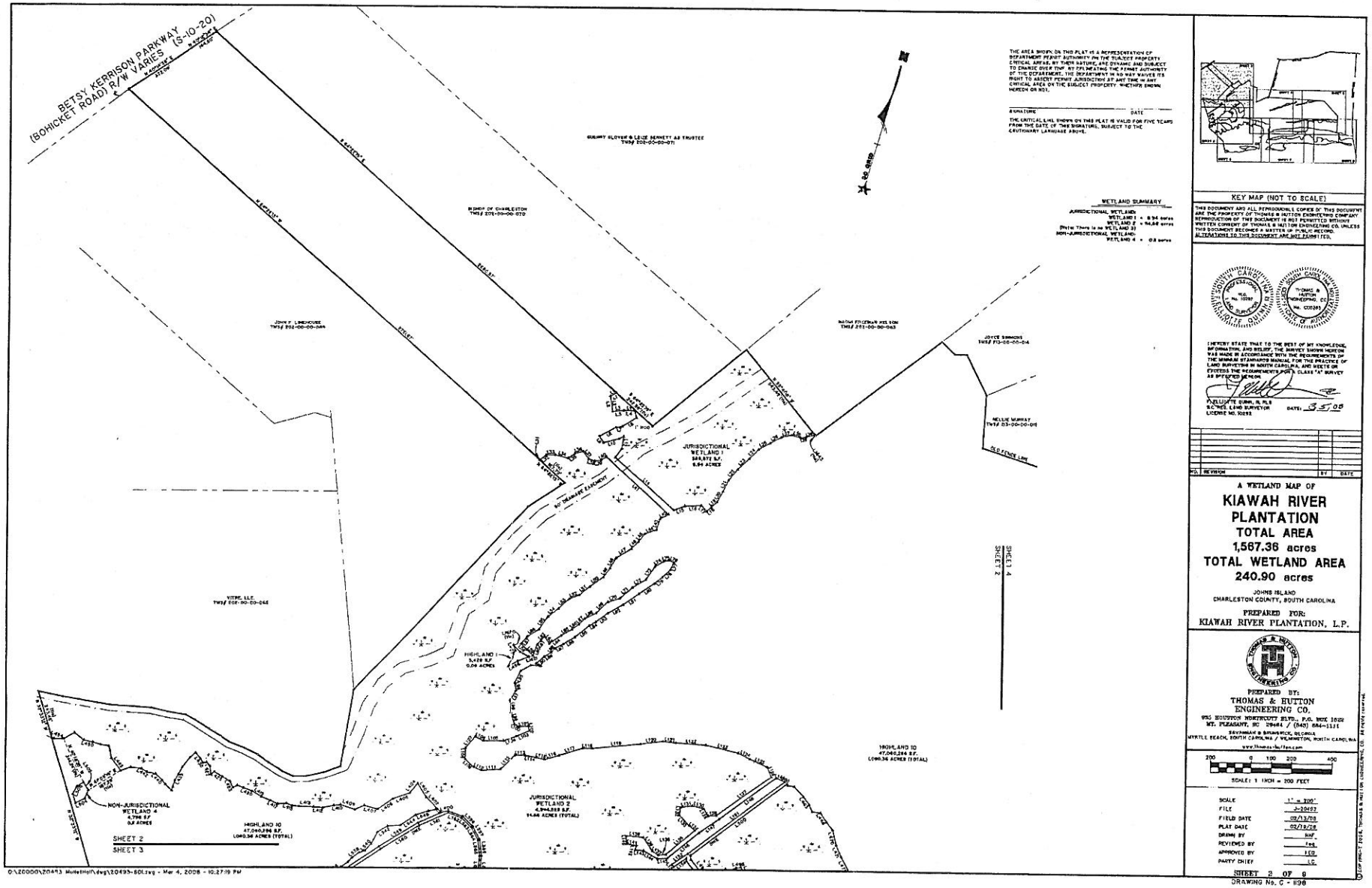


EXHIBIT 4.9
Wetland Survey



KEY MAP (NOT TO SCALE)

I HEREBY STATE THAT TO THE BEST OF MY KNOWLEDGE, INFORMATION, AND BELIEF, THE SURVEY SHOWN HEREON WAS MADE IN ACCORDANCE WITH THE REQUIREMENTS OF THE MINIMUM STANDARDS MANUAL FOR THE PRACTICE OF LAND SURVEYING IN SOUTH CAROLINA, AND MEETS OR EXCEEDS THE REQUIREMENTS FOR A CLASS "A" SURVEY AS SPECIFIED HEREON.

ALLIGATOR EDWIN, III, PLS
S.C. REG. LAND SURVEYOR
LICENSE NO. 10293
DATE: 3.5.08

NO.	REVISION	BY	DATE

A WETLAND MAP OF

KIAWAH RIVER PLANTATION

TOTAL AREA
1,567.36 acres
TOTAL WETLAND AREA
240.90 acres

JOHNS ISLAND
CHARLESTON COUNTY, SOUTH CAROLINA

PREPARED FOR:
KIAWAH RIVER PLANTATION, L.P.

PREPARED BY:
THOMAS & HUTTON ENGINEERING CO.
955 HOUSTON NORTHCUTT BLVD., P.O. BOX 1029
MT. PLEASANT, SC 29464 / (843) 884-1311
SAVANNAH & BRUNSWICK, GEORGIA
MYRTLE BEACH, SOUTH CAROLINA / WILMINGTON, NORTH CAROLINA
www.thomasandhutton.com

SCALE	1" = 200'
FILE	J-20493
FIELD DATE	09/13/05
PLAT DATE	03/19/08
DRAWN BY	MAF
REVIEWED BY	TWG
APPROVED BY	LEG
PARTY CHIEF	LC

SHEET 2 OF 9
DRAWING No. C - 898

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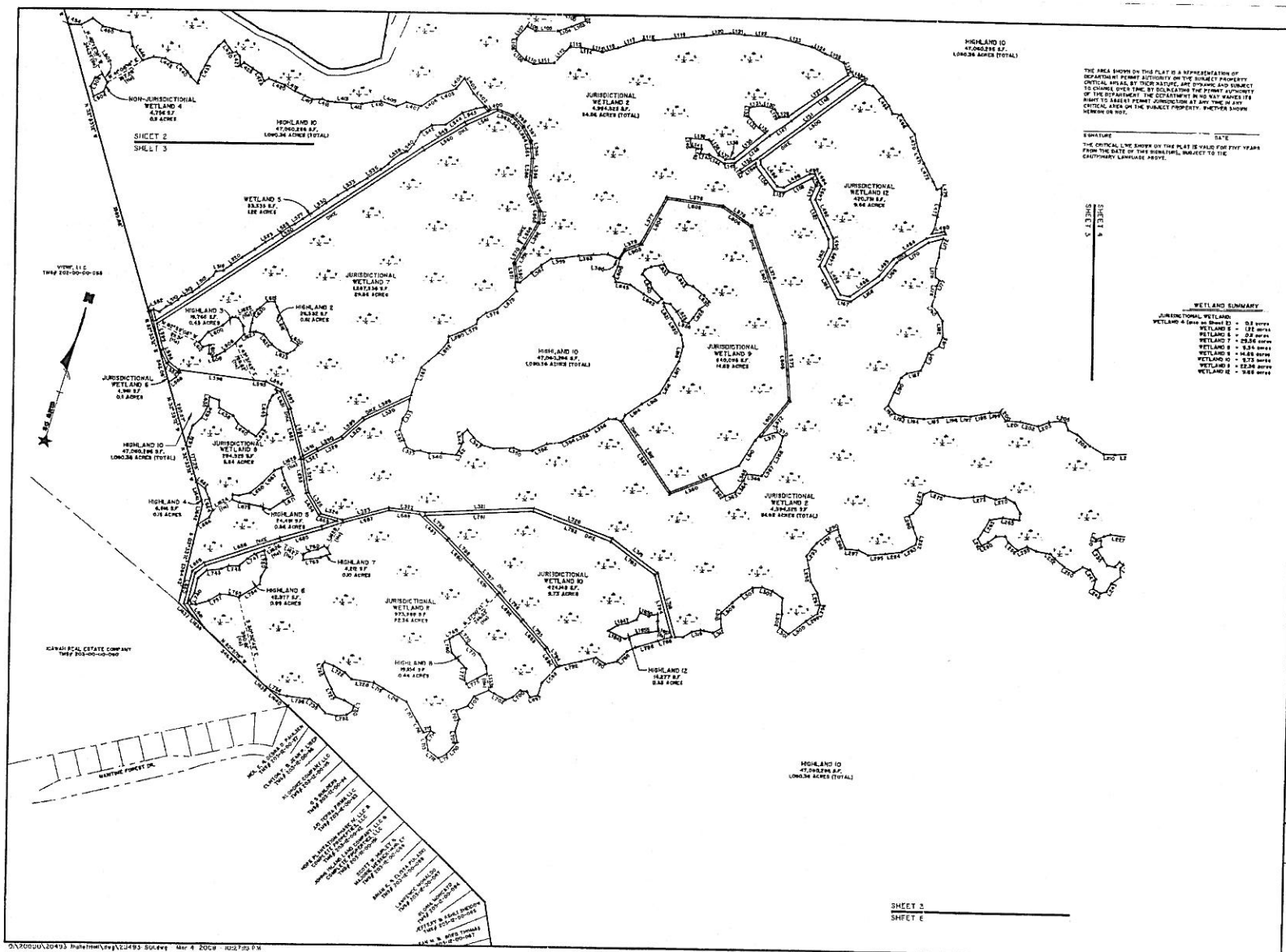

KEY MAP (NOT TO SCALE)

I HEREBY STATE THAT TO THE BEST OF MY KNOWLEDGE, INFORMATION, AND BELIEF, THE SURVEY SHOWN HEREON WAS MADE IN ACCORDANCE WITH THE REQUIREMENTS OF THE MINIMUM STANDARDS MANUAL FOR THE PRACTICE OF LAND SURVEYING IN SOUTH CAROLINA, AND MEETS OR EXCEEDS THE REQUIREMENTS FOR A CLASS "A" SURVEY AS SPECIFIED HEREON.

F. WILLASTIE DUNN, III, PLS
S.C. REG. LAND SURVEYOR
LICENSE NO. 10292
DATE: 3.07.08

NO.	REVISION	BY	DATE

A WETLAND MAP OF

KIAWAH RIVER PLANTATION

TOTAL AREA
1,567.38 acres
TOTAL WETLAND AREA
240.90 acres

JOHNS ISLAND
CHARLESTON COUNTY, SOUTH CAROLINA

PREPARED FOR:
KIAWAH RIVER PLANTATION, L.P.

PREPARED BY:
THOMAS & HUTTON ENGINEERING CO.
925 HOUSTON NORTHCUTT BLVD., P.O. BOX 1522
MT. PLEASANT, SC 29464 / (843) 884-1111
SAVANNAH & BRUNSWICK, GEORGIA
MYRTLE BEACH, SOUTH CAROLINA / WILMINGTON, NORTH CAROLINA
www.thomasandhutton.com

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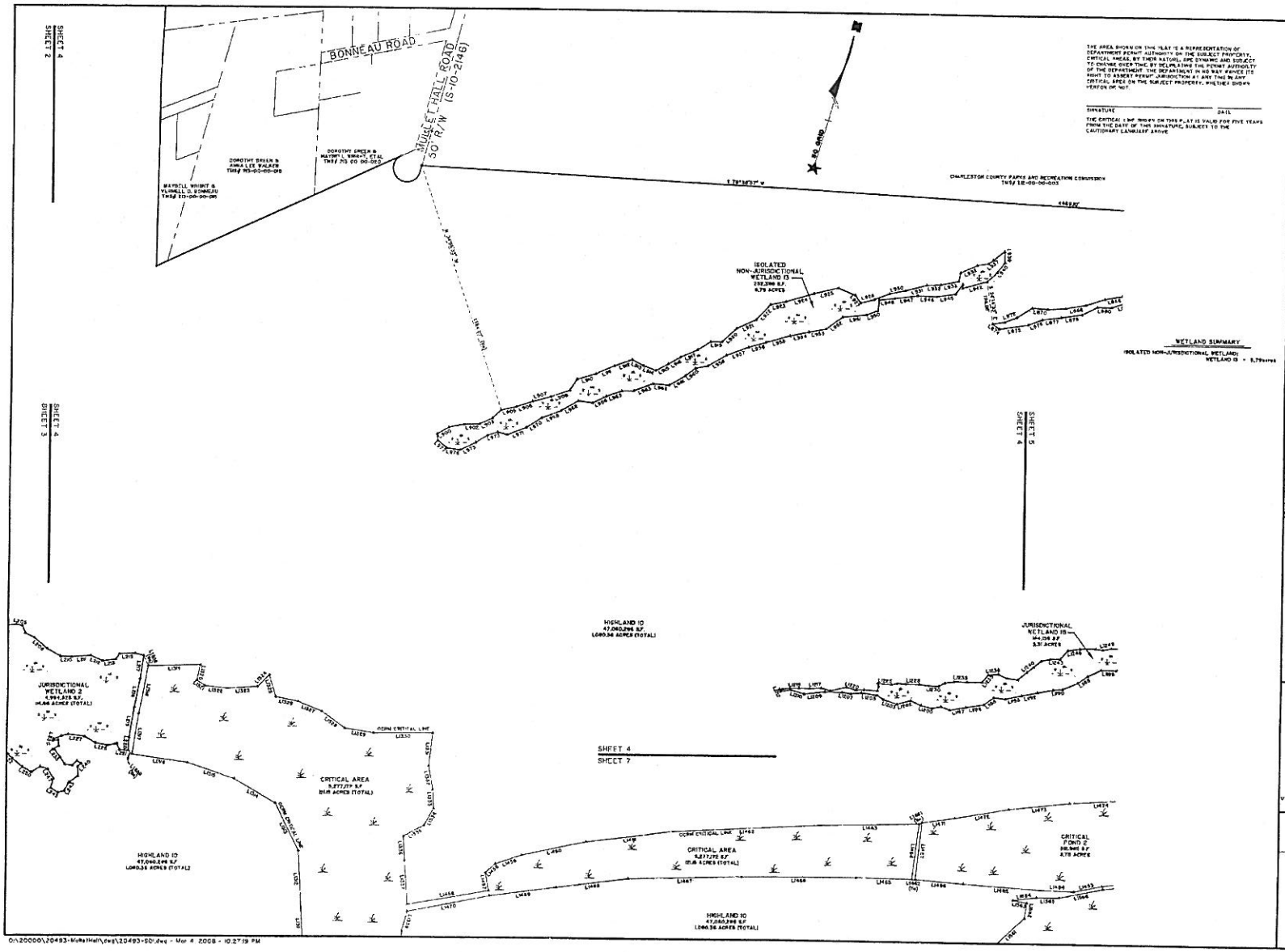
SCALE: 1 INCH = 200 FEET

SCALE	1" = 200'
FILE	J-20493
FIELD DATE	02/13/08
PLAT DATE	02/19/08
DRAWN BY	MAF
REVIEWED BY	FEQ
APPROVED BY	FEQ
PARTY CHIEF	LC

SHEET 3 OF 9
DRAWING No. C - 1198



THE AREA SHOWN ON THIS PLAT IS A REPRESENTATION OF DEPARTMENT PERMIT AUTHORITY ON THE SUBJECT PROPERTY. CRITICAL AREAS, BY THEIR NATURE, ARE DYNAMIC AND SUBJECT TO CHANGE OVER TIME. BY DELINEATING THE PERMIT AUTHORITY OF THE DEPARTMENT, THE DEPARTMENT IN NO WAY WAIVES ITS RIGHT TO ASSERT PERMIT JURISDICTION AT ANY TIME IN ANY CRITICAL AREA ON THE SUBJECT PROPERTY, WHETHER SHOWN HEREON OR NOT.

SIGNATURE _____ DATE _____

THE CRITICAL LINE SHOWN ON THIS PLAT IS VALID FOR FIVE YEARS FROM THE DATE OF THIS SIGNATURE, SUBJECT TO THE CAUTIONARY LANGUAGE ABOVE.

KEY MAP (NOT TO SCALE)

I HEREBY STATE THAT TO THE BEST OF MY KNOWLEDGE, INFORMATION, AND BELIEF, THE SURVEY SHOWN HEREON WAS MADE IN ACCORDANCE WITH THE REQUIREMENTS OF THE MINIMUM STANDARD MANUAL FOR THE PRACTICE OF LAND SURVEYING IN SOUTH CAROLINA, AND MEETS OR EXCEEDS THE REQUIREMENTS FOR A CLASS "A" SURVEY AS SPECIFIED HEREIN.

F. ELLIOTT GUNN, III, PLS
S.C. REG'D. LAND SURVEYOR
LICENSE NO. 19298

DATE: 3.5.08

NO.	REVISION	BY	DATE

A WETLAND MAP OF

KIAWAH RIVER PLANTATION

TOTAL AREA
1,567.36 acres
TOTAL WETLAND AREA
240.90 acres

JOHNS ISLAND
CHARLESTON COUNTY, SOUTH CAROLINA

PREPARED FOR:
KIAWAH RIVER PLANTATION, L.P.

PREPARED BY:
THOMAS & HUTTON ENGINEERING CO.
835 HOUSTON NORTHCUTT BLVD., P.O. BOX 1508
MT. PLEASANT, SC 29464 / (843) 884-1231
SAVANNAH & BRUNSWICK, GEORGIA
MYRTLE BEACH, SOUTH CAROLINA / WILMINGTON, NORTH CAROLINA
www.thomas-hutton.com

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SCALE: 1 INCH = 200 FEET

SCALE	1" = 200'
FILE	J-20493
FIELD DATE	02/13/08
PLAT DATE	03/19/08
DRAWN BY	MAP
REVIEWED BY	FEG
APPROVED BY	FEG
PARTY CHIEF	LC

SHEET 4 OF 9
DRAWING No. C - 898

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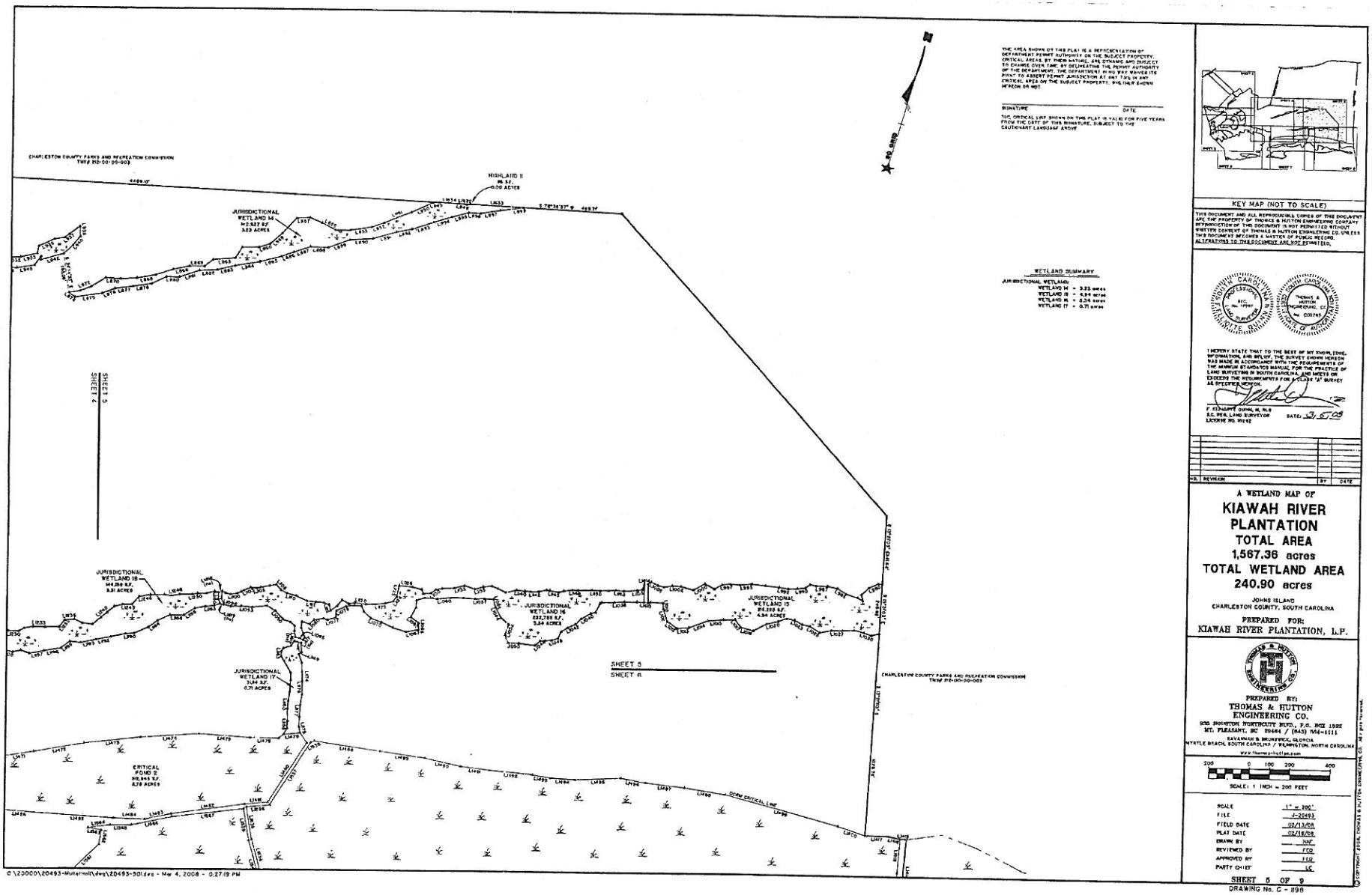

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SIGNATURE DATE

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KEY MAP (NOT TO SCALE)

I HEREBY STATE THAT TO THE BEST OF MY KNOWLEDGE, INFORMATION, AND BELIEF, THE SURVEY SHOWN HEREON WAS MADE IN ACCORDANCE WITH THE REQUIREMENTS OF THE MINIMUM STANDARDS MANUAL FOR THE PRACTICE OF LAND SURVEYING IN SOUTH CAROLINA, AND MEETS OR EXCEEDS THE REQUIREMENTS FOR A CLASS 'A' SURVEY AS SPECIFIED HEREON.

F. RICHARDT DUVAL III, PLS
S.C. REG. LAND SURVEYOR
LICENSE NO. 19492

DATE: 3.5.09

NO.	REVISION	BY	DATE

A WETLAND MAP OF

KIAWAH RIVER PLANTATION

TOTAL AREA
1,567.36 acres
TOTAL WETLAND AREA
240.90 acres

JOHNS ISLAND
CHARLESTON COUNTY, SOUTH CAROLINA

PREPARED FOR:
KIAWAH RIVER PLANTATION, L.P.

PREPARED BY:
THOMAS & HUTTON ENGINEERING CO.
1088 JOHNSTON POSTOFFICE BLVD., P.O. BOX 1000
MT. PLEASANT, SC 29464 / (843) 444-1111
SAVANNAH & BRUNSWICK, GEORGIA
MYRTLE BEACH, SOUTH CAROLINA / WILMINGTON, NORTH CAROLINA
www.thomasandhutton.com

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SCALE: 1 INCH = 200 FEET

SCALE	1" = 200'
FILE	J-20493
FIELD DATE	02/13/08
PLAT DATE	02/18/08
DRAWN BY	NAF
REVIEWED BY	FCD
APPROVED BY	FRD
PARTY CHIEF	LC

SHEET 5 OF 9
DRAWING No. C - 898

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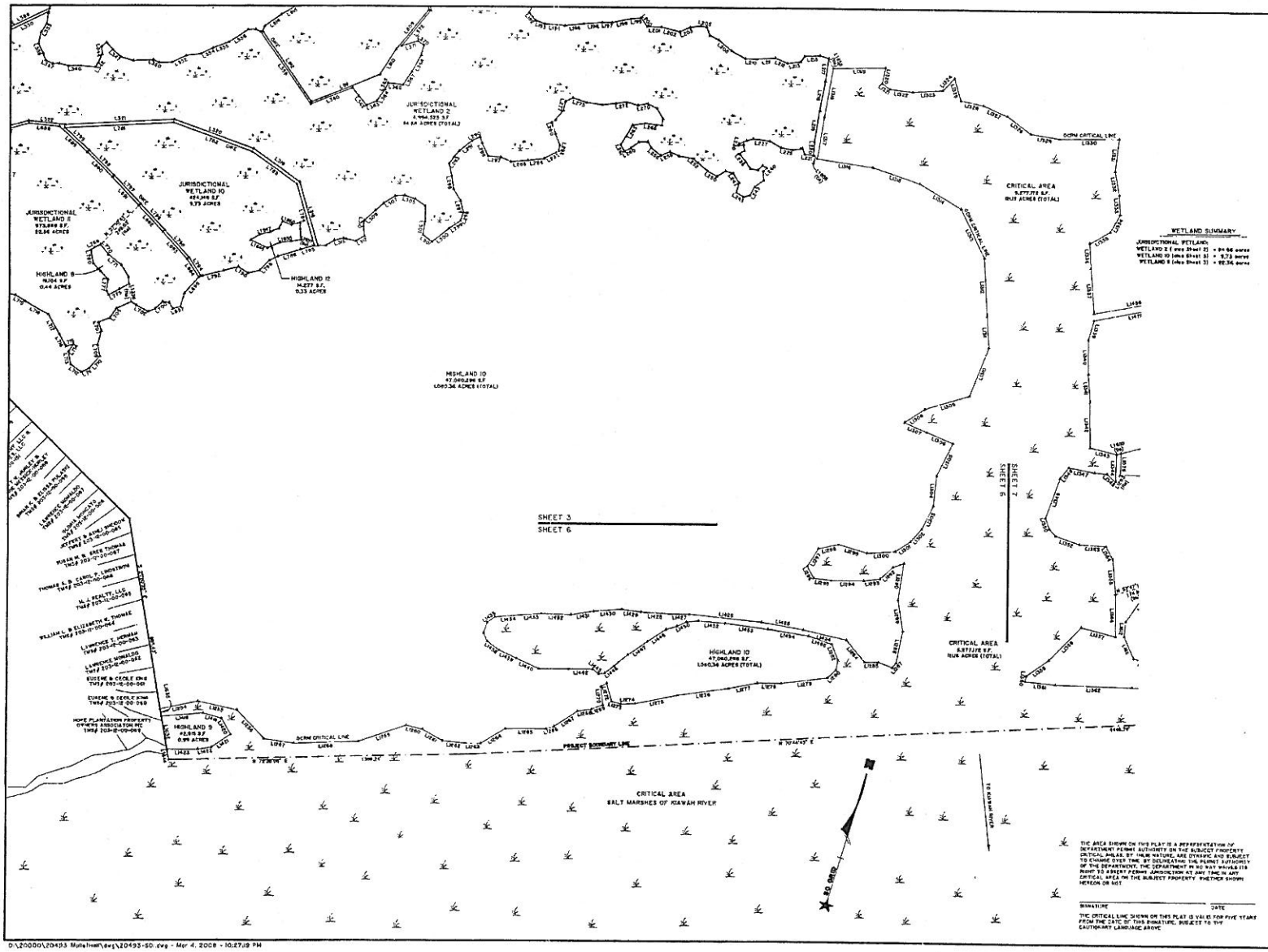

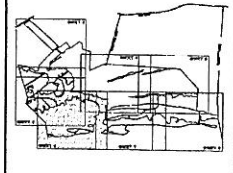

KEY MAP (NOT TO SCALE)

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F. ELLAYNE QUINN, S. PLS
S.C. REG. LAND SURVEYOR
LICENSE NO. 10292
DATE: 3.5.08

NO.	REVISION	BY	DATE

A WETLAND MAP OF

KIAWAH RIVER PLANTATION

TOTAL AREA
1,567.36 acres
TOTAL WETLAND AREA
240.90 acres

JOHNS ISLAND
CHARLESTON COUNTY, SOUTH CAROLINA

PREPARED FOR:
KIAWAH RIVER PLANTATION, L.P.

PREPARED BY:
THOMAS & HUTTON ENGINEERING CO.
925 HOUSTON NORTHCUTT BLVD., P.O. BOX 1522
MT. PLEASANT, SC 29464 / (843) 884-5111
SAVANNAH & BRUNSWICK, GEORGIA
MYRTLE BEACH, SOUTH CAROLINA / WILMINGTON, NORTH CAROLINA
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200 0 100 200 400
SCALE: 1 INCH = 200 FEET

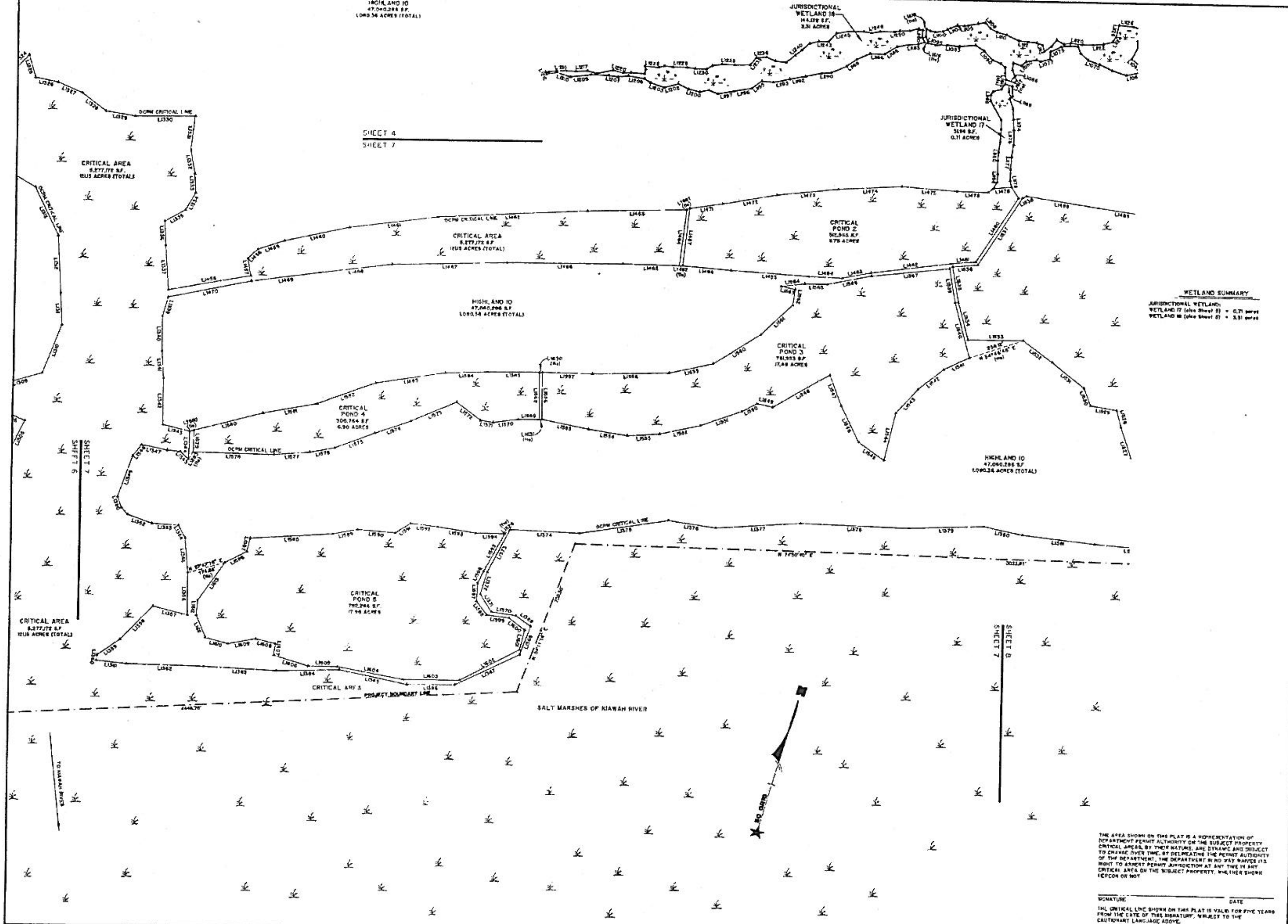
SCALE	1" = 200'
FILE	J-20493
FIELD DATE	02/13/08
PLAT DATE	02/19/08
DRAWN BY	MAF
REVIEWED BY	FEQ
APPROVED BY	FEQ
PARTY CHIEF	LC

SHEET 6 OF 9
DRAWING No. C - 1198

THE AREA SHOWN ON THIS PLAT IS A REPRESENTATION OF DEPARTMENT PERMIT AUTHORITY ON THE SUBJECT PROPERTY. CRITICAL AREAS, BY THEIR NATURE, ARE DYNAMIC AND SUBJECT TO CHANGE OVER TIME. BY DELINEATING THE PERMIT AUTHORITY OF THE DEPARTMENT, THE DEPARTMENT IN NO WAY WAIVES ITS RIGHT TO ASSERT PERMIT JURISDICTION AT ANY TIME IN ANY CRITICAL AREA ON THE SUBJECT PROPERTY, WHETHER SHOWN HEREON OR NOT.

SIGNATURE DATE

THE CRITICAL LINE SHOWN ON THIS PLAT IS VALID FOR FIVE YEARS FROM THE DATE OF THIS SIGNATURE, SUBJECT TO THE CAUTIONARY LANGUAGE ABOVE.



I HEREBY STATE THAT TO THE BEST OF MY KNOWLEDGE, INFORMATION, AND BELIEF, THE SURVEY SHOWN HEREON WAS MADE IN ACCORDANCE WITH THE REQUIREMENTS OF THE MINIMUM STANDARDS MANUAL FOR THE PRACTICE OF LAND SURVEYING IN SOUTH CAROLINA, AND MEETS OR EXCEEDS THE REQUIREMENTS FOR A CLASS "A" SURVEY AS SPECIFIED HEREON.

F. ELLIOTTE QUINN, III, RLS
S.C. REG. LAND SURVEYOR
LICENSE NO. 10692
DATE: 3.5.08

NO.	REVISION	BY	DATE

A WETLAND MAP OF

KIAWAH RIVER PLANTATION

TOTAL AREA 1,567.36 acres

TOTAL WETLAND AREA 240.90 acres

JOHNS ISLAND
CHARLESTON COUNTY, SOUTH CAROLINA

PREPARED FOR:
KIAWAH RIVER PLANTATION, L.P.

PREPARED BY:
THOMAS & HUTTON ENGINEERING CO.
935 HOUSTON NORTHCUTT BLVD., P.O. BOX 1522
MT. PLEASANT, SC 29464 / (843) 884-1111
SAVANNAH & BRUNSWICK, GEORGIA
MYRTLE BEACH, SOUTH CAROLINA / WILMINGTON, NORTH CAROLINA
www.thomas-hutton.com

SCALE: 1 INCH = 200 FEET

SCALE	1" = 200'
FILE	J-20493
FIELD DATE	02/13/08
PLAT DATE	02/19/08
DRAWN BY	NAF
REVIEWED BY	FEQ
APPROVED BY	FEQ
PARTY CHIEF	LC

SHEET 7 OF 9
DRAWING No. C - 1198

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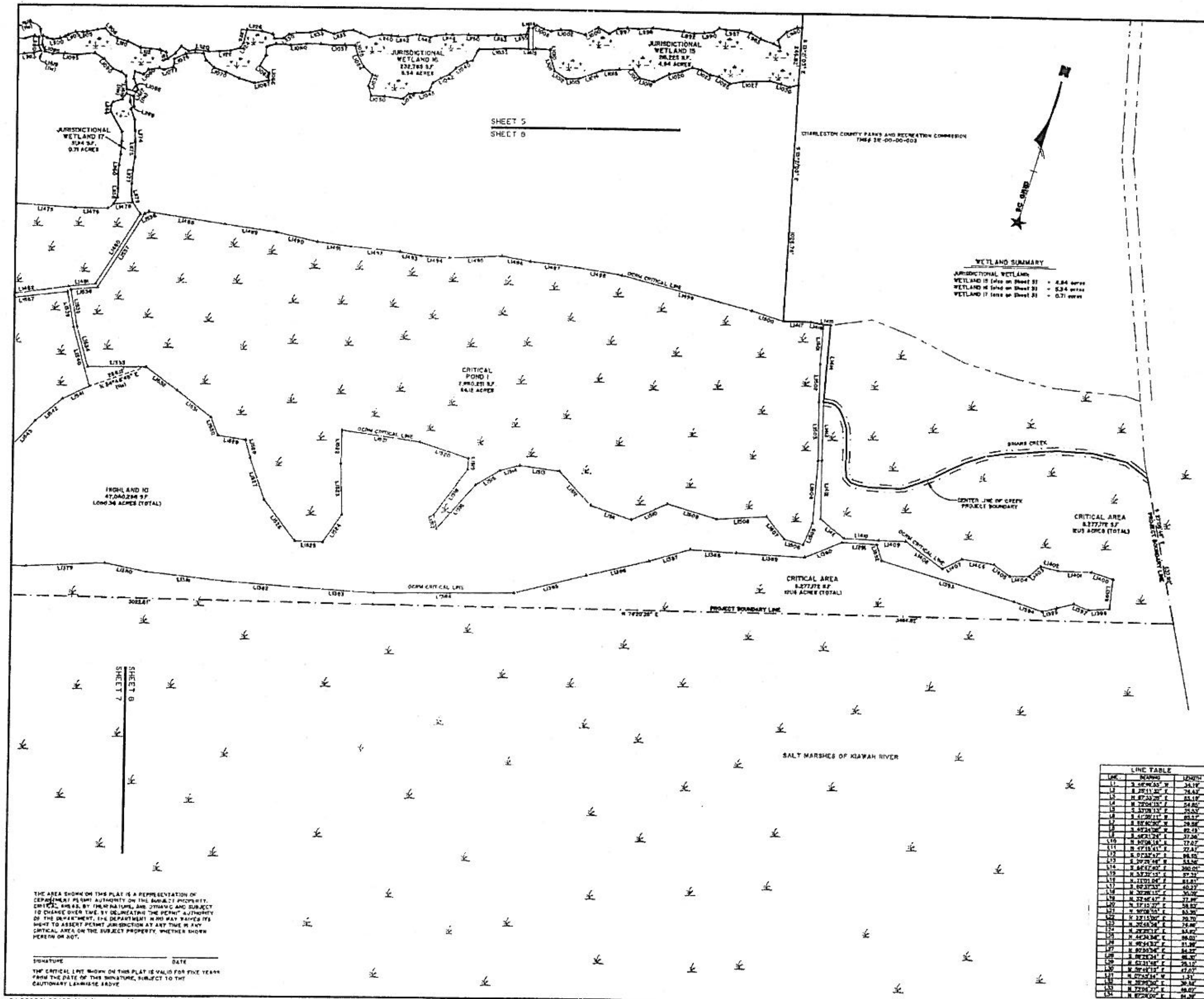

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THE AREA SHOWN ON THIS PLAT IS A REPRESENTATION OF DEPARTMENT PERMIT AUTHORITY ON THE SUBJECT PROPERTY. CRITICAL AREAS, BY THEIR NATURE, ARE DYNAMIC AND SUBJECT TO CHANGE OVER TIME. BY DELINEATING THE PERMIT AUTHORITY OF THE DEPARTMENT, THE DEPARTMENT IN NO WAY WAIVES ITS RIGHT TO ASSERT PERMIT JURISDICTION AT ANY TIME IN ANY CRITICAL AREA ON THE SUBJECT PROPERTY, WHETHER SHOWN HEREON OR NOT.

SIGNATURE DATE

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F. ELLIOTTE QUINN, III, RLS
S.C. REG. LAND SURVEYOR
LICENSE NO. 10393

DATE: 3/5/08

NO. REVISION BY DATE

A WETLAND MAP OF

KIAWAH RIVER PLANTATION

TOTAL AREA
1,567.36 acres
TOTAL WETLAND AREA
240.90 acres

JOHNS ISLAND
CHARLESTON COUNTY, SOUTH CAROLINA

PREPARED FOR:
KIAWAH RIVER PLANTATION, L.P.

PREPARED BY:
THOMAS & HUTTON ENGINEERING CO.
955 HOUSTON NORTHCUTT BLVD., P.O. BOX 1522
MT. PLEASANT, SC 29464 / (843) 884-1111
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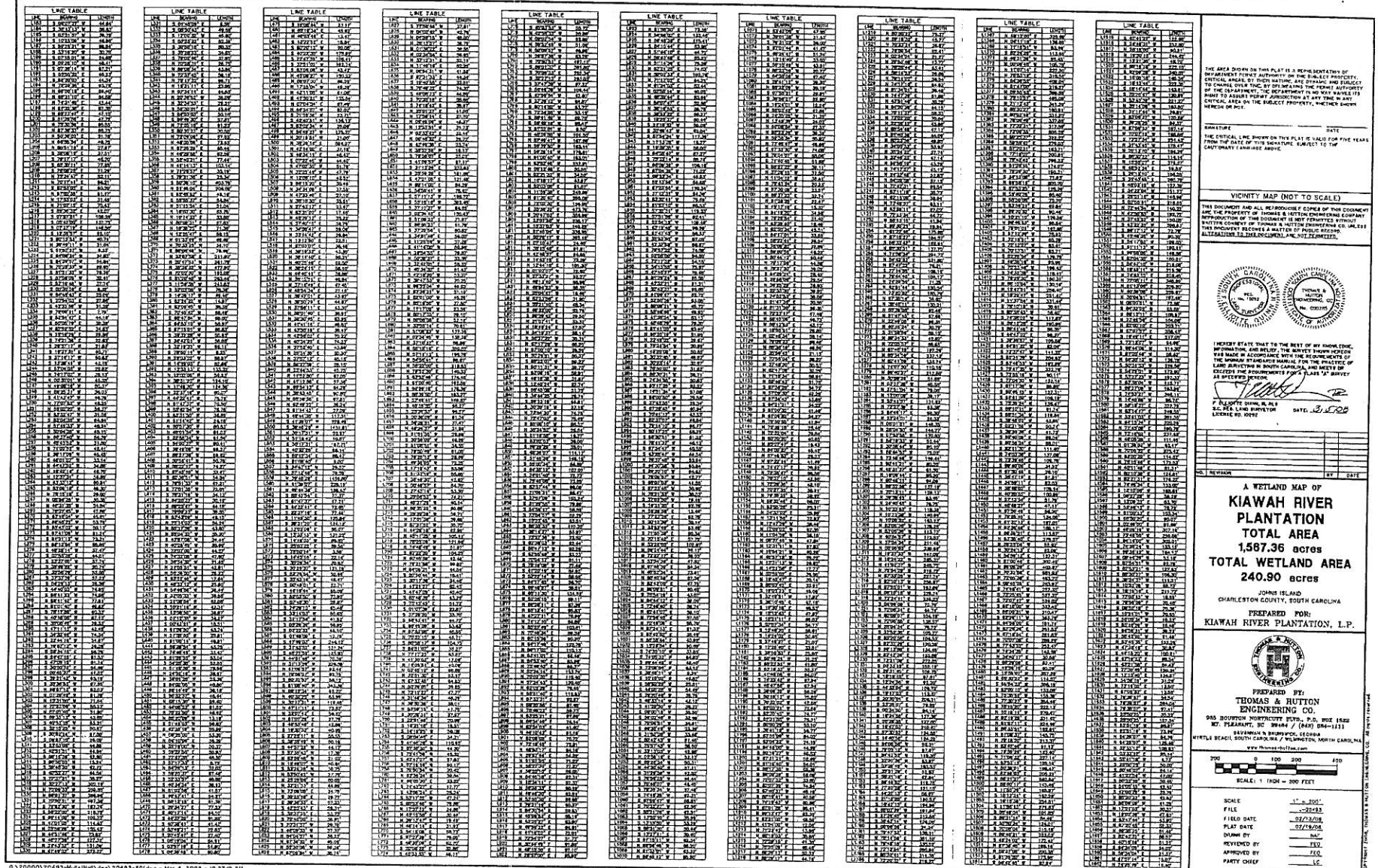
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VICINITY MAP (NOT TO SCALE)
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REG. No. 17892
PROFESSIONAL ENGINEER
SOUTH CAROLINA
F. ELLIOTT DIXON, III, PLS
S.C. REG. LAND SURVEYOR
LICENSE NO. 19292
DATE: 3/5/08
NO. REVISION
BY
DATE
A WETLAND MAP OF
KIAWAH RIVER PLANTATION
TOTAL AREA
1,587.36 acres
TOTAL WETLAND AREA
240.90 acres
JOHNS ISLAND
CHARLESTON COUNTY, SOUTH CAROLINA
PREPARED FOR:
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CHAPTER 4 : BASE ZONING DISTRICTS

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Articles 4.1 through 4.26 of the ZLDR shall not apply to the Real Property. Instead, the zoning standards, building development standards, and waterfront development standards applicable to the Real Property shall be those set forth in the Plan, especially sections 4 and 6 of the Plan.

ARTICLE 4,27 PD, PLANNED DEVELOPMENT OISTRICT

§4.27.1 DESCRIPTION

A "Planned Development," as defined by the South Carolina Government Comprehensive Planning Enabling Act of 1994, as amended, Code of Laws of South Carolina, Title 6, Chapter 29 (6-29-740) is a type of zoning district (PD) and a type of development plan. PD zoning districts are inextricably linked to Planned Development plans, in that no rights of development apply to a PD zoning designation other than those of the approved Planned Development plan.

Planned development provisions are intended to encourage innovative site planning for residential, commercial, institutional, and industrial developments within planned development districts. Planned development districts may provide for variations from other ordinances and the regulations of other established zoning districts concerning use, setbacks, lot size, density, bulk, and other requirements to accommodate flexibility in the arrangement of uses for the general purpose of promoting and protecting the public health, safety, and general welfare.

§4.27.2 FINDINGS

The County finds and determines that this Article is consistent with the following objectives of the *Comprehensive Plan:*

A. Implement a farm and forest land and open space protection program (Objective FFL1);

B. Provide families and youth with access to parks, recreation areas and facilities (Objective CD5);

C. . Encourage site design that will maintain as much of the development site as possible in natural open space where new development is proposed in rural and agricultural areas outside of existing settlements (Objective WR3, Policy 1);

D. Implement a system of incentives that will encourage environmentally sensitive site planning that is responsive to the natural characteristics of the land.

New development should be encouraged that will retain buffers along rural and urban waterways, retain natural open space, and reduce impervious surfaces (Objective WR4, Policy 1);

E. Promote a sufficient supply of a variety of housing units with access to facilities and services (Objective H1);

F. Increase ownership of affordable housing through new construction, acquisition, and/or rehabilitation (Objective H5);

G. Increase the housing alternatives for low and moderate income households (Objective H6); and

H. Increase and preserve affordable housing development and reduce the number of households below the poverty level (Objective CD10).

§4.27.3 DEFINITIONS

In this Chapter, the following term shall have the following meanings unless a contrary meaning is required by the context or is specifically prescribed:

A. Studio Unit: A dwelling unit that:

1. Has only one combined living and sleeping room; or

2. A living and sleeping room, along with a separate room that contains only kitchen facilities and also a separate room that contains only sanitary facilities.

§4.27.4 INTENT AND RESULTS

The PD, Planned Development, district regulations of this Article are intended to encourage achievement of the goals of the Charleston County *Comprehensive Plan* and to allow flexibility in development that will result in improved design, character, and quality of new mixed use developments and preserve natural and scenic features of open spaces. The following objectives may be attained through the use of the planned development process:

A. A maximum choice in the types of environment available to the public by allowing a development that would not be possible under the strict application of the standards of this Ordinance that were designated primarily for development on individual lots;

B. A greater freedom in selecting the means to provide access, light, open space and design amenities;

C. Quality design and environmentally sensitive development by allowing development to take advantage of special site characteristics, locations and land use arrangements;

D. A development pattern in harmony with the land use density, transportation facilities and community facilities objectives of the *Comprehensive Plan;*

E. The permanent preservation of common open space, recreation areas and facilities;

F. An efficient use of the land resulting in more economical networks of utilities, streets, schools, public grounds and buildings, and other facilities;

G.. A creative approach to the use of land and related physical facilities that results in better development and design and the construction of amenities; and

H. A development pattern that incorporates adequate public safety and transportation-related measures in its design and compliments the developed properties in the vicinity and the natural features of the site.

§4.27.5 APPLICABILITY

There shall be no minimum site area requirement for a Planned Development as long as the Planned Development meets all requirements of Article 4.27 of this Ordinance.

§4.27.6 DEVELOPMENT STANDARDS

Development standards of the underlying zoning district pertaining to density, lot size, location, and arrangement of buildings and structures, lot dimensions, and landscaping may be altered in Planned Development Districts. The underlying standards of the zoning district may be altered only if the development will serve an overriding public interest and/or public safety concern. The development standards listed below, those in the approved Planned Development Stipulations, and any in the approved Planned Development Sketch Plan(s) shall apply.

A. Maximum Density

The maximum allowed density increase in a planned development may not exceed the maximum density as stated in Table 3.2.1 of the Charleston County *Comprehensive Plan,* as amended; ***provided, however, when a property is "split-zoned" under base zoning standards, the maximum allowed density increase in a planned development shall be the combined maximum density suggested in the Comprehensive Plan. There shall be no separate density increase limitations for different portions of the property.*** Density and lot area calculations shall comply with the requirements contained in Article 4.2, Measurements, Computations and Exceptions. In order to achieve the maximum density, the following minimum amounts of common open space, as defined in this Ordinance, shall apply where applicable:

1. 0.2 acres of common open space per dwelling unit plus ten percent (10%) of the land area designated for office, commercial, and/or industrial uses is required for parcels located in the Rural and Agricultural Areas; or

2. If the parcel is located in the Suburban Area, the following standards shall apply:

   a. Where the underlying zoning district is Single Family Residential (R-2, R-3, or R-4) and all requirements of this Ordinance are met, a maximum density of not more than two times the maximum allowable density in the underlying zoning district may be permitted when 0.05 acres of common open space per dwelling unit plus ten percent (10%) of the land area designated for office, commercial, and/or industrial uses is provided. A density bonus of up to 25% may be approved by County Council when affordable housing units are provided in accordance with the provisions of Section 4.27.8 of this Ordinance; and

b. Where the underlying zoning district is Mixed Style Residential (M-8 or M-12) and all requirements of this Ordinance are met, a maximum density of not more than two times the maximum allowable density in the underlying zoning district may be permitted when 0.05 acres of common open space per dwelling unit plus ten percent (10%) of the land area designated for office, commercial, and/or industrial uses is provided. A density bonus may be approved by County Council when affordable housing units are provided in accordance with the provisions of Section 4.27.8 of this Ordinance.

B. Dimensional Standards

1. The Waterfront Development Standards of the base zoning district, as set forth in Article 4.26 of this Ordinance; shall be applied to all waterfront lots within the planned development; ***provided, however, when a property is "split zoned" under base zoning standards, the waterfront development standards of the least restrictive base zoning district shall be applied if the applicant reduces the overall number of single-family lots on the waterfront edge and if the applicant restricts the number of docks permitted on the waterfront edge.***

~~2. Each lot located on the perimeter of the planned development shall maintain the rear yard setback requirements and any buffer requirements of the adjacent zoning district.~~

C. Architectural Standards

The Architectural Design Guidelines of Article 9.6 shall apply to all proposed planned developments. Modifications to the Architectural Design Guidelines may be proposed in a planned development request where the Planning Director determines that the architectural design of the proposed development is compatible with the architectural design of development on adjacent properties.

D. Lots to Abut Upon Common Open Space

Residential parcels shall maximize orientation towards common open space or similar areas.

E. Access

1. Streets within planned developments should connect to adjoining neighborhoods/developments. Cul-de-sacs, T-turnarounds, and dead-end streets are discouraged.

2. Areas between structures shall be covered by easements where necessary for access and to provide for maintenance and utility service.

3. Primary vehicular access to office, commercial, or industrial development shall be through limited access roads.

F. Commercial Areas

1. Commercial areas and adjacent residential, office, and industrial areas shall be directly connected through paved sidewalks, trails, or other pedestrian infrastructure.

2. Commercial areas shall be planned as groups having common parking areas and common ingress and egress points.

G. Industrial Areas

1. A minimum vegetated buffer of forty (40) feet shall be required where industrial uses abut residential uses.

2. All intervening spaces between the right-of-way line and project building line and intervening spaces between buildings, drives, parking areas and improved areas shall be landscaped with trees and plantings and properly maintained at all times.

H. Areas Designated for Future Use

All areas designated for future expansion or not intended for immediate improvement or development shall remain in a natural state until such time as development permits are approved.

I. Signs

Specifications of size, type, height, setback, location, design, illumination, and number of signs shall be included in the planned development guidelines. Specifications shall be as restrictive or more restrictive than the standards set forth in this Ordinance.

J. Parking

Parking shall be provided in accordance with the standards set forth in Article 9.3 of this Ordinance. Modifications to the parking standards of Article 9.3 may be proposed in a planned development request where the Planning Director determines that the amount of parking requested and its location is sufficient for the use proposed.

K. Resource Areas

1. Planned developments shall protect any resources determined significant by the Planning Director including, but not limited to: agricultural soils and active farmland, buffer areas between active farmland and existing/planned future non-farm development, wetlands, mature trees, land adjacent to preserved farmland on neighboring properties, scenic views, water access and shoreline buffers, and habitat of species designated as of federal, state and local concern.

2. ~~Planned developments shall comply with all provisions of Article 0.4, Tree Protection and Preservation, of this Ordinance~~. ***All live oak trees of 24" DBH and greater shall be subject to Article 9.4 of this Ordinance. Modifications to the other tree protection and preservation standards of this Ordinance may be proposed in a planned development request when the Planning Director determines that the amount of tree protection and preservation requested is sufficiently similar to the County standards.***

§4.27.7 COMMON OPEN SPACE

A. Common open space area shall be located to preserve any significant

resources. Where common open space is designated, the following standards shall apply:

1. The common open space area shall be detailed on each Sketch Plan and recorded with the Final Plat (as approved under Article 8.5 of this Ordinance) or separate instrument.

2. The proposed common open space shall be usable and appropriate to the size of the development and to the new residents of the planned development. The purpose of common open space is to permit areas, which could otherwise be developed into buildable lots or otherwise sold individually, to provide a significant amenity to the residents who will interact with the open space on a daily basis. It is not the purpose of common open space to permit open space for land that is otherwise unusable on a daily basis by residents. Common open space may include unimproved land, landscaped areas, improved recreation areas, recreational buildings, and structures that are totally accessory to recreational uses, as well as freshwater wetland areas and water surfaces, all located within the development. Natural landscapes, such as wetlands, may also be considered as open space if preserved and meet the requirements of subsection C below. "Usable" means that the open space includes uses or facilities that are adaptable to recreational or leisure use and are accessible to the residents of the proposed development or the general public, such as seating areas, picnic shelter, community garden, pedestrian and bicycle trail access to a designated greenway, public square, swimming pools, playing fields, or a new playground. The use or facility must be approved by County Council in accordance with the approval and conveyance procedures below.

3. The total combined acreage of freshwater wetlands, detention ponds, and buffers to be used as open space shall not comprise more than forty percent (40%) of the open space requirement as stated in this Section.

4. Land designated as common open space shall not be occupied by streets, drives, parking areas, or structures, other than recreational structures; ***provided, however, streets, drives, parking areas or structures which are Pervious may be included within common open space.***

5. All property owners in the planned development shall have access to the open space by means of a public or private street ***in an easement a minimum of 20 feet in width*** or walkway ~~in an easement a minimum of 20 feet in width.~~

6. Common open space shall be provided within each phase of the planned development in sufficient amounts to serve the expected population of that phase.

7. The common open space shall be conveyed prior to recording the final plat, in accordance with one of the methods listed below. The applicant must have proof of commitment from the entity that will be responsible for the common open space prior to the Planning Commission Meeting for which the case is scheduled.

a. By dedication to the County as publicly-owned open space. Parks, open space, and recreation facilities proposed for dedication to the County must be acceptable to the Parks and Recreation Commission, Planning Commission, County Council, and other governmental entities with regard to the size, shape, location, improvement, environmental condition (i.e., the applicant may be required to provide an environmental assessment), and budgetary and maintenance terms; or

b. By leasing, conveying, or retaining title (including beneficial ownership) to a corporation, homeowner's association or other legal entity. The terms of such lease of other instrument of conveyance must restrict the use of the area to open space/recreational uses.

§4.27.8 AFFORDABLE DWELLING UNITS

A. As an incentive to provide affordable dwelling units, County Council may approve a density bonus above the maximum allowable density provided for in Section 4.27.6A. This density bonus is only applicable to properties located in the Suburban Area and shall only apply to affordable housing units (no market rate units may be included in the density bonus).

B. Zoning permit fees for affordable dwelling units shall be reimbursed upon the request of the developer and certification that the dwelling units are affordable, as defined in Section 4.27.3A.

C. If affordable dwelling units are provided within a planned development ***as part of a density bonus***, the following requirements shall apply:

1. Affordable dwelling units shall be provided within each phase of the planned development in sufficient amounts to serve the expected population of that phase;

2. Affordable dwelling units shall be integrated throughout the development and not located in a single area of the development;

3. Any studio dwelling unit provided under this Section must be a minimum of 500 square feet in floor area; and

4. In no instance shall more than fifty percent (50%) of the affordable dwelling units be provided in the form of studio units.

§4.27.9 PLANNED DEVELOPMENT PROCEDURE

This procedure involves a pre-application conference, a community workshop and approval of a PD development plan and PD zoning map amendment.

A. Pre-Application Conference

Before submitting a PD Development Plan for Planned Development, the applicant shall confer with the Planning Director and any other officials designated by the Planning Director. The purpose of this pre-application conference is to discuss the proposal and the applicable development review and approval procedures.

B. Community Workshop

After the pre-application conference, it is recommended that the applicant hold one (1) or more community workshops. The purpose of a community workshop is to ensure early citizen participation in an informal forum, in conjunction with the development applications and to provide an applicant the opportunity to understand and try to mitigate any impacts an application may have on an affected community. A community workshop is not intended to produce complete consensus on all applications, but to encourage applicants to be good neighbors.

C. PD Development Plan

1. Application

After the required pre-application conference, a complete application for PD Development Plan approval must be submitted to the Planning Director on a form established by the Planning Director including an approved and recorded plat showing the current property lines of the property/properties to be included in the planned development, a current recorded deed, and all applicable fees. If the proposed development is zoned R-2, R-3, or R-4 and would exceed the maximum density of the Residential Low Density Future Land Use Designation in the *Comprehensive Plan,* a *Comprehensive Plan* Amendment must be approved concurrently with a Planned Development application (see Article 3.2, *Comprehensive Plan* Amendment). County Council may waive the fees at their discretion. The PD Development Plan application shall include the requested Planned Development Stipulations and Sketch Plan. The Sketch Plan shall be drawn to scale.

a. The following shall be included in the requested Planned Development Stipulations:

   i. The name of the planned development, not duplicating the name of any other planned development or subdivision, the final plat of which has been recorded in Charleston County, South Carolina;

   ii. A statement of objectives of the proposed development;

   iii. The total acreage of the planned development, broken down into total acreage, total highland acreage, total freshwater wetland acreage, and total Critical Line wetland, or marsh, acreage;

   iv. A table of proposed land uses including:

      a. A table of proposed maximum and average residential densities for each residential use (The applicant may refer to the density ranges listed in the Charleston County *Comprehensive Plan* for residential densities);

      b. The maximum total acreage of each residential use, including affordable dwelling units, if applicable;

c. The maximum allowable number of each type of residential unit requested, including affordable dwelling units, if applicable;

d. The maximum proposed floor area ratios (% of lot in relation to building floor area), and the maximum building/lot coverage for each non-residential use; and

e. All dimensional and lot standards requested, for each land use type designated.

v. A description of the affordable dwelling units, if applicable, including location, unit type, and cost analysis;

vi. An analysis of the impact of the proposed development on existing public facilities and services (e.g. roads and streets, water, sewer, etc.). Any proposed future improvements to these facilities and services to be made as part of the planned development shall also be included;

vii. A traffic study that meets the requirements of Article 9.9 of this Ordinance for planned developments that contain (1) 50 or more dwelling units or (2) 5 or more acres of nonresidential development;

viii. A development schedule with a generalized phasing schedule, if appropriate. The phasing schedule ~~***shall***~~ ***may*** include the number of dwelling units, total acreage of each residential use, total gross floor area of each non-residential use, percentage and acreage of common open space to be included in each phase, and percentage, number and acreage of affordable dwelling units to be included in each phase (if applicable);

ix. A statement indicating how any common open space/recreation areas will be owned or managed;

x. A statement indicating how all roads and alleys will be owned and maintained;

xi. A statement of inclusion and compliance with processes included in the Charleston County Zoning and Land Development Regulations that are not mentioned in the planned development stipulations;

xii. A statement of agreement to proceed with proposed development in accordance with the provisions of these zoning regulations, applicable provisions of the Charleston County *Comprehensive Plan,* and with such conditions as may be attached to any rezoning to the applicable PD district;

xiii. Letters of coordination from all agencies from which the applicant must either (1) obtain permits or (2) obtain services and/or facilities; and

xiv. Any other information that the Planning Director determines is necessary to determine whether the application complies with the standards established in this Article.

b. The following shall be included on the requested Sketch Plan. Multiple Sketch Plans may be submitted. Sketch Plans shall be drawn to scale.

i. The general location and amount of land proposed for each land use including single family residential, multi-family residential, institutional, office, commercial, industrial, common open space/recreation, street use, etc.;

ii. Conceptual lot lines;

iii. Pedestrian and motor traffic circulation;

iv. Location, acreage, and type (freshwater or Critical Line/marsh) of all wetlands as they exist prior to development. The location and acreage of all freshwater wetlands to be developed upon shall be indicated;

v. A tree survey to include all Grand trees (24 inches or greater) on residential lots of one acre or less and in road rights-of-way and easements. Significant trees shall be shown on residential lots greater than one acre. Tree surveys for non-residential uses shall conform with the standards of Section 9.4.3 of this Ordinance; ***provided, however, when the proposed planned development is part of a concept plan, the Planning Director may permit a high-resolution aerial photograph to be substituted for a tree survey, but a tree survey for a phase of the development must be provided as part of a site plan review or preliminary plat application for that phase;***

vi. Architectural elevations for each type of residential and nonresidential unit;

vii. The general location, size, and capacity of all existing and proposed water and sewer lines;

viii. Areas to be included in each phase of development, including the location of all common open space areas and/or affordable housing units to be included in each phase; ***provided, however, when the proposed planned development is part of a concept plan, the applicant may submit a conceptual***

delineation of the phases of the development , but a more detailed delineation of the areas to be included in a phase, including the location of all common open space and/or affordable housing units to be included in the phase must be provided as part of a site plan review or preliminary plat application for that phase;

ix. The location of all construction entrances;

x. A Landscaping Sketch Plan including the location and composition of all screening and buffering materials; ***provided, however, when the proposed planned development is part of a concept plan, the applicant may submit a conceptual delineation of the landscaping proposed on the property combined with a set of regulations applicable to screening and buffering on the property, but a more detailed delineation of the screening and buffering materials to be included in a phase of the development must be provided as part of a site plan review or preliminary plat application for that phase;***

xi. A Utility Sketch Plan with the location of any on-site natural areas, buffers, trees and sidewalks that may be impacted by utility facilities including existing and proposed location of any easements or rights-of-way; ***provided, however, when the proposed planned development is part of a concept plan, the applicant may submit a conceptual delineation of the utilities infrastructure to be included on the property, but a more detailed delineation of the on-site natural areas, buffers, trees and sidewalks that may be impacted by utility facilities including existing and proposed location of any easements or rights-of-way to be included in a phase of the development must be provided as part of a site plan review or preliminary plat application for that phase;*** and

xii. Any other information that the Planning Director determines is necessary to determine whether the application complies with the standards established in this Article.

2. Public Hearing Notice

Newspaper, Neighbor, Parties in Interest, and Posted notice of the County Council's public hearing shall be provided in accordance with the requirements of Section 3.1.6 of this Ordinance.

3. Planning Director Review and Report

Once an application is deemed complete and to contain all information required herein by the Planning Director, the application will be scheduled for a Planning Commission meeting and the applicant and other interested parties will be notified in accordance with this Ordinance. The Planning Director shall prepare a staff report that reviews the PD Development Plan application.

4. Planning Commission Review and Recommendation

The Planning Commission shall review the proposed PD Development

Plan and adopt a resolution, by majority vote of the entire membership, recommending that the County Council approve, approve with conditions or deny the proposed development plan. The Planning Commission's recommendation shall be based on the Approval Criteria of Section 4.27. 9.C.6. The Planning Commission shall submit its recommendation to the County Council within 30 calendar days of the Planning Commission meeting at which the PD Development Plan was introduced.

At any time prior to action by the Planning Commission, the applicant may request that the Planning Commission enter mediation. When mediation is requested, the Planning Commission shall assign one of its members as a representative in mediation proceedings and the Planning Director shall represent the Planning Staff. A majority vote of the entire Planning Commission membership in a public meeting shall be required to accept any mediated settlement. An accepted mediated settlement cannot waive the standards of this Ordinance. Prior to beginning talks, applicable time limits for review and action on complete applications must be extended by mutual agreement of the applicant and Planning Commission.

5. County Council Hearing and Decision

After receiving the recommendation of the Planning commission, the County Council shall hold at least 1 public hearing, and any time after the close of the public hearing, take action to approve, approve with conditions or deny the proposed PD Development Plan based on the Approval Criteria of Section 4.27.9.C.6 of this Chapter. If the County Council takes action to approve the PD Development Plan, it may require time-frames for development of the entire Planned Development and its individual phases, if any. Within ten (10) working days of approval by County Council of a planned development, the applicant shall submit three (3) copies of the approved Planned Development Guidelines and Sketch Plan to the Planning Department. This plan shall contain all changes and conditions approved by Council. The approval of a planned development shall deem it to be a new zoning district with its own zoning designation.

6. Approval Criteria

Applications for PD Development Plan approval may be approved only if the County Council determines that the following criteria are met:

a. The PD Development Plan complies with the standards contained in this Article;

b. The development is consistent with the intent of the *Comprehensive Plan* and other adopted policy documents; and

c. The County and other agencies will be able to provide necessary public services, facilities, and programs to serve the development proposed, at the time the property is developed.

§4.27.10 IDENTIFICATION OF ZONING MAPS

Approved PDs shall be indicated on the official zoning map.

§4.27.11 COMPLIANCE WITH OTHER REGULATIONS

Unless expressly stated in this Section or approved at the time of a Planned Development

approval, all applicable standards of this Ordinance and other law shall apply to development within a Planned Development. Planned Developments may provide for variations from this Ordinance or other ordinances and the regulations of established zoning districts concerning use, setbacks, lot area, density, bulk and other requirements to accommodate flexibility in the arrangement of uses for the general purpose of promoting and protecting the public health, safety, and general welfare. All development other than single family residential, shall comply with the Site Plan Review Requirements of this Ordinance.

§4.27.12 SUBDIVISION OF LAND LOCATED WITHIN APPROVED PLANNED DEVELOPMENTS

All subdivision of land located within approved planned developments shall be deemed a Major Subdivision, as defined in Section 8.3.3 of this Ordinance.

CHAPTER 5 | OVERLAY AND SPECIAL PURPOSE ZONING DISTRICTS

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The Real Property is not included in an overlay or special purpose district. Therefore, Articles 5.1, 5.2, and 5.4 through 5.9 shall not apply. Article 5.3 shall apply as set forth herein.

ARTICLE 5.3 WDU, WATER-DEPENDENT USE OVERLAY DISTRICT

§5.3.1 DESCRIPTION

The WDU, Water-Dependent Use Overlay District is intended to accommodate community docks, boat ramps, marinas and commercial docks and other nonresidential uses that require locations near water bodies.

A. Private docks intended for the private use of one family shall be exempt from the requirements of this Ordinance.

B. Joint use docks intended for the private use of two to four families shall be exempt from the requirements of this Article.

§5.3.2 USES

Community docks, boat ramps, marinas and commercial docks and other uses that require locations near water bodies may be allowed in the WDU District, if approved in accordance with the procedures of this Ordinance.

§5.3.3 COMMUNITY DOCKS

A community dock(s) is any docking facility that provides access for more than four families (greater than or equal to 5 watercraft slips and less than or equal to 10 watercraft slips) and is not a marina. All community docks shall be considered a Water-Dependent Use.

Community dock(s) shall be subject to the following standards:

1. All proposed community docks shall comply with the Site Plan Review procedures contained within this Ordinance;

2. All proposed community docks shall comply with all applicable regulatory requirements of State and Federal agencies including but not limited to South Carolina Department of Health and Environmental Control (SCDHEC) and U.S. Army Corps of Engineers;

3. All proposed community docks must have a minimum of 75 feet of lot frontage at the marsh edge (OCRM Critical Line) and a minimum of 75 feet between its extended property lines at the location in the waterbody of the proposed dock;

4. No leasing or other transfer of space to individuals who do not reside in the residential community or other commercial uses are allowed at community docks;

5. Project proposals shall include facilities for the proper handling of litter, waste, refuse and petroleum products in accordance with SCDHEC regulations;

6. A boat ramp may be allowed at a community dock subject to §5.3.4; and

7. Approval of this particular use by Charleston County shall not relieve the recipient (use) of responsibility for complying with all other applicable requirements of any other local, county, state or federal agency. In addition, approval by Charleston County does not guarantee nor recommend approval from any other legal entity or governmental agency.

§5.3.4 STANDARDS FOR BOAT RAMPS

Boat ramps provide access to the water for the launching and retrieving of watercraft not exceeding 12,000 pounds gross weight. Boat ramps providing launching and retrieving of watercraft in excess of 12,000 pounds gross weight shall follow the Special Exception provisions of this Ordinance in addition to the following requirements which shall apply to all boat ramps.

Boat ramps shall be subject to the following standards:

1. Filling or excavating of vegetated wetlands for boat ramp construction is prohibited unless no feasible alternatives exist in non-vegetated wetland areas. In addition, the area to be filled or excavated must be limited to that which is reasonable for the intended use;

2. Boat ramps must consist of environmentally acceptable materials, demonstrate sound design and construction so that they could reasonably be expected to be safe and effective, and minimize adverse effects;

3. Justification for boat ramp construction in environmentally sensitive areas shall be considered using the following priorities:

   (i) Public use - open to all citizens;

   (ii) Restricted use - open to citizens of a area or organization only;

   (iii) Private use - use for one citizen or family.

4. In cases where private use is necessary, siting of ramps must, wherever feasible, be located in areas where the least environmental impact will accrue to the area and be limited to 12 feet in width;

5. Boat ramp location requiring dredging or filling of wetlands to provide deep water access to the ramp, parking areas for the ramp, or other associated facilities are prohibited unless no feasible alternatives exist and environmental impacts can be minimized;

6. The siting of "public use" boat ramps is encouraged in easily accessible

areas such as bridges and existing, abandoned causeways, provided that these sites comply with other applicable regulations;

7. All proposed boat ramps shall comply with the Site Plan Review procedures contained within this Ordinance;

8. All proposed boat ramps shall comply with all applicable regulatory requirements of State and Federal agencies including but not limited to South Carolina Department of Health and Environmental Control (SCDHEC) and U.S. Army Corps of Engineers;

~~9. All proposed "public use" boat ramps shall require review and approval in accordance with the Special Exception procedures of this Ordinance; and~~

9. Approval of this particular use by Charleston County shall not relieve the recipient (use) of responsibility for complying with all other applicable requirements of any other local, county, state or federal agency. In addition, approval by Charleston County does not guarantee nor recommend approval from any other legal entity or governmental agency.

§5.3.5 STANDARDS FOR MARINAS

A marina is any of the following: (a) lock harbor facility; (b) any facility which provides fueling , pump-out, maintenance, or repair services; or (c) any facility which has permanent docking space for 11 or more watercraft slips; (d) any water area with a structure which is used for docking or otherwise mooring vessels and constructed to provide temporary or permanent docking space for more than ten boats; (e) a dry stack facility. All marinas shall be considered a Water-Dependent Use. Marinas shall be subject to the following standards:

A. Uses

The following uses and activities shall be allowed in association with a Marina:

1. Marinas may provide the following services if specifically authorized by a Special Exception approval:

a. Launching ramps and small hoists (to accommodate primarily the launching of water craft not exceeding 12,000 pounds in Residential and Agricultural Residential districts);

b. Piers, wharfs and other facilities for the berthing and securing of recreational water craft;

c. Dockside maintenance and repair necessary to keep water craft in operable condition;

d. Wet storage and mooring of seaworthy pleasure craft in operable condition;

e. Dispensing of fuel, subject to all applicable Ordinance requirements;

f. Shower and laundry facilities for marina clientele only;

g. Vending machines; and

h. Dry stack storage of water craft.

2. Excluding marinas in agricultural and residential districts, marinas providing 25 or more boat slips may provide the following additional services:

a. Bait and tackle retail sales;

b. Retail sales of basic marine supplies and accessories necessary for boat operation, maintenance and upkeep (not to include the sale of boats and/or motors); and

c. Snack bars and retail groceries.

B. Performance Standards

In addition to any other applicable provisions of the Ordinance, marinas shall be subject to the following performance standards.

MARINA DENSITY/INTENSITY AND DIMENSIONAL STANDARDS	
MINIMUM LOT AREA	1 Acre
MINIMUM LOT WIDTH	250 feet
MINIMUM SETBACKS [1]	
Front/Street Side	25 feet
Interior Side	15 feet
Rear	25 feet
OCRM Critical Line	50 feet
MAXIMUM BUILDING COVER	35% of lot
MAXIMUM HEIGHT	35 feet [2]

[1] Landscape buffer standards and Wetlands buffer standards of Chapter 9 also apply.

[2] Properties located within the Water-Dependent Use district that have a zoning district designation of Industrial (I) or Community Commercial (CC) are allowed a maximum height of sixty (60) feet.

1. Lot Area and Location

The property shall have frontage on a public-owned road or a privately maintained road built to county road and meet the following density/intensity and dimensional standards unless more restrictive standards are imposed at the time of Special Exception approval:

2. Services

All services provided by the marina shall be located on the same zoning lot or on the piers associated therewith.

3. Structures

All retail sales and services shall be enclosed. The maximum structure size or bulk shall be limited to ten square feet of net floor area for each boat slip.

4. Setbacks

All structures shall be setback a minimum of 100 feet from abutting agricultural and residential zoning districts except where the property line is the street right-of-way line, in which case the front setback established for the zoning lot shall apply.

5. Parking

Off-street parking shall be provided in accordance with the requirements contained in Chapter 9. Any parking associated with the use of the launching ramp and other marine activities must be accommodated on-site. Parking surfaces and off-street roads or driveways within the facility shall be graded and covered with a permanent dust proof surface.

6. Storage

Areas for boat trailer storage and open field boat storage shall be designated and screened in accordance with the Landscaping, Screening and Buffer requirements of Chapter 9. Open field boat storage on trailers may be provided at a ratio of one (10-foot x 20-foot space) for each two boat slips.

7. Screening

Marina developments, including areas for boat trailer storage and open field boat storage, shall be screened from adjacent uses in accordance with the Landscaping, Screening and Buffer requirements of Chapter 9.

8. Signs

Those signs that identify commercial activity shall be placed and designated so as not to distract the general public.

9. Wastewater Disposal Facilities

Wastewater disposal facilities shall meet the requirements of the regulatory agencies having jurisdiction.

10. Fire Prevention

Firefighting or fire prevention equipment shall be as specified by the local fire district in which the marina is located.

11. Siting Standards

Marinas shall meet all of the following requirements:

a. All proposed marinas shall comply with the Site Plan Review procedures contained within this Ordinance;

b. All proposed marinas shall comply with all applicable regulatory

requirements of State and Federal agencies including but not limited to South Carolina Department of Health and Environmental Control (SCDHEC) and U.S. Army Corps of Engineers;

c. All proposed marinas shall require review and approval in accordance with the Special Exception procedures of this Ordinance;

d. New marinas, which includes all structures defined as marinas in Chapter 12, are not allowed in waters classified for shellfish harvesting, except for any lock harbor, dry stack or expanded existing marina that does not close any additional waters for shellfish harvesting, as provided by SCDHEC;

e. Marinas should be located in areas that will have minimal adverse impact on wetlands, water quality, wildlife and marine resources, or other critical habitats; and

f. Approval of this particular use by Charleston County shall not relieve the recipient (use) of responsibility for complying with all other applicable requirements of any other local, county, state or federal agency. In addition, approval by Charleston County does not guarantee nor recommend approval from any other legal entity or governmental agency.

§5.3.6 STANDARDS FOR COMMERCIAL DOCKS THAT ARE NOT MARINAS

A Commercial dock(s) is a docking facility used for commercial purposes. A commercial dock is not necessarily a marina, a boat yard of a dry storage facility but shall be subject to the following standards:

1. All proposed commercial docks shall comply with the Site Plan Review procedures contained within this Ordinance;

2. All proposed commercial docks shall comply with all applicable regulatory requirements of State and Federal agencies including but not limited to South Carolina Department of Health and Environmental Control (SCDHEC) and U.S. Army Corps of Engineers;

3. All proposed commercial docks shall require review and approval in accordance with the Special Exception procedures of this Ordinance;

4. All proposed commercial docks must meet the Density/Intensity and Dimensional standards of §5.3.5.B.1.

5. Project proposals shall include facilities for the proper handling of litter, waste, refuse and petroleum products in accordance with SCDHEC regulations;

6. New commercial docks are not allowed in waters classified for shellfish harvesting if their proposed uses would result in closure of additional waters for shellfish harvesting, as provided by SCDHEC;

7. Commercial docks should be located in areas that will have minimal adverse impact on wetlands, wildlife and marine resources, or other critical habitats;

8. A boat ramp may be allowed at a commercial dock subject to §5.3.4; and

9. Approval of this particular use by Charleston County shall not relieve the recipient (use) of responsibility for complying with all other applicable requirements of any other local, county, state or federal agency. In addition, approval by Charleston County does not guarantee nor recommend approval from any other legal entity or governmental agency.

§5.3.7 LEGAL NONCONFORMING WATER-DEPENDENT USES

A. Any Water-Dependent Use, as defined by this Article, that is a legal nonconforming use, has been permitted or application has been made for permitting to the State existing prior to June 17, 2008, shall be considered an existing Water-Dependent Use for the purposes of this Article. Any expansion of the existing use that" is more intense or increases by 25 percent or more of the use shall be subject to allprovisions contained within this Article.

CHAPTER 6 | USE REGULATIONS

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Articles 6.1 through 6.3 and Table 6.1.1 of the ZLDR shall not apply to the Real Property. Instead, section 4 of the Plan and Table 4-1 therein shall apply. Articles 6.4 and 6.5 of the ZLDR shall apply as modified herein. Article 6.6 shall not apply to the Real Property. Instead, section 4 of the Plan shall apply.

ARTICLE 6.4 USE CONDITIONS

The following use conditions shall apply to principal uses ~~in any Zoning District~~ where these uses are allowed as "Conditional Uses" ~~or "Special Exceptions"~~ as shown in ~~Table 6.1-1~~ 4.1 of the Plan.

§6.4.1 ANIMAL PRODUCTION AND AGRICULTURAL PROCESSING USES

Animal production and agricultural processing uses shall be subject to the following standards.

A. In order to be permitted by right, such uses must be located on a lot with a minimum area of five acres. On lots with an area of under five acres, such uses are allowed only if reviewed and approved in accordance with the Special Exception procedures of this Ordinance.

B. The use shall be set back at least 100 feet from road rights-of-way and property lines bordering undeveloped parcels. A minimum 200-foot setback shall be required from property lines abutting developed parcels.

C. A minimum 50-foot buffer shall be maintained and planted within the setback area along all interior property lines.

D. Any outdoor lighting shall be oriented and arranged to minimize spillover lighting and glare on surrounding roads and properties.

§6.4.2 ATTACHED SINGLE-FAMILY DWELLINGS

Attached Single family dwellings shall be subject to the following standards.

A. Number of Attached Units in a Single Structure

~~In R-4 and more restrictive districts, no single structure may contain more than two attached single-family dwellings. In all other districts n~~No single structure may contain more than eight attached single family dwellings.

B. Lot Area

The minimum lot area for attached dwellings shall comply with the minimum lot area standards of the ***Plan*** ~~underlying zoning district~~. Where a common area is provided, minimum lot area requirements may be calculated as an average lot area by counting a proportionate amount of the common area in calculating the area of each lot.

C. Accessory Structures

All accessory structures shall be located on the property of the Attached Single family Dwelling and for the private use of the property occupant(s). A minimum interior setback of three feet is required between an accessory structure and the interior lot lines, provided that an accessory structure may be located on one of the zero lot lines when constructed of a material finish matching the dwelling unit exterior or is the same height and materially a part of a fence or wall.

D. Design Standards

1. The front facade of an attached single family dwelling may not include

more than 40 percent garage wall area.

2. The roof of each attached single family dwelling must be distinct from the other through either separation of roof pitches or direction, or other variation in roof design.

3. At least ten percent of the area of each facade that faces a street must be comprised of windows.

E. Other Requirements

Prior to development or redevelopment of attached housing on parcels in these districts, an applicant must complete site plan review and meet all standards of ~~*this Ordinance*~~ ***the Plan.*** Single family detached residences are exempt from this requirement.

§6.4.3 HAIR, NAIL OR SKIN CARE SERVICES

Hair, Nail or Skin Care Services shall be subject to the following standards:

A. Hair, Nail or Skin Care Services shall be limited to a maximum of one chair in those districts in which they are allowed as a use subject to conditions, otherwise this use shall fall under the special exception (S) provisions of this Ordinance. There shall be no limit on the number of chairs in those zoning districts in which they are a use allowed by right (A).

B. Where Hair, Nail and Skin Care Services are allowed as a use with conditions (C), this use shall have a maximum floor area of 5,000 square feet, otherwise this use shall fall under the special exception provisions of this Ordinance.

C. Barber Shops, Beauty Salons, and Nail salons are allowed as a home occupation in all residential and agricultural districts with a maximum of one chair.

§6.4.4 BED AND BREAKFASTS

Bed and Breakfasts shall be subject to the following standards.

A. The Bed and Breakfast must be residential in nature and comply with the Home Occupation regulations of Section 6.5.9 of this Chapter.

B. No exterior alterations, other than those necessary to assure the safety of the structure, shall be made to any building for the purpose of providing a Bed and Breakfast.

C. Bed and Breakfasts shall contain no more than ~~ten~~ ***twelve*** guest rooms.

D. There shall be an owner or innkeeper/manager residing on the premises ***unless otherwise approved by the ARB.***

E. Meals may be served by the resident owner to paying guests staying at the Bed and Breakfast.

F. Parking areas for bed and breakfast uses located in agricultural or residential

zoning districts shall be screened from view of residential zoning districts and

public rights-of-way by evergreen plant material that will provide opaque screening at the time of plant maturity.

§6.4.5 COMMUNICATIONS TOWERS

A. Purpose and Legislative Intent

The Federal Telecommunications Act of 1996 affirmed Charleston County 's authority concerning the placement, construction and modification of Wireless Telecommunications Facilities. The regulations of this Section are designed to site communications towers in Charleston County. It is the intent of these regulations to allow for the harmonious coexistence of communications towers and other land uses. It is also the intent of these regulations to reduce the overall negative impact of communications towers by:

1. Reducing the number of towers needed through a policy of encouraging co-location; and

2. If co-location is not feasible, encouraging the following:

   a. The use of Stealth Tower Design, as defined in Section 6.4.5.C.1;

   b. The clustering of towers ("tower farms");

   c. The placement of towers away from roadways;

   d. The provision of effective screening; and

   e. The location of communications equipment on existing structures or within existing utility substations or uses.

B. Co-Location Exemption

Proposed communications equipment co-locating on existing towers and structures without adding to their height shalt require only a Zoning Permit and shall not be subject to the requirements of this Section.

C. Stealth Tower Provision

1. For the purposes of this Section, the term "Stealth Tower" shall mean a communications tower designed to unobtrusively blend into its existing surrounding so as not to have the appearance of a communications tower. Examples of Stealth Towers include, but are not limited to, antenna tower alternative structures, architecturally screened roof- mounted antennas, building-mounted antennas painted to match the existing or proposed trees and landscaping, and antenna structures designed to look like light poles.

2. All proposed Stealth Tower designs must be approved by the Planning Director.

3. A complete zoning permit application for a Stealth Tower that meets all requirements of this Ordinance shall be approved.

D. Tower Abandonment

A tower that is not used for communication purposes for more than 120 days (with no new application on file for any communication user) is presumed to be out of service and the owner of such tower must notify the staff and remove the tower within 50 days. Towers which are not maintained by the owner according to the County Building Code shall be removed by the owner within 60 days. To assure the removal of towers which do not meet requirements for continued use or proper maintenance, a statement of financial responsibility shall be submitted for each tower over 100 feet and a performance bond for the amount of anticipated removal costs shall be posted for each tower over 150 feet. Removal costs shall be charged to the tower owner. The bond must be renewed as necessary to ensure that it is maintained at all times during the existence of the tower.

E. Pre-Application Meeting

Prior to submitting a formal application for a Zoning Permit for Communications Tower the applicant is required to attend one or more pre-application meetings. The purpose of the pre-application meeting is to address key issues which will help to expedite the review and permitting process. The Planning Director may conduct a site visit at the pre-application meeting.

F. Zoning Permit Submittal Requirements

Prior to Zoning Permit approval, all applications for Communications Towers shall complete the Site Plan Review process as provided in Chapter 3 of this Ordinance. In addition to any Site Plan Review requirements, the application must contain the following items:

1. A site plan, drawn to engineer's scale, showing the location of the tower guy anchors (if any), existing or proposed buildings and structures or improvements, including parking, driveways or access roads, fences, and protected and Grand Trees affected by the proposed construction. If there are no Grand Trees affected, a surveyor's statement on the Site Plan must be shown. Adjacent land uses shall also be noted on the site plan, with precise measurements noted between the proposed tower and any residential structures on surrounding properties.

2. The Site Plan must show a vegetated buffer, either existing or installed, that provides an effective screen from public rights-of-way and adjacent property owners. If a buffer is to be installed, its placement on the site will vary in order to provide the most effective screening from public view. Required materials will be based on installation of a 25' buffer around the fenced area.

3. The height and typical design of the tower, typical materials to be used, color, and lighting shall be shown on elevation drawings. The applicant shall submit documentation justifying the total height of any Communications Towers, facility and/or antenna and the basis therefore. Additionally, color and material samples shall be provided.

4. The tower must be located no closer to a residential structure than a distance equal to 1 ½ feet for each 1 foot in height of the proposed tower

plus 50 feet as measured from the center of the proposed tower. At a minimum, there must be a 150-foot distance between the proposed tower and a residential structure.

5. A 6 foot non-climbable fence must be placed around the tower (except for those designed in a manner compatible with Section 6.4.5.A.2, Stealth Exemption) and any associated building. Guy wires may be fenced separately.

6. The proposed tower shall only be illuminated as required by the Federal Communications Commission or Federal Aviation Administration. Nighttime strobe lighting shall not be incorporated unless required by the Federal Communications Commission or Federal Aviation Administration. If lighting is required, the applicant shall provide a detailed plan for sufficient lighting that shall be as unobtrusive and inoffensive as permissible under State and Federal regulations, and an artist's rendering or other visual representation showing the effect of light emanating from the site on neighboring habitable structures within fifteen-hundred (1,500) feet of all property lines of the parcel on which the Communications Towers are located.

7. Communications Towers shall contain a sign no larger than four (4) square feet to provide adequate notification to persons in the immediate area of the presence of an Antenna that has transmission capabilities. The sign shall contain the name(s) of the owner(s) and operator(s) of the antenna(s) as well as emergency phone number(s). The sign shall be located so as to be visible from the access point of the site. No other signage, including advertising, shall be permitted on any facilities, Antennas, Antenna supporting structures or Antenna Towers, unless required by law.

8. The proposed tower must be located such that adequate setbacks are provided on all sides to prevent the tower's fall zone from encroaching onto adjoining properties. The fall zone shall be determined by an engineer certified by the State of South Carolina in a letter which includes the engineer's signature and seal.

9. Proposed towers may not be located within 1,000 feet of the center of an existing tower unless the applicant certifies that the existing tower does not meet the applicant's structural specifications and the applicant's technical design requirements, or that a co-location agreement could not be obtained at a reasonable market rate. In the event of the above situation, the clustering of new towers on the same parcel near existing towers is permitted.

10. A copy of the tower's search ring.

11. The Applicant shall supply the FAA study number for the proposed tower.

12. For the purposes of co-location review and review of efforts at siting a tower on the same lot near an existing tower, the applicant shall submit

satisfactory written evidence such as correspondence, agreements, contracts, etc., that alternative towers, buildings, or other structures are not available or suitable for use within the applicant's tower site search area that are structurally capable of supporting the intended antenna or meeting the applicant's necessary height criteria, providing a location free of interference from other communication towers, or available at the prevailing market rate (as determined by staff communication with persons doing business within the industry). Additionally, the applicant shall build the proposed tower in such a manner as may allow other telecommunication users to co-locate.

13. The tower shall be designed with excess capacity for future needs.

14. A statement of financial responsibility shall be submitted for each tower over 100 feet and a performance bond for the amount of anticipated removal costs shall be posted for each tower over 150 feet. The bond must be renewed as necessary to ensure that it is maintained at all times during the existence of the tower.

15. The applicant shall furnish a Visual Impact Assessment which shall include:

    a. A "Zone Visibility Map" which shall be provided in order to determine locations where the Tower may be seen.

    b. Pictorial representations of "before and after" view from key viewpoints both inside and outside the County, including but not limited to major highways and roads; state and local parks; historic districts; preserves and historic sites normally open to the public; and from any other location where the site is visible to a large number of visitors, travelers or residents.

    c. An assessment of the visual impact of the tower base, guy wires and accessory buildings from abutting and adjacent properties and streets.

G. Retention of Expert Assistance and Reimbursement by Applicant

1. The County may hire any consultant and/or expert necessary to assist the County in reviewing and evaluating the application, including the construction and modification of the site, once permitted, and any requests for recertification.

2. For towers proposed to be 100 feet or higher, the applicant shall deposit with the County funds sufficient to reimburse the County for all reasonable costs of the consultant and expert evaluation and consultation to the County in connection with the review of any application including the construction and modification of the site, once permitted. The initial deposit shall be $5,000.00. The application will not be processed until receipt of this initial deposit. The County will maintain a separate account for all such funds. The County's consultants/experts shall invoice the County for all its services in

reviewing the application, including the construction and modification the site, once permitted. If at any time during the process this account has a balance less than $1,000.00, the applicant shall immediately, upon notification by the County, replenish said account so that it has a balance of at least $5,000.00. Such additional account funds shall be deposited with the County before any further action or consideration is taken on the application. In the event that the amount held in the account by the County is more than the amount of the actual invoicing at the conclusion of the project, the remaining balance shall be promptly refunded to the applicant. The applicant shall not be entitled to receive any interest earnings on unusedfunds.

3. The total amount of the funds needed as set forth in subsection 2 of this Section may vary with the scope and complexity of the project, the completeness of the application and other information as may be needed to complete the necessary review, analysis and inspection of any construction or modification.

4. Additional fees may be required if additional hearings before the board of Zoning Appeals are caused by or requested by the applicant.

H. Surrounding Property Owner Notification

1. In order to better inform the public, in the case of a new Communications Towers, the applicant shall hold a "balloon test" as follows: the applicant shall arrange to fly, or raise upon a temporary mast, a minimum of three (3) foot diameter brightly colored balloon at the maximum height of the proposed new tower. The dates (including a second date, in case of poor visibility on the initial date) shall be provided to the Planning Director ten (10) days after receipt of the complete application notice. The dates shall be set a minimum of fifteen (15) days prior to the Planning Director making a final decision on the Zoning Permit. The balloons shall be flown for ten (10) consecutive hours between 8:00 a.m. and 6:00 p.m.

2. Once the application is deemed complete by the Planning Director for a Communications Tower Zoning Permit, the Planning Department shall provide Parties in Interest, Neighbor, Posted and Newspaper Notice in accordance with the requirements of Section 3.1.6 of this Ordinance. The public notice shall include the dates of the balloon tests as provided by the applicant and the date the Planning Director must make a final decision on the Zoning Permit.

I. Time Limit for Staff Review

Upon receipt of an application deemed complete by the Planning Director for a Communications Tower Zoning Permit, the Planning Director shall have a maximum of 45 days to act on the application. The 45 days begins from the date the applicant is sent written notice of a complete application from the Planning Director. Failure to act on the application within 45 days will result in the applicant being granted a Zoning Permit.

J. Zoning Permit Approval Criteria

1. A complete zoning permit application for a Stealth Tower that meets all requirements of this Ordinance shall be approved.

2. Upon review of a complete application, no Zoning Permit shall be issued for a communications tower until the Planning Director determines that the proposed tower complies with the following criteria and standards:

   a. That the location and height of the proposed tower will not substantially impact the character of property listed in or eligible for the National Register of Historic Places, other significant environmental, cultural or historical sites, officially designated scenic roads or rivers, and that the tower is designed to blend into the environment and minimize visual impact.

   b. If a completely new tower is necessary, the applicant must provide written proof of attempts at co-location and siting a tower on the same lot near an existing tower were proven not feasible or practical.

   c. That the applicant has pursued any available publicly owned sites and privately owned sites occupied by a compatible use, and if not utilized, that these sites are unsuitable for operation of the facility under applicable communications regulations and the applicant's technical design requirements.

   d. Staff shall review and approve the color and materials to be used for the proposed tower.

3. If the Planning Director finds a proposed communications tower will have a substantially negative impact on a surrounding area or adjoining property, the use shall fall under the Special Exception (S) provisions of this Ordinance.

   In determining whether the use shall fall under the Special Exception (S) provisions, the Planning Director may consider one or more of the following items:

   a. The proposed use will be detrimental to adjacent land uses including historical sites;

   b. The proposed use will have a negative aesthetic visual impact;

   c. The proposed use will have an adverse affect on the environment (not including radio frequency emissions); and

   d. The proposed use is contrary to the public health, safety or welfare.

§6.4.6 DRIVE-IN THEATERS

Drive-in Theaters shall be subject to the following standards:

A. A use for this purpose shall have a setback 200 feet from any agricultural, residential or office zoning district. Adult drive-in theaters are subject to Section 6.4.18 of this Chapter.

B. Such use shall be located as to draw a minimum of vehicular traffic to and through local streets in nearby residential areas.

C. The principal vehicular access for such use shall be on a major thoroughfare or collector street having a right-of-way at least 60 feet wide.

D. Vehicular entrances and exits shall be provided separately and not less than 100 feet apart.

E. Between the street entrance and the ticket gate there shall be an area for vehicles waiting to pass the gate. Said area shall have such capacity as will make it ordinarily unnecessary for entering vehicles to wait in the street.

§6.4.7 DWELLING GROUPS

Where two or more principal single family residential structures are located on the same zoning lot, the following criteria shall apply:

A. Density/Intensity and Dimensional Standards

Density/intensity and dimensional standards of the ~~underlying zoning district~~ Plan shall apply. In each case, the distance between structures shall not be less than the sum of the minimum interior setbacks required. This distance shall be measured from the closest protrusion of each structure. Where no building footprint is indicated, a maximum of a 100-foot by 100-foot area shall be shown for each dwelling to indicate the area where each dwelling is to be constructed.

B. Facing of Dwelling Units

Each dwelling unit shall face (front) either a street, courtyard or outdoor living space.

C. Vehicle Access

Each dwelling group shall provide an access consistent with the Road Construction Standards in Appendix A of this Ordinance.

D. Other Zoning Requirements

Unless specifically modified by this Section, Dwelling Groups shall comply with all other requirements of this Ordinance for the district in which located.

A. ~~Such use shall be allowed only if reviewed and approved as a Special Exception in accordance with the procedures of this Ordinance.~~

D.

§6.4.9 FARM LABOR HOUSING

Farm Labor Housing shall be subject to the following standards:

A. Such use shall be set back 100 feet from road rights-of-way and property lines bordering undeveloped parcels. A minimum 200-foot setback shall be required from property lines abutting developed parcels.

B. A minimum 50-foot buffer shall be maintained and planted within the setback area along all interior lot lines.

C. For Farm Labor Housing that is not dormitory style, the minimum lot area for such use as a use permitted by right shall be five acres. Such use shall be allowed as a Special Exception on parcels under five acres in area.

D. Farm Labor Housing shall be used on a seasonal basis only, not as year-round housing.

§6.4.10 NATURE EXHIBITIONS

A. Where nature exhibitions are of public ownership or listed in the National Registry of Natural Landmarks or registered as a Heritage Site with the South Carolina Heritage Trust in accordance with the provisions of Act #600 of the 1976 Acts and Joint Resolutions, either in public or private ownership, accessory uses to acquire maintenance revenue are permitted.

B. Accessory uses are limited to the retail sale of gifts, novelties, souvenirs, food services, and bicycle, horse or boat rental for on-premises use.

C. Accessory structures so used shall not exceed ten percent in size of the principal structures when the nature exhibit is housed, or 1,200 square feet for each acre when the nature exhibit is not enclosed.

D. Parking requirements for each accessory use, in addition to the parking requirements for the principal use, shall comply with the parking requirements for the type of use as specified in the Off-Street Parking Schedule of Chapter 9 of this Ordinance.

E. Signs advertising accessory uses shall *be* located on the premises and not visible from a public road.

§6.4.11 PARKS, RECREATION AND OUTDOOR RECREATION/ENTERTAINMENT

Any structure established in connection with such uses shall have a setback of not less than 100 feet from any ***Lot or Development Parcel with an*** ~~property in an~~ agricultural, residential or office **use** ~~zoning district~~, except where such property line abuts a street. in which case the front setback established ***in the Plan for the district*** shall apply.

§6.4.12 RECREATIONAL VEHICLE PARKS

Recreational Vehicle Parks shall be subject to the following standards:

A. Location and Access

Recreational Vehicle Parks shall be located in a public park or with direct access to a state or federal numbered highway or an approved County road. No entrance to or exit from a Recreational Vehicle Park shall be through an agricultural, residential or office zoning district.

B. Site Conditions

Condition of soil, groundwater level, drainage and topography shall not create hazards to the property or the health or safety of the occupants. No portion of the site that is subject to unpredictable and/or sudden flooding, subsidence, or erosion shall be used for any purpose that would expose persons or property to hazards.

C. Spaces for Occupancy; Uses Permitted; Lengths Of Stay

Spaces in recreational vehicle parks may be used by recreation vehicles, as defined herein. Spaces shall be rented by the day, week, or month only, and no recreational vehicle shall remain in the same trailer park for more than six (6) months. The recreational vehicle park owner shall be responsible for maintaining records of all recreational vehicles and their lengths of stay and shall make these records available to the Planning Director for review upon request.

D. Site Planning and Required Improvements

Site Planning and Improvements shall provide for:

1. Facilities and amenities appropriate to the needs of the occupants;

2. Safe, comfortable, convenient and sanitary use by occupants under all weather conditions to be expected during periods of occupancy; and

3. Protection of occupants from adverse environmental influences, and where appropriate, protection of the neighborhood from potential adverse influences within the recreational vehicle park.

E. Relation of Spaces to Public Streets

No space shall be located so that any part intended for occupancy for sleeping purposes shall be within 50 feet of the right-of-way line of any major thoroughfare or collector street, or within 25 feet of the right-of-way line of any other street.

§6.4.13 RELIGIOUS ASSEMBLY

All religious assembly uses shall comply with the Site Plan Review requirements of this Ordinance.

§6.4.14 RESOURCE EXTRACTION/MINING

All uses involving resource extraction shall complete the Site Plan Review process, which includes representatives from the Planning Department, Department of Public Works, South Carolina Department of Health and Environmental Control (SCDHEC), South Carolina Department of Transportation, State Historic Preservation Office, U.S. Army Corps of Engineers, Office of Ocean and Coastal Resource Management, and other departmental representatives deemed necessary by the Planning Director to address issues relevant to respective issues of the project. Before submitting an application for a Special Exception for a Resource Extraction use, the applicant shall show proof of application to the South Carolina Department of Health and Environmental Control (SCDHEC). Prior to Site Plan Review approval, the applicant shall receive Special Exception approval and approval from the SCDHEC. The Board of Zoning Appeals may, on a case-by-case basis, also require that the excavation area be screened, that a drainage plan be submitted and approved for the restoration of the site when excavation has been completed. When approval by the Board of Zoning Appeals has been granted to the applicant, the Planning Department will provide locator data by tax map data to the Environmental Health section of DHEC as well as to the Mosquito Abatement section of the Public Works Department.

§6.4.15 RESTAURANTS, BARS AND LOUNGES SERVING ALCOHOLIC BEVERAGES

All proposed bars, lounges and restaurants serving beer or alcoholic beverages located within 500 feet of the property line of a lot in a residential zoning district or a lot containing a residential use shall require review and approval in accordance with the Special Exception procedures of this Ordinance. Distances shall be measured from the nearest property line of the subject parcel to the nearest property line of a lot containing a residential use or located in a residential zoning district.

§6.4.16 SELF-SERVICE STORAGE (MINI-WAREHOUSE) FACILITY

Self-Service Storage facilities shall be subject to the following standards.

A. Performance Standards

1. Front Setback

All structures, including the accessory manager's office/apartment, must be set back a minimum of 25 feet from the right-of-way or the district minimum setback, whichever is greater.

2. Side and Rear Buffers/Screening

a. Where projects abut lots ***dedicated*** to ~~zoned~~ office, commercial, or industrial ***~~uses~~*** **,** no side and rear setbacks are required.

b. Where sites abut ***residential or mixed use*** ~~***residentially zoned***~~ properties, buildings adjacent to the perimeter must face inward with their doors away from such areas.

3. Building Lengths and Access
To ensure ease of access for emergency vehicles, no building shall exceed 300 feet in length. Spaces between ends of buildings shall be at least 30 feet.

4. Accessory Office/Apartment
One management office and/or accessory residence shall be permitted.

5. Parking and Circulation

a. Project entrances shall be 30 feet in width.

b. Roadway widths on interior drives shall be at least 24 feet in width where buildings face and open onto such drives on only one side. Where buildings face and open onto drives on both sides, widths of such drives shall be at least 34 feet.

c. Turning radii, whether provided at the terminus of interior drives or at points between buildings, shall be at least 30 feet to provide for the maneuverability of emergency vehicles.

6. Signs
Signs shall comply with the requirements contained in Chapter 9 of this Ordinance. Signs shall not be attached to or displayed on walls or fences used as required screening.

B. Operating Conditions

1. Commercial Activities
The manufacture or sale of any commercial commodity or the provision of any service from the premises is prohibited.

2. Commercial Repair Activities
Commercial repairs of autos, boats, motors, furniture, or other items on the premises is prohibited.

3. Storage of Flammable Substances
Storage of flammable chemical substances within the complex is prohibited.

4. Open Storage
Open storage of automobiles and boats is permitted only where such areas are screened to comply with Landscaping, Screening and Buffer requirements contained in Chapter 9 of this Ordinance.

§6.4.17 SEWAGE DISPOSAL FACILITIES

Sewage Disposal Facilities shall be subject to the following standards:

A. Sewage Disposal Facilities shall comply with the Site Plan Review requirements of this Ordinance; and

B. Any structure established in connection with such uses shall have a setback of not less than 50 feet from any property line.

§6.4.18 SEXUALLY ORIENTED BUSINESSES

A. Purpose and Intent

It is the purpose of the regulations of this Section to regulate sexually oriented businesses in order to promote the health, safety and general welfare of the citizens of the county, and to establish reasonable and uniform regulations to prevent the continued deleterious locating and concentration of sexually oriented businesses within the county. The provisions of this Section have neither the purpose nor effect of imposing a limitation or restriction on the content of any communicative materials including sexually oriented materials. Similarly, it is not the intent or effect of this Section to restrict or deny access by adults to sexually oriented materials protected by the First Amendment, or to deny access by the distributors and exhibitors of sexually oriented entertainment to their intended market. Neither is it the intent or effect of this Section to condone or legitimize any use or act which is otherwise prohibited or punishable by law.

B. Findings of Fact

1. There are a number of sexually oriented businesses in Charleston County and it is in the interests of the health, safety, and welfare of the patrons of such businesses, as well as the citizens of Charleston County, to provide certain minimum standards and regulations for sexually oriented businesses, as well as the operators and employees of such businesses.

2. Sexually oriented businesses generate secondary effects that are detrimental to the public health, safety and welfare. Additionally, sexually oriented businesses are frequently used for unlawful sexual activities, including public sexual indecency, prostitution and sexual encounters of a casual nature. Such businesses are of particular concern to the community when they are located in close proximity to each other, or close to schools, churches or parks and playgrounds.

3. The concern over sexually transmitted diseases is a legitimate health concern of the county which demands reasonable regulation of sexually oriented businesses in order to protect the health and well-being of our citizens.

4. Live entertainment presented by some sexually oriented businesses involves a considerable amount of bodily contact between patrons and semi-nude and nude employees and dancers, including physical contact, such as hugging, kissing and sexual fondling of employees and patrons. Many sexually oriented businesses have "couch" or "straddle" dancing, and in these "dances," employees sometimes do such things as sit in a patron's lap, place their breasts against the patron's face while physical contact is maintained, and gyrate in such a manner as to simulate sexual intercourse. Such behavior can lead to prostitution. The County Council recognizes that preventing prostitution and the spread of sexually

transmitted diseases are clearly within its police powers: Southeastern Promotions, Inc. v. Conrad, 341 F. Supp. 465, 477 (E.D. Tenn. 1972), rev'd on other grounds, 420 U.S. 546 (1975). The County Council believes that prohibiting physical contact between performers and patrons at a sexually oriented business establishment is a reasonable and effective means of addressing these legitimate governmental interests.

5. Licensing is a legitimate and reasonable means of accountability to ensure that operators of sexually oriented businesses comply with reasonable regulations, to facilitate the enforcement of legitimate location and distancing requirements, and to ensure that operators do not knowingly allow their establishments to be used as places of illegal sexual activity or solicitation.

6. The location of sexually oriented businesses close to residential areas diminishes property values and leads to conditions that give rise to crime in residential neighborhoods. Many studies performed in other communities indicate conclusively that property crimes and sexual crimes increase significantly in neighborhoods in which a sexually oriented business is located.

7. It is not the intent of this Section to suppress any speech activities protected by the First Amendment or to place any impermissible burden on any constitutionally-protected expression or expressive conduct by the enactment or enforcement of this Ordinance. Rather, it is the intent of the County Council to enact a "content neutral regulation" that addresses the secondary effects of sexually oriented businesses.

C. Definitions

For the purposes of this Section, the following terms shall have the following meanings:

1. "Adult arcade" means any place to which the public is permitted or invited wherein coin-operated, slug-operated or electronically, electrically, or mechanically controlled still or motion picture machines, projectors or other image-producing devices are maintained to show images to one or more persons per machine at any one time, and where the images so displayed are distinguished or characterized by the depicting or describing of "specified sexual activities" or "specified anatomical areas."

2. "Adult bookstore', "Adult retail store" or "Adult video store" means a commercial establishment which excludes any person by virtue of age from all or part of the premises generally held opened to the public where products or equipment distinguished or characterized by a predominant emphasis or simulation of "specified sexual activities" or "specified anatomical areas" are sold, rented or displayed therein, (unless the business complies with the requirements of Section 6.4 .18C.2 .c. herein) or, which has as one of its principal business purposes, the sale or rental of any form, for consideration, one or more of the following:

a. Books, magazines, periodicals or other printed matter, or photographs, films, motion picture, video cassettes or video reproductions, slides, or other visual representations which depict or describe "specified sexual activities" or "specified anatomical areas."

b. Instruments, devices, paraphernalia or clothing which are designed for use in connection with "specified sexual activities," excluding condoms and other birth control and disease prevention products. A commercial establishment may have other principal business purposes that do notinvolve the offering for sale or rental of material depicting or describing "specified sexual activities" or "specified anatomical areas" and still be categorized as an adult bookstore or adult video store. Such other business purposes will not serve to exempt such commercial establishment from being categorized as an adult bookstore or adult video store so long as one of its principal business purposes is the offering for sale or rental, the specified materials which depict or describe "specified sexual activities or "specified anatomical areas."

c. "Adult bookstore," "Adult retail store" or "Adult video store" does not mean any establishment which displays , rents or sells sexually-explicit materials in an enclosed room equal to less than ten percent of the business's total square footage, and which prohibits anyone under 18 years of age from entering the room.

d. "Principal business purpose," as used in this Section, means that more than 25 percent of the "stock in trade" of the business is devoted to the display, rent or sale of items, products or equipment distinguished or characterized by a predominant emphasis on, or simulation of, "specified sexual activities" or "specified anatomical areas."

e. "Stock in trade" for purposes of this subsection shall mean the greater of:

i. The retail dollar value of all items, products or equipment readily available for purchase, rental, viewing or use by patrons of the establishment, excluding material located in any storeroom or other portion of the premises not regularly open to patrons; or

ii. The total volume of shelf space and display area.

3. "Adult cabaret" means a nightclub, bar, restaurant or similar commercial eating or drinking establishment, which regularly features:

a. Persons who appear in a state of nudity.

b. Live performances which are characterized by the exposure of "specified anatomical areas" or by "specified sexual activities."

c. Films, motion pictures, video cassettes, slides or other photographic reproductions which are characterized by the depiction or description of "specified sexual activities" or "specified anatomical areas."

4. "Adult car wash" means a car wash where some or all of the employees are semi-nude or nude and/or where "specified sexual activities" occur or "specified anatomical areas" are exhibited.

5. "Adult motel" means a hotel, motel or similar commercial establishment which:

a. Offers accommodations to the public for any form of consideration; provides patrons with closed-circuit television transmissions, films, motion pictures, video cassettes, slides or other photographic reproductions. which are characterized by the depiction or description of "specified sexual activities" or "specified anatomical areas;" and which may have a sign visible from the public right-of- way which advertises the availability of these types of photographic reproductions, or

b. Routinely offers a sleeping room for rent for a period of time that is less than eight hours, or

c. Routinely allows a tenant or occupant of a sleeping room to sub-rent the room for a period of time that is less than eight hours, or

d. Evidence that a sleeping room in a hotel, motel, or a similar commercial establishment has been rented and vacated two or more times in a period of time that is less than eight hours creates a rebuttable presumption that the establishment is an adult motel as that term is defined in this Section.

6. "Adult motion picture theater" means a commercial motion picture theater, one of whose principal business purposes is, for any form of consideration, to regularly show films, motion pictures, video cassettes, slides or similar photographic reproductions which are characterized by the depiction or description of "specified sexual activities" or "specified anatomical areas."

7. "Adult theater" means a commercial theater, concert hall, auditorium, or similar commercial establishment, one of whose principal business purposes is to regularly feature persons who appear in a state of nudity, or which features live performances which are characterized by the exposure of "specified anatomical areas" or by "specified sexual activities."

8. "Certificate of Nonconformity" means a certificate issued by the Charleston County Planning Department to any sexually oriented business which is operating at the time of the enactment of this Chapter, and is not in compliance with one or more of its provisions.

9. "Dancer" means an employee of a sexually oriented business who entertains patrons through expressive forms of dance and/or movement.

10. "Employee" means an individual working and performing services for any sexually oriented business, including any independent contractor who provides services on behalf of any sexually oriented business to the patrons of such business.

11. "Established" or "establishment", as used in this Chapter, means and includes any of the following:

    a. The opening or commencement of any sexually oriented business as a new business.

    b. The conversion of an existing business, whether or not a sexually oriented business, to a sexually oriented business.

    c. The addition of any sexually oriented business to any other existing sexually oriented business.

    d. The relocation of any sexually oriented business.

12. "Health club", as used in this Chapter, means a health club where some or all of the employees are nude or semi-nude, or in which "specified sexual activities" occur or "specified anatomical activities" are exhibited.

13. "Licensee" means a person in whose name a Sexually Oriented Business Regulatory License to operate a sexually oriented business has been issued, as well as the individual listed as an applicant on the application for a Sexually Oriented Business Regulatory License.

14. "Live entertainment", for purposes of this Chapter, means a person who appears nude, semi-nude, or a performance which is characterized by the exposure of "specified anatomical areas" or "specified sexual activities."

15. "Nude model studio" means any place where a person appears in a state of nudity or displays "specified anatomical areas" and is observed, sketched, drawn, painted, sculptured, photographed, or similarly depicted by other persons who pay money or any other form of consideration, and such place is not subject to an exemption pursuant to any provision herein.

16. "Nude, Nudity or state of nudity" means: (a) the appearance, real or simulated, of a bare human buttock, anus, male genitals, female genitals, or the areola or nipple of the female breast; or (b) a state of dress which fails to completely cover a human buttocks, anus, male or female genitals, pubic region or areola or nipple of the female breast.

17. "Operate " or "causes to be operated", as used in the Chapter, means to cause to function or to put or keep in operation.

18. "Operator" means any person on the premises of a sexually oriented business who is authorized to exercise overall operational control of the business, or who causes to function or who puts or keeps in operation the business. A person may be found to be operating or causing to be operated a sexually oriented business whether or not the person is an owner, part owner, or licensee of the business.

19. "Patron" means any person who pays a sexually oriented business any form of consideration for services provided to him or her by the sexually oriented business.

20. "Person" means an individual proprietorship, partnership, corporation, association, or other legal entity.

21. "Semi-nude" or "semi-nudity" means a state of dress in which clothing covers no more than the genitals of a man, or the pubic region and areolae of the breasts of a woman.

22. "Sexually oriented business" includes an adult arcade, adult bookstore, adult retail store or adult video store, adult cabaret, adult motel, adult motion picture theater, adult theater, nude model studio, or any other business, such as a car wash or a health club, which offers, for consideration, materials or services characterized as depicting "specified sexual activities" or "specified anatomical areas", or whose employees perform services in a state of nudity or semi-nudity.

23. "Sexually Oriented Business Regulatory License" means a special annual operating license necessary for a sexually oriented business to do business in Charleston County. Such license is in addition to a Charleston County Business License, and is issued by the Charleston County Planning Department.

24. "Specified anatomical areas" means the male genitals in a state of sexual arousal and/or the vulva or more intimate parts of the female genitals.

25. "Specified sexual activities" means and includes any of the following:

    a. The fondling or other erotic touching of human genitals, pubic region, buttocks, anus or female breasts.

    b. Sex acts, normal or perverted, actual or simulated, including intercourse, oral copulation, or sodomy.

    c. Masturbation, actual or simulated.

    d. Excretory functions as part of or in connection with any of the activities set forth in A. through C. above.

26. "Substantial enlargement" of a sexually oriented business means the increase in floor areas occupied by the business by more than 25

percent, as the floor areas exist on the date the original Charleston County Zoning Permit was obtained.

27. "Transfer of ownership" or control of a sexually oriented business means and includes any of the following:

    a. The sale, lease or sublease of the business.

    b. The transfer or securities which constitute a controlling interest in the business, whether by sale, exchange or similar means.

    c. The establishment of a trust, gift or other similar legal device which transfers the ownership or control of the business, except for transfer by bequest or other operation of law upon the death of the person possessing the ownership or control.

28. "Viewing Room" means the room, booth, or area where a patron of a sexually oriented business would ordinarily be positioned while watching a film, video cassette, video reproduction, or live production.

D. Permits and Licenses; Application

1. Every person engaged or intending to engage in a sexually oriented business is required to obtain a Sexually Oriented Business Regulatory License.

2. A person commits a misdemeanor if he or she operates a sexually oriented business without a valid Zoning Permit and Business License and Sexually Oriented Business Regulatory License issued by Charleston County.

3. An application for a Zoning Permit and/or a Sexually Oriented Business Regulatory License must be made on a form provided by the Planning Department. The application must be accompanied by a sketch or diagram showing the configuration of the premises, including a statement of total floor space occupied by the business. The sketch of diagram need not be prepared by an architect, engineer or surveyor, but must be drawn to a designated scale or drawn with marked dimensions of the interior of the premises to an accuracy of plus or minus 6 inches.

4. The applicant must be qualified according to the provisions of Article 6.4.18.E and the premises must be inspected and found to be in compliance with applicable State laws by the South Carolina Department of Health and Environmental Control (DHEC) and the Building Official.

5. If an entity wishing to operate a sexually oriented business is an individual, he or she must sign the application for a Sexually Oriented Business Regulatory License as applicant. If an entity wishing to operate a sexually oriented business is other than an individual, each individual

who has a ten percent or greater interest in the business must sign the application for a Sexually Oriented Business Regulatory License as an applicant.

6. The fact that a person possesses other types of state or county permits and/or licenses does not exempt him or her from the requirements to obtain a Sexually Oriented Business Regulatory License.

7. All licenses granted pursuant to this Chapter shall be for a term of one year. Said term shall commence on January 1 of each year and terminate upon December 31 of the same year. Applications for a license filed at any other time during the year shall be treated the same as if they were filed January 1 of that year and shall terminate on December 31 of that same year, and no proration shall be permitted.

8. The completed application shall contain the following information and shall be accompanied by the following documents:

   a. If the applicant is:

      i. An individual, the individual shall state his or her legal name and any aliases and shall submit satisfactory proof that he or she is eighteen (18) years of age;

      ii. A partnership, the partnership shall state its complete name, and the names of all partners, whether the partnership is general or limited, and a copy of the partnership agreement, if any;

      iii. A corporation, the corporation shall state its complete name, the date of its incorporation, evidence that the corporation is in good standing under the statutes of the state, or in the case of a foreign corporation, evidence that it is currently authorized to do business in the state, the names and capacity of all officers, directors ad principal owners, and the name of the registered corporate agent and the address of the registered office for service of process;

      iv. A limited liability company shall state its complete name, the date of filing of the articles of organization and operating agreement, the names of all managers and members.

   b. Whether the applicant or any other individual listed under subsection (A) of this Section had worked under or has had a previous Sexually Oriented Business Regulatory License under this Chapter or other adult business or adult entertainment ordinance from another state, city or county denied, suspended or revoked, including the name and location of the adult business for which the permit was denied, suspended or revoked, as well as the date of the denial, suspension or revocation.

c. Whether the applicant or any other individual listed under subsection (A) for this Section holds any other licenses under this Chapter or other similar adult business ordinance from another city, county or state and, if so, the names and locations of such other permitted business.

d. The location of the proposed sexually oriented business, including a legal description of the property, street address and telephone number(s), if any.

e. Proof of the applicant's right to possession of the premises wherein the sexually oriented business is proposed to be conducted.

f. The applicant's or any other individual's listed, pursuant to subsection (A) of this Section, mailing address and residential address.

g. A photocopy of the driver's license or other government issued identification card for the individuals listed in subsection (A) of this Section.

9. If the applicant is an individual, he/she must sign the application for a license. If the applicant is a corporation it must be signed by the president or vice president, attested to by the secretary or assistant secretary, and each individual having a 10 percent or greater interest in the corporation. If the applicant is a general or limited partnership it must be signed by a general partner. If the applicant is a limited liability company it must be signed by the manager and each individual having a 10 percent or greater interest in the company.

10. If an omission or error is discovered by the Planning Director, the application will be returned to the applicant for completion or correction without further action by the Planning Director. Any application rejected due to an omission or error shall be refiled only when the omission or error has been remedied. For the purposes of this Chapter, the date the Planning Director accepts an application which is complete shall be the date the application is deemed to be filed with the Planning Director.

11. In the event that the Planning Director determines that the applicant has improperly completed the application, he/she shall promptly notify the applicant of such fact and allow the applicant thirty (30) days to property complete the application. The time period for granting or denying a license shall be stayed during the period in which the applicant is allowed an opportunity to properly complete the application.

12. Applicants for a license under this Chapter shall have a continuing duty to promptly supplement application information required by this Section in the event that said information changes in any way from what is stated on the application. The failure to comply with said continuing duty within thirty (30) days from the date of such change, by supplementing the

application on file with the Planning Director, shall be grounds for suspension or revocation of a Sexually Oriented Business Regulatory License.

E. Approval/Denial of License:

1. The Planning Director shall approve or deny the issuance of a Sexually Oriented Business Regulatory License to an applicant within thirty (30) days after receipt of a completed application. The Planning Director shall deny a license if:

   a. The applicant (if a natural person) is under the age of eighteen (18) years;

   b. The applicant has made a false statement upon the application or has given false information in connection with an application;

   c. The applicant or any holder of any class of stock, or a director, officer, partner or principal of the applicant has had an adult business license revoked or suspended anywhere within the state within one year prior to the application;

   d. The applicant has operated an adult business which has determined to be a public nuisance under state law or this code within one year prior to the application;

   e. A corporate applicant is not in good standing or authorized to do business in the state;

   f. The applicant is overdue in the payment to the County of taxes, fees, fines or penalties assessed against him/her/it or imposed against him/her/it in relation to an adult business;

   g. The applicant has not obtained the required sales tax license; or

   h. The applicant of the sexually oriented business is in violation of, or is not in compliance with, any of the provisions of this Section.

2. In the event that the Planning Director denies a license, he/she shall make written findings of fact stating the reasons for the denial, and a copy of such decision shall be sent by first class mail to the address shown in the application. An applicant shall have the right to a hearing before the Board of Zoning Appeals as set forth in subsection J below. A written request for such hearing shall be made to the Planning Director within ten (10) days of the date of the denial of the license by the Planning Director. This hearing shall be held within sixty (60) days from the date a timely request for hearing is received. If no such hearing is held or if no order is issued within the time set forth below following such hearing, the application shall be deemed approved.

a. At the hearing referred to above, the Board of Zoning Appeals shall hear such statements and consider such evidence as the Planning staff, enforcement officers, the applicant or other party in interest, or any other witness shall offer which is relevant to the denial of the license application by the Planning Director.

b. If the Board of Zoning Appeals determines that the applicant is ineligible for a license per subsection (A) of this Section, it shall issue an order sustaining the Planning Director's denial of the application, within five (5) days after the hearing is concluded, which shall include findings of fact. A copy of the order shall be mailed to the applicant at the address supplied on the application.

c. The order of the Board of Zoning Appeals made pursuant to this Section shall be a final decision and may be appealed to the circuit court pursuant to the provisions of the SC Local Government Planning Act, as may be amended from time to time. Failure of an applicant to timely follow the limits specified above constitutes a waiver by him/her/it of any right he/she/it may otherwise have to contest denial of his/her/it license application.

3. If any county official or department fails to render a timely decision pursuant to the terms of this Section then said official or department shall be deemed to have approved or consented to the issuance of the requested license.

4. The Sexually Oriented Business Regulatory License, if granted, shall state of its face the names of the persons to whom it is granted, the expiration date, and the address of the sexually oriented business. The Sexually Oriented Business Regulatory License shall be posted in a conspicuous place at or near the entrance of the sexually oriented business so that it may be easily read at any time.

F. Temporary Permits

1. An applicant may apply for a temporary permit if a Sexually Oriented Business Regulatory License has been denied by the Planning Director, an appeal has been denied by the Board of Zoning Appeals and an appeal or other legal challenge is pending in the circuit court.

2. The temporary permit application shall include all information required by the Sexually Oriented Business Regulatory Ordinance.

3. The temporary permit application shall also include written evidence of the pendency of the appeal to the circuit court.

4. The completeness of the temporary permit application will be determined within five (5) days of its submittal.

5. After submittal of a complete application, the Planning Director shall issue the temporary permit within five (5) days.

6. Upon issuance, the applicant may commence its sexually oriented business adult use as set forth in the permit, pending compliance with other applicable non-sexually oriented business laws, rules and regulations.

7. In the event that denial of a Sexually Oriented Business Regulatory License is upheld by the courts, an investment or construction undertaken during the time of temporary permit must be removed and the business ceased. The applicant shall not have the right to continue with any business or recoup any investment from the County. Revocation of the permit shall not be considered a taking.

G. Inspection

1. An applicant or licensee shall permit representatives of the Sheriff's Office, South Carolina Department of Health and Environmental Control (DHEC), local Fire Department, Planning Department, Legal Department and/or Building inspections department to inspect the premises of a sexually oriented business for the purpose of ensuring compliance with the law, at any time it is occupied open for business.

2. The licensee (or the licensee's agent or employee) of a sexually oriented business commits a misdemeanor if he or she refuses such lawful inspection of the premises at any time it is occupied or open for business. Such refusal is also grounds for suspension or revocation of a Sexually Oriented Business Regulatory License.

H. Expiration of Sexually Oriented Business Regulatory License

1. A Sexually Oriented Business Regulatory License must be renewed each year, at least 2 weeks prior to the expiration date.

2. If, after denying the issuance or renewal of a Sexually Oriented Business Regulatory License, the Planning Director finds that the basis for denial of the license has been corrected or abated, the applicant may then be granted a Sexually Oriented Business Regulatory License.

I. Suspension of Sexually Oriented Business Regulatory License

The Planning Director shall suspend a Sexually Oriented Business Regulatory License for a period not to exceed 30 days if the Planning Director determines that a licensee or an employee of a licensee:

1. Has violated or is not in compliance with any provision of this Section.

2. Has refused to allow an inspection of the sexually oriented business premises as authorized by this Section.

3. Has knowingly permitted gambling by any person on the sexually oriented business premises.

J. Revocation of Sexually Oriented Business Regulatory License

1. The Planning Director shall revoke a Sexually Oriented Business Regulatory License if a cause of suspension in Section 6.4.18H occurs and the Sexually Oriented Business Regulatory License has previously been suspended within the preceding 12 months.

2. The Planning Director shall revoke a Sexually Oriented Business Regulatory License if the Planning Director determines that:

   a. The licensee gave false or misleading information in the material submitted to the Zoning or Business License Departments during the application process;

   b. The licensee or an employee knowingly operated the sexually oriented business during a period of time when the licensee's Sexually Oriented Business Regulatory License was suspended; or

   c. A licensee or an employee has knowingly allowed any act of sexually intercourse, sodomy, oral copulation or masturbation to occur in or on the permitted and/or licensed premises.

3. If subsequent to revocation, the Planning director finds that the basis for the revocation of the Sexually Oriented Business Regulatory License has been corrected or abated, the applicant may be granted a Sexually Oriented Business Regulatory License.

K. Appeal of Designation, Suspension or Revocation of Sexually Oriented Business Regulatory License

A sexually oriented business or a Licensee may appeal, in writing, the Planning Director's designation of a business as a sexually oriented business, or the suspension or revocation of a Sexually Oriented Business Regulatory License to the Board of Zoning Appeals in accordance with the procedures of Article 3.13.

L. Transfer of Sexually Oriented Business Regulatory License

Each Sexually Oriented Business Regulatory License issued hereunder is non-transferable. A licensee shall not transfer a Sexually Oriented Business Regulatory License to another sexually oriented business, nor shall a licensee operate a sexually oriented business under the authority of a Sexually Oriented Business Regulatory License at any place other than the address designated in the application.

M. Location Restriction

1. A person commits a misdemeanor if he or she operates or causes to be operated a sexually oriented business outside of the zoning district where the use is allowed. (See Article 6.1).

2. A person commits a misdemeanor if he or she operates or causes to be operated a sexually oriented business within 1,000 feet of:

a. A facility for Religious Assembly;

b. A public or private school;

c. A boundary of any residential zoning district;

d. A public park adjacent to any residential zoning district; and

e. The property line of a lot occupied by a residential use.

3. A person commits a misdemeanor if he or she causes or allow the operation, establishment, or maintenance of more than 1 sexually oriented business in the same building, structure or portion thereof, or the substantial enlargement of floor areas of any sexually oriented business in any building, structure or portion thereof containing another sexually oriented business without the issuance of Sexually Oriented Business Regulatory License for each use and every expansion.

4. For the purpose of this Section , measurement shall be made in a straight line, without regard to intervening structures or objects, from the nearest portion of the building or structure used as a part of the premises where a sexually oriented business is conducted, to the nearest property line of the premises of a facility for Religious Assembly, a public or private school, to the nearest boundary of any residential zoning district, a public park adjacent to any residential zoning district, or the nearest property line of a lot occupied by a residential use.

5. No expansion of the uses or physical structure of a building housing a sexually oriented business shall occur without the issuance of a Sexually Oriented Business Regulatory License for each use and expansion.

N. Regulation of Adult Car Washes

Nude or semi-nude employees of adult car washes must not be able to be seen from any public right-of-way or adjoining parcels. Necessary fencing and/or buffers, as set forth in the relevant chapters of this Ordinance, must be placed around the establishment in order to ensure that patrons can only view the employees once the patrons are inside the establishment.

0. No Fondling or Caressing

It is a misdemeanor for any nude or semi-nude employee or dancer to fondle or caress any patron, and no patron shall fondle or caress any nude or semi-nude employee or dancer.

P. Nonconforming Sexually Oriented Business

1. Any sexually oriented business operating on the date the original Sexually Oriented Business Regulations were enacted by Charleston County Council (Section 6.4.18), that is found to be in violation of any of the location provisions of Article 6.4.18L above, shall be deemed a nonconforming use, and upon written notification by the Planning Director, must obtain a Certificate of Nonconformity from the Planning

Department. A certified nonconforming use will be permitted to continue to operate for a period not to exceed 1 year before being licensed.

2. If the sexually oriented business does not, within 6 months of notification by the Planning Director, obtain a Certificate of Nonconformity, then the business will be deemed in violation of the Ordinance, and will not be permitted to continue to operate more than 6 months after the date that the regulations of this Section (Article 6.4.18) first became effective.

3. No nonconforming use shall be increased, enlarged, extended or altered except that the use may be changed to a conforming use.

4. If 2 or more sexually oriented businesses are within 1,000 feet of one another and otherwise in a permissible location, the sexually oriented business which was first established and continually operating at that particular location is the conforming use and the later-established business is the nonconforming use.

5. Any sexually oriented business lawfully operating as a conforming use is not rendered a nonconforming use due to the subsequent location of a church, public or private elementary or secondary school, public park, residential district, or a residential lot within 1,000 feet of the sexually oriented business. This provision applies only to the renewal of a valid Sexually Oriented Business Regulatory License, and does not apply when an application for a Sexually Oriented Business Regulatory License is submitted after a Sexually Oriented Business Regulatory License has expired or has been revoked.

Q. Adult Motels Prohibited

A person in control of a sleeping room in a hotel, motel, or similar commercial establishment, commits a misdemeanor if he or she rents or sub-rents a sleeping room to a person, and then, within 8 hours from the time the room is rented, rents or sub-rents the same sleeping room again, as such creates a rebuttable presumption that the establishment is an adult motel as that term is defined in this Section. For purposes of this Section, “rent" or "sub-rent" means the act of permitting a room to be occupied for any form of consideration.

R. Six-Foot Distance Rule

1. No nude or semi-nude employee or nude or semi-nude dancer shall perform live entertainment within six feet of any patron, nor shall any patron experience live entertainment within six feet of any nude or semi- nude employee or nude or semi-nude dancer, in a sexually oriented business. In the case of adult car washes, the six-foot distance rule necessitates that patrons get out of their vehicles, and watch the vehicles being washed no less than 6 feet away from the nude or semi-nude employees.

2. Sexually oriented businesses with live entertainment shall conspicuously post a sign that advises patrons that they must be at least 6 feet away from nude or semi-nude dancers at all times.

S. Gratuities

1. No patrons shall personally pay or personally give a gratuity to any nude or semi-nude dancer or nude or semi-nude, employee in a sexually oriented business establishment. Gratuities can be placed in containers at a location away from the nude or semi-nude dancer, or handed to clothed employees. In the alternative sexually oriented businesses could charge a cover charge, and prohibit all gratuities.

2. No nude or semi-nude dancer or nude or semi-nude employee a sexually oriented business shall solicit or accept any pay or gratuity personally from a patron.

3. Sexually oriented businesses with nude or semi-nude dancers or nude or semi-nude employees shall conspicuously post a sign that advises patrons that gratuities to be paid personally to nude or semi-nude dancers and nude or semi-nude employees are prohibited.

T. Additional Regulations Pertaining to the Exhibition of Sexually Explicit Films and Videos, Adult Arcades and Health Clubs

A person who operated or causes to *be* operated a sexually oriented business, as defined in this Section, which exhibits on the premises in a viewing room of less than 150 square feet of floor space, a film, video cassette or other video reproduction which depicts "specified sexual activities" or "specified anatomical areas", or which allows "specified sexual activities" or "specified anatomical areas", or which allows "specified sexual activities" to occur in a separate room in the establishment shall comply with the following requirements:

1. Upon application for a Sexually Oriented Business Regulatory License, the application shall be accompanied by a diagram of the premises showing a plan thereof specifying the location of 1 or more manager's stations and the location of all overhead lighting fixtures, and designating any portion of the premises in which patrons will not be permitted. A manager's station may not exceed 32 square feet of floor area. The diagram shall also designate the place at which the permit will be conspicuously posted, if granted. A professionally prepared diagram in the nature of an engineer's or architect's blueprint shall not be required; however, each diagram should be oriented to the north or to some designated street or object, and should be drawn to a designated scale or with marked dimensions sufficient to show the various internal dimensions of all areas of the interior of the premises to an accuracy of plus or minus six inches. The Planning Director may waive the foregoing diagram for renewal applications if the applicant adopts a diagram that was previously submitted and certifies that the configuration of the premises has not been altered since it was prepared.

2. The application shall be sworn to be true and correct by the applicant.

3. No alteration in the configuration or location of a manager's station may be made without the prior approval of the Planning Director.

4. It is the duty of the owners and operator of the premises to ensure that at least 1 employee is on duty and situated in each manager's station at all times that any patron ispresent inside the premises.

5. The interior of the premises shall be configured in such a manner that there is an unobstructed view from a manager's station of every area of premises to which any patron is permitted access for any purpose, excluding restrooms. Restrooms may not contain video reproduction equipment. If the premises has 2 or more manager's stations. The view required in this subsection must be by direct line of sight form the manager's station.

6. It shall be the duty of the owners and operator, and also the duty of any agents and employees present in the premises, to ensure that the view area specified in subparagraph "5" remains unobstructed by any doors, walls, merchandise, display racks or other materials at all times and to ensure that no patron is permitted access to any area oaf the premises which has been designated as an area in which patrons will not be permitted in the application filed pursuant to subparagraph "1" of this Section.

7. No viewing room, nor any room or enclosed area in a health club that cannon be viewed from the manager's station, may be occupied by more than 1 person at any time.

8. In order to ensure that places to which patrons access are adequately illuminated, the premises shall be equipped with overhead lighting fixtures at an illumination at least 1 candle foot as measured at the floor level.

9. It shall be the duty of the owners and operator, and also the duty of any agents and employees present in the premises, to ensure that the illumination described above is maintained at all times that any patron is present in the premises.

10. A person having a duty under subparagraphs 1. through 9. above commits a misdemeanor if he or she knowingly fails to fulfill thatduty.

U. Exemptions

It is a defense to prosecution under this Section that a person appearing in a state of nudity did so in a modeling class operated:

1. By a proprietary school licensed by the State of South Carolina; a college, junior college, or university supported entirely or partly by taxation.

2. By a private college or university which maintains and operates educational programs in which credits are transferable to a college, junior college, or university supported entirely or partly by taxation.

3. In a structure:

a. Which has no sign visible from the exterior of the structure and no other advertising that indicates a nude person is available for viewing.

b. Where, in order to participate in a class, a student must enroll at least three days in advance of the class.

c. Where no more than one nude model is on the premises at any one time.

V. Violations

Refer to provisions contained in Chapter 11, Violations, Penalties and Enforcement.

W. Severability

If any provision of this Chapter or its application to any circumstance is held by a court of competent jurisdiction to be invalid for any reason, this holding does not affect other provisions or applications of this Chapter which can be given effect without the invalid provision or application, and to this end, the provisions of this Chapter are severable.

§6.4.19 SINGLE FAMILY DETACHED AFFORDABLE HOUSING UNITS

To promote ownership or occupancy of affordable, quality housing by low-income households, property within the ***PD,*** AG-8 or any AGR, RR-3, S-1, S-2, S-3, or R-4 zoning district may be approved for subdivision and development in accordance with the density/intensity and dimensional standards of this Section (see Section 6.4.19F below). The entity developing the subject parcel must construct new residential housing for the provision of affordable housing as certified by Charleston County. The purchaser or tenant of the affordable household, at the time of closing or rental agreement, must meet the **HUD** definition of low-income. The following standards of this Section must also be met:

A. Single Family Detached Affordable Housing Units

Single family detached affordable housing units shall meet the low-moderate income standards as defined by the United States Department of Housing and Urban Development or the Low Income definition, which is a household income 80 percent or below the median household income for Charleston County.

B. Ownership

Single family detached affordable housing units shall be sold or rented to qualified low-moderate income households, as defined in Section 6.4.19A.

C. Density/Intensity and Dimensional Standards

1. The maximum density and minimum lot area standards listed in the ~~***following table***~~ ***Plan*** shall apply to single family detached affordable housing units, ***notwithstanding the following table.***

Zoning District	Maximum Density	Minimum Lot Area
AG-10	1 dwelling unit per 5 acres	1 acre
AG-8	3 dwelling units per acre	8,000 square feet
AGR and RR-3	3 dwelling units per acre	8,000 square feet
S-3	4 dwelling units per acre	8,000 square feet
R-4	6 dwelling units per acre	4,000 square feet

2. Single family detached affordable housing units in the AG-10 Zoning District shall comply with the dimensional standards of the underlying base zoning district, as contained in Chapter 4, Base Zoning Districts, where no standard is listed in the table above.

3. Single family detached affordable housing units in the ~~AG-8~~, AGR, RR-3, S-3, and R-4 Zoning Districts shall comply with the dimensional standards of the R-4 Zoning District, as contained in Chapter 4, Base Zoning Districts, where no standard is listed in the table above.

D. Uses

1. Single family attached housing units and duplexes are allowed in the R-4 Zoning District if they meet all requirements of this Section.

2. Only single family detached affordable housing units are allowed in the AG-10, ~~AG-8~~, AGR, RR-3, and S-3 Zoning Districts.

§6.4.20 STABLE

Boarding or riding stables shall require a minimum lot area of five acres. Riding areas and trails shall be limited to the subject parcel upon which the stable is located unless documentation is provided granting access onto other lands. Such documentation shall be provided through written and recorded documents.

§6.4.21 UTILITY SUBSTATIONS

Electricity regulating substations, gas pressure control stations, or similar utility substations shall be subject to the following standards:

A. Utility Substations shall comply with the Site Plan Review requirements of this Ordinance;

B. Any structure shall have a setback of not less than 25 feet from all property lines or the minimum setback of the ~~***underlying zoning district***~~ ***Plan***, whichever is greater; and

C. The storage of vehicles and equipment on the premises shall be prohibited except in Community Commercial (CC) or Industrial (I) Zoning Districts.

§6.4.22 VEHICLE SERVICE, LIMITED

Vehicle Service, Limited shall be subject to the following standards:

A. No outdoor storage of vehicles shall be permitted in conjunction with a limited vehicle service use; and

B. ~~In zoning districts subject to conditions (C), this use shall have a maximum floor area of 5,000 square feet, otherwise this use shall fall under the special exception procedures of this ordinance.~~

§6.4.23 BONA FIDE FORESTRY OPERATIONS

For this use to be allowed, the contiguous parcels must have five acres or more of forest land. Additionally, if a parcel is harvested of Grand Trees (excluding Live Oak species per section 9.4.1.B. 2.d.) ***the mitigation requirements in section 9.4 of this Ordinance shall apply*** ~~zoning permits or development applications may not be submitted within five years of issuing permit or development applications may not be submitted within five years of issuing permit for the harvest because, it shall be presumed that such harvest was done in anticipation of future development and is not considered a bona fide forestry activity as defined by this ordinance. Any person seeking to rebut this presumption shall have the burden of proving their claim by clear and convincing evidence.~~

"Bona fide forestry operations" shall mean that the property is eligible for, and actually used for forestry or timber operations, and written application has been approved by the County Assessor for the special assessment for agricultural use for the property in question pursuant to SC Code Section 12-43-220, SC Department of Revenue Regulation 117-1780.1. and other applicable statutes, rules and regulations.

§6.4.24 MANUFACTURED HOUSING UNITS

A. Replacement in R-2, R-3, R-4, M-8, and M-12 Zoning Districts

The replacement of manufactured housing units shall be allowed by right in the R-2, R-3, R-4, M-8, and M-12 Districts if the Manufactured Housing Unit has been removed within 60 days of the receipt of the application by the Planning Director. If the Manufactured Housing Unit was removed prior to 60 days of the receipt of the application, this use must comply with the requirements and procedures of 6.4.24B and C of this Section.

B. Requirements in RR-3, S-1, S-2, S-3, R-2, R-3, R-4, M-8, and M-12 Zoning Districts

Manufactured housing units placed in RR-3, S-1, S-2, S-3, R-2, R-3, R-4, M-8, and M-12 Zoning Districts shall be skirted by: manufactured skirting, or other materials suitable for exterior use, including corrosion-resistant metal, fiberglass/plastic, wood/wood siding (both must be protected from the elements by water resistant solution/substance), decay resistant wood/pressure treated lumber , and masonry concrete. The enclosed crawl space under the manufactured housing unit must be ventilated. Skirting placed on manufactured housing units in any Federal Emergency Management Agency (FEMA) Flood Hazard Boundary Area must comply with any applicable FEMA requirements.

C. Placement in R-4, M-8, and M-12 Zoning Districts

Placement of a manufactured home within the R-4, M-8, and M-12 Zoning Districts is conditional upon determination by the Planning Director that:

1. The area within 300 feet of the parcel proposed for manufactured home placement is characterized either entirely of manufactured homes or a mix of site built and manufactured homes. (The mix shall contain a minimum number of manufactured homes equivalent to twenty-five percent (25%) of the number of existing principal residences located on

parcels within 300 feet of the subject property); and

2. If the Planning Director determines that the area is not characterized either entirely of manufactured homes or by a mix of site built and manufactured homes, the use shall fall under the Special Exception procedures of this Ordinance.

§6.4.25 SINGLE FAMILY DETACHED DWELLING UNITS IN NON-RESIDENTIAL ZONING DISTRICTS

Single family detached dwelling units shall be allowed in all non-residential zoning districts subject to the following conditions:

A. A maximum of one single family detached dwelling unit shall be allowed per zoning lot in non-residential zoning districts;

B. Dwelling units for security or maintenance personnel as accessory structures, per Section 6.5.1C of this Ordinance, shall not be permitted on the same zoning lot as a single family detached dwelling unit; and

C. The single family detached dwelling unit must meet all dimensional standards of the non-residential zoning district in which it is located.

§6.4.26 PERSONAL IMPROVEMENT EDUCATION

In zoning districts subject to conditions (C), personal improvement education shall have a maximum floor area of 5,000 square feet or less; otherwise this use shall fall under the special exception procedures of this Ordinance.

§6.4.27 HISTORICAL SITE

In zoning districts subject to conditions (C), the operation of historical sites shall be restricted to the hours between 7:00 a.m. and 8:00 p.m., otherwise this use shall fall under the special exception procedures of this Ordinance.

§6.4.28 POSTAL SERVICE, UNITED STATES

In zoning districts subject to conditions (C), any postal service facility shall have a maximum floor area of 5,000 square feet or less; otherwise this use shall fall under the special exception procedures of this Ordinance.

§6.4.29 ADULT OR CHILD DAY CARE FACILITY

All adult or child day care facilities shall comply with the Site Plan Review procedures contained within this Ordinance.

§6.4.30 RECREATION OR ENTERTAINMENT, INDOOR

No indoor shooting ranges shall be allowed in the Commercial Transition (CT) zoning district.

§6.4.31 UTILITY SERVICE, MINOR

Minor Utility Service uses shall comply with the Limited Site Plan Review requirements of this Ordinance and shall obtain a clearing and grubbing permit prior to commencement of such activities.

Minor Utility Service shall be underground in the Commercial Transition (CT) zoning district.

§6.4.32 PET STORES OR GROOMING SALONS, SMALL ANIMAL BOARD, AND VETERINARY SERVICES

In the nonresidential zoning districts, pet stores, grooming salons, small animal boarding and veterinary services shall have a maximum floor area of 2,000 square feet or less; otherwise these uses shall fall under the special exception procedures of this Ordinance. In the agricultural and residential zoning districts, pet stores, grooming salons, small animal boarding and veterinary services shall have a maximum floor area of 1,500 square feet, otherwise these uses shall fall under the special exception procedures of this Ordinance.

§6.4.33 BANKS AND FINANCIAL SERVICES

In zoning districts subject to conditions (C), banks and financial services shall have a maximum floor area of 5,000 square feet or less; otherwise these uses shall fall under the special exception provisions of this Ordinance.

§6.4.34 CATERING SERVICE

A. In zoning districts subject to conditions (C), a structure or structures used for catering services shall have a maximum floor area of 5,000 square feet.

B. In zoning districts subject to Special Exception provisions (S), a structure or structures used for catering services shall have a maximum floor area of 2, 000 square feet.

C. On-site retail sales are prohibited.

D. All catering service uses shall comply with the Site Plan Review requirements of this Ordinance.

§6.4.35 ADMINISTRATIVE OR BUSINESS OFFICE, GOVERNMENT OFFICE, AND PROFESSIONAL OFFICE

In zoning districts subject to conditions (C), administrative or business office, government offices, and professional offices shall have a maximum floor area of 5,000 square feet or less; otherwise these uses shall fall under the special exception provisions of this Ordinance.

§6.4.36 SPECIAL TRADE CONTRACTORS

Special Trade Contractors shall be subject to the following standards:

A. This use excludes any tractor trailer containers in outside storage areas; and

B. ~~In zoning districts subject to conditions (C), this use shall have a maximum area of 5,000 square feet including the building and any outside storage, otherwise this use shall fall under the special exemption procedures of this Ordinance.~~

§6.4.37 PARKING LOTS

In the Commercial Transition (CT) zoning district, all parking lots shall have one canopy tree per six parking spaces and a maximum of fifteen spaces in a row between trees.

§6.4.38 CONSUMER GOODS RENTAL SERVICE

In zoning districts subject to conditions (C), consumer goods rental services shall have a maximum floor area of 5,000 square feet or less; otherwise this use shall fall under the special exception procedures of this Ordinance.

§6.4.39 BOAT YARD

If a boat yard provides dry stack or wet slip storage of watercraft or direct access to the water, this use shall be considered a Water-Dependent Use and subject to the Water-Dependent Use requirements contained in Chapter 5 of this Ordinance. ·

§6.4.40 REPAIR SERVICE, CONSUMER

Repair Service, Consumer shall be subject to the following standards:

A. ~~In zoning districts subject to conditions (C), consumer repair services shall have a maximum floor area of 5,000 square feet or less; otherwise this use shall fall under the special exception procedures of this Ordinance.~~

A. ~~In the Neighborhood Commercial (CN) zoning district, n~~ No outside storage will be allowed.

§6.4.41 LIQUIFIED PETROLEUM GAS DEALERS

The amount of storage for liquid petroleum gas dealers shall be limited to 40,000 gallons per site.

§6.4.42 BUILDING MATERIALS OR GARDEN EQUIPMENT AND SUPPLIES DEALERS

Building Materials or Garden Equipment and Supplies Dealers shall be subject to the following standards:

A. This use excludes any tractor trailer containers in outside storage areas; and

B. ~~In zoning districts subject to conditions (C), this use shall have a maximum area of 5,000 square feet including the building and any outside storage, otherwise this use shall fall under the special exception procedures of this Ordinance.~~

§6.4.43 FOOD SALES

In zoning districts subject to conditions (C), food sales shall have a maximum floor area of 5,000 square feet or less; otherwise this use shall fall under the special exception procedures of this Ordinance.

§6.4.44 RETAIL SALES OR SERVICE, GENERAL

In zoning districts subject to conditions (C), retail sales or service, general shall have a maximum floor area of 5,000 square feet or less; otherwise the use shall fall under the special exception procedures of this Ordinance.

§6.4.45 SERVICE STATION, GASOLINE

In zoning districts subject to conditions (C), gasoline service stations shall have a maximum floor area of 5,000 square feet or less; otherwise this use shall fall under the special exception procedures of this Ordinance.

§6.4.46 CONSUMER CONVENIENCE SERVICES

In zoning districts subject to conditions (C), consumer convenience services shall have a maximum floor area of 5,000 square feet or less; otherwise this use shall fall under the special exception procedures of this Ordinance.

§6.4.47 PERSONAL IMPROVEMENT SERVICES

In zoning districts subject to conditions (C), personal improvement services shall have a maximum floor area of 5,000 square feet or less; otherwise this use shall fall under the special exception procedures of this Ordinance.

§6.4.48 SERVICES TO BUILDING OR DWELLINGS

A. Services to Buildings or Dwellings

In zoning districts subject to conditions (C), services to buildings or dwellings shall have a maximum floor area of 5,000 square feet or less; otherwise this use shall fall under the special exception procedures of this Ordinance.

B. Landscaping Services

1. In zoning districts subject to conditions (C), a structure or structures used for landscaping services shall have a maximum floor area of 2,000 square feet; and

2. All landscaping service uses shall comply with the Site Plan Review requirements of this Ordinance.

§6.4.49 FREIGHT FORWARDING FACILITIES

In zoning districts subject to conditions (C), freight forwarding facilities shall have a maximum floor area of 10,000 square feet or less; otherwise this use shall fall under the special exception procedures of this Ordinance.

§6.4.50 GOLF COURSES

Golf courses shall be subject to the following standards and criteria:

A. An impact analysis must be submitted that indicates the potential number of members, the characteristics of the golf course membership, a traffic impact analysis and a complete site analysis as detailed below:

1. Required Site Analysis

The layout of any golf course shall be determined after preparing the required site analysis. The detailed site analysis will be done in order to identify the site's most significant environmental, historic, cultural, and natural resources. The site analysis will include:

a. Vegetation

Characteristics of a vegetation survey related to land use will describe principal, predominant, and significant vegetation, by type, condition, age, use, and general or specific location. Features in the survey will include trees and shrubs, agricultural fields, treelines, native vegetation, orchards , groves , woodlots, pastures, wetlands,

forests, and grasslands. The vegetation survey shall indicate any significantly large trees or endangered plant or animal species that may reside on the site and is protected by law.

b. Historical, Archaeological and Cultural Resources
Historical resources located within the proposed golf course development must be identified on the plat. Sources such as the County of Charleston Historical Survey (1991), state registers, and federal registers such as the National Register of Historic Places shall be utilized in identifying these resources. The historical survey is important for noting structures and areas that must be protected as designated landmarks.

c. Adjacent Land Use Patterns
Land use on adjacent properties shall be identified. Features such as, but not limited to, roads, rice dams, traditional settlement areas, cemeteries, clusters of structures, parks, marinas, and logging areas shall be shown.

d. Hydrography
All water features including streams and sensitive areas on the site, such as wetlands and riparian corridors, must be located. The purpose of locating these features is to limit disturbance of soil and vegetation that affect water quality features. Hydrography shall be used to determine where water required wetland buffers and other requirements such as drainage easements will be located. Wetland buffers of 50 feet are required on all saltwater marshes, and 35 feet on all protected freshwater wetlands. All water bodies - rivers, streams, drainage channels, marshes or wetland, floodplains and aquifers must be inventoried or identified.

e. Wildlife Habitat Areas
The purpose of identifying wildlife areas is to assess the ecological conditions of the landscape and to provide continuation of these habitat areas. Features of this survey shall include the presence of any threatened or endangered species, natural areas vital to wildlife species, habitat areas that are connected to larger undisturbed natural habitat (connected habitat system). Through this method the study will develop key points or areas that should be left undeveloped, then define those areas most suitable for development.

~~B. Within the RM, AG, AGR, RR-3, S-1, S-2, S-3, R-2, R-3, and R-4 Zoning Districts, only Audubon International "Signature Program" golf courses will be allowed.~~

B. Potential sites should be selected which allow the golf course to be routed in such a way as to minimize the need to alter, create or remove existing native landscapes, trees, and vegetation, and which provide opportunities for restoration/enhancement of valuable habitat.

C. Sites which have Archaeologically or Geologically significant and sensitive or critical habitat or environmental features shall be identified and either relocated or preserved through careful golf course design. Permanent open space easements or other techniques may be used, as appropriate, to effect preservation. The site design shall identify areas for restoration, replanting, and enhancement of riparian and littoral habitat to re-establish wildlife migration corridors and lineages between fragmented habitat areas. Protection and planned restoration/enhancements for such areas during construction and ongoing operation must be ensured. Native habitats and communities of special value to threatened/endangered species shall be preserved to the greatest extent possible, consistent with State and Federal regulation.

D. Each site selected [as a] golf course development will likely have a variety of habitat types present. These habitat types must be identified and provisions made for routing of the course or relocation of the species.

E. The site plan should protect drainage systems that support retained vegetation. Ponds shall be developed which mimic conditions in terms of both aesthetics and habitat.

F. Structures and buildings should be located such that impacts to habitats and significant natural areas are avoided.

G. Design and Construction Standards

1. Marshes, Creeks and Wetlands

a. The golf course design must attempt to minimize the number of marsh, creek or wetland crossings. Marsh, creek or wetland crossings must be designed in such a way to minimize erosion and harmful effects of significant habitat and migration corridors.

b. Bridges must minimize alteration of the marsh, creek or wetland environment.

c. Design must create and restore riparian habitat, especially in previously degraded habitat areas, and must reduce the impact of alterations necessitated by design and construction of the course.

d. The course design must employ vegetated buffer strips of sufficient width to mitigate impacts to riparian corridors and other significant habitat which may result from surface drainage of the golf course, cart paths, and other developed areas. In certain circumstances where riparian vegetation has been degraded or does not exist, turf grass and rough areas may be located in closer proximity to the marshes, creeks and wetlands.

e. Cart paths must be graded such that runoff from them generally does not flow directly into any marsh, creek or wetland.

f. Construction fencing/siltation barriers must be utilized during the

construction phase where needed to protect habitat and marsh, creek or wetland areas.

2. Trees

a. The selected site must not be heavily forested (with more than 60 percent tree canopy coverage).

b. The design of the course and related facilities must maximize the preservation of clusters or significant stands of trees, particularly grand trees, and otherwise preserve "interior" habitat areas.

c. Irrigation systems shall be designated to avoid impacting existing oaks or other sensitive vegetation.

d. If required by the Planning Director, a certified professional arborist, botanist, or forester shall be employed by the applicant to evaluate the status of the trees and related habitats on the site and provide direction for restoration and/or enhancement of impacted trees.

e. Cart paths within the drip lines of trees slated for preservation must be grated in such a way as to not damage or stress the tree.

f. Barriers (curbs, fencing, vegetation, etc.) should be established to discourage cart and pedestrian travel off paths located within or adjacent to sensitive habitat.

3. Water Quality

a. Lined artificial storage ponds must not be located in prime groundwater recharge areas.

b. Turf grass species and landscaping around buildings should be selected which are drought resistant or tolerant and which are suited for any special site characteristics or soil conditions.

c. State-of-the-art irrigation systems with site meteorological monitoring capability should be used to minimize water use.

d. If on-site wells or ponds are to be used as the irrigation water source, analysis will be required to determine the safe yield in order to prevent aquifer, off-site wells and/or marsh, creek or wetland depletion. The developer will be held responsible for any negative impact on water supplies to adjacent or nearby properties.

e. Paved areas should be limited in order to minimize impermeable surfaces, and thereby reduce surface runoff.

f. The project should employ established best management practices pursuant to the Non-Point Source Program guidelines to control non-point source (stormwater) runoff pollution. For example:

impervious liners for detention/retention ponds and water hazards to protect ground and surface water quality; buffer strips, oil/grease separators or other recommended techniques for parking area drainage systems; grease traps and other recommended technologies for facilities such as golf cart maintenance or wash areas to prevent untreated runoff from entering the natural aquatic environmental berms, vegetative strips, grease traps, or other recommended technologies in parking areas for drainage controls to minimize pollution to nearby riparian areas ad surface waters.

g. The overall drainage system should be designed to insure that there is no increase in the velocity or amount of off-site flows during major storm events.

4. Archaeology

a. The design of the course must preserve significant archaeological areas and/or historical features present on the site.

b. Significant archaeological sites must be staked, flagged, or fenced off to insure their protection.

5. Noise

a. Where possible, clubhouse facilities and other noise-generating uses and facilities should be located away from neighbors who might be impacted.

b. Roads must be sited such that traffic noise is minimized for adjacent areas.

6. Growth-Inducing Impacts

~~a. This project should not provide infrastructure improvements that would be capable of serving new development other than the proposed project.~~

~~b. The project should not stimulate economic expansion or growth (e.g. major changes in tax revenue base, employment expansion, etc.) other than that necessary to serve this proposed project.~~

~~c~~a . The project should not establish a precedent for significant change in current *Comprehensive Plan* policy.

~~d~~b. In cases where the golf course developer owns lands adjacent to the project site, a plan for the potential development of those adjacent lands should be submitted for evaluation.

~~e~~c. Deed restrictions, open space easements, or other appropriate techniques must be used to mitigate or prevent growth-inducing impacts inside the development.

I. Notification
Upon the receipt of a complete application for a golf course, the Planning Department shall notify neighbors within a 300-foot radius, parties in interest and place notification in the newspaper within ten (10) days. All notifications shall be done in accordance with the provisions contained in Chapter 3 of this Ordinance.

J. Time Limit for Staff Review
Upon the receipt of a complete application for a golf course, the Planning Department shall have a maximum of 45 days to act on the application. Staffs failure to act on the application within 45 days will result in the applicant being granted a Zoning Permit.

§6.4.51 SOLID WASTE DISPOSAL FACILITY

A. Solid Waste Disposal Facilities located in the Resource Management (RM) Zoning District shall comply with all of the requirements contained in the South Carolina Solid Waste Policy and Management Act of 1991, as amended.

B. The following requirements shall apply to Solid Waste Disposal Facilities located in or proposed to be located in the Industrial (I) Zoning District:

0. Solid Waste Disposal Facilities that were legally established before April 21, 1999 shall be deemed Uses Permitted by Right, as defined in Chapter 12 of this Ordinance.

1. Any proposed Solid Waste Disposal Facilities, except existing Solid Waste Disposal Facilities, shall fall under the special exception procedures of this Ordinance.

2. All Solid Waste Disposal Facilities shall comply with all of the requirements contained in the South Carolina Waste Policy and Management Act of 1991, as amended.

§6.4.52 CONTAINER STORAGE FACILITIES

A. Facilities for or including container storage (whether temporary or permanent), shall be subject to the following additional standards:

1. Uses shall be separated from any adjoining uses or public or private rights-of-way, excluding points of ingress or egress, by way of one of the following:

a. A suitably landscaped earthen berm sufficient to screen neighboring or nearby property from the facility; and in no event less than eight (8) feet in height above finished grade; or

b. A solid concrete, brick or masonry wall of not less than ten (10) feet in height above finished grade and completely screened from view from public rights-of-way by way of a vegetative buffer; or

c. A minimum vegetative buffer depth of two hundred (200) feet along the boundaries adjacent to any property zoned Residential (R) and a minimum vegetative buffer depth of fifty (50) feet otherwise. This buffer shall be located within the required setback as described in Section 6.4.52.3.b.

2. Container yard light fixtures installed after January 1, 2005, shall be a type that minimizes fugitive light scatter and shall be directed into the container yard away from neighborhoods. In addition, yard light fixtures installed after January 1, 2005, shall not be visible above the tree line from adjacent residential neighborhoods.

3. Storage within a container yard shall be restricted by the following:

a. Container stacking may be permitted, where appropriate, pursuant to an approved container stacking plan. Such plan shall, at a minimum, include a site plan showing the location of all abutting streets and sidewalks, all internal travel-ways, a stagger stacking schedule, and the proposed maximum stacking heights. A suitable stacking plan shall feature a slope not exceeding a rise/run of ½ , shall include a perimeter setback of not less than thirty (30) feet from the nearest stored container, the nearest sidewalk edge, or right-of-way edge, and shall indicate how the stacking plan meets all other requirements of this Ordinance; and

b. Container and chassis storage is not permitted within three-hundred fifty (350) feet of the boundary adjacent to any property zoned Residential (R) and within fifty (50) feet otherwise. In addition, containers stacked in the yard shall not be visible above the tree line from adjacent residential neighborhoods. Structures may be allowed in the area beyond the required buffer where container and chassis storage is prohibited, provided that proposed structures meet all requirements of this Ordinance and receive Site Plan Review Approval.

4. In those instances which proposed container storage facilities are viewed by the Planning Director as having a substantially negative impact on a surrounding area(s) or adjoining property(ies), based on the facility's location, proposed use, permitted use, or actual use of the property, the Planning Director shall bring the matter to the next available meeting of the Board of Zoning Appeals for hearing and decision, pursuant to Article 3.13.

B. Amortization Provided

Any facility involved in, or location used for, the purposes provided within Section 6.4.52 and not zoned Industrial (I) as of November 20, 2001 shall cease operations no later than November 20, 2004. Any facilities engaged in stacked storage as of November 20, 2001, shall come into compliance with Section 6.4.52 by November 20, 2004, and shall be bound by the three (3) year general amortization schedule provided for herein above.

§6.4.53 CEMETERIES

Cemeteries require ~~a minimum five-acre lot area~~, a minimum 25-foot landscaped buffer from adjacent properties, and completion of the Site Plan Review process. Non-commercial, family cemeteries shall be allowed. Cemeteries on the same lot as or on a lot adjacent to a religious facility shall be allowed as a use of right.

§6.4.54 KENNEL

A minimum of a five-acre lot, and a minimum of a 100-foot screened and landscaped buffer from all adjacent properties is required.

§6.4.55 RECYCLING COLLECTION, DROP-OFF

Facilities providing recycling collection drop-off centers shall comply with the Site Plan Review procedures contained within this Ordinance.

§6.4.56 AIRPORTS, HELIPORTS AND OTHER AIRCRAFT LANDING/TAKEOFF FACILITIES

Facilities providing landing and/or takeoff areas, service, hanger, or storage for aircraft, helicopters, lighter than air aircraft, hot-air balloons, or other similar craft, must comply with the Planned Development Procedures contained within this Ordinance.

§6.4.57 SPECIALIZED MANUFACTURING

A. In zoning districts subject to condition (C), a structure or structures used for specialized manufacturing shall have a maximum floor area of 2,000 square feet and shall have no more than five (5) non-resident employees.

B. All activities related to the specialized manufacturing use shall be confined to a structure that is entirely enclosed.

C. On-site retail sales are prohibited.

D. All specialized manufacturing uses shall comply with the Site Plan Review requirements of this Ordinance.

§6.4.58 SWEETGRASS BASKET STANDS

Vehicle parking for sweetgrass basket stands shall be located entirely out of all travel lanes with a minimum of two (2) feet of clearance between the edge of the travel lane and any parked vehicle or sweetgrass basket stand.

§6.4.59 TATTOO FACILITIES

A. Tattoo facilities shall be prohibited within 1,000 feet of a church, school, or playground. This distance shall be the shortest route of the ordinary pedestrian or vehicular travel along the public thoroughfare from the nearest point of the grounds in use as part of the church, school, or playground;

B. All proposed tattoo facilities located within 1,000 feet of a property line of a lot in a residential zoning district, or a lot containing a residential use shall require review and approval in accordance with the Special Exception procedures of this Ordinance. The distance shall be measured from the nearest property line

of the subject parcel to the nearest property line of a lot containing a residential use or located in a residential zoning district;

C. All proposed tattoo facilities may only provide tattooing and may not engage in any other retail business including, but not limited to, the sale of goods or performing any form of body piercing other than tattooing;

D. All proposed tattoo facilities shall comply with all regulatory requirements of the State of South Carolina;

E. Tattoo facility uses shall comply with the Site Plan Review requirements of this Ordinance and all other applicable provisions of this Ordinance and all other applicable laws, rules, and regulations; and

F. When the provisions of this Ordinance require that Neighbor Notice be provided, the requirements of Section 3.1.6.B.3 shall apply with the exception that all property owners within 1,000 feet of the subject property shall be included in the Neighbor Notice.

ARTICLE 6.5 ACCESSORY USES AND STRUCTURES

§6.5.1 ACCESSORY USES AND STRUCTURES ALLOWED

Permitted uses and approved Special Exception uses shall be deemed to include accessory uses and structures that are necessarily and customarily associated with, and appropriate, incidental, and subordinate to the allowed principal use. These uses may be located on the same Lot as the principal use or other Lots. **The *ARB* may permit, permit with conditions, or prohibit any accessory uses on the *Real Property* or any portion thereof which are not necessarily and customarily associated with, and appropriate, incidental, and subordinate to the allowed principal use.** Accessory uses and structures shall be subject to the same regulations as apply to principal uses and structures in the Plan ~~each zoning district~~, unless otherwise expressly stated.

A. Agricultural

Accessory Agricultural uses shall include all residential accessory uses and those accessory uses and activities customarily associated with agricultural operations, as determined by the Planning Director. Barns and farm-related structures, including roadside stands selling sweetgrass baskets or indigenous produce grown or produced on the farm where the roadside stand is located, shall be allowed on all parcels in Agricultural zoning districts, even if the subject parcel does not contain a primary structure. Manufactured homes, modular building units, and pre-manufactured container units may be used for non-residential purposes only in all agricultural zoning districts subject to the following requirements as well as those in the Charleston County building Code, as amended.

1. Applicability

This Section applies to any Permanent Storage Unit, as defined in subsection B.

2. Definitions

For purposes of this Section the following definitions apply:

a. "Manufactured Housing Unit", "Modular Building Unit", and "Pre-Manufactured Container Units" are defined in Article 12.

b. "Rear Yard" means the area between the rear of the principal building and the rear lot line.

c. "Permanent Storage Unit" means any manufactured housing unit, modular building unit, or pre-manufactured container unit exceeding 120 square feet in size that is used solely for non-residential purposes.

3. Location

a. Permanent Storage Units may be established as an accessory use to any dwelling unit in an AGR, AG-8, AG-10, AG-15, **RM,** Community Commercial (CC), or Industrial (I) Zoning District. Permanent Storage Units are not permitted in any other zoning district.

b. Permanent Storage Units are permitted only in the rear yard.

4. Permitting

Permanent Storage Units shall not be established or placed on lots or parcels unless the Planning Director has issued a zoning permit authorizing the unit. (See Article 3.8)

5. Screening

a. Permanent Storage Units shall be completely screened from view along any lot line except the rear lot line, and along any lot line abutting a waterway. The screening must conform to subsection 2, below.

b. Screening shall include at least one (1) of the following:

i. The principal building and any existing vegetation on the lot; or

ii. If the methods in subsection a, above, are not sufficient to provide complete screening, a minimum Residential Class A buffer (refer to Section 9.5.4.B.5) or a minimum six (6) foot high masonry wall must be provided between the Permanent Storage Unit and the required lot lines.

c. The Planning Director may waive the screening requirements if the Residential Storage Unit complies with the Building Design Standards in subsection 6, below.

6. Building Design

a. Applicability
Subsections i. through v., below, apply to all Permanent Storage Units, regardless of screening.

i. The building footprint of the Permanent Storage Unit shall not occupy more than five hundred (500) square feet.

ii. The building height of the Permanent Storage Unit shall not exceed twelve (12) feet.

iii. Permanent Storage Units must be installed, underskirted, and anchored in the same manner as the principal building.

iv. All moving or towing apparatus must be removed or concealed with skirting, including hitch, wheels and axles.

v. Bare metal is prohibited as an exterior building material.

7. Existing Permanent Storage Units
Permanent Storage Units in existence prior to July 19, 2006 shall be considered to be existing legal non-conforming structures.

B. Residential
The following uses and structures shall be allowed as accessory uses and structures to allowed Residential uses:

1. Fences and walls;

2. Garages, carports and off-street parking areas;

3. Gate houses and guard houses;

4. Home occupations, subject to Section 6.5.9;

5. Playhouses, patios, cabanas, porches, gazebos and incidental household storage buildings;

6. Radio and television receiving antennas;

7. Recreational and play facilities for the use of residents;

8. Solar collectors, subject to Section 6.5.4;

9. Tennis courts, swimming pools and hot tubs;

10. Accessory Dwelling Units, subject to Section 6.5.7;

11. Barns and farming-related structures even if the subject parcel does not contain a primary structures or use, provided that no agricultural or farm-

related structure on a parcel of one acre or less in an R-2, R-3, R-4, M-8, or M-12 district shall exceed 250 square feet in area;

12. The selling of sweetgrass baskets is allowed as an accessory use in all Agricultural Zoning Districts and in RR-3, S-1, S-2, S-3, R-2, R-3, and R-4 Zoning Districts;

13. Other necessary and customary uses determined by the ***ARB*** ~~Planning Director~~ to be appropriate, incidental and subordinate to the principal use of the property, subject to compliance with any standards contained within this Ordinance.

C. Commercial and Industrial

The following uses and structures shall be allowed as accessory uses and structures to allowed Commercial and Industrial uses:

1. One dwelling unit for security or maintenance personnel;

2. Fences and walls;

3. Gates and guard houses;

4. ~~Off-street~~ parking ***and loading*** areas (which may be located on a separate parcel pursuant to therequirements contained in Chapter 9);
5. Radio and television receiving antennas and support structures;

6. Recreation areas and facilities for the use of employees;

7. Cafeterias, dining halls and similar food services when operated exclusively for the convenience of employees, clients, or visitors to the principal use;

8. Day care facilities when operated exclusively for the convenience of employees of the principal use;

9. Gift shops, news stands and similar commercial activities operated exclusively for the convenience of employees, clients, or visitors to the principal use;

10. Solar Collectors, subject to Section 6.5.4;

11. Off street parking

12. Temporary Real Estate office

13. Temporary construction facilities

14. Other necessary and customary uses determined by the ~~***Planning Director***~~ ***ARB*** to be appropriate, incidental and subordinate to the principal use on the lot, subject to compliance with any standards contained within this Ordinance.

D. Institutional and Civic

The following uses and structures shall be allowed as accessory uses and structures to allowed Institutional and Civic uses:

1. Refreshment stands and food and beverage sales located in uses

involving public assembly;

2. Cafeterias, dining halls and similar food services when operated primarily for the convenience of employees, residents, clients, patients or visitors to the principal use;

3. Gift shops, news stands and similar commercial activities operated primarily for the convenience of employees, residents, clients, patients or visitors to the principal use;

4. Recreation areas and facilities for the use of employees;

5. Solar Collectors, subject to Section 6.5.4 of this Chapter;

6. Off street parking

7. Temporary real estate offices

8. Temporary construction facilities; and

9. Other necessary and customary uses determined by the ~~Planning Director~~ ARB to be appropriate, incidental and subordinate to the principal use on the lot, subject to compliance with any standards contained within this Ordinance.

§6.5.2 TIME ESTABLISHMENT

Unless otherwise expressly permitted by the~~in this Ordinance~~ ARB, no accessory use shall be established and no accessory structures shall be allowed on the subject parcel until after all required permits and approvals for the principal use or activity have been obtained and there are no current zoning and/or building code violations on the property.

§6.5.3 ACCESSORY STRUCTURES IN RESIDENTIAL, OR, AND CT ZONING DISTRICTS

Unless otherwise expressly stated and in addition to any other applicable provisions of this Ordinance, accessory structures in Residential, OR and CT zoning districts shall be subject to the following standards:

A. An accessory structure erected as an integral part of the principal structure shall be made structurally a part thereof, shall have a common wall therewith, and shall comply in all respects with the requirements of these and other regulations applicable to principal structures.

B. A detached accessory structure shall be located:

1. On the rear of the lot, behind the principal structure. This limitation shall not apply to carports or garages;

2. At least six feet from any existing dwelling or dwelling under construction;

3. At least three feet from any interior lot line in a residential district; if in an OR or CT district that abuts a residential district, the accessory structure in the OR or CT district shall be located at least ten feet from the abutting interior lot line; when an OR or CT district abuts another 0 , C or I district, setbacks for accessory structures are not required; and

4. If on a corner lot, the accessory structure shall not project in front of the

front building line required or existing on the adjacent lot.

C. A detached accessory structure may be constructed on an adjacent vacant lot if both lots are in the same ownership.

D. Accessory structures shall be included in lot coverage;

E. See also the Accessory Dwelling Unit provisions of Section 6.5.7 contained within this Chapter.

§6.5.4 SOLAR COLLECTORS

Solar Collectors shall be permitted provided that the following performance standards are met:

A. Roof-mounted residential building Solar Collectors located on front or side building roofs visible from the public right-of-way shall not extend above the peak of the roof plane where it is mounted, and no portion of any such Solar Collector shall extend more than 24 inches as measured perpendicularly to the roof at the point where it is mounted.

B. Roof-mounted residential building Solar Collectors located on the rear or interior side building roofs shall not extend above the peak of the roof plane where it is mounted and no portion of any such Solar Collector shall extend more than four feet as measured perpendicularly to the roof at the point where it is mounted.

C. Ground-mounted Solar Collectors shall not exceed eight feet in total height and shall be located to meet all setback requirements.

D. All utility service lines serving a ground-mounted solar system shall be located underground.

E. Any system incorporated into a nonresidential building shall be integrated into the basic form and main body of the building. If roof mounted, all collector panels shall fit into the form of the roof; if the building's roof is sloped or if "rack" mounting is used on a flat roof, the mounting must be concealed from view at street level. Exposed rack supports and free-standing collectors apart from the main building shall not be permitted.

F. Roof mounted solar energy systems mounted on "accessory or detached buildings" are allowed on detached garages or swimming pool equipment buildings. Detached "greenhouses" are also acceptable. No free-standing panels shall be allowed.

G. If an active solar or photovoltaic solar system is utilized, all components servicing the collector panels shall be concealed, including mechanical piping and conduits.

H. All exposed metal shall be of a color that will blend into its surroundings.

§6.5.5 ACCESSORY STORAGE OF MAJOR RECREATIONAL EQUIPMENT

No such equipment shall be used for living, sleeping or housekeeping purposes when parked or stored on a residential lot or in any location not approved for such use. *No major recreational vehicles or equipment shall be parked or stored on a residential lot (unless fully enclosed within a garage) or in any location not approved for such use*

by the ARB. Notwithstanding the foregoing, the ARB may permit, permit with conditions, or prohibit any recreational vehicles or equipment from being parked or stored on the Real Property or any portion thereof.

§6.5.6 ACCESSORY RETAIL SALES AND PERSONAL SERVICES

Personal services and retail sales established with the express purpose of providing a convenience for tenants of multi-family or office development shall be permitted, subject to the following limits:

A. The accessory activity shall be located on the same zoning lot as the principal use.

§6.5.7 ACCESSORY DWELLING UNITS

~~In Agricultural and Residential zoning districts~~ one accessory dwelling unit may be established on an existing zoning lot if reviewed and approved, subject to the following standards:

A. The zoning lot must have a minimum area at least 50 percent larger than the minimum area required for a principal residential structure.

B. Only one accessory unit shall be permitted per zoning lot.

C. The heated gross floor area of the accessory dwelling unit shall not exceed 800 square feet ~~in any Residential district or shall not exceed 1,500 square feet in any Agricultural district.~~

D. Separate electrical meters shall not be allowed for attached accessory dwellings.

§6.5.8 MANUFACTURED HOUSING UNITS

A. In Agricultural zoning districts, a manufactured housing unit may be used for one caretaker's quarters. It shall not be permitted for other than residential use unless authorized elsewhere in this Ordinance.

B. Applications to use manufactured housing units for temporary use while construction is in progress on a permanent structure shall be submitted to the Planning Director for a Construction Permit in accordance with Temporary Zoning Permit requirements of this Ordinance. Such a temporary unit shall be removed from the premises within 30 days of issuance of a Certificate of Occupancy for the permanent structure.

C. Manufactured housing units may be utilized for classroom and related use for a two-year period or as otherwise expressly provided in the approval of a Special Exception. The period of use may be extended upon application and proper findings by the Board of Zoning Appeals.

D. Where needed for the general welfare of the public, governmental entities may utilize manufactured housing units as classrooms, clinics, offices and caretaker's quarters, provided Special Exception approval has been obtained.

E. Manufactured housing units, modular building units and pre-manufactured container units shall not be allowed as accessory uses nor as accessory structures for purposes of permanent storage units unless they are located in an AGR, AG-8, A-10, AG-15, RM, Community Commercial (CC), or Industrial (I) Zoning District and comply with the provisions of Section 6.5.1.A.

§6.5.9 HOME OCCUPATIONS

A. General

Some types of work can be conducted at home with little or no effect on the surrounding neighborhood. The home occupation regulations of this Section are intended to permit residents to engage in home occupations, while ensuring that home occupations will not be a detriment to the character and livability of the surrounding area. The regulations require that home occupations (an accessory use) remain subordinate to the principal residential use of the property and that the viability of the residential use is maintained. Zoning Permits shall be required for all home occupations. ***Nothing contained herein shall prohibit the Property Owner or other entity from establishing restrictive covenants prohibiting or imposing more restrictive conditions on home occupations on the Real Property or any portion thereof.***

B. Where Allowed

Home occupations that comply with the regulations of this Section shall be allowed as an accessory use to any allowed Residential or Agricultural principal use.

C. Allowed Uses

The home occupation regulations of this Section establish performance standards rather than detailed lists of allowed home occupations. Uses that comply with all of the standards of this Section will be allowed as home occupations unless they are specifically prohibited.

D. Prohibited Uses

1. Vehicle/Equipment Repair, Rental or Sales

Any type of repair, rental, sales or assembly of vehicles or equipment with internal combustion engines (such as autos, motorcycles, scooters, outboard marine engines, lawn mowers, chain saws, and other small engines) or of large appliances (such as washing machines, dryers, and refrigerators) or any other work related to automobiles and their parts is prohibited as a home occupation in the R-2, R-3, R-4, M-8, M-12, MHS, and MHP Zoning Districts, unless these types of repairs, rentals, or sales take place in an enclosed structure and pose no noise or safety concerns.

2. Restaurants

Restaurants and food service establishments are not allowed as home occupations. Food service for Bed and Breakfasts shall be allowed under this Ordinance.

3. Employee Dispatch Centers

Dispatch centers, where employees come to the site to be dispatched to other locations, are not allowed as home occupations.

4. Animal Care or Boarding

Animal care or boarding facilities (including animal hospitals, kennels, stables and all other types of animal boarding and care facilities) are not allowed as home occupations in the R-2, R-3, R-4, M-8, M-12, MHS and

MHP Residential Zoning Districts.

5. Medical Offices or Clinics

Medical offices and medical clinics are not allowed as home occupations in the R-2, R-3, R-4, M-8, M-12, MHS and MHP Residential Zoning Districts. This includes doctors' offices, dentists' offices, psychologists' offices, hospitals and all other medical care facilities. The prohibition shall not be interpreted as preventing medical practitioners from seeing patients in the practitioner's home on an emergency basis.

6. Funeral Homes

Funeral homes and funeral service activities are not allowed as home occupations.

7. Barber Shops, Beauty Shops and Nail Salons

Barber and Beauty Shops with more than one chair are not allowed as a home occupation.

8. Dancing Schools

Dancing schools are not allowed as home occupations.

E. Employees

Only one full-time or one part-time employee, who is not a full-time resident of the home where the home occupation is located, is allowed. The home occupation may have other employees who are not working at the residence, but work at other off-site locations, if applicable. For the purpose of this provision, the term "nonresident employee" includes an employee, business partner, co-owner, or other person affiliated with the home occupation, who does not live at the site, but who visits the site as a part of the home occupation.

F. Resident Operator

The operator of a home occupation shall be a full-time resident of the dwelling unit.

G. Customers

Customers may visit the site of a home occupation only during the hours of 8:00 a.m. to 8:00 p.m., with no more than an average of one customer or client per hour being allowed.

H. Floor Area

No more than 25 percent of the total floor area of the dwelling unit may be used to house a home occupation, except that Bed and Breakfasts allowed by this Ordinance are exempt from this provision. Up to 1,000 square feet of an accessory structure, such as a garage, may be used for a home occupation.

I. Outdoor Activities

All activities and storage areas associated with home occupations must be conducted in completely enclosed structures.

J. Exterior Appearance

There shall be no visible evidence of the conduct of a home occupation when viewed from the street right-of-way or from an adjacent lot. Signs for a home

What about fitness centers? You exempted them from GLA in the definitions, but not here.

occupation are expressly prohibited. There may be no change in the exterior appearance of the dwelling unit that houses a home occupation or the site upon which it is conducted that will make the dwelling appear less residential in nature or function. Examples of such prohibited alterations include construction of parking lots, paving of required setbacks, adding additional entrances to the dwelling unit or adding signs or commercial-like exterior lighting.

K. Operational Impacts

No home occupation or equipment used in conjunction with a home occupation may cause odor, vibration, noise, electrical interference or fluctuation in voltage that is perceptible beyond the lot line of the lot upon which the home occupation is conducted. No hazardous substances may be used or stored in conjunction with a home occupation.

L. Trucks

Not more than one truck, truck cab, or van used in conjunction with a home occupation may be parked at the site of the home occupation in any S-1, S-2, S-3, R-2, R-3, R-4, M-8, M-12, MHS, or MHP Zoning District. No semi-truck trailers shall be allowed in these zoning districts.

1. The following requirements shall apply to the unincorporated area of Charleston County lying within the boundaries of the North Charleston District:

   a. Not more than one commercial vehicle, heavy commercial vehicle, or truck cab, used in conjunction with a home occupation, in combination with one heavy commercial trailer used in conjunction with a home occupation may be parked at the site of the home occupation unless:

      i. The property on which the home occupation is located is ½ acre or greater in size; and

      ii. .All heavy commercial vehicles, truck cabs, and heavy commercial trailers used in conjunction with the home occupation are completely screened from view from surrounding residences when parked at the site of the home occupation. (Commercial vehicles are not subject to the requirement of Section 6.5.9.L.1.a.ii).

   b. Any variation from the standards of subsection 1, above, shall require Special Exception approval, per Article 3.6 of this Ordinance.

M. Deliveries

No more than four deliveries or pick-ups of supplies or products associated with home occupations are allowed between the hours of 8:00 a.m. and 8:00 p.m.

N. Sales

No article, product, or service may be sold in connection with a home occupation, other than those produced on the premises or comprise 25 percent or less of the gross receipts.

§6.5.10 ANIMALS

A The keeping of household pets shall be allowed as an accessory use in all zoning districts in which residential dwelling units are permitted.

B. The keeping of exotic or wild animals shall not be allowed as an accessory use and shall only be allowed if approved as a Special Exception in accordance with the procedures contained in Chapter 3 of this Ordinance.

§6.5.11 VEHICLE SALES

Not more than two operable or inoperable motor vehicles may be offered for sale upon any lot unless such sales activities are otherwise expressly authorized by this Ordinance. A vehicle for sale upon a lot in a Residential zoning district must be owned by the owner of the subject lot and must comply with Section 6.5.12.

§6.5.12 STORAGE AND REPAIR OF INOPERABLE MOTOR VEHICLES

A In all zoning districts, the open storage and or repair of inoperable motor vehicles is not permitted within the required front setback.

B. ~~In all Agricultural and Rural Residential zoning districts,~~ ***When permitted,*** the open storage or repair of inoperable motor vehicles must be screened by a fence, wall, building, or vegetative buffer that completely shields the vehicles from view off-site.

C. Open storage and/or repair of more than two (2) inoperable motor vehicles is prohibited on all lots in suburban residential zoning districts, as well as in all office, commercial and industrial zoning districts unless specifically authorized for use as a salvage yard. Inoperable motor vehicles must be screened by a fence, wall, building, or vegetative buffer that completely shields the vehicles from view off-site.

D. In all Suburban Residential zoning districts, storage of motor vehicle parts is permitted only within a completely enclosed accessory structure located on the same lot as the principal dwelling unit.

E. Storage of commercial vehicles in Residential zoning districts, unless otherwise expressly authorized by this Ordinance, is limited to one vehicle used as personal transportation.

§6.5.13 TEMPORARY PORTABLE STORAGE UNITS

Temporary portable storage units are permitted if located on the same zoning lot as the permanent structure subject to the following conditions:

A If the temporary portable storage unit is located on a lot with a non-residential use or zoning district designation for a period exceeding fifteen (15) days, the

Limited Site Plan Review procedures of Article 3.7 of this Ordinance shall apply;

B. The maximum size of a temporary portable storage unit shall not exceed 160 square feet of indoor storage;

C. A maximum of 160 square feet of indoor temporary portable storage shall be permitted per zoning lot in residential zoning districts;

D. Temporary portable storage units are allowed for a period not to exceed a total of sixty (60) days in one calendar year. Temporary Zoning Permits shall be required for temporary portable storage units that remain on a property for a time period exceeding fifteen (15) consecutive days;

E. Temporary portable storage units shall not be placed in any right-of-way, retention area, septic field, easement, or on public property and shall not create a site obstruction for any vehicular or pedestrian traffic;

F. Temporary portable storage units shall conform to the accessory structure requirements contained in this Ordinance;

G. The maximum area of a temporary portable storage unit dedicated to signage shall be limited to 27 square feet per side or 58 square feet total;

H. Temporary portable storage units shall be kept in good condition, free from evidence of deterioration, weathering, mildew, discoloration, rust, ripping, tearing, or other holes or breaks;

I. Temporary portable storage units shall not be used for the storage of hazardous or flammable substances, live animals, or human habitation;

J. All vendors providing service related to the transportation of household goods and/or rental/delivery of portable storage containers shall be in compliance with the State of South Carolina's Regulatory Laws and licensing requirements through the Public Service Commission. Proof that the liability insurance of the company owning the temporary portable storage unit is equal to the minimum amount required by the Public Service Commission shall be required at the time of permitting; and

K. The regulations listed above in Section 6.5.13 shall not apply to temporary storage units that are:

1. Placed for construction purposes and in conjunction with building permits, which may exceed the permitted time period, as long as the building permit remains active with continuous construction; and

2. Placed during any period of declared emergency by Federal, State or Local official action.

§6.5.14 Accessory Storage

A reasonable amount of accessory storage space, the configuration, location and amount of which the Property Owner may determine, shall be permitted on the Real Property to accommodate any and all uses on the Real Property or any portion thereof: Such accessory storage space may be located on a separate Lot or Development Parcel. from the principal use which it accommodates. Such accessory storage pace shall include but not be limited to space to accommodate the Development of the Real Property or the administration of the Real Property by any person or entity after Development. Accessory storage space shall be permitted on any Lot or Development Parcel on the Real Property, whether developed or undeveloped. The ARB shall determine appropriate buffering for these uses.

CHAPTER 8 | SUBDIVISION REGULATIONS

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CHAPTER 8 SUBDIVISION REGULATIONS

Chapter 8 shall apply to the Real Property unless otherwise provided herein. However, any references to "public" water or sewer shall include public and private water or sewer.

ARTICLE 8.1 GENERAL

§8.1.1 PURPOSE

The public health, safety, economy, good order, appearance, convenience, morals and general welfare require the harmonious, orderly, and progressive development of land within Charleston County. In furtherance of this general intent, the Subdivision Regulations are authorized for the following purposes, among others:

A. To implement the goals, objectives and policies of the Charleston County *Comprehensive Plan;*

B. To facilitate the adequate provision or availability of transportation, police and fire protection, water, sewage, schools, parks and other recreational facilities, affordable housing, disaster evacuation, and other public services and requirements;

C. To assure the provision of needed public open spaces and building sites in new land developments through the dedication or reservation of land for recreational, educational, environmental, transportation, and other public purposes;

D. To assure, in general, the wise and timely development of new areas and redevelopment of previously developed areas in harmony with the adopted or amended *Comprehensive Plan* for Charleston County and any adopted or amended municipal *Comprehensive Plan* within or adjacent to the County;

E. To implement land use policies that will preserve agricultural uses of land and the rural character of unincorporated Charleston County;

F. To identify, protect and preserve scenic, historic, and ecologically sensitive areas;

G. To prevent overcrowding of land, avoiding undue concentration of population, and lessening congestion in the streets;

H. To regulate the density and distribution of populations and the uses of buildings, structures and land for trade, industry, residence, recreation, agriculture, forestry, conservation, airports and approaches thereto, water supply, sanitation, protection against floods, public activities , and other purposes; and

I. To ensure protection from fire, flood, and other dangers, and furthering the public welfare in any other regard specified by a local governing body.

§8.1.2 APPLICABILITY

Unless expressly exempted, no subdivision shall be made, platted, or recorded for any purpose nor shall parcels resulting from such subdivisions be sold, unless such subdivision meets all applicable standards of this Ordinance and has been approved in accordance with the procedures of this Ordinance.

A. All lots shown on plats whether subdivided or not, shall have the Planning Commission Stamp of either approval or exemption on said plat; the Register of Mesne Conveyance shall not record any plat without such stamp. The plat for an individual lot exempted by virtue of pre-existence must be accompanied by a surveyor's statement on the plat that the lot is a single, individual lot, and not newly created.

B. Parcels that were recorded by deed or plat prior to the adoption of the County's original Subdivision Regulations on January 1, 1955, will receive automatic approval under a Grandfather Clause, provided the parcel involved is still in the same size and shape as when recorded prior to 1955 and is properly platted in accordance with present standards. The recorded information must be provided and attested to by the surveyor or attorney involved.

C. Preliminary Plats submitted for approval shall expire two years from the date of preliminary approval if all conditions for preliminary plat approval have not been met. The Planning Director shall be authorized to grant a one-time extension of this time frame if a written request is submitted by the applicant prior to the expiration date. The time period of the extension shall not exceed one year.

D. Upon submission of a Subdivision application, no additional Subdivision applications shall be accepted for the subject property until the original application has been withdrawn or the Decision-Making Body has rendered its final decision and all applicable time limits on refilling have expired.

§8 .1.3 EXEMPTIONS

A. Procedures

The following shall be exempt from the Subdivision Plat Procedures, if the Planning Director determines that all engineering and survey standards of this Ordinance have been met:

1. The combination or re-combination of portions of previously platted lots where the total number of lots is not increased. When the plat is finalized, it shall be submitted to the Planning Director for recording. Deeds and plats shall be recorded simultaneously.

2. The public acquisition of land for right-of-way or drainage easements or any lot or parcel created therefrom.

3. Contiguous properties that are to be divided for the purpose of exchanging or trading parcels of land. When the plat is finalized, it shall be submitted to the Planning Director for recording. Deeds and plats shall be recorded simultaneously.

4. A parcel of land that is proposed to be used as the site for a utility

substation, power line easements or right-of-way, pumping station, pressure regulating station, electricity regulating substation, gas pressure control station, or similar facilities.

5. The combination or recombination of entire lots of record where no new street or change in existing streets is involved.

6. The division of land into parcels of five acres or more, where no new street or easement is involved. Plats of these exceptions must be received as information by the Planning Director , which fact shall be indicated on the plats.

B. Standards

Lots created and recorded prior to August 15, 1971, shall be exempt from compliance with the standards of this Chapter, provided that the subject property:

1. Was or is surveyed and platted in accordance with prescribed standards;

2. Has the approval of the South Carolina Department of Health and Environmental control {DHEC); and

3. Contains no drainage ways or easements needed to drain surrounding properties, as determined by the Public Works Director.

§8.1.4 CHARLESTON COUNTY ROAD CONSTRUCTION STANDARDS

The regulations and standards of this Chapter are intended to supplement the Charleston County Road Construction Standards, as amended, in Appendix A of this Ordinance, which shall be considered the minimum design standards for roads and drainage systems in Charleston County. (Note: Road and drainage systems not meeting the Standard Specifications for Local Governments' Road and Street Construction will not be eligible for maintenance from the State "C" or donor County funds.)

§8.1.5 RELATIONSHIP TO DEVELOPMENT REVIEW PROCEDURES OF ARTICLE 3.1

The "General" procedural requirements and standards of Article 3.1 of this Ordinance shall apply to the subdivision plat procedures of this Chapter.

§8.1.6 SURVEY COMPLIANCE

All Land Surveys in the County shall be in accord with the land use designated for the proposed subdivision of property and the criteria specified in Urban Land Surveys as promulgated by the South Carolina Code of Regulations, 1991, Chapter 49, Article 3, R.400-490, as amended, and described as the "Minimum Standards Manual for the Practice of Land Surveying in South Carolina."

ARTICLE 8.2 PRE-APPLICATION INFORMATION

§8.2.1 PRE-APPLICATION CONFERENCE

Pre-Application Conferences offer an opportunity for Planning, Public Works and other affected agencies to familiarize applicants with applicable procedures, submittal requirements,

development standards, and other pertinent matters before finalizing the development proposal or laying out the proposed subdivision. Applicants requesting Minor Subdivisions are suggested to schedule a pre-application process before submittal of an application. Applicants for Major Subdivisions are required to have a pre-application conference before submittal of an application. Applicants shall be responsible for scheduling pre-application conferences with the Planning Director who shall be responsible for contacting the Public Works Director and other affected agencies.

ARTICLE 8.3 MINOR AND MAJOR SUBDIVISIONS

§8.3.1 MINOR SUBDIVISION

A Minor Subdivision is a division of any tract of land into ten (10) or fewer lots, provided that:

A. No public street right-of-way dedications are involved;

B. The Public Works Director does not require a Preliminary Plat for a drainage easement;

C. The lots meet South Carolina Department of Health and Environmental Control (DHEC) requirements for sewage disposal systems. Systems that are determined by DHEC to be properly functioning or "grandfathered" must comply with DHEC regulations as a condition of minor subdivision approval;

D. Off-site sewage disposal systems must be approved by DHEC and an off-site utility easement must be shown along with all lots served by the off-site system if public sewer is accessible and is provided to each lot;

E. No new or residual parcels will be created that do not comply with all applicable requirements of this Ordinance; and

F. The tract to be subdivided is not located within an approved planned development or an area that is subject to an application for planned development approval by the landowner. All such subdivisions are considered Major Subdivisions.

G. Non-Buildable Lots

1. For the purpose of this subsection, non-buildable lots are lots that meet all requirements of this Ordinance, with the exception of water and/or sewer availability requirements;

2. For all non-buildable lots, all new parcels being created less than five (5) acres in size shall meet the minimum lot size and comply with applicable requirements of this Ordinance;

3. Non-buildable lots may be approved by the Planning Commission as a Minor Subdivision ten (10) lots or less without certification by DHEC for on-site waste disposal systems and water or where public water and sewer is not available;

4. The property owner(s) shall sign the "Certification of Non-Evaluation". This certification statement shall be placed on the plat and signed by the property owner(s);

5. The property owner(s) shall have a deed prepared by an attorney for each non-buildable lot less than five (5) acres in size explaining the "Certification of Non-Evaluation" to be recorded with the plat;

6. The "Certification of Non-Evaluation" for water and sewer availability shall be used in conjunction with Minor Subdivision (development) plats when no evaluation regarding the availability of public water/sewer or on-site septic systems and water have been approved; and

7. The following certification shall be placed on the plat and deed and signed by the property owners:

   'The Property owner(s) of record hereby acknowledge(s) that the surveyed parcel(s) and/or tract remainder has not been approved to determine the availability of on-site waste disposal systems or provisions of public water/sewer services. Recordation of this plat and deed shall not be an implied or expressed consent of Charleston County that the lots or other land divisions shown hereon are capable of being serviced by on- site waste disposal or public water/sewer systems. Unless otherwise stated hereon, all surveyed parcels and/or tract remainders have not been reviewed for on-site waste disposal systems or public water/sewer services."

   Property Owner(s) Signature_____
   Date_____

§8.3.2 MINOR SUBDIVISION PROCESS

Applications for Minor Subdivisions shall be submitted to the Planning Director on forms available in the Planning Department. There is one required step in the Minor Subdivision process which is Final Plat review and approval. Generally, Minor Subdivisions are reviewed in the Planning Department and approved by the Planning Director. However, the Planning Director may send Minor Subdivision applications to the Planning Commission for approval in order to determine whether or not the proposed subdivision is consistent with the goals and objectives of the *Comprehensive Plan.* Applicants for Minor Subdivisions are strongly encouraged to schedule and attend a Pre-Application Conference prior to filing a minor subdivision.

§8.3.3 MAJOR SUBDIVISION

A. Any land division that is not a Minor Subdivision shall be processed as a "Major Subdivision." All Major Subdivision applicants are required to attend a Pre-Application Conference.

B. Subdivision Roads and Utilities
   A Zoning Permit is required for grading, drainage, or the construction of roads and utilities in a subdivision.

§8.3.4 MAJOR SUBDIVISION PROCESS

Applicants for Major Subdivisions are required to schedule and attend a Pre-Application Conference prior to filing a Major Subdivision application. After the Pre-Application Conference, there are three required steps in the process: (1) Preliminary Plat review and approval; (2) Final Plat review and approval; and (3) Letters of Coordination. Each step of the process shall be completed before initiating the next step. Applications for Major Subdivisions shall be submitted to the Planning Director and shall include a completed application form (available from the Planning Department). Additional components for consideration of a Major Subdivision that are necessary at the Pre-Application Conference are:

A. A plat, or survey of the subject property, if available, or a tax map that identifies the subject property; and

B. A Concept Plan that includes the following information:

1. The proposed means of access to a public road;

2. Surrounding land uses;

3. All adjacent roads;

4. A preliminary map and analysis of natural resources present on the subject property and surrounding property; and

5. A conceptual layout of the proposed subdivision, which shall be overlaid on the preliminary site analysis and which shall show streets, drainage, lots, parks and other facilities located to protect natural resource areas.

[Commentary: Approval from other local, state or federal agencies may be necessary in the development of land in Charleston County, particularly in regard to environmental concerns. Pre-application conferences should be held with these agencies, including the South Carolina Department of Health and Environmental Control, Coastal Resources Management, U.S. Army Corps of Engineers and the U.S. Fish & Wildlife Service.]

§8.3.5 REQUIRED TREE PROTECTION FOR MINOR AND MAJOR SUBDIVISIONS

Trees shall be protected in accordance with Chapter 9 of this Ordinance.

§8.3.6 LETTERS OF COORDINATION FOR MAJOR AND MINOR SUBDIVISIONS

Letters of coordination are required that acknowledge that the County and other agencies will be able to provide necessary public services, facilities and programs to service the development proposed, at the time the subdivision plat is processed.

ARTICLE 8.4 PRELIMINARY PLAT

§8.4.1 APPLICABILITY

Preliminary Plats shall be required for all Major Subdivisions.

§8.4.2 APPLICATION

A. Requirements

The following shall be submitted:

1. Completed applications for Preliminary Plat approval shall be submitted to

the Planning Director on forms available in the Planning Department. Ten (10) copies of the Preliminary Plat shall be filed with the application.

2. Preliminary Plats shall be drawn to engineer's scale no smaller than one inch equals 200 feet. Where large areas are being platted, they may be drawn on one or more sheets, 22 inches by 34 inches in size. For small areas being platted, a scale of one inch equals 100 feet shall be used.

3. ~~Even~~ if the applicant intends to subdivide only_ a portion of a parcel or tract of land initially, the Preliminary Plat ~~shall~~ ***need not*** show a proposed street and lot layout, drainage plan and other requirements for the entire parcel or tract of land in which such portion is contained; ~~except that~~ ***unless required by*** the Planning Director, with the recommendation of the Public Works Director, ~~may waive this requirement on a finding that such a complete layout is not necessary to carry out the purpose of these regulations.~~

4. The following information shall be required on each plat:

   a. The courses and distances of the perimeter of the land involved shall be indicated on the plat shown with all courses marked to show which are actual field observations and which are computed.

   b. References to a known point or points such as street intersections and railroad crossings shall be shown.

   c. The total acreage of the land involved in the subdivision, and the acreage of high land above the Office of Coastal Resource Management Critical Line. Date of Critical Line certification shall be indicated. (Aerial photography may not be used to determine OCRM Critical Line location.)

   d. The names of adjacent land owners and streets where known or available shall be given (with the tax parcel numbers), and all intersecting boundaries or property lines shall be shown.

   e. Proposed divisions to be created shall be shown, including building envelopes for each lot, right-of-way widths, roadway widths, road surface types, sidewalks (if applicable), proposed drainage easements , and names of streets; the locations of proposed utility installations and utility easements; lot lines, dimensions and angles; sites reserved or dedicated for public uses; and sites for apartments, civic/institutional commercial and industrial uses. The status of the existing lot access and the concept of the type of road construction being proposed shall be indicated (e.g., Ingress/Egress Easement, Private Road constructed or unconstructed, Public Secondary or Primary Rural Road, Public Secondary or Primary County Road, and other details as appropriate; i.e., curb and gutter, asphalt swales, inverted crown, roadside open ditch, etc.).

   f. The title, scale (including graphic scale), north arrow (magnetic,

grid, or true), date, name of applicant and the name and seal of engineer or surveyor with South Carolina Registration Number shall be shown.

g. All existing structures and physical features of the land, including contours (contours not required on proposed private subdivisions, and only within the rights-of-way of proposed rural public streets), drainage ditches, roads and wooded areas shall be shown. The contour interval shall be one foot, unless otherwise approved in advance of submission by the Public Works Director. All contour information shall be based on mean sea level datum and shall be accurate within one-half foot. The Bench Mark, with its description, and the datum used for the survey shall be clearly noted on the plat.

h. General drainage features, including proposed drainage easements and detention/retention basins. Also the proposed direction of drainage on each street, ditch and lot shall be indicated by the use of arrows and proposed street names.

i. The location of required landscape buffers as specified in Chapter 9 of this Ordinance, which shall not be located within drainage easements unless expressly approved by the Public Works Director.

j. Jurisdictional wetlands, with the date of certification, on lots of five acres or less in size and within all publicly dedicated rights-of-way and easements.

k. A notation shall be made on the plat clearly indicating the applicable OCRM Critical Line buffers and setbacks.

l. Tree Surveys on lots of one acre or less are to include Grand Trees on the entire lot. Tree surveys of Grand Trees may be requested upon site inspection if lots greater than one acre appear to be unbuildable due to the presence of Grand Trees.

m. Tree Surveys of all Grand Trees are required within access easements, drainage easements, and rights-of-way.

n. A signature block on the plat, signed by the owner(s) of the property and notarized indicating that the proposed preliminary plat being put forth is an action of the owner, heirs thereto or assigns.

o. A vacant block shall be provided on each page of the plat that is three inches by eight inches in dimension for Charleston County approval stamps and notations.

p. A statement that any easements for utilities or other encroachments in the area to be dedicated for streets, highways, drainage or other public or private use are subject to binding provision that the costs of future relocation of any such encroachments due to the construction or maintenance of public improvements shall be borne by the holder of the easement and/or utility company.

5. Accompanying Data

a. The Preliminary Plat shall be accompanied by a statement as to the availability of and specific indication of the distance to and location of the nearest public water supply and public sanitary sewers.

b. The Preliminary Plat shall be accompanied by a statement indicating what provisions are to be made for water supply and sewage disposal.

c. Proposed subdivisions encompassing 100 or more acres of land area shall provide a master plan showing the general layout of future development of the entire tract and on adjacent lands that are under common ownership or control. This master plan shall provide a generalized description and plan that addresses the following future development considerations: traffic circulation, drainage, environmental preservation, utility placement, land use, density and any areas that are to remain undeveloped.

d. The engineer and/or surveyor who prepared the Preliminary Plat shall affix their seal(s), name(s), and South Carolina Registration Number(s). Only engineers or surveyors registered in the State of South Carolina shall attest and fix their seal on the Preliminary Plat.

[Commentary-For the purpose of Preliminary Plat applications, a complete application means one that includes all required information and fees and that addresses the findings of the inspection report and has received all approvals from other agencies that are a prerequisite to Preliminary Plat approval.]

§8.4.3 PLANNING DIRECTOR-REVIEW AND REPORT

Upon receipt of a complete application for Preliminary Plat approval, the Planning Director shall have 30 calendar days to (1) review the proposed Preliminary Plat; (2) compile a staff report on the proposed plat (which includes the comments and recommendations of the Public Works Director and other affected agencies); and (3) forward the report and any recommendations to the Planning Commission.

§8.4.4 PLANNING COMMISSION-REVIEW AND DECISION

Within 30 calendar days of receipt of a report from the Planning Director, the Planning Commission shall review the proposed Preliminary Plat and act to approve, approve with conditions, or deny the Preliminary Plat based on whether it complies with all applicable requirements of this Ordinance and the adopted Charleston County *Comprehensive Plan.*

§8.4.5 EFFECT OF PRELIMINARY PLAT APPROVAL

Approval of a Preliminary Plat shall constitute general acceptance of the overall planning concepts for the proposed subdivision and is a prerequisite for the filing of a Final Plat application.

§8.4.6 LAPSE OF PRELIMINARY PLAT APPROVAL

An approved Preliminary Plat shall lapse and be of no further force and effect if a Final Plat for the subdivision (or a phase of the subdivision) has not been approved within two years of the date of approval of the Preliminary Plat. If the subdivision is to be developed in phases, a phasing plan, including a timetable for development of the entire subdivision, shall be approved as part of the Preliminary Plat approval. No final plats shall be accepted and no construction shall be allowed for any phase not approved as part of the Preliminary Plat.

§8.4.7 APPEALS OF PLANNING DIRECTOR'S PRELIMINARY PLAT DECISION

Any Party in Interest in a Preliminary Plat decision of the Planning Director regarding a complete or incomplete application may appeal the decision to the Planning Commission by filing an appeal with the Planning Director within 30 calendar days of the date of the decision.

A. Appeal Powers

In exercising its appeal power the Planning Commission may reverse or affirm, wholly or partly, or may modify the decision on appeal. In acting upon the appeal the Planning Commission shall be authorized only to determine whether the decision of the Planning Director was made in error. The Planning Commission shall not be authorized to approve modifications or waivers of Ordinance standards through the appeal process. If the Planning Commission determines that it is necessary to obtain additional evidence in order to resolve the matter it may remand the matter to the Planning Director with directions to obtain such evidence and to reconsider the decision in light of such evidence.

B. Consideration of Evidence

The decision of the Planning Commission shall be a matter of record; it shall consider only the same application, plans, and related project materials that were the subject of the original decision and only the issues raised by the appeal.

C. Burden of Persuasion of Error

In acting on the appeal, the Planning Commission shall grant to the decision of the Planning Director a presumption of correctness, placing the burden of persuasion of error on the appellant.

D. Approval Criteria

An appeal shall be sustained only if the Planning Commission finds that the decision of the Planning Director was in error.

E. Vote Required

A quorum of the Planning Commission shall be achieved when the number of members in attendance equals more than one-half of its total membership. At least two-thirds of the members present and voting shall be required to reverse a final plat decision of the Planning Director.

[Commentary-Appeals of Planning Director and other subdivision-related administrative decisions [including decisions to reject applications as incomplete], shall be processed in accordance with Article 3.14 described in Chapter 3.)

§8.4.8 APPEALS OF PLANNING COMMISSION PRELIMINARY PLAT DECISION

Any party in interest in a Preliminary Plat decision of the Planning Commission or any officer, board, or bureau of the County may appeal the Planning Commission decision to the Circuit Court of Charleston County. Appellants shall file with the Court Clerk a written petition plainly and fully setting forth how such decision is contrary to law. Such appeal shall be filed within 30 calendar days after actual written notice of the Planning Commission's decision.

§8.4.9 CONSTRUCTION PLANS

After approval of a Preliminary Plat and before commencing any work within the proposed subdivision (including land clearing and grading), road and drainage plans prepared by an engineer registered in the State of South Carolina shall be submitted to the Public Works Director for review and approval in accordance with the Charleston County Road Construct ion Standards in Appendix A of this Ordinance.

§8.4.10 INSPECTIONS

A. Subdivision plats that are submitted for review are field inspected by Planning and Public Works staff to ensure compliance with any applicable Ordinance requirements and County standards.

B. Prior to submitting a Preliminary Plat where no public sewer is provided to any proposed lot, the applicant shall contact a representative of South Carolina Department of Health and Environmental Control (DHEC) and arrange for a test of the soil on any proposed lot. DHEC staff will inspect the proposed lot(s) in order to identify areas that meet minimum septic system requirements required by the State of South Carolina. The results of this test shall be submitted by the applicant at the time of the Preliminary Plat application.

C. Where subdivision streets and/or drainageways are being constructed, the Public Works Director or the authorized representative will make periodic visits to the site as indicated in Charleston County Road Construction Standards, Appendix A, to ensure construction compliance with County-approved road and drainage plans. The Public Works Director's or the authorized representative's certification that all roads and drainage systems have been constructed in compliance with the plans is required prior to final approval of the development. This approval is only necessary for public subdivisions.

§8.4.11 CONDITIONAL PLAT APPROVAL

A. Prior to approval of a Final Plat, the developer shall install all required public improvement s or post an approved financial guarantee of performance, in

accordance with the requirements of this Ordinance. If financial guarantees are posted, the Planning Director shall be authorized to grant conditional plat approval on plats that involve two (2) or more guaranteed public improvements, with final approval contingent upon completion and acceptance of all required improvements. No Certificates of Occupancy shall be issued until all required improvements have been installed and accepted, and the Final Plat has been recorded by the Charleston County Register of Mesne Conveyance. Conditional Plat approval shall be valid for a period not to exceed two years from the date Conditional Plat Approval is granted.

B. Where plats are submitted under an approved financial guarantee for Conditional approval the following three (3) notes shall be placed on the plat;

1. Approval of this plat does not authorize occupancy;

2. Duration of approval shall be limited to two (2) years; and

3. The approval of this plat in no way obligates the County of Charleston to accept for continued maintenance any of the roads or easements shown hereon.

C. The duration of the financial guarantee for a conditional plat shall be no longer than twenty-four (24) months unless extended by the Planning Commission. No later than two (2) months before the expiration, the applicant shall notify the County that the applicant has completed the final plat or is securing a replacement bond to be issued within 30 days of expiration of the original bond. If no action is taken by the applicant, the County shall execute the provisions of the performance bond.

ARTICLE 8.5 FINAL PLATS

§8.5.1 APPLICABILITY

Final Plats shall be required for all Subdivisions.

§8.5.2 APPLICATION

A. Final Plat Applications Requirements:

1. Applications for Final Plat approval shall be submitted to Planning Director on forms available in the Planning Department. Ten (10) copies of the Final Plat shall be filed with the application.

2. Written certification from the design engineer that the subdivision's road and drainage infrastructure and any other required improvements have been constructed in accordance with the approved plans.

3. The Final Plat shall be drawn in ink on a material specified by the Register of Mesne Conveyance for recording, on sheets 22 inches by 34 inches in size, and at an engineer's scale of one inch equals 100 feet or larger. Where necessary the plat may be on several sheets accompanied

by an index sheet or key map insert showing the entire subdivision. Where necessary, the size of the plat may be adjusted to a smaller scale than 1"=100' with the approval of the Planning Director.

B. The Final Plat Shall Show the Following:

1. All proposed divisions of land shall be shown, including: each lot showing lot lines, with bearings and distances; all rights-of-way; all drainage easements; names of all streets; the locations of all utility rights-of-way and utility easements; all structures; and all sites reserved or dedicated for public uses.

2. The title, scale (including graphic scale), north arrow (magnetic, grid, or true), date, name of applicant and the name of engineer or surveyor with South Carolina Registration Number shall be shown.

3. Block and lot numbers suitably arranged by simple system.

4. The full names of adjacent land owners and streets where known or available shall be given (with the tax parcel numbers), and all intersecting boundaries or property lines shall be shown. Names of adjacent property owners may be omitted in established residential platted subdivisions; however, Legal Block and Lot Numbers and County Parcel ID Numbers are required.

5. Certificates:

   a. The signature and seal of the registered land surveyor in accordance with the current Minimum Standard Manual for the Practice of Land Surveying in South Carolina.

   b. A statement of dedication by the property owner of streets, rights-of-way, easements, and any other sites for public or private use and warranty of title of property offered for dedication. If any change in ownership is made subsequent to the submission of the plat and prior to the granting of final approval, the statement of dedication shall be corrected accordingly.

   c. For any public dedication, a warranty deed for the transfer of the right(s)-of-way(s), easement(s), or other sites for public use to the County on legal documents of the form suitable to the County must be provided.

   d. A statement that any easements for utilities or other encroachments in the area to be dedicated for streets, highways, drainage or other public or private use are subject to a binding provision that the costs of future relocation of any such encroachments due to the construction or maintenance of public improvements shall be borne by the holder of the easement and/or utility company.

6. All easements shall include their location, width and centerline.

7. The approved Office of Coastal Resource Management (OCRM) Critical Line with signed approval statement on the final plat.

8. At the Planning Director's discretion, the applicant/surveyor may be required to show buffers and setbacks on lots less than one acre in size or on newly created lots that may appear to have encroachment of structures into a buffer or setback.

9. Freshwater Wetlands/Waterways on lots of five acres or less in size.

10. High land acreage and low land acreage (Freshwater Wetlands or acreage below the Office of Coastal Resource Management Critical Line).

11. Tree Surveys on lots of one acre or less are to include Grand Trees on the entire lot. Tree Surveys of Grand Trees may *be* requested upon site inspection if lots greater than one acre appear to be unbuildable due to the presence of Grand Trees.

12. Tree Surveys of all Grand Trees are required within access easements, drainage easements, and rights-of-way.

13. Ownership and maintenance status of the lot access shall be indicated for any newly-created lots.

14. A vacant block shall be provided on each page of the plat that is three inches by eight inches in dimension for Charleston County approval stamps and notations.

C. Accompanying Data

1. A certificate of title or a sworn affidavit establishing the ownership of the land to be recorded. If any change in ownership occurs subsequent to the date of the certificate of title or affidavit and prior to the granting of final approval, a new certificate of title or sworn affidavit establishing the ownership of the land shall be submitted to the Planning Director.

2. In subdivisions where existing public water and public sewer systems have been extended and/or a new system installed, a certification of inspection and associated operating permits from the South Carolina Department of Health and Environmental Control (DHEC) shall be submitted.

3. Restrictive covenants affidavit(s) signed by the applicant or current property owner(s) in compliance with State law.

4. Should the Landowner/Developer decide to utilize Article A.2, Private Road Standards, of Appendix A, the following five (5) notes shall be placed on the plat:

   a. Any future subdivision of this parcel, or road construction or extension of the existing roads shown hereon shall require

compliance with the Charleston County Ordinances. Before Charleston County will consider acceptance of any dedication of roads into the County road system, the property owner(s) shall construct the roads to County of Charleston Road Construction Standards;

b. It is hereby expressly understood by the property owner, developer or any subsequent purchaser of any lots shown on the plat that the County of Charleston is not responsible for the maintenance of the streets, roads, common areas, drainage systems and any other municipal services which include, but are not limited to, garbage disposal, public sewage, fire protection or emergency medical service;

c. Be aware that the County of Charleston is not responsible for drainage and flooding problems relevant to the real property, and that emergency vehicles may have difficulty accessing the property;

d. No public funds shall be used for the maintenance of the roads shown on the plat; and

e. This approval in no way obligates the County of Charleston to maintain the 50 foot right-of-way until it has been constructed to County standards and accepted for maintenance by Charleston County Council.

5. Letters of Coordination
Letters of Coordination are required which acknowledge that the County and other agencies will be able to provide necessary public services, facilities, and programs to service the development proposed, at the time the subdivision plat is processed.

D. Certification of Approval
When the Planning Director has approved the plat, a certificate noting such approval and carrying the signature of the Planning Director shall be placed on the original drawing of said plat.

§8.5.3 PLANNING DIRECTOR-REVIEW AND DECISION

Within 45 days of receipt of a complete Final Plat application, the Planning Director shall review the proposed Final Plat and the reports from the Public Works Director and other affected agencies and act to approve, approve with conditions or deny the Final Plat, based on whether it complies with the approved Preliminary Plat, all applicable requirements of this Ordinance, and the purposes and intent of Article 1.5.

§8.5.4 ACCEPTANCE OF DEDICATIONS

Approval of a Final Plat shall not constitute acceptance of any public improvements. Such acceptance will require County Council acceptance of dedication.

Documents or instruments granting easements within the area to be dedicated must provide that:

A Future relocation or replacement costs of any encroachments, including, but

not limited to utilities, due to maintenance or construction of public improvements, is to be borne solely by the easement holder/utility company; and

B. The County will not be responsible for costs relating to future relocation or replacement of utilities or other encroachments made necessary by maintenance and/or construction of public improvements; and

C. All expenses pertaining to said relocation shall be paid for by the easement holder/utility company; and

D. Relocation shall be completed within 90 days from receipt of written request by the County or as otherwise agreed to by the County.

§8.5.5 RECORDING

Approved Final Plats shall be recorded by the Planning Director with the Register of Mesne Conveyance within 30 days of final approval. Notice to the applicant shall be sent within a reasonable time following the date of the recording with the Register of Mesne Conveyance.

§8.5.6 APPEALS OF PLANNING DIRECTOR'S FINAL PLAT DECISION

Any person with a substantial interest in a Final Plat decision of the Planning Director may appeal the decision to the Planning Commission by filing an appeal with the Planning Director within 30 calendar days after the actual notice of the decision.

A. Appeal Powers

In exercising the appeal power, the Planning Commission may reverse or affirm, wholly or partly, or may modify the decision being appealed. In acting upon the appeal, the Planning Commission shall be authorized only to determine whether the decision of the Planning Director was made in error. The Planning Commission shall not be authorized to approve modifications or waivers of Ordinance standards through the appeal process. If the Planning Commission determines that it is necessary to obtain additional evidence in order to resolve the matter, it may remand the matter to the Planning Director, with directions to obtain such evidence and to reconsider the decision in light of such evidence.

B. Consideration of Evidence

The Planning Commission's decision shall be on the record; it shall consider only the same application, plans, and related project materials that were the subject of the original decision and only the issues raised by the appeal.

C. Burden of Persuasion or Error

In acting on the appeal, the Planning Commission shall grant to the Planning Director's decision a presumption of correctness, placing the burden of persuasion of error on the appellant.

D. Approval Criteria

An appeal shall be sustained only if the Planning Commission finds that the Planning Director erred.

E. Vote Required

A quorum of the Planning Commission shall be achieved when the number of members in attendance equals more than one-half of the total membership of the Planning Commission. At least two-thirds of the members present and voting shall be required to reverse a final plat decision of the Planning Director.

[Commentary-Appeals of Planning Director and other subdivision-related administrative decisions (including decisions to reject applications as incomplete), shall be processed in accordance with Article 3.14 described in Chapter 3.]

§8.5.7 APPEALS OF PLANNING COMMISSION'S DECISION

A. Any person with a substantial interest in a Final Plat (appeal} decision of the Planning Commission may appeal the Planning Commission decision to the Circuit Court of Charleston County. Appellants shall file with the Court Clerk a written petition plainly and fully setting forth how such decision is contrary to law. Such appeal shall be filed within 30 calendar days after actual notice of the Planning Commission's decision.

B. At any time prior to appeal of a Planning Commission decision on a Final Plat (appeal) decision, the applicant may request that the Planning Commission enter mediation. When mediation is requested, the Planning Commission shall assign one of its members as a representative in mediation proceedings. A vote of the Planning Commission in a public meeting shall be required to accept any mediated settlement. An accepted mediated settlement cannot waive the standards of this Ordinance. Prior to beginning talks, applicable time limits for review and action on complete applications must be extended by mutual agreement of the applicant and Planning Commission.

ARTICLE 8.6 MARKERS

§8.6.1 PLACEMENT

A marker shall be set on the right-of-way line at the ends of the block for every block length of street. When blocks occur that have a curve or curves in them, markers shall be set on both sides of the street at the ends of tangents. Markers shall also be set on right-of-way lines (on each side of the centerline) at angle points when curves are not used. All interior lot corners shall be marked. The location and type of markers used shall be indicated on the Final Plat.

§8.6.2 TIMING

Markers shall be installed prior to the submission of and approval of the Final Plat.

ARTICLE 8.7 LOTS

Article 8.7 of the ZLDR shall not apply to the Real Property. The layout, design, and other dimensional standards for lots shall be as set forth in the Plan, especially section 6 thereof.

ARTICLE 8.8 TREE PRESERVATION

§8.8.1 TREE SURVEYS

Tree surveys shall comply with the following:

A Lots within subdivisions shall be laid out and designed to provide a buildable area on each lot that does not require the removal of Grand Trees.

B. Tree protection standards are described in Chapter 9 of this Ordinance ***(as modified herein) and section 9 of the Plan.***

C. Tree Surveys on lots of one acre or less are to include Grand Trees on the entire lot. Tree Surveys of Grand Trees may be requested upon site inspection if lots greater than one acre appear to be unbuildable due to the presence of Grand trees.

D. Tree Surveys of all Grand Trees are required within access easements, drainage easements, and rights-of-way.

ARTICLE 8.9 TREES, SHRUBS, AND PAVEMENT

§8.9.1 MINIMUM OFFSET OF TREES AND SHRUBS FROM ROAD PAVEMENT

A. Trees and shrubs shall be set back from ***public*** street and road pavement in accordance with the following minimum requirements:

Roadside Feature	Speed (MPH)	Offset from Edge of Pavement (feet)	
		Canopy Trees	Understory Trees/Shrubs
Guiderail	All	5*	3*
Barrier Curb	40 and less	5*	3*
	45 to 50	**8***	5*
	55 and greater	12*	5*
Open Shoulder	40 and less	10	5
	45 to 50	15	7
	55 and greater	20	10

*Tree limbs hanging below 15 feet in height shall be trimmed so that they do not encroach beyond the back of the curb. Minimum overhead clearance of 14 feet should be maintained for safe passage When a barrier curb or guide rail exists, offset is measured from the face of the curb or guide rail to the face of the tree at ground level.

B. Understory trees may be located two feet from the edge of pavement with the approval of the Planning Director and Public Works Director.

ARTICLE 8.10 PEDESTRIAN WAYS

Community Ways shall be provided on the Real Property as set forth in the Agreement and the Plan. This Article 8.10 shall therefore not apply to the Real Property; provided, however, any pedestrian ways within publicly dedicated rights-of-way shall comply with County standards.

§8.10.1 WHERE REQUIRED

Pedestrian ways shall be provided in all major subdivisions within the Urban and Suburban Areas of the County. If development characteristics warrant, the Planning Director may waive this requirement for any portion of the proposed subdivision. Requests for such waivers shall be submitted along with written justification to the Planning Director for approval.

§8.10.2 PLACEMENT

Paved pedestrian ways within publicly dedicated rights-of-way shall conform to the construction details for paved sidewalks contained in Charleston County Road Construction Standards, Appendix A. Unpaved, alternative surface walkways that are not within a right-of-way or drainage easement, and bike trails or walking trails that are designed to connect neighborhoods

and provide access to common areas may be provided when approved by the Planning Director.

§8.10.3 TIMING OF SIDEWALK INSTALLATION

The installation of required sidewalks within proposed publicly dedicated rights-of-way can be postponed until after the Final Plat has been recorded, provided the following criteria have been met:

A. The other required road and drainage system improvements have been completed and accepted;

B. All final plat conditions and stipulations have been finalized;

C. An approved Financial Guarantee is posted of an amount sufficient to guarantee completion of the required sidewalk improvements (150 percent (150%) of the actual cost, verified by the Directors of the Public Works and Planning Departments and certified by the subdivision project engineer, a minimum of $10,000) within a time period not to exceed two (2) years; and

D. The subdivision Developer must be issued an encroachment permit for construction of the entire subdivision sidewalk system within the proposed right-of-way.

The subdivision's required two (2) year maintenance guarantee period will start once the entire sidewalk system has been completed and approved. The construction of the sidewalk on each individual lot must be completed prior to issuing the Certificates of Occupancy.

ARTICLE 8.11 STREET NAMES AND STREET SIGNS

§8.11.1 STREET NAMES

Street names proposed by the applicant must be placed on reserve with the Planning Department prior to submitting a plat. See Article 3.15, Addressing and Street Names.

§8.11.2 STREET SIGNS

Installation and maintenance of street signs on private roads or easements are the responsibility of the applicant, developer, Home Owners Association, or property owners in accordance with the Charleston County Road Construction Standards in Appendix A of this Ordinance, MUTCD Standards, and with Chapter 4; and Article VII of the Charleston County Code of Ordinances, as amended.

ARTICLE 8.12 UNDERGROUND UTILITIES AND SERVICES

All electrical, telephone, cable television and similar distribution lines providing service to a development site should be installed underground.

ARICLE 8.13 WATER SUPPLY AND SEWAGE DISPOSAL

In accordance with South Carolina Department of Health and Environmental Control (DHEC) regulations, all subdivisions shall be served by approved public water and sewer systems, if accessible for connection, or if in the opinion of DHEC, the public's health and the environment would best be protected by the installation of such systems. Where public sewer is not available, all new lots must meet minimum soil requirements established by DHEC. This provision shall not be interpreted to require that subdivisions be annexed in order to obtain public water or sewer service.

ARTICLE 8.14 FINANCIAL GUARANTEES (SURETY)

§8.14.1 PERFORMANCE GUARANTEES

A. In lieu of completing the required subdivision improvements of this Chapter, a financial guarantee in the form of a no-contest, irrevocable bank letter of credit, or performance and payment bond underwritten by an acceptable South Carolina licensed corporate surety, subject to County attorney approval of the guarantee to determine that the interests of Charleston County are fully protected.

B. The applicant shall submit to the appropriate governmental agency a detailed itemized unit cost estimate for the proposed public improvements to be included in the financial guarantee. Performance Guarantees are for Public Improvements only; Public Roads, Public Water and Public Sewer. (Example: public roads constructed to County Road Standards dedicated to the public and accepted into the road system by Charleston County Council, or a public water system approved and accepted by another public entity). Charleston County will only accept a Financial Guarantee (Surety) for two (2) or more of the above public improvements. The amount of the financial guarantee shall be verified by the appropriate governmental agency that exercises operational control (Commissioners of Public Works for public water, Commissioners of the appropriate Public Service Districts for street name signs and public sewer, and the Public Works Director for all other public improvements covered in this Chapter). The amount shall be sufficient to guarantee completion of the required improvement (125 percent of the actual cost of the improvements with a minimum of $10,000) within a time period specified by the government agencies, not to exceed two years. The governmental agencies determining the amount of financial guarantee shall provide a letter to the Planning Director (copy to the applicant) setting forth the amount of bond, conditions of acceptance and the period covered. The Planning Director will inform all interested governmental agencies, particularly the County Building Inspection Director.

C. Upon completion of the improvements as required by this Chapter, written notice thereof shall be given by the applicant to the bond holder, who shall cause an inspection of the improvements to be made. The bond holder will, within 30 days of the date of notice, authorize in writing the release of the security given, provided improvements have been completed in accordance with the required specifications. Should the improvements not be completed in accordance with the required specifications by the date originally stipulated in writing by the bond holder, the funds derived from said bond will be used by the bond holder to complete the improvements according to required specifications, at the earliest reasonable time. Where it appears that the bond was insufficient to finance the required improvements after the applicant has defaulted, County Council will assess the individual applicant the cost of the improvements over and above the surety amount.

D. In no instance will the bond issuer or bond holder be authorized to extend for the applicant the completion date originally stipulated.

E. Pro-rated refunds based on a percentage of overall completion shall not be authorized, with the exception of an irrevocable bank letter of credit.

F. In lieu of completed subdivision improvements, the decision-making body may accept the written guarantee of a governmental agency to complete required improvements within 90 days of the date of such acceptance by County Council. Failure to complete required improvements within the 90-day period shall void, any subdivision approvals received by the applicant.

G. The acceptance of performance bonds in lieu of completed performance is made possible only by the introduction of effective occupancy control. This control will be coordinated with final approvals so as to ensure that all conditions covered by one or more bonds are completely fulfilled, except as specified in the Charleston County Building Code, before an occupancy permit can be issued by the County Building Inspection Director.

§8.14.2 MAINTENANCE GUARANTEES

Street and stormwater management/drainage systems that are to be dedicated to Charleston County for public maintenance shall be under warranty for all defects and failures for a period of two years. Prior to Final Plat approval, the developer shall provide written verification of financial responsibility for the correction of any defects and/or failures in those related improvements that will be dedicated to the county. The warranty shall be in an amount of at least ten percent of the construction costs. The cost amounts shall be verified by the Public Works Director. The warranty shall be effective for a period of two years from the date of acceptance by the County Council. The financial warranty shall be in the form of a no-contest, irrevocable bank letter of credit, a performance and payment bond underwritten by an acceptable South Carolina licensed corporate surety. Payment is subject to County Attorney approval of the guarantee to determine that the interests of Charleston County are protected. The Public Works Director shall maintain surveillance over the system and provide written notification to the developer if repair work is required during the warranty period. The Public Works Director shall identify defects not considered to be a public safety issue and notify the developer of such defects. The developer shall then have 30 days to prepare a schedule of corrective actions and begin such corrective actions. If not completed within the approved schedule, the Public Works Director shall make the repairs and bill the bonding company. Public safety defects shall be addressed immediately by the Public Works Director, with reimbursement from the bonding company.

CHAPTER 9 | DEVELOPMENT STANDARDS

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CHAPTER9 I DEVELOPMENTSTANDARDS

ARTICLE 9.1 PURPOSE AND INTENT

The purpose of the regulations contained in this Chapter is to protect the public health, safety, and general welfare; to promote harmonious and orderly development; and to foster civic beauty by improving the appearance, character and economic value of civic, commercial and industrial development within the unincorporated areas. The Development Standards are authorized for the following purposes, among others:

A. Implement the goals, objectives, and policies of the County of Charleston *Comprehensive Plan;*

B. Facilitate safe transportation, access, vehicular circulation, and parking;

C. Assure the protection and preservation of natural resources, such as trees and wetlands;

D. Implement the use of vegetated buffers in order to mitigate the effects of incompatible adjacent uses, to provide transition between neighboring properties and streets, to moderate climatic effects, and to minimize noise and glare;

E. Implement basic architectural standards, right-of-way buffer standards, and sign standards that will promote attractive, well-designed development, foster balanced streetscapes, and reduce visual clutter along major roadways, thus enhancing safe traffic flow; and

F. Insure protection from fire, flood and other dangers, and furthering the public welfare in any regard specified by a local governing body.

ARTICLE 9.2 Applicability

Unless expressly stated, the articles in this Chapter apply to development occurring on property within unincorporated Charleston County.

ARTICLE 9.3 OFF-STREET PARKING-AND LOADING

§9.3.1 GENERAL

A. Applicability

1. New Development
The off-street parking and loading standards of this Article apply to any new building constructed and to any new use established.

2. Expansions and Alterations
The off-street parking and loading standards of this Article apply when an existing structure or use is expanded or enlarged. Additional off-street parking and loading spaces will be required only to serve the enlarged or expanded area, not the entire building or use, provided that in all cases the number of off-street parking and loading spaces provided for the entire use (preexisting + expansion) must equal at least 75 percent of minimum ratio established in Off-Street Parking Schedule "A" of this Article.

B. Timing of Installation

Required parking spaces and drives shall be ready for use and approved by the Planning Director prior to issuance of a Certificate of Occupancy.

C. Reduction Below Minimums

The Planning Director shall be authorized to reduce the number of required parking spaces by no more than 10 percent (10%) when more than ten (10) spaces are required with the following conditions:

1. The site can support the minimum required number of parking spaces and meet all development standards in this Ordinance including buffers and landscaping requirements; or

2. The reduction is necessary to meet the Tree Protection and Preservation regulations contained in Article 9.4 of this Ordinance.

This allowable reduction excludes medical offices and restaurant uses. Any change in use that increases applicable off-street parking or loading requirements will be deemed a violation of this Ordinance unless parking and loading spaces are provided in accordance with the provisions of this Article.

§9.3.2 OFF-STREET PARKING SCHEDULE A

Off-street parking* spaces shall *be provided in accordance with section 10 of the Plan. ~~Unless otherwise expressly allowed, off-street parking spaces shall be provided in accordance with the following.~~

§9.3.3 RULES FOR COMPUTING PARKING AND LOADING REQUIREMENTS

The following rules apply when computing off-street parking and loading requirements:

A. Multiple Uses

Lots containing more than one use must provide parking and loading in an amount equal to the total of the requirements for all uses.

B. Fractions

When measurements of the number of required spaces result in a fractional number, any fraction of one-half or less will be rounded down to the next lower whole number and any fraction of more than one-half will be rounded up to the next higher whole number.

C. Area Measurements

Unless otherwise expressly stated, all square-footage-based parking and loading standards must be computed on the basis of gross floor area. Storage areas or common areas incidental to the principle use shall be exempt from this measurement when the following conditions are met:

1. The storage area or common area is a minimum of two hundred fifty (250) square feet; and

2. The applicant has provided documentation that such areas will not be used as space for employees, customers, or residents.

D. Occupancy-Based Standards

For the purpose of computing parking requirements based on employees, students, residents or occupants, calculations shall be based on the largest number of persons working on any single shift, the maximum enrollment or the maximum fire-rated capacity, whichever is applicable and whichever results in the greater number of spaces.

E. Unlisted Uses

Upon receiving a development application for a use not specifically listed in an off-street parking schedule, the Planning Director shall apply the off-street parking standard specified for the listed use that is deemed most similar to the proposed use or require parking spaces in accordance with a parking study prepared by the applicant.

§9.3.4 LOCATION OF REQUIRED PARKING

A. On-Site Parking

1. Except as expressly stated in this Section, all required off-street parking spaces may be located on any lot and or street right-of-way within the Real Property ~~must be located on the same lot as the principal use~~ and shall be arranged and laid out so as to ensure that no parked or maneuvering vehicle will encroach upon a sidewalk, public right-of-way or property line.

~~2. Parking lots in Office (O) and Commercial (C) districts containing more than ten parking spaces shall be located to the side or rear of the principal structure's front facade or within a courtyard surrounded by a structure on at least three sides.~~

B. Off-Site Parking

~~A maximum of 50% of off-street parking spaces may be located on a separate lot from the lot on which the principal use is located if the off-site parking complies with the all of following standards. If any one of the following standards cannot be met, Special Exception approval shall be required:~~

~~1. Off-site parking may not be used to satisfy the off-street parking standards for residential uses (except for guest parking), restaurants, convenience stores or other convenience oriented uses. Required parking spaces reserved for persons with disabilities shall not be located off site.~~

~~2. No off-site parking space may be located more than 600 feet from the primary entrance of the use served, unless shuttle bus service is provided to the remote parking area. Off-site parking spaces may not be separated from the use that it serves they serve by a street right-of-way with a width of more than 80 feet, unless a grade separated pedestrian walkway is provided, or other traffic control or shuttle bus service is provided to the remote parking area.~~

~~3. Parking spaces located off site in accordance with this Section shall be considered accessory to the primary use, regardless of the fact that such accessory use is not located on the same parcel as the principal use.~~

~~4. Off-site parking areas serving uses located in Nonresidential zoning districts must be located in non-residential zoning districts. Off-site parking areas serving uses located in Residential or Agricultural zoning districts may be located in Residential, Agricultural or Nonresidential zoning districts.~~

1. In the event that an off-site parking area is not under the same ownership as the principal use served, a written agreement will be required. An attested copy of the agreement between the owners of record must be submitted to the Planning Director for recording on forms made available in the Planning Department. Recording of the agreement with the Register of Mesne Conveyance must take place before issuance of a zoning permit, building permit or Certificate of Occupancy for any use to be served by the off-site parking area. An off-site parking agreement may be revoked only if all required off-street parking spaces will be provided in accordance with this Article

~~6. Shared parking areas must be connected by a continuous network of sidewalks and pedestrian crosswalks.~~

C. Shared Parking

Notwithstanding the following, the shared parking standards in the Plan, including Table 10.2, shall apply to the Real Property.

1. Uses with different operating hours or peak business periods may share off-street parking spaces if the shared parking complies with the all of following standards. If any one of the following standards cannot be met, Special Exception approval shall be required.

~~2.~~ Shared parking spaces may be located anywhere on the Real Property. ~~must be located within 600 feet of the primary entrance of the use served, unless shuttle bus service is provided to the shared parking area. Shared parking may not be separated from the use that it serves by a street right-of-way with a width of more than 80 feet, unless a grade separated pedestrian walkway is provided, or other traffic control or shuttle bus service is provided to the parking area.~~

~~3. Shared parking areas serving uses located in Nonresidential zoning districts must be located in non-residential zoning districts. Shared parking areas serving uses located in Residential or Agricultural zoning districts may be located in Residential, Agricultural or Nonresidential zoning districts.~~

2. Those wishing to use shared parking as a means of satisfying ~~off-street~~ the parking requirements must submit a shared parking analysis to the Planning Director that clearly demonstrates the feasibility of shared parking. The study must be provided in a form established by the Planning Director and made available to the public. It must address, at a minimum, the size and type of the proposed development, the composition of tenants, the anticipated rate of parking turnover and the anticipated peak parking and traffic loads for all uses that will be sharing off-street parking spaces.

3. A shared parking plan will be enforced through written agreement among all owners of record. An attested copy of the agreement between the owners of record must be submitted to the Planning Director for recording on forms made available in the Planning Department. Recording of the agreement with the Register of Mesne Conveyance must take place before issuance of a building permit or Certificate of Occupancy for any use to be served by the off-site parking area. A shared parking agreement may be revoked only if all required off-street parking spaces will be provided in accordance with this Article.

~~6. Shared parking areas must be connected by a continuous network of sidewalks and pedestrian crosswalks.~~

§9.3.5 ACCESSIBLE PARKING FOR PHYSICALLY DISABLED PERSONS

The parking standards of this Article are intended to ensure compliance with the Americans with Disabilities Act (ADA). A portion of the total number of required off-street parking spaces in each off-street parking area shall be specifically designated, located and reserved for use by persons with physical disabilities.

A. Number of Spaces

The minimum number of accessible spaces to be provided shall be a portion of the total number of off-street parking spaces required, as determined from the following schedule. Parking spaces reserved for persons with disabilities shall be counted toward fulfilling off-street parking standards.

Total Parking Spaces Provided	Minimum Number of Accessible Spaces	Minimum Number of Van-Accessible Spaces	Minimum Number of Car-Accessible Spaces
1-25	1	1	0
26-50	2	1	1
51-75	3	1	2
76-100	4	1	3
101-150	5	1	4
151-200	6	1	5
201-300	7	1	6
301-400	8	1	7
401-500	9	2	7
501-1,000	2%of total spaces	1 out of every 8 accessible spaces	7 out of every 8 accessible spaces
Over 1,000	20 + 1 per each 100 spaces over 1,000		

8. Minimum Dimensions

All parking spaces reserved for persons with disabilities shall comply with the parking space dimension standards of this Section, provided that access aisles shall be provided immediately abutting such spaces, as follows:

1. Car-accessible spaces shall have at least a five-foot-wide access aisle located abutting the designated parking space_

2. Van-accessible spaces shall have at least an eight-foot-wide access aisle located abutting the designated parking space.

§9.3.6 PARKING SPACE AND PARKING LOT DESIGN

A. Parking Lot Design

Parking layouts shall be approved by the ARB. Dead end type of parking layouts that cause or contribute to poor vehicular circulation will not be allowed unless all other site configurations and parking options of the required number of parking spaces have been exhausted.

8. Aisle Widths and Parking Space Dimensions

Drive aisle widths and parking space dimensions shall comply with the standards in the following table. Twenty percent (20%) of the minimum number of required parking for a development may utilize compact and sub-compact vehicle parking dimensions. These dimensions shall be a minimum of 7 feet 6 inches x 15 feet (7'6" x 15') and clearly marked for compact vehicles only.

X0	Stall Width A	Stall Depth B	Aisle Width C	Skew Width D
60°	8' 0" 8' 6" 9' 0"	19'7" 18'0" 17' 0"	19'0" 18' 0" 17' 0" *One Way	9'3" 9' 10" 10' 5"
45°	8' 0" 8' 6" 9' 0"	18'5" 18'8" 19' 1"	12'0 11'0" 11'0" *One Way	11'4" 12'0" 12'9"
30°	8' 0" 8'6" 9'0"	15' 11" 16'5" 16' 10"	11'0" 10'0" 9' 0" *One Way	16' 0" 17'0" 18' 0"
90°	8' 0" 8' 6" 9' 0"	22' 0" 22' 0" 23' 0"	11' 0" 11' 6" 12' 0" *One Way	N /A (PARALLEL)
	8' 0" 8' 6" 9' 0"	18' 0" 18'0" 18' O"	28' to 32' 25' to 29' 23' to 27' *Two Way	N/A

Note: Two Way drive aisles shall always require a minimum width of 23 feet.

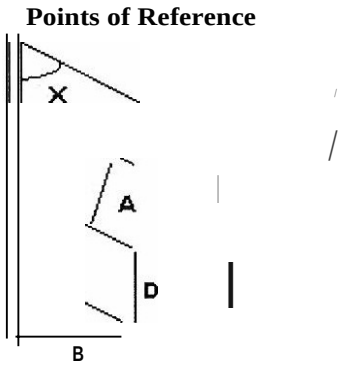


Figure 2

C. Parking Lot Landscaping

See Article 9.5 of this Chapter.

D. Markings and Surface Treatment

1. In paved parking areas, each off-street parking space shall be identified by surface markings at least four inches in width. Markings shall be visible at all times. Such markings shall be arranged to provide for orderly and safe loading, unloading, parking and storage of vehicles. In unpaved parking lots, all parking spaces must have a curb stop ~~(minimum height of four inches)~~ or another feature approved by the ARB to delineate the location of the space and to prevent the encroachment of parking onto adjoining properties, ~~rights-of-way~~, or landscaped areas.

2. One-Way ~~and Two-Way~~ access~~es~~ into required parking facilities shall be identified ~~by directional arrows~~.

3. Unpaved parking lots must have an all weather surface such as gravel, slag or other pervious surface, not including asphalt shingles. ~~Entrance and exit drives serving unpaved parking lots accessed from a paved street must be paved from the edge of the street pavement to a distance of 20 feet into the property. No more than 120 percent of the required number of off-street parking spaces may be paved and no more than 70 percent of all developable land within parcels may be paved, unless approved by the Planning Director.~~

E. Access

1. Required parking spaces shall not have direct access to a street unless the street and the parking spaces are appropriately designed for such maneuvers as determined by the directors of Planning and Public Works. ~~or highway. Access to required parking spaces shall be provided by on-site driveways. Off-street parking spaces shall be accessible without backing into or otherwise reentering a public right-of-way.~~

2. Parking lot entrance and exit drive curb cuts within the River Village shall be located based on conditions as determined by the ARB. Parking lot entrance and exit drive curb cuts in all other locations will not be more than 30 feet in width. Entrances or exits which include a median strip to separate traffic flow in opposite directions may be expanded to 60 feet. Curb cuts shall be allowed in accordance with the following table:

LENGTH OFFRONTAGE	MAX1MUM NUMBER OF DRIVEWAYS
250 feet or less	1*
251 feet to 1,500 feet	2
1,500 feet or more	3

* On frontages of 250 feet or less, a pair of one-way driveways may be substituted only if the internal circulation on the site is compatible with the one-way driveways and wrong-way movements on the driveways are rendered impossible or extremely difficult for motorists. Refer to the South Carolina Department of Transportation's Access and Roadside Management Standards Manual for recommended spacing of driveways based on speed of traffic~~.~~

3. Except within the River Village entrance and exit drives shall be located at least 100 feet from the edge of the right-of-way of any street intersection. If the subject lot has less than 100 feet of frontage, the Planning Director shall be authorized to alter these requirements. Suitable provisions will be made to prevent ingress or egress at other than designated entrance or exit drives. Within the River Village entrance and exit drives shall be located a safe distance from the right-of-way as determined by the design engineer.

4. The Planning Director shall be authorized to require that access to dwelling units comply with the International Fire Code, as adopted by County Council.

5. Shared access between parcels may be allowed with written agreement among all owners of record. An attested copy of the access agreement between the owners of record must be submitted to the Planning Director for recording on forms made available in the Planning Department.

Recording of the agreement with the Register of Mesne Conveyance must take place before issuance of a zoning permit or certificate of occupancy for any use to be served by shared access. Any shared access must meet all dimensional requirements of this Ordinance and any applicable SCOOT requirements.

§9.3.7 USE OF REQUIRED PARKING SPACES

Required off-street parking areas shall be used solely for the parking of licensed, motor vehicles in operating condition. Required spaces may not be used for the display of goods for sale or lease, for motor vehicle repair or service work of any kind, or for long-term storage of vehicles, boats, motor homes, campers, manufactured housing units, or building materials.

§9.3.8 Vehicle Stacking Areas

A. Minimum Number of Spaces

Off-street stacking spaces shall be provided as follows:

Activity Type	Minimum Spaces	Measured From
Bank teller lane	3	Teller Window
Automated teller machine	2	ATM
Restaurant drive-through	5	Order Box
Restaurant drive-through	4	Order Box to Pick-Up Window
Car wash stall, automatic	4	Entrance
Car wash stall, self-service	3	Entrance
Dry Clean Service	3	Pick up Window
Gasoline pump island	2	Pump Island
Other	Determined by Planning Director	

B. Parking Area Design and Layout

Required stacking spaces are subject to the following design and layout standards:

1. Stacking spaces must be a minimum of eight feet by 20 feet in size.

2. Stacking spaces may not impede on or off-site traffic movements or movements into or out of off-street parking spaces.

3. Stacking spaces must be separated from other internal driveways by raised medians if deemed necessary by the Director of Public Works for traffic movement and safety.

4. The Planning Director may require pick-up and drop-off loop drives with sufficient vehicle stacking lanes to prevent vehicle backups into internal

travel lanes and parking lots for school uses, adult and child day care facility uses, public assembly uses, and conference facility uses.

§9.3.9 OFF-STREET LOADING

A. Spaces Required

For every retail sales, service, wholesaling, warehousing, or manufacturing establishment and each bus or truck terminal, there shall be provided sufficient space to accommodate the maximum number of trucks that will be loading, unloading, or standing at any one time.

B. Size of Space

Each off-street loading space shall be of a size commensurate with the buildings to be accommodated. In no case shall required off-street loading space encroach upon off-street parking space required under this Article.

C. Location

All required off-street loading spaces shall be located near the on the same lot as the building which they are intended to serve.

D. Entrances and Exits

Off-street loading entrance and exit drives shall be located at least 25 feet from any street intersection.

E. Loading Spaces Adjacent to Sidewalks

Where a loading space is adjacent to a public sidewalk or other public pedestrian way, it shall be so located, arranged, and improved with curbs or other barriers, as to provide adequate protection for pedestrians.

F. Maneuvering Areas

All off-street loading spaces shall be provided with adequate off-street maneuvering areas.

G. Exception: River Village area may load from the public right-of-way and or drive isle as approved by the ARB.

Landscaping, Buffers and Screening

See Article 9.5 of this Chapter.

§9.3 .10 PEDESTRIAN WAYS

A. Where Required

1. Paved ***or unpaved pedestrian*** ways shall be provided in all non-residential development within the Urban and Suburban Areas of the County; and

2. Paved ***or unpaved*** pedestrian ways shall link surrounding roadways with the front entrance and shall provide pedestrian linkages between the proposed development and uses on adjoining lots.

B. Placement

Paved pedestrian ways within publicly dedicated right-of-ways shall conform to the construction details for paved sidewalks contained in Charleston County

Road Construction Standards, Appendix A. Alternative surface walkways may be used outside of right-of-ways when deemed appropriate to surrounding development characteristics by the Planning Director.

ARTICLE 9.4 TREE PROTECTION AND PRESERVATION

§9.4.1 GENERAL

A. Findings

Trees are an essential natural resource, an invaluable economic resource, and a priceless aesthetic resource. Trees play a critical role in purifying air and water, providing wildlife habitat, and enhancing natural drainage of stormwater and sediment control. They also help conserve energy by providing shade and shield against noise and glare. Trees promote commerce and tourism by buffering different land uses and beautifying the landscape. The Tree Protection and Preservation regulations of this Article are intended to enhance the health, safety and welfare of Charleston County citizens.

B. Applicability and Exemptions

1. Applicability

The provisions of this Article in their entirety shall apply to all real property in unincorporated Charleston County, except as otherwise expressly exempted.

2. Exemptions

a. Single family detached residential lots of record shall be exempt from all provisions in this Article except for the Grand Tree documentation, protection and replacement provisions. ~~This exemption does not include applications for Major or Minor Subdivisions for which landscape buffers may be required per Section 9.5.4~~

b. The Planning Director shall be authorized to modify or reduce the standards of this Article for commercial nursery operations.

c. This Article shall not restrict public utilities and electric suppliers from maintaining safe clearance around existing utility lines, and existing easements in accordance with applicable state laws. Siting and construction of future gas, telephone, communications, electrical lines or other easements shall not be exempt from the provisions of this Article.

d. Removal of trees for the purpose of conducting "bona fide forestry operations" shall be exempt from the provisions of this Article except for removal of Live Oak species of Grand T~~t~~rees.

e. Removal of trees for the purpose of establishing bona fide agricultural uses, as specified in Section 3.8.2A of this Ordinance,

shall be exempt from the provisions of this Article except for the *Grand Tree* documentation, protection and replacement provisions.

f. Removal of trees for the purposes of maintaining safe clearance for aircraft as required by federal law or the establishment of facilities exclusively dedicated to aviation operations are exempt from this Article.

g. Removal of trees on *Lots* or *Development* Parcels ~~properties~~ to be **developed for use as** ~~in the~~ a ***Golf Course(s),* wastewater treatment facility, commercial area or any area developed pursuant to a traditional neighborhood design** ~~Industrial Zoning District~~ is permitted pursuant to the following conditions:

i. Tree removal cannot occur prior to site plan approval;

ii. This exemption shall not apply to Live Oak species of *Grand Trees* or any *P~~p~~rotected T~~t~~rees* within required buffers and parking lots; and

iii. Mitigation of removed trees, as stated in this Section, is required. ~~Staff~~ **The *ARB*** shall approve the mitigation of such trees in accordance with Section 9.4.6 of this Ordinance. **Evidence of such mitigation shall be provided to the Planning Director.**

3. Partial Exemptions for SCDOT and CCPW

The South Carolina Department of Transportation (SCOOT) and Charleston County Public Works (CCPW) shall be exempt from the provisions of this Article except the following:

a. All trees species measuring 6 inches or greater *DBH* located in rights-of-way along Scenic Highways as designated in this Ordinance shall be protected and require a variance from the Charleston County Board of Zoning Appeals for removal per Article 9.4.5B and 9.4.6.

b. *Grand Tree* Live Oak species in all present and future rights-of-way shall be protected and require a variance from the Charleston County Board of Zoning Appeals for removal per Article 9.4.5.B and 9.4.6.

c. All *Grand Trees* other than Live Oak species not located on a Scenic Highway are protected but may be permitted to be removed administratively when mitigated per Article 9.4.6.

C. DEFINITION OF "TREE REMOVAL"

For the purpose of this Article, the term "tree removal" shall include, but not be limited to, damage inflicted to the root system by machinery; girdling; storage of materials and soil compaction, changing the natural grade above or below the root system or around the trunk; damage inflicted on the tree permitting fungus

infection or pest infestation; excessive pruning; excessive thinning; paving with concrete, asphalt or other impervious material within such proximity as to be harmful to the tree; or any act of malicious damage to a tree. Excessive pruning or thinning shall be pruning or thinning that exceeds more than 25 percent of the leaf surface on both the lateral branch and the overall foliage of a mature tree that is pruned within a growing season. Additionally, one-half of the foliage of a mature tree is to remain evenly distributed in the lower two thirds of the crown and individual limbs upon completion of any pruning.

D. MEASUREMENTS AND DEFINITIONS

1. Diameter Breast Height

~~Diameter Breast Height is used for measuring all trees greater than 23 inch caliper. The Diameter Breast Height (DBH) of a tree is the total diameter, in inches, of a tree trunk or trunks measured 4 ½ feet above existing grad (at the base of the tree). In measuring DBH, the circumference of the tree shall be measured with a measuring tape design specifically to calculate diameter. A standard measuring tape may be used to measure diameter when the circumference is divided by 3.14. If a tree trunk splits at ground level and the trunks and do does not share a common base (separated by earth at natural grade), then each trunk shall be measured as a separate tree. If a multi-trunk tree splits below the 4.5 feet mark and the trunks share a common base, all trunks shall be measured separately, added together, and count as one tree. Any trunk measuring less than 8 inches DBH is not included in the calculation.~~ ***Diameter Breast Height*** **or** ***DBH*** **shall be as defined** in **section 3 of the** ***Plan.***

~~2.~~1. **Caliper**

Caliper is the diameter of a tree trunk measured six inches above the ground on trees with calipers of four inches or less. For trees between four-inch and 12-inch caliper, the trunk is measured 12 inches above the ground.

~~**3. Grand Tree**~~

~~Any tree measuring 24 inches or greater diameter breast height (DBH) except pines. All Grand Trees are prohibited from removal unless a Grand Tree Removal Permit is issued.~~ ***Grand Tree.*** **shall be as defined in section 3 of the** ***Plan.***

~~**4. Protected Trees**~~

~~Any tree on a parcel with a diameter breast height of eight inches or greater prior to development and all trees within required buffers or required landscape areas. Limited removal is allowed only when specified by the provisions of this Ordinance.~~

Protected Tree **shall be as defined in section 3 of the** ***Plan.***

§9.4 .2 ADMINISTRATION

A. Zoning Permit Required

1. Tree Removal

Removal of required trees is prohibited prior to the issuance of a Zoning Permit by the Planning Director. Zoning Permits will be issued only after a tree plan is approved by the ~~Planning Director~~ ARB **(with respect to any *Protected Trees* other than *Grand Trees)* and the Planning Director (with respect to *Grand Trees)*,** as outlined below.

2. Excess Canopy (Limb) Removal

a. Removal of three or more limbs with an individual diameter of six inches or greater shall require ~~a Zoning Permit~~ **approval by the *ARB*.**

b. Removal of any size limbs which contribute to more than one hundred continuous linear feet of canopy over public roadways shall require Variance approval from the Board of Zoning Appeals. This requirement shall not preclude the SCOOT, CCPW or other entities from maintaining height clearances of 14' or less and width clearances within designated travel ways and from removing unprotected trees along right-of-ways for road widening projects.

8. Documentation

Tree plans, prepared by a licensed registered surveyor, civil engineer or landscape architect shall be required on all non-exempt parcels before any zoning permits are issued.

§9.4.3 TREE PLANS AND SURVEYS

A. General

Tree plans of the same scale as, and superimposed on, a development site plan or preliminary plat shall include location, number, size *(j) BH),* and species with a scaled graphic representation of each *Grand Tree,* canopy size and shape, and the trunk location. All required tree surveys shall include the name, phone number, address, signature, and seal of a licensed surveyor, landscape architect, or civil engineer registered in the State of South Carolina. The survey shall include all trees to be protected or preserved, and those scheduled to be removed, including dead and damaged trees. In cases where a previously approved recorded plat is utilized for the purpose of tree plans the name, address, phone number, signature and seal of the licensed landscape architect, civil engineer, forester or surveyor, registered in the State of South Carolina shall be provided. A scaled infrared or high resolution black and white aerial photograph or print of equal quality may be substituted in cases where the ~~Planning Director~~ ARB determines that it would provide the same information as a tree plan. However, all *Grand Trees* within 40 feet of proposed construction and land disturbance areas and trees within required buffers must be surveyed and mapped.

B. Major and Minor Subdivision Preliminary Plats

Refer to Section 8.4.2.A.4 Preliminary Plat Application in the Subdivision Regulations of Chapter 8 of this Ordinance.

C. Commercial, Industrial and Multi-Family Parcels

1. All tree surveys must show the location, number, size and species of all ~~*Trees 8 inches or greater DBH (Diameter Breast Height)*~~ ***Protected Trees,*** including those scheduled to be removed.

2. When there are ***Protected*** ~~**Trees trees 8 inches or greater DBH**~~, documentation of this fact shall be provided from a registered surveyor, engineer or landscape architect.

[Commentary: Assistance in tree identification and condition should be provided by a forester or qualified arborist.]

D. Single Family Detached Residential Parcels

1. Single family detached residential parcels shall show all *Grand Trees* within the area of construction and land disturbance and in conjunction with the subdivision regulations of this Ordinance at the time a zoning or building permit application is made.

§9.4.4 REQUIRED TREE PROTECTION

A. General

All *Grand Trees* and any other trees required to remain on a site as outlined in this Ordinance must be protected during construction and development of the parcel. Tree protection must be shown on all development plans prior to site plan approval. A site inspection of the tree barricades must be scheduled by the applicant with the Planning Department for approval prior to the issuance of permits or the start of development activities.

Prior to issuance of a zoning permit, a pre-construction planning conference for tree preservation is required on site with the Planning Director's representative **and the *ARB's* representative,** the applicants, and any parties deemed appropriate for the purpose of determining if there is a need for additional tree protection techniques and for designating placement of tree barricades, construction employee parking, temporary construction office and dumpsters.

B. Tree Protection During Development and Construction

Protective barricades shall be placed around all required trees in or near development areas on all zoning parcels, prior to the start of development activities. These barricades, constructed of wood or plastic fencing or other approved materials shall be erected in accordance with standards by the Planning Director **(with respect to *Grand Trees* only) and standards by the *ARB* (with respect to all other *Protected Trees)*** and placed beneath the canopy drip line or one and one-half feet times the *DBH* of the tree. Other protective devices or construction techniques may be used as approved by the Planning Director. The barricades shall remain in place until development activities are complete. The area within the protective barricade shall remain free of all building materials, dirt, fill, or other construction debris, vehicles, and development activities. All ***Grand Trees*** ~~required trees~~ are also subject to the provisions of Section 9.5.6 of this Chapter and subject to the enforcement criteria of Chapter 11.

C. Partial Exception for Limited Clearing

Limited clearing and grubbing may be authorized by the Planning Director **(with respect to *Grand Trees* only) and the *ARB* (with respect to all other *Protected Trees)*** prior to the installation of protective tree barricades on sites that exhibit unusually heavy undergrowth where access to the interior of the site and its protected trees would be otherwise highly impractical. Limited clearing shall be for the express purpose of accessing the property and *Pprotected Ttrees* to erect the required tree protection and silt fencing. For the purposes of this Article, limited clearing shall be clearing done with hand tools, push or walk behind equipment or lightweight bush-hog type equipment designed specifically for brush and undergrowth clearing that is not capable of removing vegetation greater than 3 inches in diameter. Under no circumstances will metal tracked bulldozers, loaders, or similar rider/operator types of equipment be allowed on the site until the protective barricades are erected and a zoning permit isissued.

D. Separation of Trees from Pavement, Grading and Structures

Paved areas shall be separated from trees by a minimum distance of the drip line or one and one-half feet times the *P BH* or as modified by the Planning Director **(with respect to *Grand Trees* only) or the *ARB* (with respect to all other *Protected* Trees)** as deemed necessary to protect the root system of the tree. Paved areas shall not constitute more than 25 percent of the protected area beneath a tree. Any paving, grading, trenching, or filling within the remaining 75 percent of the protected area must be approved by the Planning Director **(with respect to *Grand Trees* only) or the *ARB* (with respect to all other *Protected Trees)*** and may require specific construction techniques be used in order to preserve the health of the tree. Refer to Chapter 9 exhibits for examples. When grading and construction within the protected area of a tree has been approved, all damaged roots shall be severed clean and inspected by the County Landscape Architect or Inspector **(with respect to *Grand Trees* only) or a representative of the *ARB* (with respect to all other *Protected Trees)*** prior to the receipt of a Zoning Permit.

E. Quantity and Location of Trees to be Protected

Before the issuance of a Zoning Permit for Commercial, Industrial, Multi-Family, and Civic/Institutional uses, the following number of ***Protected Trees*** ~~trees with a diameter breast height of 8 inches or greater~~ shall be preserved and protected in accordance with the provisions of Section 9.4.4.B of this Ordinance. All trees located within required buffers as outlined in Article 9.5 shall be protected.

1. 20 trees per acre; or

2. Any number of trees with a combined ~~DBH (diameter breast height)~~ of at least 160 inches per acre.

3. Required drainage improvements such as detention and retention ponds and wetlands may be subtracted from the area used to calculate tree preservation requirements.

4. Exception: This section does not apply to the River Village area

§9.4.5 TREE REMOVAL

A. Generally

Permits for tree removal may be approved where one or more of the following conditions are deemed to exist by the Planning Director **(with respect to *Grand Trees* only) or the *ARB* (with respect to all other *Protected* Trees):**

1. Trees are not required to be retained by the provisions of this Article.
2. Trees are diseased, dead or dying (as determined by the Planning Director **(with respect to *Grand Trees* only) or the *ARB* (with respect to all other *Protected Trees)*** or a qualified arborist);
3. Trees pose an imminent safety hazard to nearby buildings, or pedestrian or vehicular traffic (as determined by the Planning Director **(with respect to *Grand Trees* only), or the *ARB* (with respect to all other *Protected Trees)*** or a qualified arborist); or
4. Removal of required trees has been approved by the Board of Zoning Appeals **(with respect to *Grand Trees* only) or the *ARB* (with respect to all other *Protected* Trees).**

B. Variances

Grand Trees ~~and protected trees~~ that do not meet the above criteria may be removed only where approved by the Board of Zoning Appeals, and shall be replaced according to a schedule determined by the Board. The Planning Director will make recommendations to the Board concerning the number, species, *DBH* or caliper, and placement of such trees. ***Protected Trees* that do not meet the above criteria may be removed only where approved by** the *ARB and* shall be replaced according to a schedule determined by the *ARB.* The applicant shall provide evidence of mitigation to the Planning Director.

C. Emergency Provisions

In the event that a tree poses a serious and imminent threat to public safety due to death, disease or damage resulting from emergencies including, but not limited to, fires, flooding, storms, and natural disasters, the Planning Director may waive requirements of this Article. Documentation must later be submitted for review outlining the threat to public safety which initiated the removal. Documentation must include any written findings by a qualified arborist and photographs supporting the tree removal emergency. The Planning Director may require replacement of required trees that are removed where it is determined that death or disease resulted from negligence.

D. Violations and Penalties

Violations and penalties are specified in Chapter 11 of this Ordinance.

§9.4.6 TREE REPLACEMENT

A. Generally

Tree replacement shall be required accompanying development on all non-

exempt properties in the manner described below:

1. When replc;1cement canopy trees are required in fulfillment of the requirements of this Article, they shall be no smaller than two and one- half-inch caliper.

2. **With respect to *Grand Trees* only,** tThe Planning Director or Board of Zoning Appeals is empowered to require trees of larger caliper as determined appropriate for site-specific conditions and the circumstances, lawful or illegal, under which removal occurred.
3. **With respect to all other *Protected Trees*, the *ARB* is empowered to require trees of larger caliper as determined appropriate for site-specific conditions and the circumstances, lawful or illegal, under which removal occurred.**

B. Wooded Site with 160 Inches per Acre or More DBH

The requirements of this section apply to all areas of the development except the River Village. **When ~~*trees of 8 inches DBH or greater*~~ *Protected Trees* have been removed in** violation of this Ordinance, replacement trees shall be planted in the same general area according to a replacement schedule approved by the Planning Director ~~**(with respect to *Grand Trees* only) and the *ARB* (with respect to all other *Protected* Trees)**~~.

C. Sites with Less Than 160 Inches per Acre Combined DBH

The requirements of this section apply to all areas of the development except the River Village. When lots lack a sufficient number of trees to meet the requirement for DBH/number of trees per acre, all ~~***Protected Trees*** *trees six inches DBH or greater*~~ shall be preserved and protected in accordance with Section 9.4.4.B of this Chapter during development and must equal no less than 40 inches per acre combined DBH. On lots with less than 40 inches per acre combined DBH, additional trees shall be planted on the lot equaling or exceeding 40 inches per acre combined *P BH.* Planting schedules shall be approved by the ARB ~~Planning Director~~

D. Previously Cleared Sites

Where sites were completely cleared of trees prior to adoption of this Article or have been cleared subsequently for activities exempted from this Article, replacement trees shall be planted, the combined caliper of which equals or exceeds 40 inches per acre. Replacement schedules, including number, species, caliper and placement shall be approved by the ARB. ~~Planning Director.~~

E. Tree Fund

The Tree Fund is a fund established to receive monies exacted from tree removal violation fines to include, but not be limited to, removal, damage, destruction, or as defined in Section 9.4.1.C of this Chapter, and as a form of mitigation when planting of the required trees is determined to be detrimental to the overall health of existing trees or impractical for the intended site design. The Planning Director shall impose a Tree Mitigation fee based on the current market retail value of two- to three-inch caliper trees installed to the American Association of Nurserymen Standards. If the applicant disagrees with the amount of the Tree Mitigation fee imposed, they may file appeal with the Board

of Zoning Appeals in accordance with the prov1s1ons contained in this Ordinance. All Tree Mitigation fees collected shall be paid to the County Treasurer and placed in an account established exclusively for public beautification through the planting of trees in Charleston County.

F. Bankruptcy or Abandonment of Site

When trees have been removed through an approved mitigation program and the project will not be completed for any reason (i.e., bankruptcy, abandonment, change in ownership, etc.), the owners of the subject property are responsible for the mitigation of the removed trees as outlined and agreed or subject to Section 9.4.6E of this Chapter.

§9.4.7 INSPECTIONS AND FINAL APPROVAL

A The Planning Director **and a representative of the *ARB*** shall periodically visit development sites prior to completion to monitor compliance with the tree plan approved for a project.

B. Prior to issuance of a Certificate of Occupancy for a completed structure by the Director of Building Services, the Planning Director **(with respect to *Grand Trees* only) and the *ARB* (with respect to all other *Protected* Trees)** shall issue a statement of approval attesting to the developer's compliance with the site plan approved for the project (including landscaping, parking, drainage, etc.). The Director of Building Services shall withhold certificates of occupancy pending verification of compliance. It is the responsibility of the owner or agent to contact the Planning Director **and *ARB*** regarding the compliance inspection. Such inspections will occur within five working days of contact. Failure to obtain a Certificate of Occupancy prior to occupying or using the building for its intended purpose will result in ticketing and fines. However, the Planning Director shall approve a delayed schedule for planting materials (provided by the applicant's contractor) when the immediate planting schedule would impair the health of the plants. When a delayed planting schedule is approved, the applicant shall provide a bond equivalent to one and one-half times the projected cost of the planting materials. This is designed to include severe weather, such as droughts, heat waves, and floods.

C. Within three years of the issuance of the Certificate of Occupancy, the ARB ~~Planning Director~~ shall perform a site inspection to verify the health of trees which were retained to meet the requirements of this Article and which may have suffered damage due to insufficient protective measures during development. **The results of this inspection shall be immediately provided to the Planning Director.**

D. Each required tree that is determined by the ARB ~~Planning Director~~ to be diseased or injured to the extent it is irreparably damaged shall be approved for removal. The burden of proof of the extent of the disease or injury shall rest with the applicant, who must provide documentation from a qualified arborist. Any tree damaged during or as a result of construction shall be repaired to the satisfaction of the ARB ~~Planning Director~~ and in accordance with accepted ANSI A300 or International Society of Arboriculture practices. Tree damage must be repaired prior to issuance of a Certificate of Occupancy.

E. The owners of a non-exempt property or properties shall be responsible for the maintenance of all required trees. No department or agent of the County of Charleston is in any way responsible for the maintenance of required trees on private property.

ARTICLE 9.5 LANDSCAPING, SCREENING AND BUFFERS

§9.5.1 APPLICABILITY

Unless expressly exempted, the landscaping, screening and buffering standards of this Article shall apply to all new non-residential development and all new major roadways that serve Residential Major Subdivisions (ten or more lots). Minor Subdivisions (those with fewer than ten lots) may be required to provide landscaping, screening or buffering on major roadways when the Planning Director determines that such landscaping, screening or buffering is necessary to ensure that the purposes of this Ordinance are met. When modifications or additions are being made to an existing non-residential building or site, the standards of this Article shall apply to those portions of the subject parcel that are directly affected by the proposed improvements, as determined by the Planning Director, provided that when modifications or additions are proposed that would increase the number of parking spaces, the area of vehicular use areas or

gross floor area of buildings by more than 25 percent (above existing), then the entire parcel shall be brought into compliance with all applicable standards of this Article. Before calculating the percentage of area for re-development and improvement, any proposed demolition of structures and parking is subtracted from the existing gross floor area of buildings and number of parking spaces.

§9.5.2 EXHIBITS

Drawings included as exhibits at the end of this Chapter are meant to compliment the language of the Ordinance. In the event of a conflict with the text of the Ordinance, the text shall apply.

§9.5.3 PARKING, LOADING AND VEHICULAR USE AREA LANDSCAPING

A. Parking, Loading and Vehicular Area Perimeters THE REQUIREMENTS OF THIS SECTION APPLY TO ALL AREAS OF THE DEVELOPMENT EXCEPT THE RIVER VILLAGE.

Unless otherwise expressly stated, perimeter landscaping shall be required around the outer perimeter of all off-street, surface parking, loading and vehicular use areas. Parking areas for the exclusive use of single family or agricultural uses shall be exempt from these requirements. Any off-street parking, loading or vehicular use area that will be entirely screened from *view* by an intervening building or structure or by a buffer provided to satisfy the standards of this Chapter shall also be exempt from these (parking, loading and vehicular use Area) perimeter landscaping requirements.

1. A perimeter landscape area at least eight feet in-depth shall be provided at the perimeter of all off-street parking, loading and vehicular use areas, except where permitted driveway openings are to be provided. Where drainage or other utility easements exist along property lines, the perimeter landscape area shall be located adjacent to the easement.

2. Required perimeter landscape areas shall be planted in accordance with the following minimum standards:

   c. One canopy tree shall be provided for each 50 linear feet of parking, loading or vehicular use area perimeter. These trees may be used to satisfy the interior parking lot landscaping requirements.

   d. A hedge or other landscape material of at least three feet in height (at maturity) shall be planted within the perimeter landscape area to provide a continuous landscape element, or a combination of trees, hedge, other durable landscape material or approved wall, fence or earth berm may be used to form the continuous landscape element;

   e. All portions of the perimeter landscape area not planted with shrubs or trees or covered by a wall or fence barrier shall be planted in grass or ground cover; and

   f. Parked vehicles may overhang a landscaped area if curbing or wheel stops are installed *to* prevent any damage to plants within the required perimeter landscape area. Landscaping, walls, fences and earth berms will be so located as to prevent their damage and/or destruction by overhanging vehicles.

B. Interior Areas THE REQUIREMENTS OF THIS SECTION APPLY TO ALL AREAS OF THE DEVELOPMENT EXCEPT THE RIVER VILLAGE.

The following interior parking lot landscaping requirements shall apply to all parking lots except those exclusively serving single family residential or agricultural uses.

3. A minimum of one landscape island shall be provided for each ten parking spaces within an off-street parking area. Required landscape islands shall have a minimum of 325 square feet, variably dependent upon the species of the canopy tree proposed by the designer. Each parking lot bay must terminate with a tree island.

4. Each required landscaping island shall contain at least one canopy tree and there shall be no more than ten parking spaces in a row between tree islands. Interior parking landscape islands that separate double loaded parking bays shall be a minimum of nine feet wide. Canopy trees planted in these islands must be planted in line with the parking stripes (between vehicles) and may be used to satisfy the parking lot tree requirements, however, all parking lot bays must terminate with a tree island. Example shown in Chapter 9 exhibits.

5. Curbs, wheel stops or other approved protective barriers shall be installed around all required landscape islands, as approved by the Planning Director.

6. Landscaping provided to meet the right-of-way buffer standards of Section 9.5.4 of this Chapter may not be used to satisfy interior parking lot landscaping requirements. Canopy trees provided to meet perimeter adjacent use buffer landscaping requirements may be counted to satisfy interior parking lot landscaping requirements.

C. Parking, Loading and Vehicular Area Perimeters THE REQUIREMENTS OF THIS SECTION APPLY TO THE RIVER VILLAGE.

1. If required by the ARB a perimeter landscape area shall be provided at the perimeter of all off-street parking, loading and vehicular use areas, except where permitted driveway openings are to be provided. Where drainage or other utility easements exist along property lines, the perimeter landscape area shall be located adjacent to the easement.

2. Required perimeter landscape areas shall be planted as required by the ARB

D. Interior Areas THE REQUIREMENTS OF THIS SECTION APPLY TO THE RIVER VILLAGE.

Interior parking lot landscaping requirements shall be as determined by the ARB.

LANDSCAPE BUFFERS (APPLIES TO BETSY KARRISON PARKWAY ONLY)

A. Right-of-Way Buffers

1. Applicability

Right-of-way buffers shall be required adjacent to road rights-of-way for all uses except for the following: agricultural and residential uses existing on or prior to November 20, 2001. Minor Subdivisions may not have to comply with the requirements of this Section if the Planning Director determines that compliance is not necessary to satisfy the purposes of this Ordinance.

2. Buffer Reductions

The Planning Director shall be authorized to reduce the depth of a required right-of-way buffer by up to one-third its depth if the following circumstances exist:

a. The parcel is located on a corner lot with required right-of-way buffers of 35 feet or more; or

b. The area of all required buffers, including Land Use Buffers and Tree

Protection Areas exceeds 30 percent of the site.

3. Buffer Types by Roadway

Landscape buffers shall be required along roadways in accordance with the following table. Streets and roads not indicated in the table shall comply with the S2 buffer requirements. Section 9.5.4 of this Chapter describes buffer types and planting requirements.

4. Development Within Buffer Areas

a. No development may occur within required buffer areas; with the exception of sidewalks and permitted drives and signs;

b. All buffer areas shall accommodate required plant material within the buffer;

c. Drainage swales and stormwater detention ponds may be placed in the buffer only when trees are not endangered and only when they meander through the buffer in a natural manner; and

d. Stormwater detention ponds may not occupy more than twenty-five percent (25%) of the buffer area.

ROADWAY	BUFFER TYPE	ROADWAY	BUFFER TYPE
Abbapoola Road	S4	Magwood Road	S3
Ashley Hall Road	S1	Main Road (Limehouse Bridge to Maybank Hwy.)	S5
Hwy. 61/Ashley River Road (Saint Andrews Boulevard to Sam Rittenberg Boulevard)	S1	Main Road (Bees Ferry Road to Limehouse Bridge)	S4
Hwy. 61/Ashley River Road (Sam Rittenberg Boulevard to Mark Clark Expressway)	S2	Manse Road	S4
Hwy. 61/Ashley River Road (Mark Clark Expressway to Church Creek)	S3	Mark Clark Expressway	S5
Hwy. 61/Ashley River Road (Church Creek to Muirfield Parkway/Maclaura Hall Ave.)[11]	S5	Mary Ann Point Road	S3
Hwy. 61/Ashley River Road (Muirfield Parkway/ Maclaura Hall Avenue intersection to Charleston County Line) [11]	S6	Mathis Ferry Road [1]	S4
Bears Bluff Road	S5	Maybank Highway Corridor Overlay District	[2]
Bees Ferry Road	S4	Maybank Highway [James Island]	S1
Belvedere Road	S4	Maybank Hwy (Main Road to Rockville)	S5
Betsy Kerrison Parkway [1]	S6	Meeting Street	S1
Bohicket Road [1]	S5	Murraywood Road	S4
Botany Bay Road	S4	Old Georgetown Road	S4
Brownswood Road	S4	Liberia Road	S4
Abbapoola Road	S4	Old Georgetown Road in the "Loop" area (designated on the Mount Pleasant Overlay map)	S1
Cane Slash Road	S4	Old Jacksonville Road	S4
Chisolm Road	S4	Old Pond Road	S4
Chuck Dawley Boulevard	S1	Old Towne Road	S1
Coleman Boulevard	S1	Orange Grove Road	S1
Doar Road	S4	Orleans Road	S1
Dorchester Road	S1	Parkers Ferry Road	S4
Eddingeville Beach Road	S4	Patton Avenue/Fickling Hill Road	S4
Edenvale Road	S4	Peters Point Road	S4

ROADWAY	BUFFER TYPE	ROADWAY	BUFFER TYPE
Fordham Road	S1	Pine Landing Road	S4
Fort Johnson Road [1]	S3	Plow Ground Road	S4
Hamlin Road	S3	Raccoon Island Road	S4
Harborview Road	S1	Rifle Range Road	S3
Highway 162	S4	River Road [1]	S5
Highway 165	S4	Riverland Drive [1]	S4
Highway 17 (Hwy. 41 to County Line)	S5	Rivers Avenue	S1
Highway 17 (east of Isle of Palms Connector to Hwy. 41, not including Old Georgetown Hwy "Loop" Area)	S4	Rutledge Road	S4
Highway 17 in the Old Georgetown Road "Loop" area (as designated on the Mount Pleasant Overlay map)	S1	Saint Andrews Boulevard	S1
Highway 17 (west of the Isle of Palms Connector including bypass)	S1	Savannah Highway [Bees Ferry Rd. to County Line] otherwise S2	S3
Highway 174 (Highway 164 to Edisto Beach) [1]	S5	Seewee Road	S4
Highway 174 (Highway 17 to Highway 164)	S3	South Santee Road	S4
Highway 41	S4	Steamboat Landing Road (Jenkins Hill Rd to Steamboat Creek)	S4
Highway 45	S4	Tibwin Road	S4
Humbert Road	S3	Toogoodoo Road	S4
James Island Bridge/Highway 61 Connector	S3	Venning Road	S3
James Island Expressway	S4	Wappoo Road	S1
Liberia Road	S4	Wescott Road	S4
Long Point Road (SPA Wando Terminal to I-526)	S1	Willtown Road	S4
Long Point Road (Outside of MP-O district) [1]	S4		

[1] Denotes Scenic Road des1gnat1on that shall require protection under the provisions of this Ordinance of all trees 6 inches or greater in diameter breast height (DBH) which are located within rights-of-way.

[2] S6 for industrial use; S5 all other uses.

~~5. Buffer Depth and Planting Standards~~

~~STANDARD~~	~~BUFFER TYPE~~					
	~~S1~~	~~S2~~	~~S3~~	~~S4~~	~~S5~~	~~S6~~
~~MIN. BUFFER DEPTH (ft from right-of-way) [1]~~	~~15~~	~~20~~	~~35~~	~~50~~	~~75~~	~~100~~
~~MINIMUM BUFFER LANDSCAPING (Plants per 100 linear feet) [2][3]~~						
~~Canopy Trees [4]~~	~~2~~	~~2~~	~~4~~	~~6~~	~~9~~	~~12~~
~~Understory Trees (at least 50 percent evergreen)~~	~~3~~	~~4~~	~~6~~	~~9~~	~~12~~	~~15~~
~~Shrubs~~	~~25~~	~~30~~	~~40~~	~~50~~	~~60~~	~~75~~
~~Street Trees (may be counted toward canopy tree req.) [5]~~	~~2~~	~~2~~	~~2~~	~~2~~	~~2~~	~~NA~~

~~All trees with a diameter breast height (DBH) of 6 inches or greater within buffers shall be preserved.~~

~~[1] Buffers may be traversed by permitted driveways and pedestrian ways.~~

~~[2] The retention of natural buffers shall be required along all road or street rights-of-way of S3 designation or greater. The Planning Director shall be authorized to waive/modify minimum buffer planting requirements when an undisturbed natural buffer exists that is the same depth and amount of plant materials as that which is required.~~

~~[3] Bradford Pears cannot be used to fulfill any of the tree requirements of this Ordinance. Any exotic species which are proposed by the designer are subject to approval of the Planning Director.~~

~~[4] When existing overhead utility lines are located such that they may pose interference with required canopy trees, Palmetto trees may be substituted to fulfill the canopy tree requirements. These trees are to be planted at a ratio of three Palmetto trees to one canopy tree and are to be planted in groupings of three.~~

~~[5] Street trees are trees planted in rights-of-way for the purpose of fulfilling these requirements. Any planting in rights-of-way must be approved by party(ies) authorized to grant encroachment.~~

~~Note: The Planning Director shall be authorized to require the installation of berms within required buffers where deemed necessary to protect the visual quality of a road corridor or ensure land use compatibility.~~

B. Land Use Buffers

1. Applicability

Land use buffers shall be provided in accordance with the standards of this Section, provided that the Planning Director shall be authorized to modify or waive buffer or landscape planting requirements if it is determined that:

a. Buffers will not serve any useful purpose due to the fact that fences, walls, berms, or landscaping of at least equivalent height, opacity, and maintenance already exist on the adjacent parcel;

b. Buffers will not serve any useful purpose due to the location of uses, vehicles, buildings, structures, or storage, loading, display or service areas; or

c. The area of required buffers would exceed 25 percent of the site proposed for development.

When landscape buffer requirements are modified or waived, the Planning Director may require that additional plant material be added within remaining buffers or elsewhere on the site.

2. Exemptions

Single family development on individual lots shall be exempt from the land use buffer requirements of this Section.

~~**3. Determination of Required Buffers**~~

~~The following procedure shall be used in determining which of the buffer types in the Land Use Buffer Table (Section 9 .5.4.B.4) of this Chapter apply:~~

~~a. Determine the type of use proposed for the site that is being developed. This is the "Proposed Use" (Column 1);~~

~~b. Determine the residential use type that exists on the adjacent parcel (if residential) or the zoning district classification that applies to the adjacent parcel. This is the "Adjacent Site's Use or Zoning";~~

~~c. Identify the type of landscape buffer required along the developing site's boundary (A, B, C, D, E, or F);~~

~~d. Refer to Section 9.5.4.B.5 of this Chapter to identify the buffer depth and landscaping standards for the required buffer type.~~

4. Land Use Buffer Table

Land use Buffer Table located in Section 8.2 of the PD Document ~~Land Use Buffers shall be provided along side and rear yards in accordance with the following minimum requirements:~~

Proposed Use	Use or Zoning of Adjacent Site											
	Residential Type			Zoning District								Agricultural Use
	1	2	3	R (1)	OR	OG	CN	CT	CR	CC	I	
Residential Type 1	I	A	B	I	A	B	B	B	B	C	D	E
Residential Type 2	A	I	A	I	A	B	B	B	B	C	D	E
Residential Type 3	B	A	I	I	A	A	B	B	B	C	D	E
Civic/Institutional	B	B	A	A	I	I	I	I	I	I	I	I
Commercial Type 1	B	B	B	B	I	I	I	I	I	I	I	I
Commercial Type 2	C	C	C	C	C	B	B	I	I	I	I	I
Industrial Type 1	E	E	D	D	D	D	C	C	C	B	I	I
Industrial Type 2	F	F	E	F	E	E	D	C	C	C	A	I

[1] Applies to undeveloped (vacant) R and AGR zoned property.

Residential Use Types: Type 1 = Single family Detached; Type 2 = Duplex and Single family Attached; Type 3 = Multi-Family and all other residential use types, including manufactured housing parks.

Commercial Use Types: Type 1 = Any commercial use allowed by right in an OR, OG or CN district; Type 2 = all other commercial uses that are allowed in commercial (c) zoning districts (commercial uses are those listed in the "Commercial" rows of Use Table 6.1-(1)

Industrial Use Types: Type 1 = Any industrial or commercial use that is first allowed in an industrial (I) zoning district; Type 2 = Waste-Related uses, Resource Extraction uses and Recycling Centers.

5. Buffer Depth and Landscaping Standards

Standard	Buffer Type					
	A	B	C	D	E	F
MINIMUM BUFFER DEPTH (feet from property line)	10	15	25	40	60	100
MINIMUM LAND USE BUFFER LANDSCAPING (Plants per 100 linear feet) [1][2]						
Canopy Trees	2	3	3	5	7	9
Understory Trees (at least 50 percent evergreen)	3	4	4	7	9	11
Shrubs	20	20	25	30	40	50

[1] The Planning Director shall be authorized to require the installation of fences, walls or berms within required buffers where deemed necessary to ensure land use compatibility or otherwise protect the visual quality of an area.

[2] All trees with a diameter breast height (DBH) of 8 inches or greater within buffers shall be preserved.

C. General

1. Location of Buffers

Buffers shall be located along the perimeter of a lot or parcel and shall extend to the boundary of the lot parcel. They shall not be located on any portion of public right-of-way. Where drainage or other utility easements exist along property lines, required landscape buffers shall be located adjacent to the easement and may be reduced in width by the width of the easement, but in no case shall the buffer width be less than ten feet. Required buffers shall be noted on all plats, plans and permit requests submitted for review and approval under this Ordinance.

2. Use of Buffers

The ~~following items shall be Planning Director shall be authorized to~~ allowed within required buffers; on-premises signs, fences, walls, berms, mailboxes, access to community boat ramps, permitted driveways, ~~and~~ sidewalks, and trails, drainage, and other utilities ~~within required buffers~~. Drainage and other utilities shall be installed perpendicular to minimize the impact. Other improvements may be allowed within buffers if the Planning Director determines that such improvements will not detract from the intended purpose and function of the buffer or have any adverse affect on adjacent property.

§9.5.5 Landscape Plans

Landscape and Planting Plans submitted to meet the requirements of the Ordinance are to be drawn to the same scale as the Site Plan depicting proposed shrubs and trees at maturity. It is strongly encouraged that all Landscape Plans be prepared by a licensed registered Landscape Architect or Landscape Designer familiar with the growth habits and characteristics of plant material available in the Charleston area. Landscape Plans shall be prepared by a licensed, registered Landscape Architect whenever the area of land disturbance or development activity exceeds one acre or when the total area of proposed building footprint exceeds 5,000 square feet.

§9.5.6 Landscape Material Standards

Landscape and plant material used to satisfy the standards of this Ordinance shall comply with the minimum standards of this Section. The requirements of this section apply to all areas of the Development except the River Village. The ARB shall review and approval all landscape materials for the River Village, and the Property Owner shall provide the Planning Director a copy of the ARB approval as part of each Development application.

A. Plant Material

1. Existing Plant Material

Vegetation and plant material that exists on a parcel prior to its development may be used to satisfy the landscaping standards of this Section provided that it meets the size and locational requirements of this Article.

2. Size

Unless otherwise expressly stated, all plant materials used to satisfy the requirements of this Ordinance shall meet the following minimum size standards:

PLANT TYPE	MINIMUM SIZE
Canopy Tree	2 1/2 inches caliper and 12 feet in height
Understory/Ornamental Tree	8 feet (height)
Evergreen/Conifer Tree	5 feet (height)
Shrubs	3 gallon and 18" to 24" in height or spread

Note: At least 50 percent of required understory trees shall be evergreens. Any plant material that grows to an ultimate height of less than 18 inches shall be considered a groundcover and cannot be used to fulfill any of the shrub requirements of this Ordinance.

3. Species

Species of plant material used to satisfy the requirements of this Section shall be indigenous to the Charleston County area or are cultivated to survive in the climate of this area. No single plant species shall represent more than 40 percent of total landscape plantings, except for projects whose landscape requirements for canopy trees are lower than ten.

4. Quality

Plants installed to satisfy the requirements of this Section shall meet or exceed the plant quality standards of the most recent edition of American Standard for Nursery Stock, published by the American Association of Nurserymen. Plants shall be nursery-grown and balled and burlapped or container-grown.

5. Additional Landscape Treatment

All required landscape areas, including drainageways and detention/retention ponds, and buffers not dedicated to trees, shrubs or preservation of existing vegetation shall be landscaped with grass, ground cover, or other landscape treatment, not including sand, rock or pavement. All grass areas are to be installed using proper and accepted landscape methods to assure germination and erosion control.

B. Berms and Landscape Structures

Berms and landscape structures shall comply with the following minimum standards.

1. Fences and Walls

Fences and walls used as a screen shall be at least 95 percent opaque, with a minimum height of six feet.

2. Berms

Earthen berms shall have a minimum height of three feet, with a slope not to exceed 3:1, variable dependent upon the plant materials and soil type used. The toe of any berm shall be located at least three feet from the ultimate right-of-way or property line

§9.5.7 Installation, Maintenance and Replacement

A. Installation

All landscaping shall be installed according to American Association of Nurserymen Standards and sound nursery practices in a manner designed to encourage vigorous growth. Sites for plant material shall be prepared or improved in accordance with American Association of Nurserymen Standards for soil preparation and drainage. Subsurface drainage shall be provided where berms, elevated planting areas or other suitable means for providing proper drainage do not exist.

B. Irrigation

The Planning Director shall be authorized to require the installation of automatic irrigation (sprinkler) systems when deemed necessary to ensure plant survival and proper growth.

C. Maintenance and Replacement

Required trees, shrubs, walls and other landscape features shall be considered as elements of the project in the same manner as parking, building materials and other details are elements of the plan. The land owner, or successors in interest, shall be jointly and severally responsible for the following:

1. Regular maintenance of all landscaping in good condition and in a way that presents a healthy, neat, and orderly appearance. All landscaping shall be maintained free from disease, pests, weeds and litter. This maintenance shall include weeding, watering, fertilizing, pruning, mowing, edging, mulching or other maintenance, as needed and in accordance with acceptable horticultural practices, including ANSI standards for Tree Care Operations and American Association of Nurserymen Standards;

2. The repair or replacement of required landscape structures (e.g., fences) to a structurally sound condition;

3. The regular maintenance, repair, or replacement, where necessary, of any landscaping required by this Section; and

4. Continuous maintenance of the site as a whole

When replacement of trees, plant material or other landscape features is required, such replacement shall be accomplished within one growing season, one year or such time-frame as required by the Planning Director, whichever is shorter.

ARTICLE 9.6 ARCHITECTURAL AND LANDSCAPE DESIGN STANDARDS

§9.6.1 PURPOSE

The purpose of these standards is to promote attractive, well-designed development that is built to human scale; to promote and protect the appearance, character and economic value of new development; to encourage creativity in new development (as opposed to homogeneity or "look-alike" projects); and to foster attractive streetscapes and pedestrian environments, while accommodating safe vehicular movement and access.

§9.6.2 APPLICABILITY

These standards shall apply to all developments that are subject to Site Plan Review. (See Article 3.7)

§9.6.3 ARHITECTURAL DESIGN GUIDELINES

The intent of the Architectural Design Guidelines is to assure respect for the character, integrity, and quality of the built and natural environments of the county; it is not intended to stifle innovative architecture. The following criteria shall be used in evaluating applications:

A. General Design

1. Single, large building masses shall be avoided. Structures with walls of more than 1,500 square feet should incorporate fascias, canopies, arcades, building setbacks of three feet or more or other multidimensional design features to break up large wall surfaces on their street facing elevations. Wall surfaces shall be visually divided by such features into areas of 750 square feet or less.

2. All elevations of a structure shall be in harmony, one with another, in terms of scale, proportion, detail, material, color, and high design quality.

3. The side and rear elevations of buildings shall be as visually attractive as the front elevation, especially where those side or rear elevations are most often viewed by the public. Rooflines and architectural detailing shall present a consistency in quality design.

4. All structures within a proposed development, including gasoline canopies, shall utilize a uniform architectural theme and shall be designed to create a harmonious whole. It is not to be inferred that buildings must look alike to achieve a harmony of style. Harmony of style can be created through property considerations of scale, proportion, detail, materials, color, site planning, and landscaping.

5. The scale of buildings and accessory structures (including canopies) shall be appropriate to the scale of structures located in the surrounding area. Canopies designed as domineering or overpowering architectural features are strongly discouraged.

6. Long, monotonous facade design, including, but not limited to, those characterized by unrelieved repetition of shape or form, or by unbroken extension of line, shall not be permitted.

7. The architectural design and material finish of buildings, signage, gasoline pump canopies, and other necessary structures shall be compatible with one another and with adjacent and surrounding structures where such structures are substantially in compliance with these requirements.

8. Structures which are of symbolic design for reasons of advertising shall not be permitted. A symbol or symbols attached to a building shall not be allowed unless it is secondary in appearance to the structure and landscape, and is an aesthetic asset to the building and surrounding area.

9. The location and dimension of wall signs shall be indicated upon the architectural elevations of proposed structures and shall maintain compatibility with the architectural features of the structure.

B. Building Materials

1. Concrete finishes or precast concrete panels (tilt wall) that are not exposed aggregate, hammered, sandblasted or covered with a cement based acrylic coating shall be prohibited as an exterior building material along any building elevation visible from public rights of way.

2. Unpainted or bare metal panels, regardless of depth or thickness, shall be prohibited as an exterior building material.

3. Corrugated or sheet metal, except stainless steel, copper, or galvanized metal shall be prohibited as an exterior building material along any building elevation visible from public rights of way.

4. Mirrored glass with a reflectance greater than 40 percent shall be prohibited from covering more than 40 percent of the exterior walls of any building.

5. Materials shall express their function clearly and honestly and shall not appear as materials which are foreign to the character of the rest of the building.

6. Any building exterior elevation shall consist of architectural materials which are equal in quality, appearance, and detail to all other exterior elevations of the same structure. Nothing in this Section shall preclude the use of different materials on different exterior elevations of the same structure so long as those materials maintain the architectural unity and integrity of the entire structure.

7. Shingles, metal standing seam, tile, or other roofing materials with similar appropriate texture and appearance shall be utilized. Flat roofs will not be discouraged where they are appropriate to the design theme of a structure.

C. Building Color

1. Color shades shallbe used to unify the development.

2. Color combinations of paints shall be complimentary complementary. In no case shall garish colors be permitted. In general, no more than three different colors per building shall be allowed.

D. Multiple Building Developments

Each individual building within a development shall feature predominant characteristics including, but not limited to, consistent rooflines, use of compatible proportions in building mass and outdoor spaces, complementary relationships to the street, similar window and door patterns, and the use of complementary building materials in terms of color, shades, and textures. Monotony of identically designed multiple building projects shall be avoided. Variation of detail, form, and siting shall be used to provide visual interest. The use of different textures, shadow lines and contrasting shapes may also be used to provide visual interest.

E. Building Orientation

1. To the maximum extent feasible, primary facades and entries should face the adjacent street. Except in industrial districts, a main entrance shall face the adjacent street or a connecting walkway with a direct pedestrian connection to the street without requiring pedestrians to walk through parking lots or cross driveways.

2. Where it is reasonably practical, proposed structures shall not impede scenic rural views from the main road, from existing structures, or from natural settings.

3. Structures shall be oriented so that loading areas are in no manner visible from Residential districts, from existing rights of way or from planned future public rights of way. Loading areas may be oriented toward adjoining developed properties which are commercially zoned or toward adjoining properties eligible for future commercial development if and only if they are entirely screened from view by the use of fencing which is compatible with the overall architectural scheme of the project and/or are appropriately landscaped.

4. All corner developments shall have buildings located close to the corner with majority of parking to the side andrear.

5. All buildings shall be sited so that a direct relationship with the primary street is established. The architecture, landscaping and building siting must work in concert to create a unified appearance.

6. Gas Stations:

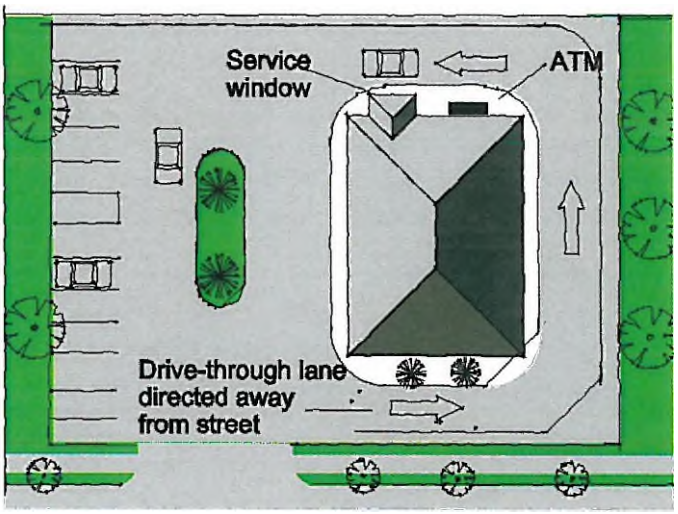
Buildings shall be sited so that gasoline pump dispensers are located to the side of the building or located behind the buildings so that the building is between the pumps and the primary street frontage. If located on a

corner lot, the building would have to be situated in the corner of the lot at the intersection.

F. Mechanical Equipment and Trash Receptacle Screening

Locations of all mechanical equipment and dumpsters shall be shown on all site plans. All mechanical equipment and trash receptacles shall be shielded and screened from public view. Mechanical equipment shall be shielded with walls, fencing or landscaping that screens the equipment entirely. Dumpsters shall be screened with a minimum 6-foot opaque fence or wall on all four sides and located toward the side or rear of the principle structure.

G. All order boxes, menu stands, pickup windows, service/teller windows, and required vehicle stacking associated with drive thru services shall be located to the side or rear of buildings. For the purpose of this Section, the side or rear shall mean the area behind a projected line running parallel from the front (street facing) side(s) of the structure to the side property lines. This concept is depicted in the graphic below:



§9.6.4 LANDSCAPING DESIGN GUIDELINES

The purpose and intent of Landscaping Design Guidelines is to reduce the visibility of paved areas from adjacent properties and streets, moderate climatic effects, minimize noise and glare, and enhance public safety by defining spaces to influence traffic movement. Landscaping will reduce the amount of stormwater runoff and provide transition between neighboring properties. The following criteria shall be used in evaluating applications:

A. General Design

1. Landscaping shall be required between buildings and sidewalks, and parking lots and driveways. The scale of the proposed landscaping shall be in proportion to the building.

2. Landscaping does not only include trees and plantings but also paving, benches, fountains, exterior lighting fixtures, fences, and any other item of exterior furniture. All items of the landscape are to be selected not only

for their functional value but [also] for their aesthetic value and must compliment [complement] the whole.

3. All utility lines in the suburban areas such as electric, telephone, CATV, or other similar lines serving individual sites as well as all utility lines necessary within the property shall be placed underground. All junction and access boxes shall be screened with appropriate landscaping. All utility pad fixtures and meters should be shown on the site plan. The necessity for utility connections, meter boxes, and the like, should be recognized and integrated with the architectural elements of the site plan. All properties shall comply with the County's Right-of-Way Management Ordinance where applicable.

4. Ease of pedestrian access between proposed developments and adjacent developments shall be a required consideration in the development of a proposed project's site and circulation plans.

B. Parking/Drives

1. Parking areas and driveways shall be paved with material which is appropriate to the comprehensive design scheme of the project and to the intensity of use to which parking areas and driveways will be subject.

2. Buildings shall be sited so that the majority of parking is located to the side and rear of the building. The placement of the major portion of a proposed development's parking area to the rear of a main structure's corridor facade, or within a courtyard surrounded on three sides by a proposed structure, is strongly encouraged. The rationale for this guideline is to promote good proportional spatial definition for the corridors to be accomplished through a reduction in the distance required for a building's setback.

3. Drive through access shall be integrally designed with the building and not dominate the design. Only single lane drive throughs are allowed. Multi-lane drive throughs are only allowed for banks (or similar financial institutions), post offices or utilities.

C. Site Lighting

Site lighting shall be from a concealed light source fixture and shall not interfere with the vision of vehicular traffic. A lighting plan with photo-metrics shall be stamped and signed by a registered professional engineer and comply with the following criteria:

1. Maximum average foot candles shall not exceed 5 foot candles as depicted on photometric plans with a maximum not to exceed 12 foot candles close to light sources. Maximum foot candles under gasoline canopies and outdoor sales lots shall not exceed 30 fc candles.

2. All exterior lights shall be arranged and installed so that the direct or reflected illumination does not exceed one half foot candle *above* the

~~background measured at the lot line of any adjoining residential or agricultural parcel and public right-of-way.~~

~~3. Lighting shall enhance the overall aesthetics of the site.~~

~~4. Security lighting shall be provided, particularly at pedestrian walkways.~~

~~5. Lighting shall be integrated with architectural design of the buildings.~~

~~6. Light sources (light bulbs) shall not be visible. They shall be shielded to reflect down onto the ground and not out onto the streets or neighboring property.~~

§9.6.1 APPLICABILITY

The Kiawah River ARB shall develop and administer the architectural and landscaping requirements for the Real Property as provided in the Covenants. The Property Owner shall provide the Planning Director a copy of the ARB approval of the architectural and landscaping design as part of each Development application.

ARTICLE 9.7 WETLANDS, WATERWAYS AND OCRM CRITICAL LINE

§9.7.1 WETLAND BUFFERS AND SETBACKS

A. Intent

The buffer standards of this Article are intended to provide a natural vegetated area between the furthermost projection of a structure, parking or driveway area, or any other building elements, and all saltwater wetlands, waterways and OCRM (saltwater) critical lines. The purpose of these required buffers is to provide a visual, spatial, and ecological transition zone between development and the County's saltwater wetlands and waterways, and to protect water quality and wildlife habitat.

B. Wetland, Waterway and OCRM Critical Line Buffer Depth and Setbacks

1. Standards

The following minimum wetland/waterway buffers/setbacks shall be required:

OCRM Critical Line Buffer: ***Any Single-Family Detached Lot abutting an OCRM Critical Line shall have a minimum OCRM Critical Line buffer of 15feet.***

OCRM Critical Line Setback: ***Any Single-Family Detached Lot abutting an OCRM Critical Line shall have a minimum OCRM Critical Line Setback of 35 feet.***

~~Minimum Buffers/Setbacks (feet)~~	~~RM~~	~~AG-15~~	~~AG-10~~	~~AG-8~~	~~AGR~~	~~RR-3~~	~~S-1~~	~~S-2~~	~~S-3~~	~~R-2~~	~~R-3~~	~~R-4~~	~~M-8~~	~~M-12~~
~~OCRM Critical Line Buffer~~	~~35~~	~~35~~	~~35~~	~~35~~	~~35~~	~~35~~	~~35~~	~~15~~	~~15~~	~~15~~	~~15~~	~~15~~	~~15~~	~~15~~
~~Setback from OCRM Critical Line~~	~~60~~	~~60~~	~~60~~	~~60~~	~~60~~	~~60~~	~~60~~	~~35~~	~~35~~	~~35~~	~~35~~	~~35~~	~~35~~	~~35~~

Minimum Buffers/Setbacks (feet)	MHS	MHP	OR	OG	CT	CN	CR	CC	I
OCRM Critical Line Buffer	15	15	35	35	35	35	35	35	35
Setback from OCRM Critical Line	35	35	50	50	50	50	50	50	50

2. Reduction of OCRM Critical Line Setbacks

The Planning Director shall be authorized to reduce OCRM Critical Line setbacks to a distance not less than the buffer depth, when deemed necessary by the Director to accommodate reasonable development of the parcel and when it is determined by the Director that the setback reduction will not have a significant adverse impact on public health or safety.

3. Reduction of Buffers and Setbacks on Parcels Created Prior to April 21, 1999

When the application of buffer/setback requirements contained within this Ordinance render a parcel that existed prior to April 21, 1999, unbuildable, the Planning Director shall be authorized to reduce front, side and rear yard buffers/setbacks as necessary to make a parcel buildable. The Planning Director cannot reduce any front and/or rear yard buffer in an amount which would result in the placement of a structure closer to either the front or rear property line than any structure on an adjacent property. Any further reduction in any required buffer shall be made by appeal to the Board of Zoning Appeals.

C. Measurement

Required OCRM critical line buffers and setbacks shall be measured from the OCRM critical line, whether the critical line or wetland/waterway is located on, adjacent to, or near the subject parcel.

~~E). Lot Width~~

~~The minimum lot width standards of the underlying zoning district shall apply at the required buffer or setback line.~~

§9.7.2 PROHIBITED ACTIVITIES

The following activities are specifically prohibited in a buffer area:

A. Removal excavation, or disturbance of the soil, except for minimal disturbance associated with the planting of shrubs or trees for landscaping and for the installation of utility crossings; pursuant to PD Section 8.2B3.d.

B. Grassed lawns requiring regular maintenance such as herbicides; pesticides, fertilizers and frequent mowing;

C. Gardens, fences, or structures, except for permitted crossings;

D. Paved or other impervious surfaces; and

E. Destruction or addition of plant life which would alter the existing pattern of vegetation.

ARTICLE 9.8 HISTORIC PRESERVATION

~~§9.8.1 INTENT~~
~~The standards of this Section are intended to safeguard the integrity of historic structures, sites, and their context, and to protect public views of these resources along public rights-of-way.~~

~~§9.8.2 APPLICABILITY~~
~~The standards of this Section shall apply to all sites (existing and future) listed on the National Register of Historic Places.~~

~~§9.8.3 DEMOLITION~~
~~No demolition of a historic structure or site may occur until a Special Exception has been approved in accordance with the provisions of this Ordinance.~~

~~§9.8.4 MOVING~~
~~No relocation of a historic structure or site may occur until a Special Exception has been approved in accordance with the provisions of this Ordinance. Relocation should not be considered, except as a final alternative to demolition.~~

~~§9.8.5 NEW CONSTRUCTION; EXTERIOR ALTERATIONS~~
~~No new construction located on a historic structure or site or significant exterior alteration of a historic structure or site may occur until a Special Exception has been approved in accordance with the provisions of this Ordinance. The applicant must demonstrate that all proposed renovations are consistent with the National Register of Historic Places (NRHP) such that the structure shall remain listed on the NRHP following the completion of the proposed new construction and exterior alterations.~~

~~§9.8.6 NEARBY DEVELOPMENT~~
~~Subdivision plats for multi-family, manufactured housing park, office, commercial, or industrial development or residential subdivisions proposed to be located within 300 feet of a historic structure or site should be reviewed to determine their impact on the historic site. The Planning Director shall require that potential negative impacts be minimized through the location of vehicular access points, screening/buffering and other site design tools.~~

9.8.1 APPLICABILITY

The County's Historic Preservation Ordinance, Art. 21 of the County's Code of Ordinances also does not apply. A Cultural Resources Study has been completed and approved by the State History and Preservation Office (SHPO). Sites found to be eligible for the National Register are being preserved. The remaining areas of the property are not historic.

ARTICLE 9.9 TRAFFIC IMPACT STUDIES

§9.9.1 APPLICABILITY

A traffic impact study shall be required with applications for zoning map amendments, preliminary plats and planned developments that are projected to generate 100 or more peak hour vehicle trips, based on trip generation rates from the latest edition of the Institute of Transportation Engineers Trip Generation manual. The Planning or Public Works Director shall also be authorized to require traffic impact studies when it is determined that a proposed development is likely to have a significant impact on transportation capacity, transportation levels of service or traffic safety in the vicinity of the proposed development.

§9.9.2 STUDY SCOPE

When a traffic impact study is required, the type and scope of the study shall be determined during a scoping meeting with the Planning and Public Works Directors. The meeting may also involve representatives of or request assessments from other agencies and departments. The elements to be determined during the scoping session shall include:

A. Type of Study
The possible types of reports include: a letter report, full traffic impact analysis report or special report (e.g., sight distance survey).

B. Definition of Impact Area
The points of access and key streets and intersections that may be affected by development of the subject tract constitute the impact area. Traffic recorder and turning movement assessment locations shall be determined.

C. Period of Analysis
Periods of analysis may include daily traffic, a.m., p.m. or weekend peak hour.

D. Analysis Scenarios
Scenarios for analysis include: existing conditions, opening year conditions with and without development, and 10 years after opening with and without development.

E. Process
Process for determining trip generation and distribution including: trip generation category, diversion assumptions and distribution assumptions.

F. Growth Rate Assumption
The rate of growth assumed in background traffic assumptions.

G. Pipeline Development
Developments in the area that have been approved or are under review.

§9.9.3 TRAFFIC STUDY ELEMENTS

A letter report or special report shall include those elements agreed upon in the scoping meeting. A full traffic impact study shall include the following elements:

A. Existing Condition Survey

1. Street System Description
The street system shall be described including geometric features, lane usage, traffic control, signage, sight distances and adjacent uses and curb cuts.

2. Traffic Volumes
Existing traffic volumes shall be provided for the impact area including both AADT (Average Annual Daily Traffic) and "Design" peak hour volumes. MDT may be derived from current counts of the South Carolina Department of Transportation (if available) and peak hour volumes shall be done from field counts. Data shall be adjusted for daily and seasonal

variations. Turning movement counts for the peak hour shall be provided for critical intersections. Peak hour periods sha11 be as determined at the scoping meeting.

3. Capacity Analysis
Existing capacity of signalized and unsignalized intersections.

4. Other
Other items may be required at the discretion of the Public Works Director depending upon the type and scale of the project. These may include but are not limited to queue length analysis, pedestrian counts, accident data, traffic speeds (both 50th and 85th percentile), and stopping sight distances.

B. Future without Development
Capacity analysis is to be provided for opening year and plus ten-year for key intersections (and roadway segments where appropriate) without the development but including any planned developments. The analysis shall be based upon the Highway Capacity Manual or other methodologies approved in advance by the Public Works Director.

C. Future with Development

1. Projections of the daily and peak hour traffic generation of the project shall be made using the latest edition of the Institute of Transportation Engineers Trip Generation manual unless the Public Works Director determines that locally derived data will provide more accurate forecasts. Data from similar facilities may be used where the information is not available from the Institute of Transportation Engineers.

2. The projected trips shall be distributed onto the road network as agreed in the scoping meeting.

3. Capacity analysis for opening year and plus ten-year for key intersections (and roadway segments where appropriate).

4. Special analysis as may be required to determine warrants for signalization, minimum safe sight distances, gap analysis, turning radius requirements, queue length analysis, turning lane length analysis, curb cut locations or similar requirements.

D. Mitigation Plan
Where the analysis indicates that the project will create deficiencies in the impact area, improvements shall be recommended which shall include projected cost estimates. The design of improvements shall be in accordance with specifications of the Public Works Director and, where appropriate, the South Carolina Department of Transportation. Where a Decision-Making Body determines that a mitigation plan is not adequate to address the traffic impacts of the project, it may serve as a basis for denial of the rezoning, preliminary plat or planned development request.

E. Consultants

The Public Works Director may require that a mutually agreed upon independent consultant be hired by the County to perform required traffic impact studies or to review all or part of a study prepared by the applicant's consultants. The Public Works Director is authorized to administer the contracts for such consultants.

1. The Public Works Director shall determine the scope of services to be performed by the independent consultant and receive a cost estimate of such services.

2. The applicant shall provide an amount equal to the estimate to the Public Works Director, who will deposit the amount in an escrow or special account set up for this purpose. Any funds not used for the independent consultant shall be returned to the applicant in a timely manner without interest.

3. The Public Works Director may require additional fees for the independent review if: the Decision-Making Body expands the scope of the required review; the applicant substantially amends the application; additional meetings involving the consultants are requested by the applicant; the consultant's appearance is requested at Planning Commission or County Council meetings beyond what was initially anticipated; or the consultant's attendance is required at meetings with regional, state, or federal agencies or boards which were not anticipated in the earlier scope of services.

ARTICLE 9,.10 VISION CLEARANCE

§9.10.1 MAJOR ROADWAYS

Corner lots on major roadways shall have no structure or obstruction that obscures travel vision from 30 inches to ten feet above ground level in a triangular area formed by measuring from the point of intersection of the front and side lot lines a distance of 40 feet along the lot lines and connecting the points to form a triangle.

§9.10.2 COLLECTOR STREETS

On Collector Streets, the triangular area formed by measuring from the point of intersection of the front and side lot lines is 30 feet.

§9.10.3 SUB-COLLECTOR STREETS

On Sub-Collector Streets, the triangular area formed by measuring from the point of intersection of the front and side lot lines is 20 feet.

§9.10.4 PRIVATE DRIVES AND PRIVATE LANES

On private driveways of commercial or industrial activities, the triangular area formed by measuring from the point of intersection of the drive edge is 15 feet.

ARTICLE 9.11 SIGNS

immediately upon notice.

§9.11.2 ON-PREMISES SIGNS Visible from Betsy Kerrison Parkway Only

A. Free-Standing Signs

1. Maximum size, height, width, length, number of sign faces, number of signs per establishment and required minimum height and setbacks are based upon establishment size and shall conform with Table 9.11.2-A.

2. A maximum of one reader board shall be allowed per zoning lot for single or multi-tenant structures containing office, commercial, or industrial uses if attached to permanent free-standing signs. The area of the reader board shall be included in the site's total sign area allowance.

3. All new free-standing signs are to be designed as monument signs, pedestal style signs or pole mounted signs.

4. All pedestal style signs shall have a pole skirt.

5. The predominate materials used for free-standing signs, excluding copy material or materials not visible from the public right-of-way, must incorporate the following:

    a. If the predominate building materials colors and design elements on the principal building conform to Section 9.6.3B. of this Ordinance, the exterior sign materials must compliment those found on the principal structure as reviewed and approved through the site plan review process. Materials, design and color of the sign do not need to be the same as those found on the principle structure to be considered complimentary.

6. Signs that are located in parking lots (such as directional signs) may be internally lit when constructed with routed letters or an opaque background.

7. The hanging or attachment of objects is not permitted unless they are shown on the drawings approved for sign construction and meet all the requirements of this Ordinance.

8. When calculating the sign area of a "monument sign", "pedestal sign", or "pole sign", the internal structural framework supporting the sign or other solid structural features (not containing copy or any graphic, word, symbol, insignia, text sample, model, device, or combination thereof which is primarily intended to advertise, identify or notify, exclusive of a frame or border) shall not be used in the calculation of the maximum area of the sign. Signs may be mounted on a base or foundation that will not be included in the square footage; however, the base for monument signs must be as wide as the sign.

B. Wall/Facade Signs

1. A maximum of two signs shall be allowed per wall/facade, with a maximum of four per building. Total area of all signs shall not exceed square footage of Table 9.11.2-B.

2. Maximum size of wall/facade signs is dependent upon building frontage and setback, in accordance with Table 9.11.2-B.

3. The hanging or attachment of objects is not permitted unless they are shown on the drawings approved for sign construction and meet all the requirements of this Ordinance.

4. Awning Signs

   a. The use of awnings for the purpose of providing signage will be considered a wall sign. The awning signage must meet all dimensional and intensity standards applicable to wall signs in this Article.

   b. For purposes of the subsection, an awning sign is a sign used for the purpose of providing signage and must be located above a display window or entryway.

   c. Text or graphic shall be limited to the face of an awning.

TABLE 9.11.2-A
FREE-STANDING ON-PREMISES SIGNS

~~ZONING DISTRICT~~ USE			
Requirement [1] [2]	**Agricultural**	**Residential**	**Non-Residential**
Maximum Area (sq. ft.)	10 (32 with Special Exception)	10	Bldg. Size (sq. ft.) / Sign Size 0 sq. ft. to 2,500 sq. ft. = 50 2,500 sq. ft. to 25,000 sq. ft. = 100 25,000 sq. ft. to 100,000 sq. ft. = 150 100,000 sq. ft. + = 200
Maximum Height (ft.)	14	5	5-foot setback = 20 ft. maximum height OR Districts: 5 ft. minimum setback-6 ft. maximum height
Minimum Height (ft.)	None	None	None
Maximum Width (height of sign with face) (ft.)	N/A	5	Ratio-Longest side: Shortest side 5:1
Maximum Length (ft.)	N/A	5	Ratio-Longest side: Shortest side 5:1
Setbacks (Front/Int) (ft.)	10/10	10/10	5/10
Max. No. Sign Faces	2 per sign	2 per sign	2 per sign
Max. No. Signs	1 per major frontage	1 per major frontage	1 per major road frontage

[1] Sign regulations for the CT Zoning District can be found m Section 4.22.4.
[2] Sign regulations for properties located in overlay districts can be found in Chapter 5.

TABLE 9.11.2-B WALL/FACADE SIGNS

Building Length Facing Street	**Setback**	**Maximum Size (sq. ft.)**
50 feet or less	0-99 ft. 100-399 ft. 400 or more ft.	50 100 150
More than 50 feet	0-99 ft. 100-399 ft. 400 or more ft.	Bldg. Frontage x 1 Bldg. Frontage x 2 Bldg. Frontage x 3

C. Special Signs

1. Maximum size, number, and height of special signs shall conform with Table 9.11.2-C.

2. Temporary Signs

a. Size, Number and Height
Maximum size, number and height of temporary signs shall conform with Table 9.11.2-C.

b. Types
Commercial and Non-Commercial Temporary Signs of the following varieties are permitted:

i. Banners are permitted only in the Savannah Highway/St. Andrews Boulevard Overlay District.

ii. Portable signs are permitted in accordance with standards of the National Electrical Code and anchoring provisions of the Standard Building Code.

c. Duration

i. Non-Commercial Temporary Signs shall be allowed for a maximum of 30 days per event.

ii. Commercial signs temporary [Temporary Signs] shall be allowed for a maximum of 30 days, starting with the opening of a business.

D. Real Estate Signs

1. Maximum size, number and height of real estate signs shall conform with Table 9.11.2-C of this Chapter.

2. Signs shall face a maximum of two directions, and may be mounted back-to-back or V'ed.

3. Where signs are V'ed, the space between panels shall not exceed 3 feet at the point at which panels are closest, and the interior angle formed by signs shall not exceed 60 degrees. For purposes of these requirements, V'ed signs shall be counted as one sign.

4. Where signs face two directions, whether back-to-back or V'ed, both signs must be the same standard size.

E. Flags Used As Signs

1. A permit shall be required for the installation of all flag poles or flag display devices erected on lots zoned for multi-family office, commercial,

or industrial use or occupied by a multi-family, office, commercial, or industrial use.

2. Applicants must submit with the permit application a scaled site plan giving the location of all flag poles and complete dimensional and installation engineering data.

3. Applicants must provide documentation of minimum clearance from electric, telephone or cable TV lines as certified by the proper utility prior to issuance of permit, or installation.

4. Maximum size and number of flags used as signs, and height of flag poles shall conform with Table 9.11.2-C of this Chapter.

5. The American flag and the flag of the State of South Carolina are exempt from the provisions for maximum size of flags and maximum size of flagpoles in Table 9.11.2-C of this Chapter.

TABLE 9.11.2-C
SPECIAL SIGNS

Type	Maximum Size	Maximum Number	Minimum Setback Maximum Height
Subdivision/Multi-Family I.D. Signs	32 sq. ft.	2 per entrance	Minimum setback: 5 ft. Maximum height: 12 ft.
Directional	3 sq. ft.	Unlimited	4 ft.
Temporary Signs: Includes real estate signs, grand openings and permitted special events	48 sq. ft. Time Limit: Shall be removed no later than 15 days after the conclusion of the sale, event, or first day of grand opening	1 per 1500 ft. frontage Maximum: 3 per lot	Minimum setback: 5 ft. Maximum height: 12 ft. Maximum 6 ft. height in residential zoning districts
Flags	60 sq. ft.	3 per zoning lot	35 ft. or 15 ft. above highest point of roof
Civic/Institutional	100 sq. ft. 50 sq. ft. in Residential or Agricultural uses	1 per zoning lot	Min. setback: 5 ft. Max. height 12 ft. Sign must have opaque background except the marquee. Marquee cannot exceed 25% of total sign size

F. Nonconforming Signs
Refer to Chapter 10, Nonconformities.

§9.11.3 OFF-PREMISES SIGNS

A. Outdoor Advertising of America Standards
All Off-Premises Signs shall be constructed in compliance with Outdoor Advertising of America Standards.

B. Location and Setbacks

1. Off-Premises Signs shall be allowed ~~in these zoning districts indicated in Chapter 6~~ **on the *Real Property;* provided, however, *ARB* approval of each Off-Premises Sign on the *Real Property* must first be obtained."' Upon approval by the *ARB,* such signs may be shared by two or more businesses; provided, however, all such businesses must be located on the *Real Property.***

2. Permitted sizes, maximum height, minimum setbacks and location criteria shall be as indicated in Table 9.11.3-A of this Chapter.

C. Orientation

1. Signs shall face a maximum of two directions, and may be mounted back to back or V'ed.

2. Where signs are V'ed, the space between panels shall not exceed three feet at the point at which panels are closest, and the interior angle formed by signs shall not exceed 90 degrees.

D. Compatible Size Signs

Where signs face two directions, whether back to back or V'ed, both signs must be the same standard size.

E. Nonconforming Signs

Refer to Chapter 10, Nonconformities.

TABLE 9.11.3-A
OFF-PREMISES SIGNS

Maximum Length	48 ft.
Maximum Width	14 ft.
Maximum Area	672 sq. ft.
Maximum Height	40 ft.
Minimum Setback (front/side)	25/20 ft.
Location Criteria[1] Minimum distance to nearest off-premises sign Minimum distance to nearest on-premises Sign	1,000 ft. 500 ft.

[1] The *A R B* may approve an increase in the location criteria for signs advertising a business on the *Real Property* so long as the sign is also located on the *Real Property.*

ARTICLE 9.12 DRAINAGE DESIGN

Refer to the Charleston County Stormwater Management Ordinance # 1518 approved on August 14, 2007 and found in Appendix B of this Ordinance.

CHAPTER 9 EXHIBITS

Note: The following exhibits are for illustration purposes only. In case of any difference of meaning or implication between the text of this Ordinance and any heading, drawing, table, figure, or illustration, the text shall control.

The Estimated Economic Impact of the Proposed Kiawah River Plantation Development on Charleston County, South Carolina

Prepared for
Kiawah River Plantation, LP

By

Dr. Thomas Tanner, Director
Regional Dynamics and Economic Modeling Laboratory

December, 2008

REGIONAL DYNAMICS & ECONOMIC MODELING LABORATORY
CLEMSON UNIVERSITY RESEARCH FOUNDATION

THE STROM THURMOND INSTITUTE

Contents

Executive Summary

In the interest of providing facts and analysis that will allow the citizens of Charleston County to make informed decisions and substantively debate the merits of the proposed Kiawah River Plantation mixed use development, The Regional Dynamics and Economic Modeling Laboratory at the Strom Thurmond Institute of Government and Public Affairs at Clemson University was asked to conduct an extensive economic and fiscal impact analysis of the proposed development. The Laboratory conducted the economic and fiscal impact analysis using their Regional Dynamics economic modeling system, a massive and very detailed county level model of the United States economy. At 7.6 terabytes in size, the model is currently the largest and most sophisticated computerized economic model in the world. The model was designed by Dr. Tanner, director of the Economic Modeling Laboratory at the Institute and the individual who conducted the Kiawah River Plantation analysis.

Kiawah River Plantation is a mixed-use development, with a mix of single family housing, denser residential, hospitality, and retail uses, and significant recreational open space and other environmental amenities.

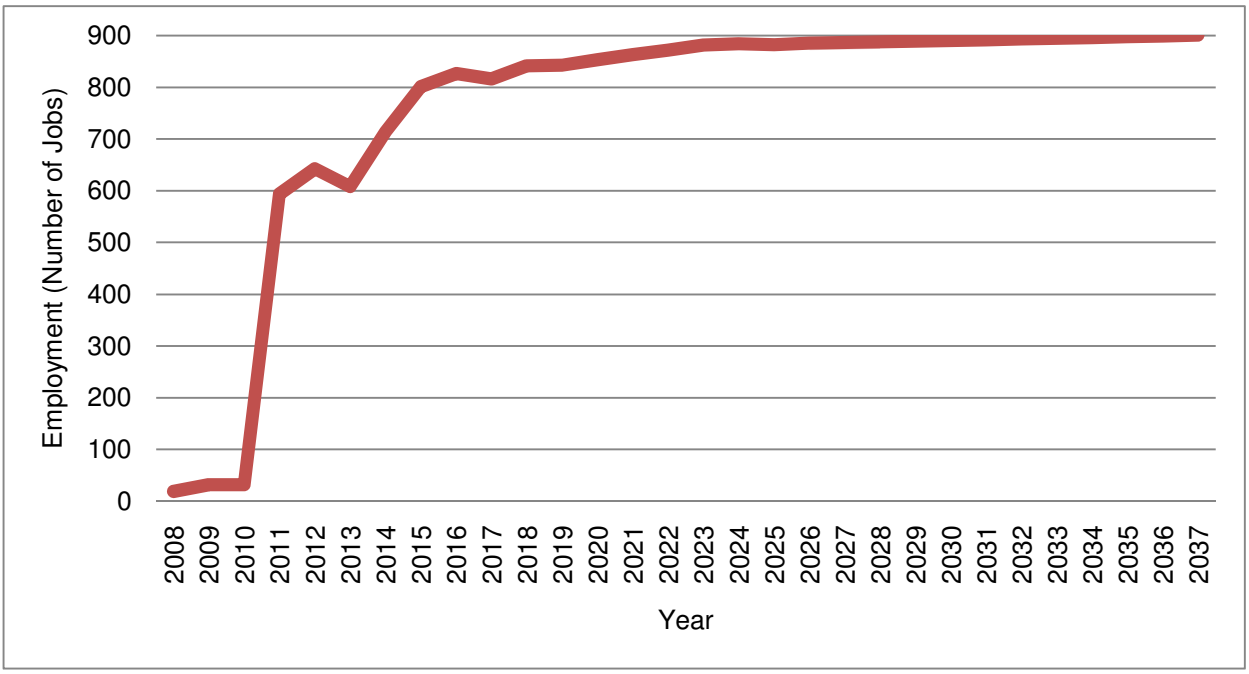
Because the Kiawah River Plantation Development project involves Tax Increment Financing, it was essential to estimate the gross economic and fiscal impact of the development on the economy of Charleston County. Thus, this project represents a departure from the traditional analyses conducted by the Regional Dynamics and Economic Modeling Lab, in that the analysis that was conducted did not attempt to isolate the impact of the Kiawah River Plantation development from the underlying growth that would take place in Charleston. This analysis thus reports the amount of additional economic activity and the net fiscal impacts that would take place in Charleston County as a result of the development through the 2008-2037 time frame, as though none of the businesses or residents of the development would otherwise choose to locate in the County. Other alternative scenarios were run, testing the importance of various assumptions in the model, but the final report concentrates on the gross economic impact of the development.

Regardless of the assumptions used, the economic impact of the Kiawah River Plantation project is forecast to be significant and positive for Charleston County, in terms of jobs generated, output, and disposable income in the County. In addition, the impact analysis demonstrates a positive net fiscal impact for the County, with additional revenue received by the County as a result of the project more than sufficient to cover the additional expenditure burden for the County generated by the project. The project is thus expected to be a significant net revenue generator for the county, independent of the assumptions used in the analysis.

The impact analysis suggests that the Kiawah River Plantation project would generate approximately 850-900 jobs in Charleston County in the long term, and an additional 1400-1500 jobs statewide. Total output (that is, total gross sales of all businesses located in Charleston County) is forecast to be approximately $70-$77 million dollars per year greater as a result of the Kiawah River Plantation Development. In addition, total yearly disposable income of all Charleston County residents (total income after taxes) is expected to be approximately $29-$33 million greater as a result of the Kiawah River Plantation development.

There is some year-by-year fluctuation in the employment and other economic impact numbers for Charleston County in the estimate, a result of the fluctuating spending on the development project itself, and on minor long term fluctuations in the structure of the Charleston County economy as a result of the project. The impact of Kiawah River Plantation grows steadily through the first ten years of the build-out period for the project and the sales cycle for the housing units and commercial property. The employment impact of Kiawah River Plantation on Charleston County is shown in Figure 1; changes in other economic variables roughly parallel that demonstrated in the employment graph.

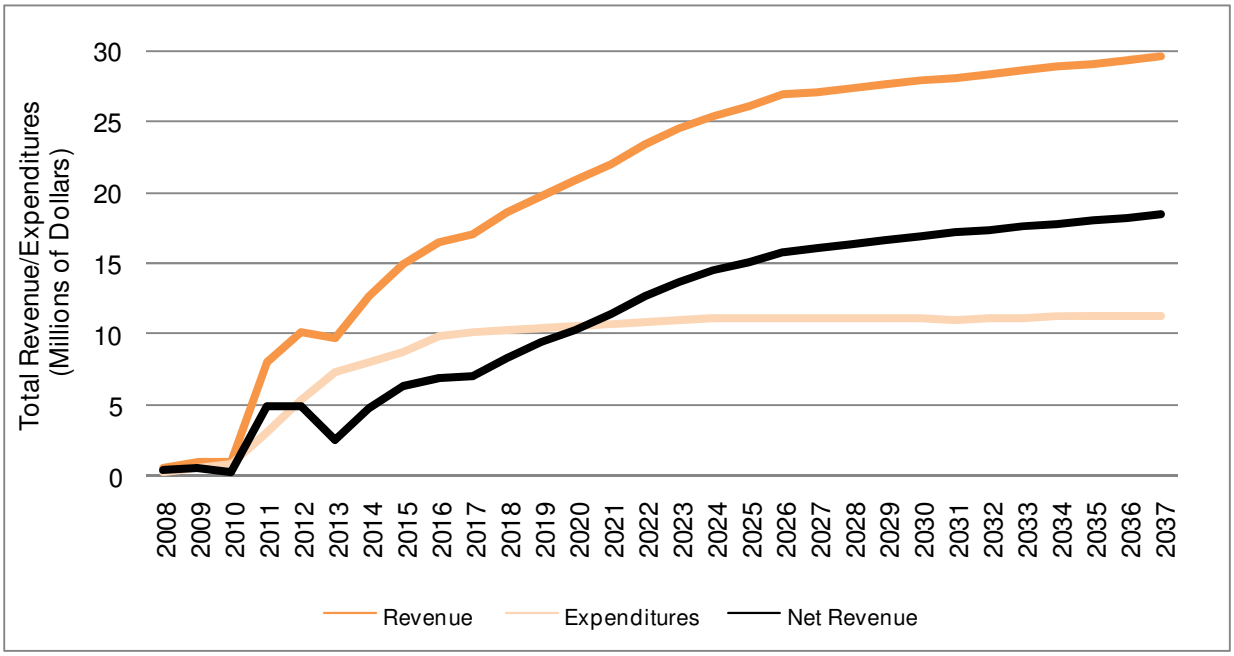
Figure 1 - Estimated Impact of Kiawah River Plantation Development on Total Employment in Charleston County, South Carolina, 2008-2037



In addition to the economic impact of such a project, it is critical to consider the fiscal implications of a project like Kiawah River Plantation on local government revenue and expenditures. To that end, the analysis conducted by the Thurmond Institute included a detailed fiscal impact analysis. The analysis suggests that the Kiawah River Plantation project would generate additional expenditure requirements for local (county and municipal) governments in Charleston County of approximately $10-$11 million dollars per year once complete. These additional expenditures are required primarily to provide a level of services to new Charleston County residents generated by the project at a level consistent with that enjoyed by current Charleston County residents. However, the project is also estimated to generate a total of $15-$30 million dollars worth of revenue per year in the long term for Charleston County governments. The result is an estimated average annual net fiscal gain to Charleston County of over $16

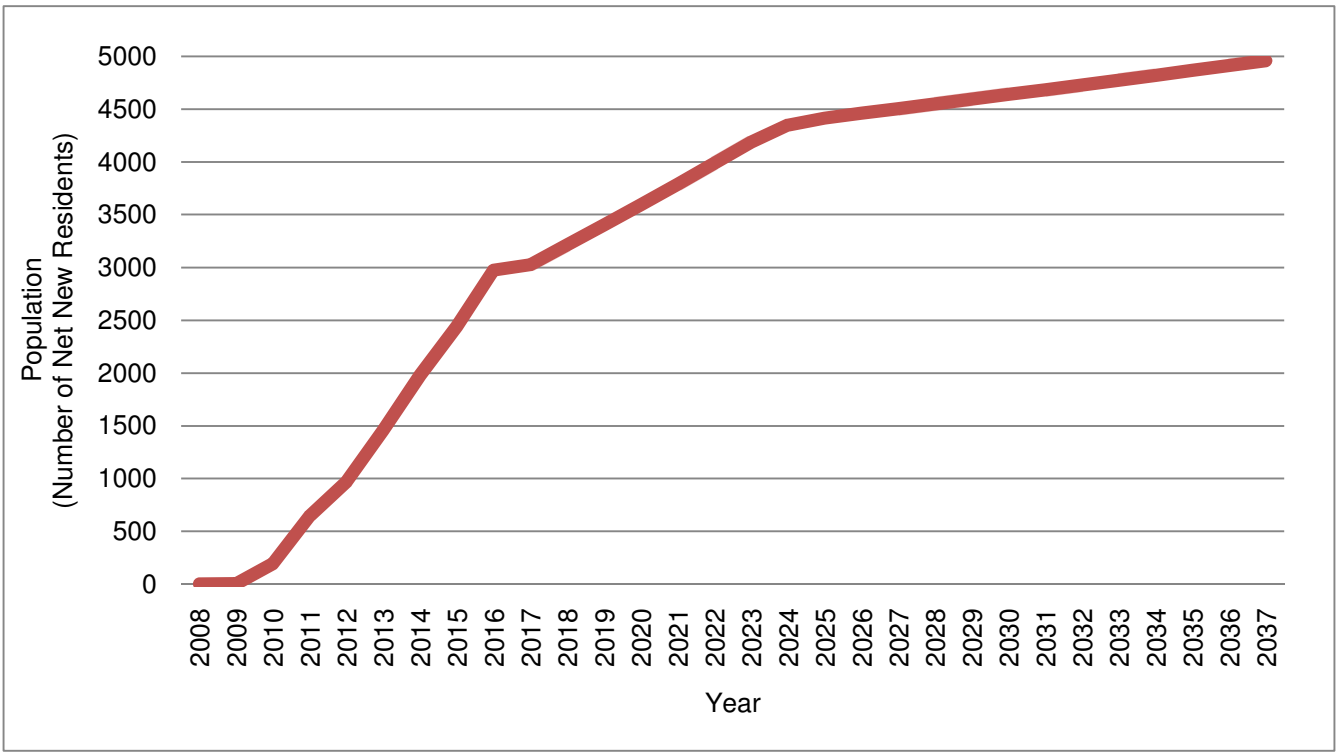
million dollars per year in the long run. Note also that these impact estimates are in addition to any exceptional impact fees paid by the developers, and any exceptional public infrastructure paid for by the developer, which were disregarded by the analysis for the sake of keeping all assumptions as conservative as possible. The annual estimated impact of the project on county government revenue and expenditures are shown in Figure 2.

Figure 2 - Estimated Impact of Kiawah River Plantation Development on Charleston County Government Revenue and Expenditures, 2008-2037



The gross impact of the development on Charleston County population is shown in Figure 3. This gross population impact is generated primarily by the new residences built at the development, of course, but also some modest population gains that are generated as a result of the economic growth in Charleston County generated by the project.

Figure 3 - Estimated Net Impact of Kiawah River Plantation Development on Charleston County Population, 2008-2037



About The Kiawah River Plantation Development Project

Kiawah River Plantation is a mixed use community proposed for development by Kiawah River Plantation, LP, on 2003.46 acres of land on John's Island in Charleston County, South Carolina. Primary access to the property is from Betsy Kerrison Parkway (Bohicket Road), with secondary access from River Road.

The community will include up to 1,274 single family detached and attached homes and condominium units, 127 units of workforce housing, 85,000 square feet of retail commercial and office space, 2 hotels and related cottages with a total of 450 rooms, a golf course, several parks and open spaces and recreational amenities including trails, community docks, boathouse, pools, fitness center, playgrounds and tennis, pickleball and other courts. In addition, the community is located adjacent to the

Charleston County Parks Commission Mullet Hall Equestrian Center and Community Park. Kiawah River Plantation is designed to be a highly amenitized community, with a strong orientation to water, nature and recreation. The Kiawah River Plantation development is designed to be particularly attractive to second home owners nearing retirement and active retirees, an important consideration in determining both the expected economic and fiscal impacts of the development.

About the Thurmond Institute's Regional Dynamics Model

Researchers at the Regional Dynamics and Economic Modeling Lab at Clemson University used the Regional Dynamics (REDYN) model, developed by Dr. Tom Tanner specifically for conducting state and local economic and fiscal impact analysis and forecasting. The REDYN model is the largest computer model of the U.S. economy ever built (currently approximately 7.6 terabytes in size); the model uses detailed county level economic, demographic and fiscal data from the Bureau of Economic Analysis, the Bureau of Labor Statistics, the Department of Energy, the Bureau of Census, and other public sources.

REDYN is structural in nature, meaning that it clearly includes cause-and-effect relationships. The model is based on two key underlying assumptions from mainstream economic theory: (1) households maximize utility and (2) producers maximize profits. Because these assumptions make sense to most people, lay people as well as trained economists can understand the model.

In the model, businesses produce goods to sell to other firms, consumers, investors, governments, and purchasers outside the region. Output is produced using labor, capital, fuel, and intermediate inputs. Demand for labor, capital, and fuel per unit

of output depends on relative costs because an increase in the price of any one of these inputs leads to substitution away from that input to other inputs.

In the model, supply and demand for labor determine wage rates. These wage rates, along with other prices and productivity, determine the cost of doing business for every industry in the model. An increase in the cost of doing business causes either an increase in prices or a decrease in profits, depending on the market for the product. In either case, an increase in costs would decrease the share of the local and U.S. market supplied by local firms. This market share, combined with the demand previously described, determines the amount of local output. The model has many other feedbacks. For example, changes in wages and employment affect income and consumption, while economic expansion changes investment and population growth influences government spending.

Within the model, firms produce goods and services that are purchased either by final consumers or by other firms as inputs to their own production processes. Firms also purchase labor, capital, and other inputs. Labor and capital requirements depend on both output and relative costs. Population and labor supply contribute to demand and to wage determination. Economic migrants, in turn, respond to wages and other labor market conditions. Supply and demand interact in the wages, prices, and profits block. Prices and profits determine market shares. Output depends on market shares and the components of demand.

The model brings together all of the elements to determine the value of each variable for each year in the baseline forecasts. Interindustry interactions that are included in input-output models are used to estimate the values of other regional

economic variables. In order to broaden the model in this way, it was necessary to estimate key relationships. Extensive data sets covering all areas in the country and two decades worth of research were used to ensure that the model was theoretically sound and based on all of the relevant data available.

The model has strong dynamic properties; that is, it forecasts not only what will happen but also when it will happen. It enables long-term predictions that have general equilibrium properties, meaning that the long-term properties of general equilibrium models are preserved, accurate year-by-year predictions are maintained, and key equations can be estimated by using primary data sources. A complete technical description of the model can be found in Appendix A.

The effects of the Kiawah River Plantation development on the state and local economies are determined by comparing a baseline forecast with an alternative forecast that incorporates the assumptions used for this study. The baseline forecast uses recent data (data from 2000-2006) and thousands of equations to generate projected economic activity for a particular region or set of regions for a specified time period of up to 60 years (2000-2060). The impact of Kiawah River Plantation is estimated by providing the model with information about the magnitude of the project, and those same equations are then used to calculate a new forecast for every region in the model.

This analysis was conducted strictly for the purpose of assessing the economic and fiscal impact of the Kiawah River Plantation development on Charleston County. However, for the sake of guaranteeing an accurate assessment of the impact within a larger economic framework, a nine region REDYN model of the U.S. economy was assembled for the project. The nine regions explicitly modeled were Charleston County,

Jasper County, Colleton County, Hampton County, the Charleston-North Charleston Metropolitan Statistical Area (Berkeley, Charleston and Dorchester Counties), the Savannah, GA Metropolitan Statistical Area (Bryan, Chatham and Effingham Counties in Georgia), the rest of the state of South Carolina, the rest of the state of Georgia, and the rest of the United States. This multiregional structure helps to guarantee the accurate representation of Charleston County's relationship to its neighbors and trading partners, and allows the analyst to assess the reasonableness of the impact simulations being run.

Data and Underlying Assumptions

Three key impacts of the Kiawah River Plantation project were explicitly modeled for this analysis. The most straightforward component of the Kiawah River Plantation Project is the economic impact of the development and construction expenditures on Charleston County, each of the neighboring counties, the rest of South Carolina, the states of North Carolina and Georgia, and the rest of the United States. As money is routed to the construction of Kiawah River Plantation residential and nonresidential structures and related infrastructure, and away from other economic activities in other places, this will have impacts on the economies of all regions included in the analysis. Additional demand for construction in Charleston County will lead to additional construction employment in Charleston County and other neighboring counties (as construction activity in Charleston can be done by firms that are located nearby, but not necessarily in the county). The increase in construction will also increase the demand for lumber, concrete, hardware, and all of the other commodities used in the construction process, which will create additional economic activity to satisfy the so-

called “supply chain.” In addition, the construction employment and wages will lead to increased demand for groceries, gasoline, clothing, and all of the other economic activities associated with this increase in household consumption. The detailed forecast construction schedule for the Kiawah River Plantation development (the amount spent on various development and construction activities each year of the project), was provided by the project developers; the REDYN model used this information to calculate all of the expected spillover effects, and where and when these spillover effects will take place.

The second element of the Kiawah River Plantation Development that has potentially serious impacts is the total number of new residents brought to the region as a result of the development. Based upon the number of residential units forecast for Kiawah River Plantation provided by the developers, and based upon the information on United States household size and demographic characteristics by age and income group, we were able to estimate the number of new residents brought in during each stage of the development, and their estimated demographic characteristics, to create a complete population projection for Kiawah River Plantation. In light of the development design, the expected population skews both slightly wealthier and distinctly older than the average US household, with slightly fewer individuals per household. A key component of the economic impact of Kiawah River Plantation residents is their spending profile (what they buy, where, and when), which will clearly be affected by how much income they have. An income distribution was generated for Kiawah River Plantation residents, based upon the property characteristics and the profile presented by the developer. It was felt that this estimate would more accurately reflect the income

of Kiawah River Plantation residents then would any simpler estimate such as the current average household income for Charleston County. This income estimate was inflated year-over-year to reflect the average forecast household income growth for the labor market area.

This final aspect of the Kiawah River Plantation project that was considered was the economic impact of the nonresidential components of the project. Because Kiawah River Plantation is envisioned to be a mixed use development, included in the development are extensive nonresidential construction elements, meant to house businesses in the Kiawah River Plantation community. The question that remains to be addressed is how much economic activity will be housed in these nonresidential structures, and what economic activity these businesses would generate in the County. In order to estimate the total economic activity generated in the County, the region, and the state, it is first necessary to produce some estimate of the sizes and types of businesses that might be attracted to these structures. For the general retail portion of the development, since no specific businesses are yet identified, we chose to estimate that the mix of businesses attracted to the Kiawah River Plantation nonresidential elements would be the same mix of commercial and service sector businesses currently found in Charleston County (as defined by the Bureau of Labor Statistics and Bureau of Economic Analysis). That is, the new businesses would be the same mix of retail and service industries currently found in the county. To find the total size of industry we used national data from the Bureau of Labor Statistics to identify the total level of employment and wages per square foot of structures associated with the industry. By scaling this set of numbers to the total nonresidential structure square footage on the

Kiawah River Plantation project, we get an estimated direct employment and wage bill for each type of industry locating in Kiawah River Plantation. By introducing this information to the REDYN model, we can estimate the total economic impact of this activity across all of the regions and years in the model. We used the same approach to estimate the hotel employment and the two hotel properties to be developed, and employment associated with the golf course to be located on the property.

A summary of annual expenditures associated with all phases of the Kiawah River Plantation project can be found in Appendix B, and a summary of all annual housing and other sales at Kiawah River Plantation can be found in Appendix C.

Impacts Not Included in the Analysis

While we feel that we have captured all of the critical elements of the Kiawah River Plantation project in our analysis, there are certain aspects of the Kiawah River Plantation project that have not been considered, either because they are not expected to have any economic impact (recall that the REDYN model is designed only to capture economic effects), or because no reliable data or methodology exists to quantify the impact.

Elements of the Kiawah River Plantation that were not included in the analysis are what economists refer to as the amenity values of the project; that is, the effect of the Kiawah River Plantation development of the quality of life of Charleston County residents both within and outside of Kiawah River Plantation. These amenity impacts can have real economic effects (either positive or negative), as people are willing to pay the price of living in a high quality of life region either through higher cost of living or lower wages, and must be compensated to live in a low quality of life region either through lower cost of living or higher wages. While these quality of life issues can have

real economic impacts, they are very difficult to reliably estimate. In the case of Kiawah River Plantation, there is certainly no reason to believe that quality of life would be significantly lowered in Charleston County, since this would lower home values and run counter to the developer's goal of earning a profit. In light of the significant amenities that are included in the design of the community, there is some reason to believe the project would increase the overall amenity value ("attractiveness") of Charleston County, but since quantifying the amenity value would be highly speculative, we have chosen to disregard the amenity aspects of the project.

With this caveat in mind, we can now explore the estimated economic impact of Kiawah River Plantation, to get some idea of the magnitude of the project's impact on the county.

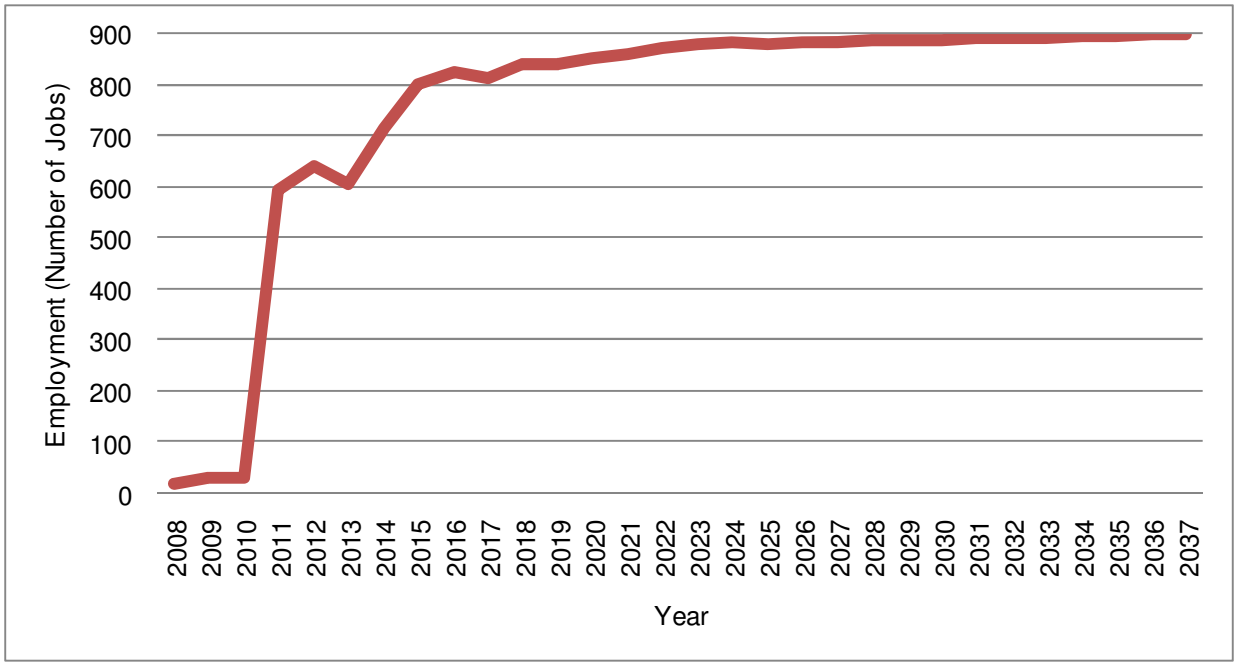
Estimated Economic Impact of the Kiawah River Plantation Development

This section of the report presents the best estimate of the economic impact of the Kiawah River Plantation project on Charleston County for the 2009–2028 study period. Recall that this estimate is based upon the presumption that all Kiawah River Plantation residents are net new residents to Charleston County; that is, in the absence of Kiawah River Plantation they would choose to live somewhere other than Charleston County. The estimates outlined below were produced by comparing baseline and alternative forecasts of Charleston County, as outlined in the description of the REDYN model. These summary estimates represent the effects of Kiawah River Plantation on three key measures of the state and local economies: employment, gross regional product, and real disposable personal income.

Employment

The initial employment impact of Kiawah River Plantation (in terms of number of jobs) on Charleston County is expected to be significant in the long run, but generating only approximately 30 jobs in the initial construction years of 2008-2010. The employment impact is projected to jump significantly as the first commercial/retail lots are filled, and to grow steadily for the remainder of the construction phase of the project, reaching just under 900 additional jobs in Charleston County as a result of the Kiawah River Plantation by 2037. The average employment impact of the Kiawah River Plantation project on Charleston County, throughout the forecast period is approximately 750 jobs. Figure 4 illustrates the estimated annual employment impact of the Kiawah River Plantation on Charleston County.

Figure 4 - Estimated Impact of Kiawah River Plantation Development on Total Employment in Charleston County, South Carolina, 2008-2037

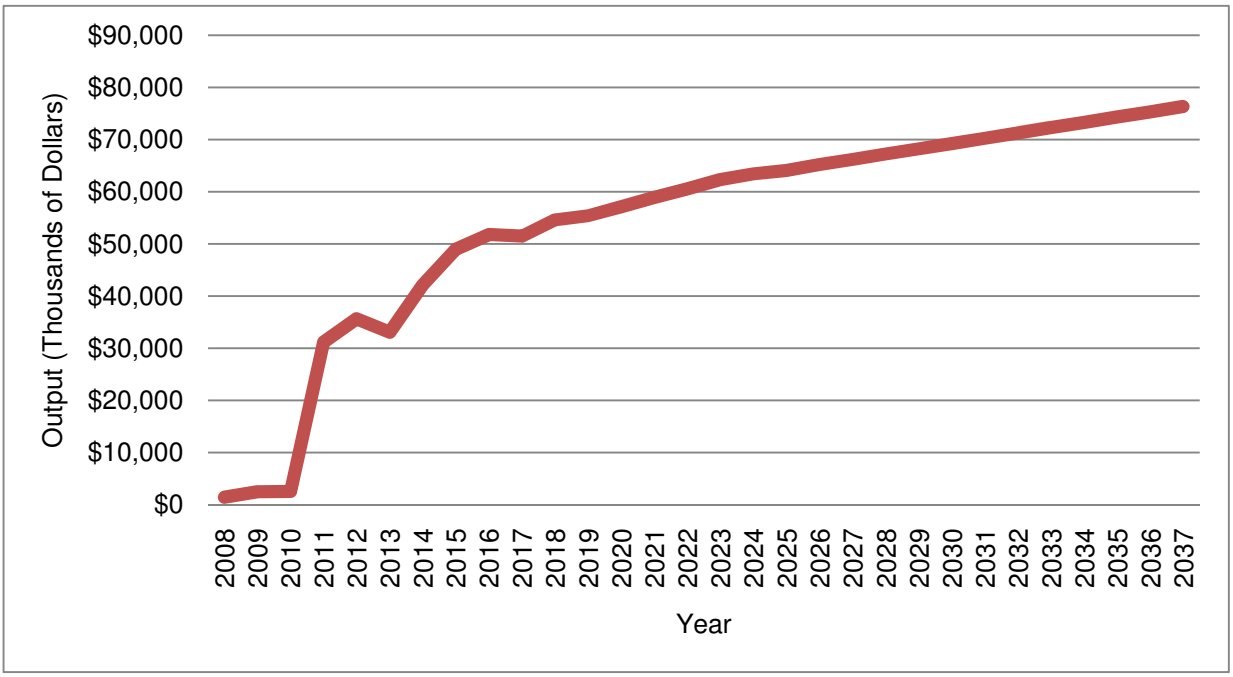


Gross Output

Figure 5 illustrates the estimated impact of Kiawah River Plantation on total

output (that is, total gross sales) for Charleston County. As might be expected, the impact of Kiawah River Plantation on output follows very much the same pattern as the impact of the development on employment. In the first years of the project, the impact of Kiawah River Plantation on output is quite modest, increasing output for Charleston County in 2010 by $2.6 million above what would otherwise be sold in the county. The "leakage" of construction and resident spending into neighboring counties, nearby metropolitan areas, and other regions in the model causes output increases for the state as a whole to be larger than the Charleston County impact throughout the forecast period. The impact of Kiawah River Plantation on total output in Charleston County is forecast to grow throughout the forecast period, to over $75 million (in inflation adjusted dollars) by 2037. The average annual impact of Kiawah River Plantation on county output over the forecast period is approximately $54 million dollars per year. For further detail, a table showing the project's impact on annual output of the retail trade industries in Charleston County is provided in Appendix D.

Figure 5 - Estimated Impact of Kiawah River Plantation Development on Total Output in Charleston County, South Carolina, 2008-2037

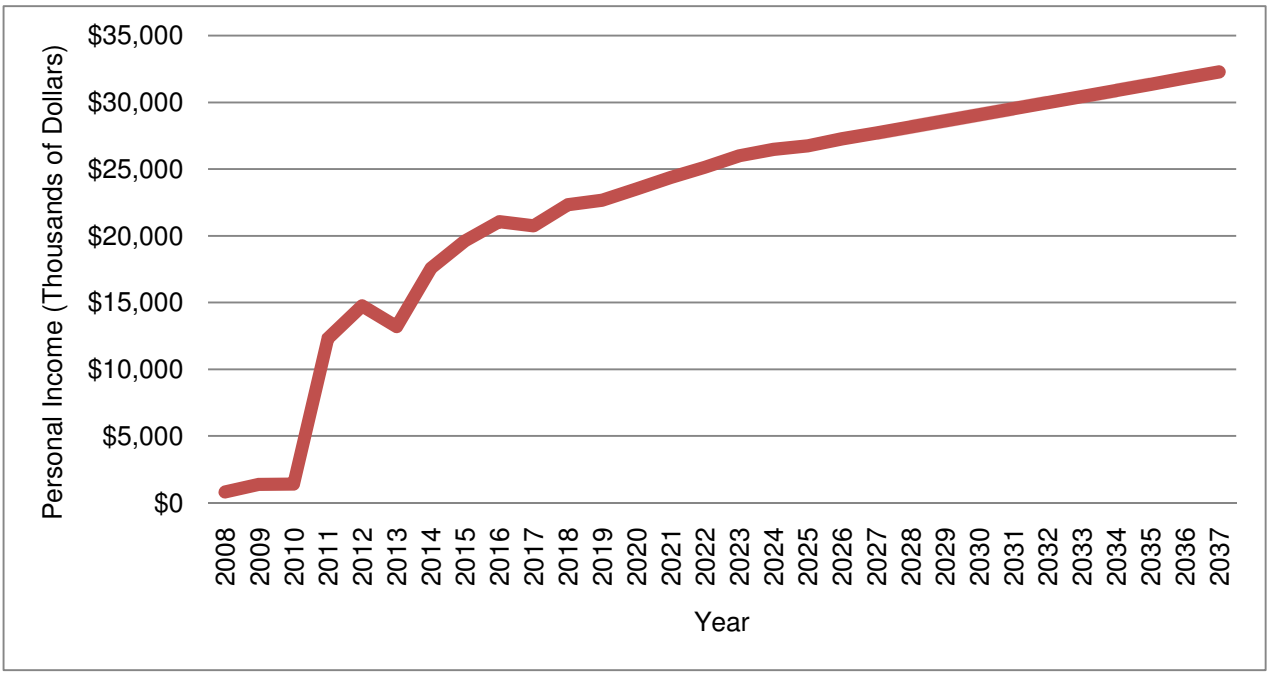


Real Disposable Personal Income[1]

The impact of Kiawah River Plantation on total disposable (after tax) personal income In Charleston County follows a similar pattern to the employment and output impacts. The income is generated in part in the county through the additional gross sales described in the previous section. In addition, the large retirement age portion of the Kiawah River Plantation community is expected to bring significant retirement and investment income to the region. By 2037, Kiawah River Plantation is forecast to generate approximately $32 million per year in additional disposable income for Charleston County. Figure 6 illustrates the impact of Kiawah River Plantation on personal income in Charleston County throughout the forecast period. A detailed annual table of all elements of personal income is provided in Appendix E.

[1] Real Disposable Personal income consists of employee compensation (wages and salaries), minus personal contributions to social insurance, minus net residence adjustment (wages moved from place of work to place of residence), plus dividends, interest and rent and transfer payments, minus taxes and adjusted for inflation.

Figure 6 - Estimated Impact of Kiawah River Plantation Development on Total Personal Income in Charleston County, South Carolina, 2008-2037



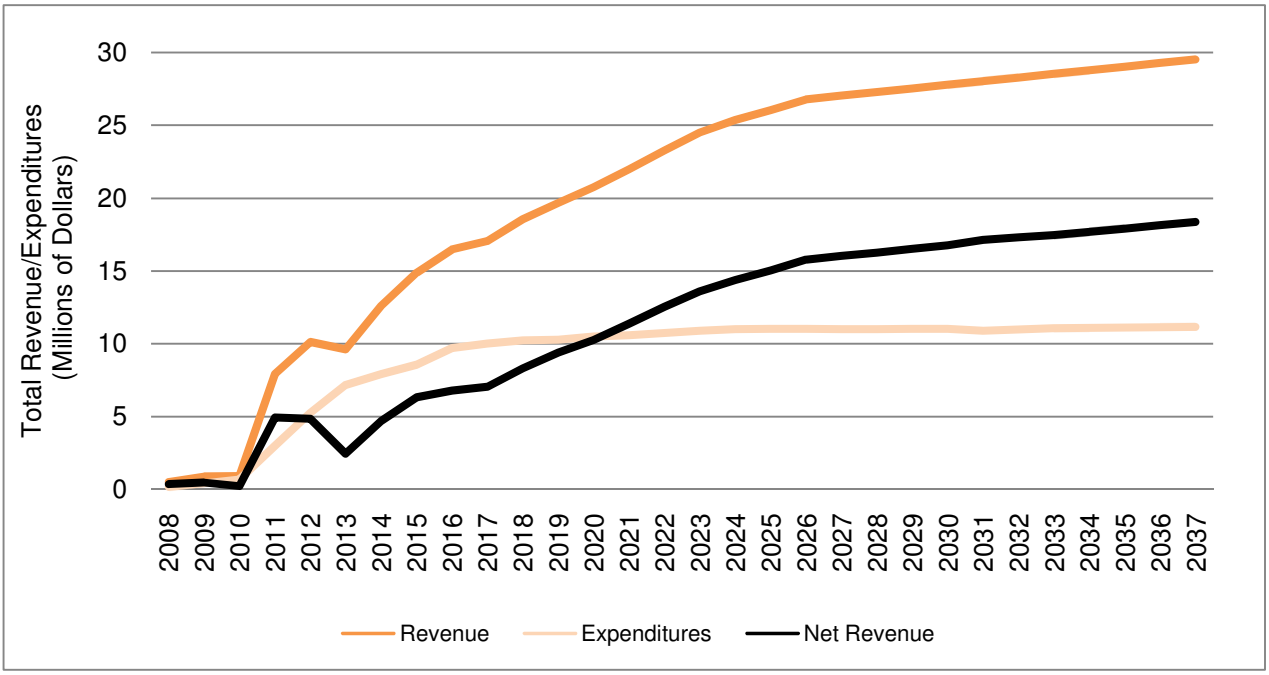
Local Government Net Fiscal Impact

The Kiawah River Plantation project can clearly be expected to have a significant positive impact on the Charleston County economy, as measured by employment, output, total income, or any number of other measures; while careful modeling can give us a good idea of the magnitude of the impact, the direction of the impact is immediately clear even without a model. However, the net fiscal impact of such a project on Charleston County government is not at all immediately obvious. On the one hand, the development generates income and business activity in the region, which can be expected (generally) to generate additional tax revenue for the county from multiple sources. At the same time, the project can be expected to attract additional people to the region, which is expected to generate additional government expenditures required to maintain the current level of government services, but might be expected to generate

additional transfers of money from the state government as well. The net result of all of the changes in all government revenue and expenditure streams is far from clear prior to analysis.

The Regional Dynamics model uses data on local government revenue and expenditures from the federal Census of Governments (from the U.S. Census Bureau). The data set provides very comprehensive, standardized revenue and expenditure data for all government entities with taxing authority in the United States, with over 50 individual revenue and expenditure line items. The REDYN model associates each revenue stream with an associated economic/demographic variable in the model (for example, gas tax revenue is associated with total gasoline sales) to determine a rate of revenue collection, and associates each expenditure category with an appropriate economic/demographic variable (for example, primary education expenditure is associated with total population age 5-18) to determine a rate of expenditure. Once a simulation is run, the appropriate economic and demographic variables are multiplied by the calculated effective revenue and expenditure rates to determine the fiscal impact on each revenue and expenditure line item. Summing up the revenue items provides an estimate of the simulated impact on total revenue, summing up the expenditure items provides an estimate of the simulated impact on total expenditures, and subtracting the latter from the former provides an estimate of the simulated impact on net revenue. For this project, a significant adjustment to the direct property tax was included, exogenous to the model, to reflect the much higher rate of second home ownership (taxed at 6% rather than the 4% tax rate on primary residences) in the Kiawah River Plantation development than in the county as a whole.

Figure 7 - Estimated Impact of Kiawah River Plantation Development on Charleston County Government Revenue and Expenditures, 2008-2037



The net impact of the project on Charleston County revenue, expenditures, and net revenue is shown in Figure 7. The fiscal analysis clearly shows that the expected net fiscal impact of the project is positive and significant throughout the forecast period. Total revenue and total expenditures both grow gradually throughout the build out and sales of Kiawah River Plantation. The net fiscal impact fluctuates through 2017 as various phases of the development come on line, and then trends gradually but definitively upward through the balance of the forecast period. Once the development is fully built and occupied, the net annual fiscal impact averages approximately $17 million per year, with total expenditures increasing by somewhat less than $11 million per year by 2037, and total revenue increasing by just under $30 million per year by 2037, over what would be collected in Charleston County without the project. Through the entire forecast period, the net fiscal impact averages just over $11 million per year. A detailed table of revenue for all revenue streams is provided in Appendix F.

There are two key reasons the project is clearly revenue positive. First, the project includes significant commercial components, which are generally revenue-positive. Second, a significant portion of the development is directed toward retirees. Because these households do demand relatively little primary education services, they are associated with much lower expenditure rates than households in general.

Figure 8 - Estimated Impact of Kiawah River Plantation Development on Charleston County Government Revenue by Category, 2008-2037

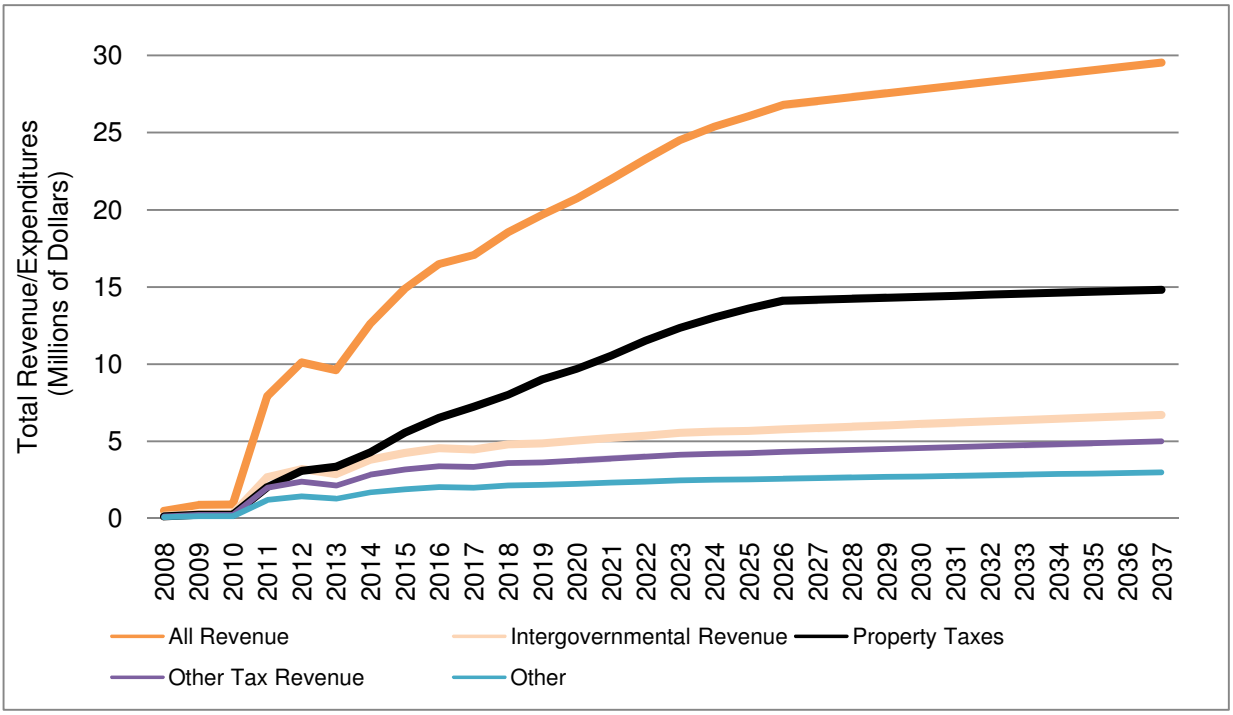


Figure 8 shows the sources of additions to county revenue that result from the Kiawah River Plantation project. As might be expected, addition to property taxes accounts for much of the increased revenue stream. The revenue expected from Kiawah River Plantation is significantly larger than might be expected from examination of the total property value being developed; this is because Kiawah River property is expected to sell largely to second home owners, and hence to be subject to the higher

second home property tax rate of 6%. However, only approximately half of the local government revenue impact is expected to come from property taxes. Other significant sources include intergovernmental transfers (additional revenue from other levels of government, largely brought in due to the county's additional population), which accounts for approximately 25% of the total impact on government revenue, and other taxes and fees, which account for approximately 20% of the total revenue impact, A comprehensive summary of revenue and expenditure impact by county, using Census of Governments revenue and expenditure categories, is available in appendix F.

Conclusion

The economic impact of the Kiawah River Plantation development project is forecast to be significant for Charleston County, South Carolina, in terms of jobs generated, output, and income earned in the county and in the state as a whole. The impact of the project is forecast to grow over time for the county, and the impact is expected to last long after the Kiawah River Plantation development is completely built out in 2026. The assumption that all residents of the community are new residents to the county is clearly very pessimistic, but the economic and fiscal impact of the project is clearly positive, regardless. Indeed, for every simulation and every alternative forecast scenario conducted as part of the final analysis, the county can clearly expect a net positive economic and fiscal impact from Kiawah River Plantation, given the characteristics of the project as provided by the developers.

Appendix A:

The Regional Dynamics Modeling System: A Multi-Sector, Multi-Year, Multi-Modal, County Level Computable Geographical Equilibrium Model of the United States Economy

Introduction

Paul Krugman (1998) expressed a hope that the new economic geography research might one day develop "'computable geographical equilibrium' models, which can be used to predict the effects of policy changes, technological shocks, etc. on the economy's spatial structure in the same way that such models are currently used to predict the effects of changes in taxes and trade policy on the economy's industrial structure." However, he acknowledges that "preliminary efforts in this direction by several researchers, myself included, have found that such models are not at all easy to calibrate to actual data." It is the objective of this paper to unite several different threads of economic research to develop the framework for just such a regional "computable geographic equilibrium" model of the United States economy. Key tools and concepts that will be incorporated into the model will include: input-output analysis, Social Accounting Matrices, gravity modeling, and new economic geography. The model framework that is developed is extremely simple, at least by the standards of most computable general equilibrium models, yet is capable of generating a wide range of extremely complex economic behaviors/outcomes, can model these behaviors at an extremely fine level of geographic and sectoral detail, and can be calibrated to "real world" data.

The Sector-Commodity Relationships in the Model: A Merged IO-SAM Framework

The data framework for the model is based on blending the traditional input-output tables of Leontief (1941), Stone and Brown (1962), with the closely related Social Accounting Matrix (SAM) framework as formalized by Pyatt and Round (1985) based upon the earlier work of Stone that has become widely used in recent decades. The beauty of the IO framework originally developed by Leontief is its utter simplicity – each industry sells its output to itself, to other industries, or to final demanders. Therefore, on a single table, you can capture all the activity in an economy. Stone and Brown, however, observed that the Leontief IO table implicitly failed to recognize that every industry uses a mix of commodities, and that every industry makes a mix of commodities. The commodities are a necessary component to describe accurately and explicitly the system's behavior. Mathematically, under the make and use table configuration of Stone and Brown, "industries" can be interpreted as a transformation system that converts a menu of commodities and factor inputs into a menu of commodities. Generally, the Stone and Brown IO tables can be used to model industry behavior using either Leontief or Cobb-Douglas production functions. The configuration is particularly well suited to Cobb-Douglas functions because all cells can be interpreted as the constant budget share of a Cobb-Douglas production function.

However, these traditional IO tables (consisting of a "make" table that identifies total spending on each commodity by each sector in the economy, and a "use" table that identifies the total sales of each commodity by each sector in the economy) have very little to contribute when we attempt to examine or model anything beyond the

industry-commodity-industry interactions. Social Accounting Matrices attempt to address these shortcomings by explicitly introducing household, government, and capital markets, and a host of behaviors such as taxation, intergovernmental transfers, etc. The SAM framework has the advantage of being absolutely comprehensive, because every transaction type is accounted for in some cell of a SAM matrix. However, while a SAM is comprehensive from an accounting perspective (every transaction shows up in some cell in the matrix), it is not complete in an economic sense, in that each cell does not represent a unique exchange of a commodity for money, as it does in an IO make and use table. This model begins with an alternative framework that draws on the comprehensiveness of the SAM, and the simplicity and economic cohesion of the IO make and use tables. The proposed framework involves viewing the economy as a continuous process where every sector of the economy is identified according to the menu of commodities they purchase and the menus of commodities they sell. The resulting merged framework is presented in figure 1.

Figure 1: A merged SAM/IO framework for the make and use tables.

MAKE TABLE

Commodities / **Sectors**	Producer Commodities	Labor	Transfer Payments	Government Goods	Financial Capital	Physical Capital	Land
Producers							
Employed Labor							
Remittance Cohorts							
Government							
Investors							
Speculators							
Land							

USE TABLE

Sector / Commodities	Producers	Employed Labor	Remittance Cohorts	Government	Investors	Speculators	Land
Producer Commodities							
Labor							
Tran Pmts/Taxes/Fees							
Government Goods							
Financial Capital							
Physical Capital							
Land							

Note that the gray cells in the figure represent areas that are likely to contain either zeros or insignificantly small transactions.

It is now possible to merge the IO and SAM methods of conceptualizing an economy into a unified system. The unified system's row elements in the make table include all the various producer industries generally included in make tables. They also include rows for a labor sector, "remittance cohort" sector (remembering that unemployed labor, retirees, and other transfer recipients are accounted for explicitly within this sector), and government rows. Finally, the make table adds "investor" rows to produce financial capital and "speculator" rows to produce physical capital as will be described in a moment.

The unified system also adds several columns to the traditional make table. The new columns include a "labor commodity" representing the wage bill produced by the labor sector added above as a make table row; a transfer payments commodity; and federal, state and local government commodities. They also include "financial capital" columns to represent commodities (dividends, interest, and rent) produced by the investor sector through the savings process; and "physical capital" columns to represent

the residential and nonresidential capital commodity outputs of the speculator industries.

Several columns in the make table require additional discussion. A transfer payment column is added to represent the "commodity" produced by remittance cohorts such as unemployed labor and retirees. Conceptually, we are simply saying that unemployed labor and retirees are producing a commodity because the very fact that they are being compensated is evidence for the commodity itself. One might debate the wisdom or rationale behind the transfer payments, but what is beyond doubt is that unemployed labor and retirees are producing some commodity, which some entity or entities are purchasing, based upon some decision making criterion (optimizing function). This is all that matters from a modeling perspective. Similarly, additional make table columns include several government commodities, which are produced by the government "industries" rows added to the make table. Again, we will infer the presence of the commodity from the presence of the transaction (taxes). The make table also will include additional columns for residential and nonresidential physical capital, which will be the commodity produced by the speculator industries that were added as rows in the make table.

A use table can be constructed along similar lines. As with make table rows, the use table will add columns for a labor sector, remittance cohorts, government, investors, and speculators. The use table also will add rows for labor; transfer payments, government taxes, and fees; financial capital; and residential and nonresidential physical capital. The labor sector will use a mix of commodities once relegated to the use table's final demand portion. In the same manner, remittance cohorts and

government also will use a mix of commodities from the final demand portion of the traditional use table.

The role of the proposed speculator industries deserves a brief explanation. Each speculator sector will use the mix of commodities identified in the traditional use table under investment final demand, in addition to the financial capital good, to produce the physical capital good(s) identified in the make table. The speculator sector is something of a “ghost in the machine” because it is a mechanism the model will use to insure that the presumably quite mobile financial capital commodity flows through speculator intermediaries to purchase presumably relatively immobile physical capital. As we develop an economic geography model of the United States, it is critical accurately to model where demand actually occurs, and introducing the speculator intermediary helps facilitate this. Finally, producer industries, in addition to using the commodities identified in a traditional IO table, also use labor, government, and physical capital commodities, which traditionally are identified as value added components in the use table.

Two industries receive very special treatment in the model, as they will both figure prominently in the behavioral equations and in the ultimate geographic equilibrium: the “real estate” sector (North American Industry Classification System code 531) and the “owner occupied dwellings” sector, which is not identified in the NAICS coding system, but is rather a constructed sector used in the make and use tables produced by both the Bureau of Economic Analysis (BEA) and Bureau of Labor Statistics (BLS) to guarantee compatibility with the United States national Income and Product Accounts. These industries are critical for the model, in that they include land

values, which is the one fixed geographic commodity in our model. Land, as we shall see shortly, is the only completely immobile commodity in the model, and land prices are the one factor that will invariably act to disperse economic activity. As such, the "other value added" components of these two industries are extracted, and are labeled as a separate land sector, producing a completely immobile land commodity. The only commodity used by the land sector is financial capital, specifically the rent (real or imputed) paid to landowners.

Several data sources are used to estimate county-level employment for the merged IO-SAM at the NAICS five-digit detail level (709 industries). A complete description of the process used to populate the model can be found in Tanner (2005). The primary data sources are the County Business Patterns (CBP) from the Bureau of the Census, and the Regional Economic Information System (REIS) from the Bureau of Economic Analysis (BEA). Wage Bill (payroll) data, which will populate the regional "labor sector" output in the model and also determine output for many other industries, are derived with the same techniques and from the same sources as the employment data. Specifically, the CBP reports the total annual payroll for each NAICS code up to the five-digit level of detail for the United States and for every region, state, and county. However, total employment and total payroll data are subject to suppressions for privacy. Rather than rely strictly on the various RAS and statistical systems traditionally used to fill all data suppressions, I developed a unique "range constraining" approach, which uses all information available in the CBP series and guarantees internal consistency with unsuppressed wage and employment data (Tanner 2005). All the furnished and estimated CBP wage bill and employment data are then totaled and

scaled to match the wage bill and employment data reported in the BEA's REIS, which includes all county and state wages at the two-digit NAICS level of detail and all employment data at one-digit NAICS detail. The REIS directly provides wage bill and employment data for the government and agriculture sectors, and also disposable personal income data by county.

The process used to build a complete set of historical and forecast IO-SAMs is also outlined in greater detail in Tanner (2005). Annual IO tables are constructed using BEA IO make and use tables, as well as biennial 11-year IO forecast tables from the Bureau of Labor Statistics (BLS). The very detailed BEA IO make and use tables are extended year-by-year to match the annual changes in make and use composition implied by the current 10-year BLS IO tables. This generates a detailed annual forecast series of national IO make and use tables. These national merged IO-SAM tables will serve as the US national forecast that will drive the model, and hence, some key characteristics of the resulting national merged IO-SAM make and use tables are in order. First, the national tables explicitly identify international exports of commodities by sector, and international imports of commodities by sector, for each year; these proportions are held constant across all regions in the model, so regardless of location in the US all industries of the same type will be importing the same proportion of their inputs and will be exporting the same proportion of their output. This amounts to an assumption that barriers to international trade in goods and services are sufficiently large that differences in US regional shipment of goods/services do not generate any substantial regional price differences for either imports or exports. Second, the resulting annual IO tables. Include explicit estimates of total US change in business inventories

by sector. As with imports and exports, these are held proportional in all regions in the model, so all industries of a particular type will experience the same change in business inventory, regardless of region. As such, the profitability variations between regions, which are explicitly calculated in the model, do not manifest trough differences in the annual change in business inventory. Finally, with respect to the labor sector, The merged IO-SAM is denominated exclusively in terms of dollars of labor bought/sold, and is mute on the point of number of people employed, and hence does not say anything about the degree of slack in the national labor market. As the BLS IO tables that underlie the merged IO-SAM are an element of the BLS long term forecast, the roll of labor market dynamics in the forecast is implicitly imbedded in the IO data, but is not explicit. However, the regional model will explicitly estimate the "profitability" of the labor sector in every region, and as such there will be regional differences in labor market dynamics. Because the purpose of this model is primarily to estimate how total US economic activity is distributed across the 3,110 regions in the model, and because all of the behavioral equations are adapted to estimate the proportion of total economic activity in each region, any US forecast could be imbedded in the model structure without need to revise the allocation equations.

Once the National Merged IO-SAM is constructed, each county's wage bill by sector is used to allocate each sector's national output to counties, the BEA Regional Economic Information System (REIS) income data is used to allocate the other sectors (labor, remittance cohorts, government, and investors) to their respective counties,. and then the regional output by sector is allocated to commodities based on the national merged IO-SAM make table proportions, for the years 2000 and 2001.

This assumes that the commodities produced by a sector are truly joint in the production process, as dictated by a nationally uniform production function for all firms in each industry based on competitive pressures to diffuse advantages quickly across all firms in an industry. Rather than relying upon the traditional matrix inversion technique used in most IO models (but unwieldy in a model with 3,110 interacting regions), in baseline and simulation forecasting the model will apply the national IO tables to estimate a complete multi-regional supply response to indirect and induced demand, and to exogenous final demand, in a search cycle that looks for the suppliers of suppliers across industries and regions. Each cycle in the search process starts up in every region where the gravity-based production function's previous cycle estimated a supply output response, and so on, until the process reaches a minimum incremental output cutoff point.

The New Economic Geography Behavioral Assumptions

Regardless of the entity in question, in our model all will face a Dixit-Stiglitx (1977) constant elasticity of substitution (CES) nested Cobb-Douglas production function of the form:

$$\prod_{g=1}^{G}\left(\tilde{g}_{gmsrt}\right)^{\theta_{\tilde{g}st}} = E_{st} + q_{msrt} \qquad (1)$$

For manufacturer m, belonging to sector (industry, labor, government, etc.) s, located in region r, at time t. G represents the total number of goods in the economy . $\tilde{g}_{gmsrt}$ is the quantity of composite commodity good $\tilde{g}$ used by manufacturer m, in sector s, in region r, at time t. $\theta_{\tilde{g}st}$ is the share of composite commodity good $\tilde{g}$ used

in sector s at time t. Note that the production function, at any point in time, is sector and time specific, but not region or manufacturer specific. E_{st} is the fixed cost of production for sector i at time t. Finally, q_{msrt} is the total output of manufacturer m, in sector s, in region r, at time t.

This behavioral equation will apply to all sectors, regardless of the "type" of entity in the traditional sense.

Every sector also faces the traditional constant returns to scale Cobb-Douglas budget share constraint given by

$$\sum_{g=1}^{G} \theta_{gst} = 1 \tag{2}$$

This is completely consistent with agglomeration economies in the new economic geography framework, which is based on increasing returns at the sector level, but not at the firm level. In addition, a constant returns to scale technology is consistent with the input-output data structure used throughout the model.

Because we wish to allow for the possibility of joint production, as implied by the data structure described earlier, we must devise a mechanism for translating between sector production and commodity production. To that end, we specify:

$$q_{msrt} = \sum_{g=1}^{G} \vartheta_{gst} q_{msrt} \tag{3}$$

Where

$$\sum_{g=1}^{G} \vartheta_{gst} = 1 \tag{4}$$

Where ϑ_{gst} is the output share of good g in sector s total output, at time t. For joint production, we shall calculate the U.S. average inputs for commodity g at time t, given by:

$$\theta_{\tilde{g}gt} = \sum_{i=1}^{I} \left(\theta_{\tilde{g}st} \frac{Q_{gst}}{\sum_{i=1}^{I} Q_{gst}} \right) \tag{5}$$

Where $\theta_{\tilde{g}gt}$ is the input share of commodity $\tilde{g}$ used in the production of commodity g at time t, and S is the total number of sectors. To simplify the process of calculating prices across all regions and commodities in the model, we shall use these input shares in all price and trade calculations. Industries will only reenter the equation when we allow for sector expansion/contraction in a region in response to price changes in the various commodities across regions.

The model we are developing will not rely upon traditional iceberg costs. Instead, we will model the transportation component of the economy as an explicit subset of inputs into the Dixit-Stiglitz production function. The iceberg transportation cost assumption is so thoroughly embedded in the new economic geography literature, that it is identified by Krugman, Fujita and Venables (1999) as one of the three cornerstones of the literature. At the same time, Krugman (1998) says of iceberg transportation costs, “it’s too bad that actual transport costs look nothing like that.” Since tractability can be maintained with a more realistic transportation assumption, for this model, transportation cost will be given by:

$$\frac{P_{g\tilde{r}rt}}{P_{g\tilde{r}t}} = \prod_{\delta=1}^{\Delta} \gamma_{g\delta t} d_{\delta\tilde{r}rt}^{\theta_{\delta gt}} \tag{6}$$

Where the left hand side of the equation, $\frac{P_{g\tilde{r}rt}}{P_{g\tilde{r}t}}$, represents the ratio of the profit-maximizing price as delivered to region r to the profit-maximizing Ex Works (EXW, the price at the factory door before any transportation expenses) price for good g, produced in region $\tilde{r}$, at time t. Δ represents the number of modes of transportation. Each mode of transportation, as mentioned earlier, is a commodity in the overall economy, hence $\Delta \in G$. $d_{\delta\tilde{r}rt}$ represents the effective distance from region $\tilde{r}$ to region r by mode δ, at time t. $\theta_{\delta gt}$ is the share of transportation commodity δ, used in production of commodity g, at time t, and $\gamma_{g\delta t}$ represents the unit distance cost of shipping commodity g, by mode δ, at time t. In estimating NEG models, the concept of $d_{\delta\tilde{r}rt}$ is often approximated inclusively by straight-line distance or an average travel time between two regions.

Under this formulation of prices, and with the CES assumption of our Dixit-Stiglitz production function, the aggregate profit maximizing behavior of producers will lead to a trade relationship for every commodity-county-county combination of:

$$T_{g\tilde{r}rt} = \frac{Q_{g\tilde{r}t} \cdot P_{g\tilde{r}rt}^{-\sigma_g}}{\left(\sum_{\tilde{r}=1}^{R} Q_{g\tilde{r}t} \cdot P_{g\tilde{r}rt}^{-\sigma_g}\right)} \cdot D_{grt} \tag{7}$$

Where $T_{g\tilde{r}rt}$ represents the volume of trade in commodity g, from region $\tilde{r}$ to region r. $Q_{g\tilde{r}t}$ is the aggregate amount of commodity g, produced in region $\tilde{r}$, at time

t, and D_{grt} is the aggregate demand for commodity g, in region r, at time t. Note that this is a completely traditional gravity model, in that the degree of interaction is a function of the relative size of the producer, the size of the demander, and the relative distance (shipping cost) between them. The specification encompasses any number of regions and commodities, and sheds the restrictive iceberg price assumption.

Estimating Price Elasticities and Trade Flows in the Model

The gravity model specified above is, by design, demand constrained. If we sum across all supplier regions $\tilde{r}$, we discover that

$$\sum_{\tilde{r}=1}^{R} T_{g\tilde{r}rt} = \sum_{\tilde{r}=1}^{R} \left(\frac{Q_{g\tilde{r}t} \cdot P_{g\tilde{r}rt}^{-\sigma_g}}{\left(\sum_{\tilde{r}=1}^{R} Q_{g\tilde{r}t} \cdot P_{g\tilde{r}rt}^{-\sigma_g} \right)} \cdot D_{grt} \right) \Rightarrow \sum_{\tilde{r}=1}^{R} T_{g\tilde{r}rt} = D_{grt} \forall g, r, t \quad (8)$$

That is, the total trade in commodity g from all regions, terminating in region r, is equal to the total demand for good g, in region r, an accounting condition that must be true by definition.

While theoretically complete, accurate empirical estimation of the above model requires one additional step: The addition of an explicit supply constraint to insure that every region in the model sells all output. As we wish to build an applied regional economic model of the United States economy, it is necessary to guarantee that our estimation process also meets the supply constraint that

$$\sum_{r=1}^{R} T_{g\tilde{r}rt} = Q_{g\tilde{r}t} \forall g, \tilde{r}, t \quad (9)$$

If the model captured all trade perfectly, this would not be a concern, but in the presence of error in the estimation, we must transform equation (7) into a classic, doubly constrained gravity model following the form developed by Wilson (1970, 1974):

$$T_{g\tilde{r}rt} = \frac{Q_{g\tilde{r}t}\left(P_{g\tilde{r}t}\cdot\prod_{\tilde{\delta}=1}^{\Delta}\left(\gamma_{g\tilde{\delta}t}d_{\tilde{\delta}rrt}\right)^{\theta_{\tilde{\delta}gt}}\right)^{-\sigma_g}}{\sum_{\tilde{r}=1}^{R}\left(Q_{g\tilde{r}t}\left(P_{g\tilde{r}t}\cdot\prod_{\tilde{\delta}=1}^{\Delta}\left(\gamma_{g\tilde{\delta}t}d_{\tilde{\delta}rrt}\right)^{\theta_{\tilde{\delta}gt}}\right)^{-\sigma_g}\right)}\cdot D_{grt} \tag{10}$$

$$P_{g\tilde{r}t}^{\ -\sigma_g} = \left(\sum_{r=1}^{R}D_{grt}\left(B_{grt}\cdot\prod_{\tilde{\delta}=1}^{\Delta}\left(\gamma_{g\tilde{\delta}t}d_{\tilde{\delta}rrt}\right)^{\theta_{\tilde{\delta}gt}}\right)^{-\sigma_g}\right)^{-1} \tag{11}$$

$$B_{grt}^{\ -\sigma_g} = \left(\sum_{\tilde{r}=1}^{R}Q_{g\tilde{r}t}\left(P_{g\tilde{r}t}\cdot\prod_{\tilde{\delta}=1}^{\Delta}\left(\gamma_{g\tilde{\delta}t}d_{\tilde{\delta}rrt}\right)^{\theta_{\tilde{\delta}gt}}\right)^{-\sigma_g}\right)^{-1} \tag{12}$$

Where $P_{g\tilde{r}rt}$ is the profit maximizing price in region r of commodity g, produced in region $\tilde{r}$, at time t, which will drive the distance decay function in the gravity model. B_{grt} is a balancing factor that insures that all output is sold in all regions in the model; that is, that equation (11) is satisfied. As such, the model of trade flows will closely follow Alonso's (1973) General Theory of Movement, though applied to trade rather than migration, and built from an explicit microeconomic foundation.

Unfortunately, there is no reliable, comprehensive, and timely data source for regional trade flows within the United States. However, if we first difference the trade gravity equation, and are willing to make the simplifying assumption that $B_{grt} = B_{grt-1}$ then we arrive at the following trade relationship:

$$\frac{Q_{g\tilde{r}t}}{Q_{g\tilde{r}t-1}} = \frac{\sum_{r=1}^{R} D_{grt}\left(B_{grt-1} \cdot P_{g\tilde{r}rt}\right)^{-\sigma_g}}{\sum_{r=1}^{R} D_{grt-1}\left(B_{grt-1} \cdot P_{g\tilde{r}rt-1}\right)^{-\sigma_g}} \tag{13}$$

Where $Q_{g\tilde{r}t}$ and $Q_{g\tilde{r}t-1}$ represent the total quantities of commodity g produced in region $\tilde{r}$ at times t and $t-1$, B_{grt-1} is the demand-balancing term for commodity g in region r at time $t-1$, and D_{grt-1} represents total quantity of commodity g demanded in region r at time $t-1$. $P_{g\tilde{r}rt}$ and $P_{g\tilde{r}rt-1}$ are the profit-maximizing prices of commodity g in region r, produced in region $\tilde{r}$, at times t and $t-1$, and σ_g is the elasticity of substitution between individual varieties of commodity g. Derivation of the trade relationship can be found in Tanner (2005).

The estimated share of each transportation mode devoted to the shipment of each commodity will be estimated by:

$$\theta_{g\delta t} = \sum_{s=1}^{S}\left(\theta_{\delta st} \cdot \frac{\vartheta_{gst} q_{st}}{\sum_{i=1}^{I} \vartheta_{gst} q_{st}}\right) \tag{14}$$

Where S is the total number of industries, $\theta_{\delta st}$ is the budget share of sector s devoted to the purchase of transportation mode δ at time t (identified by the IO table for time t), q_{st} is the total national output of sector s at time t, and ϑ_{gst} is the share of sector s output that is commodity g at time t. This equation enables the model to estimate the budget share of commodity g that is devoted to transportation mode δ as being the average of each sector's budget share devoted to transportation mode δ,

weighted by the sector's total share of the output of commodity g. Note that most commodities are produced almost entirely by a single sector, and hence the commodity share is determined almost entirely by the production function of that sector.

The distance variables $d_{\tilde{\delta}\tilde{r}rt}$, $d_{\delta\tilde{r}rt}$, $d_{\delta\tilde{r}rt-1}$, and $d_{\delta\tilde{r}rt-1}$ are normally approximated by some inclusive straight-line distance or time measure, such that:

$$d_{\tilde{\delta}\tilde{r}rt} = d_{\delta\tilde{r}rt} = d_{\tilde{\delta}\tilde{r}rt-1} = d_{\delta\tilde{r}rt-1} = d_{\tilde{\delta}r\tilde{r}t} = d_{\delta r\tilde{r}t} = d_{\tilde{\delta}r\tilde{r}t-1} = d_{\delta r\tilde{r}t-1} \tag{15}$$

However, rather than using an inclusive straight-line distance or time measure, this model applies a unique and comprehensive database of transportation impedance measures developed by the Oak Ridge National Laboratories from impedance information for 1997 (Southworth, 1997 and Southworth, Peterson and Chin, 1998). Based on the Oak Ridge impedance database, the impedance in this model can differ between two regions both with the mode and with the direction of travel, but in the currently supported analysis,

$$d_{\delta\tilde{r}rt} = d_{\delta\tilde{r}rt-1} \tag{16}$$

As additional years of transportation data become available, impedance measures could be expanded to change over time, as well as with the mode and with the direction of travel.

Under the current assumptions, we can substitute the delivered price equation into our gravity equation and perform some simple algebra to get:

$$\frac{Q_{g\tilde{r}t}}{Q_{g\tilde{r}t-1}} = \frac{\sum_{r=1}^{R} D_{grt} \cdot \left(B_{grt} \cdot \prod_{\delta=1}^{\Delta} d_{\delta\tilde{r}rt}^{\theta_{\delta gt}} \right)^{-\sigma_g}}{\sum_{r=1}^{R} D_{grt-1} \left(B_{grt} \cdot \prod_{\delta=1}^{\Delta} d_{\delta\tilde{r}rt-1}^{\theta_{\delta gt-1}} \right)^{-\sigma_g}} \tag{17}$$

At this point we have an equation where the only unknowns are the elasticity of substitution σ_g and the balancing factor B_{grt}. Estimates of σ_g are calculated for each commodity g, using non-linear least squares. The estimation is made using data for all 3,110 regions in the U.S. database for the years 1999-2001.

Once σ_g has converged, we have effectively estimated the elasticities of substitution for each commodity in the model, subject to our initial condition that $P_{g\tilde{r}t}$ and B_{grt} are 1. These EXW balancing factors $P_{g\tilde{r}t}$ and B_{grt} are solved iteratively (of necessity, since they enter into the trade flow calculations nonlinearly), and the iterative estimation of $P_{g\tilde{r}t}$ and B_{grt} is followed by a re-estimation of σ_g. The entire process is repeated until convergence is achieved.

While trade flows are calculated for every commodity in our conjoined IO/SAM framework, some restrictions and assumptions will be imposed upon the various entities in the model to capture specific behavioral limitations. Specifically:

1. No local government commodity can be shipped across county lines. This, effectively, prevents the export of local government commodities across region borders, which means that local government is paid for entirely by those entities in the region. Because this model will use counties as regions, this amounts to an assumption that local government does not cross county borders, but is provided uniformly within any given county; this is certainly a simplifying abstraction from reality, to the extent that some local government entities cross

county borders, while others may have a footprint that does not cover an entire county.

2. No state government commodity can be shipped across state borders. This has the same effect for state government as our first assumption did for local government – state government does not cross state borders, but may be transported within the state, though such shipments are subject to the explicitly estimated transportation cost for the commodity.

3. Land cannot be shipped across county borders. Recall that the land area in a region fixes the supply of the land commodities in the region. This means that any region has a fixed supply of land, and this will act as the fundamental dispersing force in the model, counteracting any tendency toward catastrophic agglomeration that might occur in the presence of transportation costs alone.

Creating CGE and Dynamic Adjustment Paths for the Model

Recall from equation (6) that, under our explicit transportation cost assumption, the profit-maximizing price in region r of commodity g, produced in region $\tilde{r}$, at time t becomes:

$$P_{g\tilde{r}rt} = P_{g\tilde{r}t} \cdot \prod_{\delta=1}^{\Delta} \gamma_{g\delta} d_{\delta rt}^{\theta_{\delta gt}} \tag{18}$$

The next task is to define the vector of EXW profit-maximizing prices for all commodities manufactured in region $\tilde{r}$ at time t:

$$P_{g\tilde{r}t} = \frac{\sigma_g}{\sigma_g - 1} \Omega_{g\tilde{r}t} \tag{19}$$

Where σ_g represents the elasticity of substitution between individual varieties of commodity g, and $\Omega_{g\tilde{r}t}$ is the marginal cost function for producing commodity g in region $\tilde{r}$ at time t.

By working within price space (rather than quantity space), as dictated by the isomorphic discovery of Robert-Nicoud (2004), the EXW marginal cost function Ω_{grt} is in turn given by:

$$\Omega_{grt} = \prod_{\tilde{g}=1}^{G-\Delta} \left(P_{\tilde{g}rt}\right)^{\theta_{\tilde{g}gt}} \tag{20}$$

Where $G-\Delta$ is the number of non-transportation commodities, $P_{\tilde{g}rt}$ is the price index of commodity $\tilde{g}$, in region r, at time t, and $\theta_{\tilde{g}gt}$ is the share of commodity $\tilde{g}$ used in production of commodity g at time t. This vastly simplifies the marginal cost functions used by others (e.g. Fan, Treyz & Treyz, 2000) in developing multi-sector NEG models.

The price index $P_{\tilde{g}rt}$ is given by:

$$P_{\tilde{g}rt} = \sum_{\tilde{r}=1}^{R} \left(\frac{T_{\tilde{g}\tilde{r}rt}}{\sum_{\tilde{r}=1}^{R} T_{\tilde{g}\tilde{r}rt}} P_{\tilde{g}\tilde{r}rt} \right) \cdot \frac{\sum_{r=1}^{R} D_{\tilde{g}rt}}{\sum_{\tilde{r}=1}^{R} Q_{\tilde{g}\tilde{r}t}} \tag{21}$$

Where R represents the total number of regions in the model. $T_{\tilde{g}\tilde{r}rt}$ is the total trade in commodity $\tilde{g}$, originating in region $\tilde{r}$ and sold to region r, at time t, and $P_{\tilde{g}\tilde{r}rt}$ is the profit-maximizing price in region r of commodity $\tilde{g}$, produced in region $\tilde{r}$, at time

t. The ratio of total demand in all markets, $\sum_{r=1}^{R} D_{\tilde{g}rt}$ to total supply in all markets $\sum_{\tilde{r}=1}^{R} Q_{\tilde{g}\tilde{r}t}$, might seem superfluous. Remember that the national IO tables are balanced by design, and hence, this ratio should equal 1 and be irrelevant to the calculation – and indeed, for most commodities, this is the case. However, in the case of the state and local government commodities and, critically, the land commodity, markets are not national in scope, and this ratio is likely not going to be 1.

To generate our dynamic new economic geography model of the economy, it is critical that we unwrap the concept of the EXW price of good g. Within a new economic geography framework, the EXW price can be decomposed as:

$$P_{grt} = \frac{\sum_{r=1}^{R} D_{grt}}{\sum_{r=1}^{R} Q_{grt}} \cdot \prod_{\tilde{g}=1}^{G-\Delta} \left(P_{\tilde{g}rt}\right)^{\theta_{\tilde{g}gt}} \cdot A_{gr} \tag{22}$$

That is, the EXW price P_{grt}, is equal to the demand to supply ratio of the commodity in the market times the production function weighted price index for all nontransportation intermediate inputs. The refinement that we must introduce at this point is the variable A_{gr}, which is the first nature production cost of commodity g in region r, and is calibrated from the EXW price equation (19). The EXW price equation (19) is correct, only if there are no location-specific price differences in production for any region, except those originating from the price of intermediate inputs. However, in the real world, regions are intrinsically heterogeneous. For example, coal mining is intrinsically more profitable in Wyoming than in Delaware, not because market access is better in Wyoming than in Delaware, but because Wyoming is intrinsically different than

Delaware – Wyoming has lots of rich coal deposits, and Delaware does not. Likewise, boat building will tend to be more profitable when there is a body of water in the region, agriculture will be more profitable for regions that have the appropriate soil, etc. In a completely homogenous world, there would be no such first nature differences, all A_{gr} values would be expected to equal 1, and the only other force driving the location decision would be market access. But with our CGE behavioral equations, and with our trade flow calculations from the previous section, we can estimate a completely new economic geography model.

For each origin region $\tilde{r}$ and destination region r, for each good g, we calculate the delivered price equation (18) for the last history year using our calculated EXW price $P_{g\tilde{r}t}$ from equations (19) and (20). Once we have calculated the delivered price for all regions and commodities in the last history year, we can use equation (21) to calculate the price index for every commodity and region in the last history year. Finally, the EXW price for every commodity is decomposed into its respective elements, per equation (22), specifically to calibrate the first nature differences, A_{gr}, for each good and region in the last history year. We shall assume that these first nature differences do not fluctuate over time.

Once these calculations are made, there is certainly no guarantee that profits of all industries, in all regions, will be equal. Given the monopolistic competition configuration of the model, any potential for profit will be realized in regions that can produce and deliver output at a low relative price within the various markets they serve.

As such, given the behavioral equations outlined in the previous section, we can estimate an index of relative profitability for firms in sector i in region r at time t as:

$$\pi_{srt} = \sum_{\tilde{g}=1}^{G} \left(\vartheta_{\tilde{g}st} \cdot \sum_{r=1}^{R} \left(\frac{T_{\tilde{g}\tilde{r}rt}}{\sum_{r=1}^{R} T_{\tilde{g}\tilde{r}rt}} \cdot \frac{P_{\tilde{g}rt}}{P_{\tilde{g}\tilde{r}rt}} \right) \right) \tag{23}$$

Where π_{srt} is an index of relative profitability for sector s, in region r, at time t.

At this point, we must develop an output adjustment process for the CGE model in order to recognize that the adjustment to a stable, long run equilibrium is not an instantaneous process, but rather a series of myopic steps as each sector in each region makes adjustments, over time, in response to their profitability signals. An output adjustment process is estimated by

$$\frac{Q_{s\tilde{r}t+1}}{\sum_{\tilde{r}=1}^{R} Q_{s\tilde{r}t+1}} = \frac{Q_{s\tilde{r}t}}{\sum_{\tilde{r}=1}^{R} Q_{s\tilde{r}t}} + \lambda_s \cdot \left(\sum_{\tilde{g}=1}^{G} \left(\vartheta_{gst+1} \cdot \sum_{r=1}^{R} \left(T_{\tilde{g}\tilde{r}rt} \cdot \frac{P_{\tilde{g}rt}}{P_{\tilde{g}\tilde{r}rt}} \right) \right) - 1 \right) \cdot \frac{Q_{s\tilde{r}t}}{\sum_{\tilde{r}=1}^{R} Q_{s\tilde{r}t}} \tag{24}$$

Where $Q_{s\tilde{r}t}$ and $Q_{s\tilde{r}t+1}$ are the quantity of output in sector s, in region $\tilde{r}$, at times t and $t+1$, respectively, and λ_s is the speed of adjustment of sector s to the relative profitability signal, and must be econometrically estimated.

Then, using our historical data, we can use equation (24) to calculate profitability response λ_s for each sector by least squares, using:

$$\frac{\frac{Q_{srt+1}}{\sum_{\tilde{r}=1}^{R} Q_{s\tilde{r}t+1}}}{\frac{Q_{srt}}{\sum_{\tilde{r}=1}^{R} Q_{s\tilde{r}t}}} = 1 + \lambda_s (\pi_{srt} - 1) \tag{25}$$

Based upon the calculated profitability π_{srt} and profitability response λ_s, we can then calculate the expected market shares for the first forecast year, and allocate supply and demand accordingly. Based upon the new allocation of supply and demand, and the estimated elasticity of substitution, we can calculate a complete and balanced set of trade flows for the first forecast year.

Then, we calculate the EXW price for each commodity, in each region, in the first forecast year, by using equation (20) and the value of $P_{\tilde{g}rt-1}$ as an estimate of $P_{\tilde{g}rt}$. Using the EXW price we have just calculated, we use equation (19) to calculate the delivered price $P_{g\tilde{r}rt}$ for every good g, and for every origin region $\tilde{r}$, and destination region r.

Using this estimate of delivered price, we calculate the price index for each good g, and region r, in the first forecast year using equation (22). Once all price indices have been updated, we can recalculate the complete menu of EXW prices, to recalculate a complete set of delivered prices, then recalculate all price indices. This process is repeated until it converges completely. Because each iteration is capturing prices across a greater number of regions, the process necessarily converges very quickly.

With the delivered price and price index data for all regions and goods for the first forecast year, we can calculate sector i profitability for all industries in all regions, using equation (23). Based upon the calculated profitability π_{srt} and profitability response λ_s, we calculate the expected market shares for the second forecast year, and allocate supply and demand accordingly. The whole process is then repeated for each and

every year of the forecast period, to build a complete county level CGE model of the United States Economy that is consistent with the new economic geography framework.

Characteristics and Behavior of the Model

Because of the switch from the SIC (Standard Industrial Classification) to NAICS (North American Industrial Classification System) system for coding industries and commodities that took place over the 1997-2000 time frame, and because the U.S. Bureau of Economic Analysis chose not to collect data in both formats for a single overlapping year, there exists no technique that will generate even a remotely useful county level time series that overlaps the two coding systems (Tanner & Hearn, 2005). Because the model we have developed ultimately is to be applied to regional planning activity, it has been built entirely in NAICS, which means that the data series cannot be extended before 1999. As such, the model is constructed using a complete historical database that covers only the years 1999-2001. The major shortcoming of this arrangement is that the model's forecasting capability cannot yet be tested against historical data; the estimation of trade flows in chapter 2 requires two years of historical data, and that leaves a measly one year of historical data that could be used to test the model. This is clearly insufficient to test a structural model. So, we are left to explore characteristics of the model forecast, while having to rely upon the integrity of the model logic, as opposed to its historical performance.

Because the model forecasts an enormous number of concepts, identifying data that will capture the overarching concepts of the New Economic Geography framework is a challenge. The challenge is intensified by the fact that the model forecasts the market share accruing to each county in every market, and hence, the U.S. aggregate

forecast tells us nothing about the nature of the regional model. Because the NEG model is fundamentally driven by market shares and the amount of land available, it seems the single metric that best captures the model behavior is “relative total sector output per acre.” That is, the total amount of output per acre in a county, relative to the total amount of output per acre in the United States. By this metric, a county with a relative total sector output per acre of 1, is producing exactly as much per acre as the U.S. as a whole. A county with a metric greater than 1 is, to some degree, a core county (a county that has experienced economic agglomeration), and a county with a metric smaller than one is, to some degree, a periphery county (a county that has experienced economic dispersion). If the metric for a county is increasing over time, this would reflect a county that is experiencing economic agglomeration, and if the metric is decreasing over time, this would reflect a county dominated by dispersion forces, the key features of the new economic geography literature.

To provide a frame of reference, in 2002 the “most peripheral” county in the United States was the Yukon-Koyukuk Census Area in Alaska. With a relative output per acre measure of 0.00031, this region had an “economic density” that was .031% of the national average. By this same metric, the five “most peripheral” counties in the United States in 2001 were: Yukon-Koyukuk Census Area, Alaska, Lake and Peninsula Borough, Alaska, Loving County, Texas, Petroleum County, Montana, and Yakutat City and Borough, Alaska.

At the other extreme, the most economically dense (or “most core”) county in the United States was New York County, New York, with a relative economic density of 5803.38, meaning that output per acre in New York County is over 5800 times the

national average output per acre. The top five "most core" counties in the United States in 2001 were: New York County, New York, San Francisco County, California, Suffolk County, Massachusetts, the District of Columbia, and Arlington, Virginia.

Under this measure of economic density, using what we know of the new economic geography structure of the model, we can begin to picture how various counties might be forecast to behave within this structure. We would expect that periphery regions like Yukon-Koyukuk, are likely to be very stable periphery counties, and that they are likely to see little change in their economic density over time. Likewise, we might expect the "most core" regions, like New York County, will be relatively stable in their market share. Between these two extremes, we have an array of regions that might, over the forecast period, be moving toward "greater coreness" or "greater peripheriness" if they are near their so-called "break point" (the point where the benefits of economic agglomeration outweigh the costs, and economic agglomeration/dispersion occurs). And we might have yet another group of midsize regions that are losing there "coreness" or "peripheryness" as they pass the sustain point for their particular equilibrium. If we look at the behavior of these counties in the aggregate, we expect to see a number of counties that are stable within their core, periphery, or dispersed equilibrium, and some counties that, across the forecast period, will be making the transition from core or periphery. We have compared our forecast to two alternative, naïve forecasts, and we see a result that is largely as expected. The first alternative forecast assumes the county share of U.S. output to remain constant throughout the forecast period, and a second assumes that the county share of U.S. output will grow at the average annual rate exhibited in the 1999-2001 historical period.

Both of these forecasts would be expected to correspond well with the counties that do not approach a break or sustain point. The constant growth forecast is expected to perform comparatively well over the short term with counties that are in transition, but will likely perform very poorly as those counties approach their new core or periphery position. The constant share forecast will not accurately reflect the counties while they are in transition, but will not be wildly incorrect over time, as those counties approach their new equilibrium and settle into a more-or-less fixed output share. By examination of the correlation coefficients over the forecast period between our model, the constant shares model, and the constant growth model, we see results consistent with our intuition (see figure1) For the first fifteen to twenty years of the forecast period, the forecasts of county level relative output per acre are very tightly correlated among the three forecast types. The correlation of the model forecast with the constant share forecast then begins to drop off, and by the close of the forecast period, the correlation between the constant growth forecast and the NEG model forecast is virtually zero. This is consistent with the idea that counties that are experiencing share growth are in transition, and not exhibiting a permanent relative growth behavior as suggested by the naïve model.

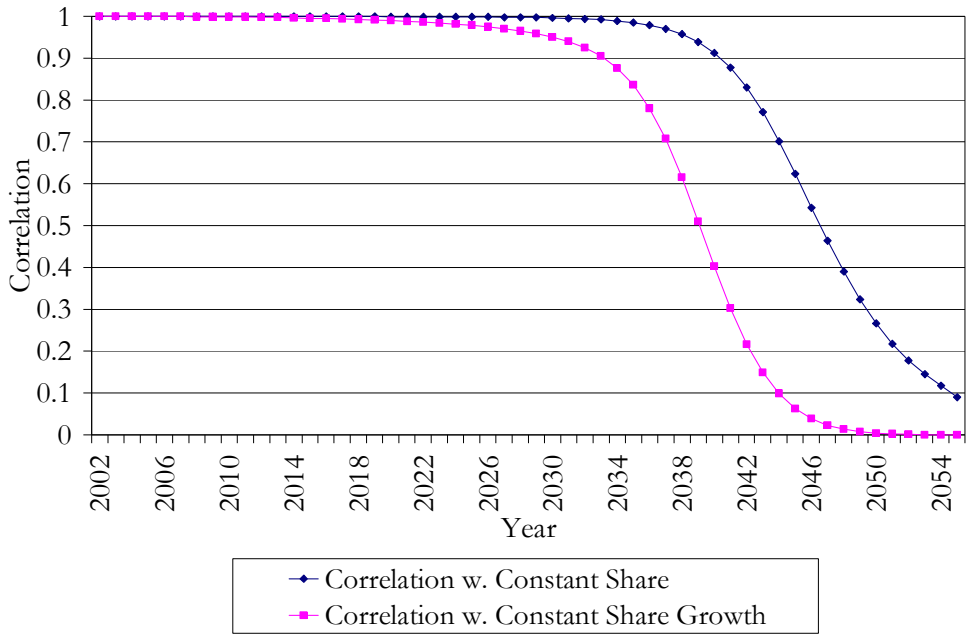


Figure 1: Correlation of the NEG model with the constant output share and constant output growth models.

The constant share forecast is much more tightly correlated with the NEG model forecast, for a much longer period of time. By the close of the forecast period, there is still approximately 9% correlation between the constant shares forecast and the NEG model forecast. Once again, this is consistent with our intuition regarding market behavior in an NEG format.

We can capture this behavior in another way, by looking at the behavior of our chosen metric, relative output per acre, within deciles. With a total of 3,110 counties, each year we divide these counties into ten groups of 311, based upon their relative output per acre. The 311 counties in the smallest decile are, in a sense, the "most peripheral," and the 311 in the largest decile are the "most core." Because our metric is a county aggregate, it necessarily abstracts from the more in depth model behavior,

since every sector, in every county, can have any degree of “coreness” or “peripheryness.” Nonetheless, if we expect that movement toward core and periphery solutions fundamentally drive the economy, we can expect some specific behaviors to appear in the data. In an economy moving toward increasing heterogeneity, we would expect the average growth rate in the very smallest regions to be either constant (if they are as peripheral as they can get) or shrinking, and the growth rate of the very largest regions to be, in general, either constant (if they have reached a point of maximum “coreness”) or growing. Somewhere in the middle of the distribution, we might expect to see counties that are in transition to a core position, or perhaps to a periphery position. A look at the growth rates by decile in Table 6.1 reveals some interesting patterns. First, the relative output of the smallest 311 counties is shrinking, and is shrinking slightly faster than it is for any other decile. Deciles 2 through 6 are shrinking slightly as well, though each successive decile is shrinking slightly less. The 622 regions in deciles 8 and 9 are actually growing in share of U.S. output, suggesting that they are moving toward becoming cores. The largest 311 regions, however, are exhibiting almost no growth in share of U.S. output, suggesting that the most core U.S. counties simply cannot get any more “core” than they already are. These counties are likely running into the model barrier created by land prices, which simply precludes further agglomeration.

Table 1: County relative growth in share of US output, by decile, 2002-2055.

Decile	**Average Growth Rate**	**Decile**	**Average Growth Rate**
Smallest	0.9814	6	0.9990

Decile	Average Growth Rate	Decile	Average Growth Rate
2	0.9883	7	0.9995
3	0.9913	8	1.0045
4	0.9923	9	1.0074
5	0.9950	Largest	1.0002

Agglomeration from a Homogeneous Economy

At this point, we have evidence that the model will maintain core/periphery economies when presented with a heterogeneous economy as a starting point; in this case, we started the model with our clearly heterogeneous 2001 economy, and allowed the model to go from there. However, it is interesting to test whether the model can develop a heterogeneous economy from a completely homogeneous starting point, and what characteristics this artificial economy might have. To that end, the forecasting model was adjusted in a few fundamental ways. First, the input-output matrix, which evolves over time in the forecasting model, is "locked down" as the 2001 input-output matrix, which means that changes in production technology will not take place, so the economy is evolving toward some fixed equilibrium, rather than an equilibrium that is, itself, changing due to input-output changes. Secondly, the total US output for every sector in the model was spread evenly across every county, in proportion to each county's share of total U.S. land area. So, a county that represents .1% of U.S. land area also was assigned .1% of total U.S. output of every sector. Thus, the model was starting from a truly dispersed "backyard capitalism" scenario.

With this starting point, a total of five alternative model specifications were built. In the first model specification, first difference values were set to 1 for all goods in all regions. That is, the model assumed that there were no first nature differences for any production activity in any region (so, coal mines, for example, could be located anywhere). Second, all impedance values, for all modes, for every region-region combination were set to 1. This means that there was also no transportation related advantage for any region in the model; any region would produce their output and sell it in every region (including there own) for the same price. All other characteristics of the model were left unchanged. This model was then allowed to run through 54 simulated years. It should come as absolutely no surprise that, under these restrictions, no agglomeration whatsoever takes place. The economy at the end of the 54 cycles remains completely homogeneous for the simple reason that, with no first nature price differences and no potential for second nature differences, there is no force to encourage any movement from the dispersed equilibrium.

For the second scenario, we reintroduce the first difference values, that were calculated for the model, but we continued to allow all goods to be shipped from any region, to any region, for the same price. This model effectively allows for first nature differences, but removes all second nature differences. When this model was allowed to cycle through 54 years, the result was spectacular agglomeration; agglomeration that is much greater than that actually seen in the U.S. economy in 2001 (as measured by the standard deviation in county output per acre). The reason for the spectacular level of agglomeration is simply that, with transportation costs not entering into the picture, all economic activity is strongly attracted to the places with the greatest first nature

advantage in production. Many activities that we intuitively know are significantly constrained by transportation (restaurants, gas stations, grocery stores) will, nonetheless, cluster in a relatively small number of counties, even if the first nature price advantage is small, simply because the transportation effect has been removed.

The next incarnation of the model again removed the first nature differences, but this time the impedance values for every mode of transportation was set to equal the straight line distance between county centroids. Internal distances for every region were set equal to the square root of the region's land area. Under this configuration, we are removing any first nature differences among regions, and allowing second nature differences, but those second nature differences use the simplifying assumption that transportation costs are simply proportional to straight line distance. When this model is allowed to continue for 54 years, it generates economic agglomerations, though the agglomerations are much more modest than those created by the first nature difference model. The agglomeration is, of course, generated strictly through the second nature differences in this model.

The next incarnation of the model was very similar, except that the straight line distances were replaced with the Oak Ridge impedance data. Therefore, this model included all transportation infrastructure data for second nature differences, but still included no information about first nature differences. Not surprisingly, this model also generated economic agglomeration over the forecast period; the agglomeration was somewhat more pronounced then that generated by the straight line distance model, but still much less than the agglomeration generated by the first nature differences themselves. The agglomeration in this model is greater than that of the straight line

distance model, simply because the transportation data is much more heterogeneous than the straight line distances. Two adjacent counties will face almost the same menu of straight line distances, and will, therefore, be almost equally preferable if that is the metric used for transportation costs. However, when a major highway, a rail line, and a port are located in one county and not the other, the difference between the two, from a profitability standpoint, becomes quite dramatic.

The final incarnation of the model included all of the transportation infrastructure data, and all of the first nature difference data. This version was simply the full model, but run on an initially homogenous distribution and with a constant IO table. This model exhibited somewhat more agglomeration than the model with transportation, but not first order differences. However, the model still showed much less agglomeration than the model of first nature differences alone.

The purpose of this experiment was not simply to look at the models compared to one another, but also to look at how the models might compare to the actual 2001 U.S. economy. We know that history matters, and that there are a near infinite number of potential equilibria in an NEG mode with this many regions and sectors. However, it seems reasonable that given the distribution of first nature differences, and given our heterogeneously distributed transportation infrastructure, we might gravitate to a similar spatial distribution of economic activity, even from very different starting points. In this case, we are taking our starting point of a homogeneous economy, with a fixed 2001 technology, and letting each of our alternative model specifications run for 54 years, to see how the resulting economy compares to the actual U.S. economy in 2001 (which obviously started from a very different starting point). Once again, we use our metric of

relative output per acre for each county, and will see whether any of our model configurations are correlated with the actual 2001 economy. The summary results are reported in Table 2.

Table 2: The degree of correlation between the distribution of economic activity in the U.S. in 2001 and the distribution of economic activity 54 years removed from a homogeneous distribution, for various model configurations.

Forecast Method:	**Correlation with 2001 Output per County:**
No First Nature Difference	NA
First Nature Effect Only	.0593
Distance Effect Only	.1314
Transportation Effect Only	.5727
Transportation and First Nature Effects	.6502

The model with no first or second nature differences, of course, exhibits no heterogeneity at the end of 54 years, so there is no correlation to discuss. The model with first nature differences, but no transportation had a very high degree of agglomeration, but the agglomeration is only minimally correlated with the agglomeration in the actual economy. While the first nature model might perform very well for some industries, such as mining, which are clearly driven by location specific cost factors, it tells us little about industries that are more affected by market access, rather than by first nature differences.

The models that capture transportation (and hence shipping cost) are each much more strongly correlated with the actual U.S. 2001 data. The model that imbeds impedance data (but without first nature differences) generates a correlation of over 57%. Finally, the full model, with first nature differences and transportation infrastructure, manages to endogenously generate a heterogeneous economy that is over 65% correlated with the 2001 U.S. economy. These correlations are surprisingly high, and are no doubt driven largely by the fact that transportation generates economic agglomeration, which drives economic development, so the model is capturing the correlation between level of infrastructure and the size of the economy. In this way, the model is generating results very similar to Sutton, Roberts, Elvidge, and Meij (1997). They tested the simple correlation between the light levels from nighttime satellite photos of the United States, and the county level income data for the United States. Their analysis found a correlation of 84% to 93%, which is in line with the numbers found in this analysis.

While the exercise of building these alternative models has no immediate practical application, it is certainly reassuring to note the model's ability to spontaneously agglomerate a homogeneous economy in a manner consistent with NEG theory. In examining the degree of correlation between the model and the 2001 data, it also suggests a certain degree of inevitability in the specific pattern of heterogeneity observed in the U.S. economy.

While we do not yet have a sufficient historical record against which to test the model, these results can at least reassure us that the model is behaving as we would expect, given the theory.

Conclusions

In this paper, we have integrated concepts, theories, and data from a number of different areas into a comprehensive regional economic modeling methodology consistent with the theoretical New Economic Geography literature. The case for using this approach to develop a computable general equilibrium model appears compelling, and on that basis we believe the model takes several important steps forward in the field of applied regional economic modeling, forecasting, and impact analysis. While the model development effort has been significant, what has been built to this point only scratches the surface of what might be possible, as additional data, computing power, and theoretical work enable making increasingly simple models that can capture increasingly complex behaviors in an increasingly accurate manner.

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Appendix B:

Annual Development Costs of the Proposed Kiawah River Plantation Development in Charleston County, South Carolina

Concept (millions of dollars)	2008	2009	2010	2011	2012
Total Costs	$4.162	$7.240	$7.648	$10.950	$16.031
-Total Direct Costs	$ -	$ -	$2.506	$3.165	$2.635
--Total Residential Investment	$ -	$ -	$2.460	$3.165	$2.635
---Total Single Family Lots Direct Costs	$ -	$ -	$2.460	$3.165	$2.635
---Total Multi-Family & Cottages Direct Costs	$ -	$ -	$ -	$ -	$ -
--Total Commercial Direct Costs	$ -	$ -	$0.046	$ -	$ -
---Mixed Use	$ -	$ -	$0.012	$ -	$ -
---Hotel Site	$ -	$ -	$0.033	$ -	$ -
---Conventional Commercial	$ -	$ -	$0.002	$ -	$ -
-Total Common Costs	$3.767	$6.922	$3.135	$1.832	$3.723
-Total Master Plan Costs	$0.395	$0.230	$0.115	$0.105	$0.095
-Total Amenity Costs	$ -	$0.088	$1.892	$5.848	$9.578

Concept (millions of dollars)	2013	2014	2015	2016	2017
Total Costs	$7.077	$14.622	$6.546	$7.471	$1.603
-Total Direct Costs	$4.086	$4.453	$3.856	$4.288	$0.145
--Total Residential Investment	$4.085	$4.453	$3.856	$4.288	$0.145
---Total Single Family Lots Direct Costs	$4.085	$4.425	$3.810	$4.285	$0.145
---Total Multi-Family & Cottages Direct Costs	$ -	$0.028	$0.046	$0.003	$ -
--Total Commercial Direct Costs	$0.001	$ -	$ -	$ -	$ -
---Mixed Use	$ -	$ -	$ -	$ -	$ -
---Hotel Site	$ -	$ -	$ -	$ -	$ -
---Conventional Commercial	$ -	$ -	$ -	$ -	$ -
-Total Common Costs	$2.420	$0.089	$0.072	$2.862	$0.120
-Total Master Plan Costs	$0.095	$0.080	$0.080	$0.075	$0.076
-Total Amenity Costs	$0.476	$10.000	$2.538	$0.246	$1.262

Concept (millions of dollars)	2018	2019	2020	2021	2022
Total Costs	$4.447	$2.789	$2.813	$2.861	$2.635
-Total Direct Costs	$2.627	$2.600	$2.600	$2.600	$2.600
--Total Residential Investment	$2.627	$2.600	$2.600	$2.600	$2.600
---Total Single Family Lots Direct Costs	$2.600	$2.600	$2.600	$2.600	$2.600
---Total Multi-Family & Cottages Direct Costs	$0.027	$ -	$ -	$ -	$ -
--Total Commercial Direct Costs	$ -	$ -	$ -	$ -	$ -
---Mixed Use	$ -	$ -	$ -	$ -	$ -
---Hotel Site	$ -	$ -	$ -	$ -	$ -
---Conventional Commercial	$ -	$ -	$ -	$ -	$ -
-Total Common Costs	$1.280	$0.149	$0.125	$0.170	$ -
-Total Master Plan Costs	$0.070	$0.040	$0.035	$0.035	$0.035
-Total Amenity Costs	$0.470	$ -	$0.053	$0.056	$ -

Concept (millions of dollars)	2023	2024	2025	2026
Total Costs	$2.635	$1.915	$0.395	$0.035
-Total Direct Costs	$2.600	$1.880	$0.360	$ -
--Total Residential Investment	$2.600	$1.880	$0.360	$ -
---Total Single Family Lots Direct Costs	$2.600	$1.880	$0.360	$ -
---Total Multi-Family & Cottages Direct Costs	$ -	$ -	$ -	$ -
--Total Commercial Direct Costs	$ -	$ -	$ -	$ -
---Mixed Use	$ -	$ -	$ -	$ -
---Hotel Site	$ -	$ -	$ -	$ -
---Conventional Commercial	$ -	$ -	$ -	$ -
-Total Common Costs	$ -	$ -	$ -	$ -
-Total Master Plan Costs	$0.035	$0.035	$0.035	$0.035
-Total Amenity Costs	$ -	$ -	$ -	$ -

Appendix C:

Annual Sales of the Proposed Kiawah River Plantation Development in Charleston County, South Carolina

Concept (millions of dollars)	2008	2009	2010	2011	2012
Total Sales	$ -	$ -	$ -	$49.597	$30.300
-Total Residential Investment	$ -	$ -	$ -	$27.225	$26.900
--Total Single Family Lots Direct Costs	$ -	$ -	$ -	$27.225	$26.900
--Total Multi-Family & Cottages Direct Costs	$ -	$ -	$ -	$ -	$ -
-Total Commercial Direct Costs	$ -	$ -	$ -	$18.972	$ -
--Mixed Use	$ -	$ -	$ -	$2.320	$ -
--Hotel Site	$ -	$ -	$ -	$16.500	$ -
--Conventional Commercial	$ -	$ -	$ -	$0.152	$ -
-Total Golf Club & Social Memberships	$ -	$ -	$ -	$3.400	$3.400
--Golf Memberships	$ -	$ -	$ -	$2.400	$2.400
--Social Memberships	$ -	$ -	$ -	$1.000	$1.000

Concept (millions of dollars)	2013	2014	2015	2016	2017
Total Sales	$35.875	$37.847	$36.075	$29.632	$36.850
-Total Residential Investment	$32.475	$34.325	$31.595	$26.140	$33.450
--Total Single Family Lots Direct Costs	$32.475	$34.325	$27.350	$25.900	$32.700
--Total Multi-Family & Cottages Direct Costs	$ -	$ -	$4.245	$0.240	$0.750
-Total Commercial Direct Costs	$ -	$0.122	$1.080	$0.092	$ -
--Mixed Use	$ -	$ -	$ -	$ -	$ -
--Hotel Site	$ -	$ -	$ -	$ -	$ -
--Conventional Commercial	$ -	$0.122	$1.080	$ -	$ -
-Total Golf Club & Social Memberships	$3.400	$3.400	$3.400	$3.400	$3.400
--Golf Memberships	$2.400	$2.400	$2.400	$2.400	$2.400
--Social Memberships	$1.000	$1.000	$1.000	$1.000	$1.000

Concept (millions of dollars)	2018	2019	2020	2021	2022
Total Sales	$37.442	$36.725	$29.850	$29.450	$34.075
-Total Residential Investment	$34.000	$32.275	$26.500	$26.100	$30.725
--Total Single Family Lots Direct Costs	$26.350	$32.275	$26.500	$26.100	$30.725
--Total Multi-Family & Cottages Direct Costs	$7.650	$ -	$ -	$ -	$ -
-Total Commercial Direct Costs	$0.092	$1.100	$ -	$ -	$ -
--Mixed Use	$ -	$ -	$ -	$ -	$ -
--Hotel Site	$ -	$ -	$ -	$ -	$ -
--Conventional Commercial	$ -	$ -	$ -	$ -	$ -
-Total Golf Club & Social Memberships	$3.350	$3.350	$3.350	$3.350	$3.350
--Golf Memberships	$2.325	$2.325	$2.325	$2.325	$2.325
--Social Memberships	$1.025	$1.025	$1.025	$1.025	$1.025

Concept (millions of dollars)	2023	2024	2025	2026
Total Sales	$23.275	$14.750	$18.650	$16.500
-Total Residential Investment	$23.275	$14.750	$18.650	$16.500
--Total Single Family Lots Direct Costs	$23.275	$14.750	$18.650	$16.500
--Total Multi-Family & Cottages Direct Costs	$ -	$ -	$ -	$ -
-Total Commercial Direct Costs	$ -	$ -	$ -	$ -
--Mixed Use	$ -	$ -	$ -	$ -
--Hotel Site	$ -	$ -	$ -	$ -
--Conventional Commercial	$ -	$ -	$ -	$ -
-Total Golf Club & Social Memberships	$ -	$ -	$ -	$ -
--Golf Memberships	$ -	$ -	$ -	$ -
--Social Memberships	$ -	$ -	$ -	$ -

Appendix D:

The Estimated Economic Impact of the Proposed Kiawah River Plantation Development on Retail Sales in Charleston County, South Carolina

Concept (millions of dollars)	2008	2009	2010	2011	2012	2013
Total Retail Trade Output[2]	$0.681	$1.177	$1.145	$15.469	$17.910	$18.585

Concept (millions of dollars)	2014	2015	2016	2017	2018	2019
Total Retail Trade Output	$23.252	$26.893	$30.158	$33.755	$35.820	$36.539

Concept (millions of dollars)	2020	2021	2022	2023	2024	2025
Total Retail Trade Output	$37.741	$38.968	$40.127	$41.366	$42.230	$42.819

Concept (millions of dollars)	2026	2027	2028	2029	2030	2031
Total Retail Trade Output	$43.698	$44.491	$45.267	$46.044	$46.822	$47.600

Concept (millions of dollars)	2032	2033	2034	2035	2036	2037
Total Retail Trade Output	$48.380	$49.160	$49.940	$50.722	$51.504	$52.287

[2] Total retail trade output is equal to the total gross sales less cost of goods sold, or total retail markup, as opposed to total gross sales

Appendix E:

The Estimated Economic Impact of the Proposed Kiawah River Plantation Development on Personal Income in Charleston County, South Carolina

Concept (millions of dollars)	2008	2009	2010	2011	2012	2013
Disposable Income	$0.794	$1.376	$1.403	$12.313	$14.740	$13.187
Wage Bill by Place of Work	$0.781	$1.339	$1.363	$14.814	$17.315	$15.596
Personal Contributions to Social Insurance	$0.085	$0.145	$0.148	$1.605	$1.876	$1.690
Residence Adjustment	$0.028	$0.037	$0.036	$2.851	$3.039	$2.813
Wage Bill by Place of Residence	$0.668	$1.157	$1.180	$10.357	$12.399	$11.093
Dividends, Interest, and Rent	$0.206	$0.356	$0.363	$3.190	$3.819	$3.416
Taxes	$0.080	$0.138	$0.141	$1.235	$1.478	$1.322
Transfer Payments	$ -	$ -	$ -	$ -	$ -	$ -

Concept (millions of dollars)	2014	2015	2016	2017	2018	2019
Disposable Income	$17.548	$19.623	$21.059	$20.735	$22.324	$22.660
Wage Bill by Place of Work	$20.879	$23.263	$24.625	$25.165	$26.610	$27.070
Personal Contributions to Social Insurance	$2.262	$2.521	$2.668	$2.727	$2.884	$2.933
Residence Adjustment	$3.855	$4.236	$4.242	$4.996	$4.947	$5.075
Wage Bill by Place of Residence	$14.761	$16.507	$17.714	$17.442	$18.779	$19.061
Dividends, Interest, and Rent	$4.546	$5.084	$5.456	$5.372	$5.783	$5.870
Taxes	$1.759	$1.967	$2.111	$2.079	$2.238	$2.272
Transfer Payments	$ -	$ -	$ -	$ -	$ -	$ -

Concept (millions of dollars)	2020	2021	2022	2023	2024	2025
Disposable Income	$23.497	$24.352	$25.133	$25.992	$26.478	$26.731
Wage Bill by Place of Work	$28.025	$28.992	$29.891	$30.865	$31.455	$31.861
Personal Contributions to Social Insurance	$3.037	$3.142	$3.239	$3.345	$3.409	$3.453
Residence Adjustment	$5.222	$5.365	$5.510	$5.656	$5.773	$5.922
Wage Bill by Place of Residence	$19.766	$20.485	$21.142	$21.864	$22.273	$22.486
Dividends, Interest, and Rent	$6.087	$6.309	$6.511	$6.734	$6.860	$6.925
Taxes	$2.356	$2.442	$2.520	$2.606	$2.655	$2.680
Transfer Payments	$ -	$ -	$ -	$ -	$ -	$ -

Concept (millions of dollars)	2026	2027	2028	2029	2030	2031
Disposable Income	$27.260	$27.700	$28.153	$28.606	$29.061	$29.516
Wage Bill by Place of Work	$32.502	$33.015	$33.568	$34.122	$34.677	$35.234
Personal Contributions to Social Insurance	$3.522	$3.578	$3.638	$3.698	$3.758	$3.818
Residence Adjustment	$6.050	$6.136	$6.248	$6.361	$6.474	$6.587
Wage Bill by Place of Residence	$22.931	$23.301	$23.682	$24.064	$24.446	$24.829
Dividends, Interest, and Rent	$7.062	$7.176	$7.293	$7.411	$7.529	$7.647
Taxes	$2.733	$2.777	$2.823	$2.868	$2.914	$2.959
Transfer Payments	$ -	$ -	$ -	$ -	$ -	$ -

Concept (millions of dollars)	2032	2033	2034	2035	2036	2037
Disposable Income	$29.973	$30.431	$30.890	$31.350	$31.812	$32.274
Wage Bill by Place of Work	$35.792	$36.351	$36.912	$37.475	$38.039	$38.606
Personal Contributions to Social Insurance	$3.879	$3.939	$4.000	$4.061	$4.122	$4.183
Residence Adjustment	$6.700	$6.814	$6.928	$7.043	$7.158	$7.273
Wage Bill by Place of Residence	$25.213	$25.598	$25.984	$26.371	$26.760	$27.149
Dividends, Interest, and Rent	$7.765	$7.884	$8.002	$8.122	$8.241	$8.361
Taxes	$3.005	$3.051	$3.097	$3.143	$3.190	$3.236
Transfer Payments	$ -	$ -	$ -	$ -	$ -	$ -

Appendix F:

The Estimated Economic Impact of the Proposed Kiawah River Plantation Development on Local Government Revenue in Charleston County, South Carolina

Revenue Source (millions of dollars)	2008	2009	2010	2011	2012
All Revenue	$0.515	$0.890	$0.906	$7.938	$10.123
-General revenue	$0.462	$0.799	$0.813	$7.125	$9.151
--Intergovernmental revenue	$0.174	$0.301	$0.307	$2.687	$3.210
---From federal government	$0.013	$0.023	$0.023	$0.202	$0.242
---From state government	$0.161	$0.279	$0.284	$2.484	$2.969
---From local government	$-	$-	$-	$-	$-
--General revenue from own sources	$0.288	$0.498	$0.507	$4.438	$5.941
---Taxes	$0.158	$0.273	$0.278	$2.433	$3.545
----Property	$0.133	$0.230	$0.234	$2.048	$3.085
----Sales and gross receipts	$0.011	$0.020	$0.020	$0.177	$0.212
-----General sales	$0.004	$0.007	$0.008	$0.067	$0.080
-----Selective sales	$0.007	$0.012	$0.013	$0.111	$0.132
------Motor fuel	$-	$-	$-	$-	$-
------Alcoholic beverage	$-	$-	$-	$-	$-
------Tobacco products	$-	$-	$-	$-	$-
------Public utilities	$0.003	$0.005	$0.005	$0.048	$0.057
------Other selective sales	$0.004	$0.007	$0.007	$0.063	$0.075
----Individual income	$-	$-	$-	$-	$-
----Corporate income	$-	$-	$-	$-	$-
----License taxes	$0.001	$0.001	$0.001	$0.013	$0.015
-----Motor vehicle license	$0.001	$0.001	$0.001	$0.013	$0.015
-----Other license taxes	$-	$-	$-	$-	$-
----Other taxes	$0.013	$0.022	$0.022	$0.195	$0.233
---Charges and miscellaneous general revenue	$0.130	$0.225	$0.229	$2.005	$2.396
----Current charges	$0.097	$0.168	$0.171	$1.502	$1.795
-----Education	$0.001	$0.002	$0.002	$0.013	$0.016
------Institutions of higher education	$0.000	$0.000	$0.000	$0.000	$0.000
------School lunch sales (gross)	$0.000	$0.001	$0.001	$0.005	$0.006
------Other education	$0.001	$0.001	$0.001	$0.008	$0.010
-----Hospitals	$0.062	$0.107	$0.109	$0.954	$1.139
-----Highways	$-	$-	$-	$-	$-
-----Air transportation (airports)	$0.003	$0.005	$0.005	$0.042	$0.050
-----Parking facilities	$0.001	$0.002	$0.002	$0.020	$0.024
-----Sea and inland port facilities	$-	$-	$-	$-	$-

Revenue Source (millions of dollars)	2008	2009	2010	2011	2012
-----Natural resources	$0.000	$0.000	$0.000	$0.000	$0.000
-----Parks and recreation	$0.002	$0.003	$0.003	$0.028	$0.034
-----Housing and community development	$0.001	$0.002	$0.002	$0.016	$0.019
-----Sewerage	$0.011	$0.020	$0.020	$0.174	$0.208
-----Solid waste management	$0.006	$0.010	$0.010	$0.091	$0.109
-----Other charges	$0.011	$0.018	$0.019	$0.163	$0.195
----Miscellaneous general revenue	$0.033	$0.056	$0.057	$0.503	$0.601
-----Interest earnings	$0.018	$0.030	$0.031	$0.272	$0.325
-----Special assessments	$0.001	$0.002	$0.002	$0.017	$0.021
-----Sale of property	$0.001	$0.001	$0.001	$0.010	$0.012
-----Other general revenue	$0.013	$0.023	$0.023	$0.204	$0.244
-Other than general revenue	$0.053	$0.091	$0.093	$0.813	$0.972
--Utility revenue	$0.053	$0.091	$0.093	$0.814	$0.973
---Water supply	$0.024	$0.042	$0.043	$0.374	$0.447
---Electric power	$0.017	$0.030	$0.030	$0.267	$0.319
---Gas supply	$0.011	$0.019	$0.019	$0.166	$0.199
---Transit	$0.000	$0.001	$0.001	$0.007	$0.009
--Liquor store revenue	$-	$-	$-	$-	$-
--Insurance trust revenue	$(0.000)	$(0.000)	$(0.000)	$(0.001)	$(0.001)
---Unemployment compensation	$-	$-	$-	$-	$-
---Employee retirement	$(0.000)	$(0.000)	$(0.000)	$(0.001)	$(0.001)
---Workers' compensation	$-	$-	$-	$-	$-
---Other insurance trust revenue	$-	$-	$-	$-	$-

Revenue Source (millions of dollars)	2013	2014	2015	2016	2017
All Revenue	$9.628	$12.624	$14.891	$16.495	$17.068
-General revenue	$8.760	$11.471	$13.605	$15.117	$15.714
--Intergovernmental revenue	$2.866	$3.807	$4.249	$4.551	$4.473
---From federal government	$0.216	$0.287	$0.320	$0.343	$0.337
---From state government	$2.651	$3.520	$3.929	$4.209	$4.136
---From local government	$-	$-	$-	$-	$-
--General revenue from own sources	$5.893	$7.664	$9.355	$10.566	$11.241
---Taxes	$3.754	$4.823	$6.185	$7.169	$7.904
----Property	$3.343	$4.277	$5.575	$6.517	$7.262
----Sales and gross receipts	$0.189	$0.251	$0.280	$0.300	$0.295
-----General sales	$0.071	$0.094	$0.105	$0.113	$0.111
-----Selective sales	$0.118	$0.157	$0.175	$0.187	$0.184
------Motor fuel	$-	$-	$-	$-	$-
------Alcoholic beverage	$-	$-	$-	$-	$-
------Tobacco products	$-	$-	$-	$-	$-
------Public utilities	$0.051	$0.068	$0.075	$0.081	$0.079
------Other selective sales	$0.067	$0.089	$0.099	$0.107	$0.105

Revenue Source (millions of dollars)	2013	2014	2015	2016	2017
----Individual income	$-	$-	$-	$-	$-
----Corporate income	$-	$-	$-	$-	$-
----License taxes	$0.014	$0.018	$0.020	$0.022	$0.021
-----Motor vehicle license	$0.014	$0.018	$0.020	$0.022	$0.021
-----Other license taxes	$-	$-	$-	$-	$-
----Other taxes	$0.208	$0.277	$0.309	$0.331	$0.325
---Charges and miscellaneous general revenue	$2.139	$2.841	$3.171	$3.396	$3.338
----Current charges	$1.602	$2.128	$2.375	$2.544	$2.500
-----Education	$0.014	$0.019	$0.021	$0.023	$0.022
------Institutions of higher education	$0.000	$0.000	$0.000	$0.000	$0.000
------School lunch sales (gross)	$0.005	$0.007	$0.008	$0.009	$0.009
------Other education	$0.009	$0.012	$0.013	$0.014	$0.014
-----Hospitals	$1.017	$1.351	$1.508	$1.615	$1.587
-----Highways	$-	$-	$-	$-	$-
-----Air transportation (airports)	$0.045	$0.060	$0.067	$0.071	$0.070
-----Parking facilities	$0.022	$0.029	$0.032	$0.034	$0.034
-----Sea and inland port facilities	$-	$-	$-	$-	$-
-----Natural resources	$0.000	$0.000	$0.000	$0.000	$0.000
-----Parks and recreation	$0.030	$0.040	$0.045	$0.048	$0.047
-----Housing and community development	$0.017	$0.023	$0.025	$0.027	$0.027
-----Sewerage	$0.186	$0.247	$0.275	$0.295	$0.290
-----Solid waste management	$0.097	$0.129	$0.144	$0.154	$0.152
-----Other charges	$0.174	$0.231	$0.258	$0.276	$0.271
----Miscellaneous general revenue	$0.537	$0.713	$0.796	$0.852	$0.837
-----Interest earnings	$0.290	$0.385	$0.430	$0.460	$0.452
-----Special assessments	$0.019	$0.025	$0.028	$0.030	$0.029
-----Sale of property	$0.010	$0.014	$0.016	$0.017	$0.016
-----Other general revenue	$0.218	$0.289	$0.323	$0.346	$0.340
-Other than general revenue	$0.868	$1.153	$1.286	$1.378	$1.354
--Utility revenue	$0.869	$1.153	$1.287	$1.379	$1.355
---Water supply	$0.399	$0.530	$0.591	$0.633	$0.622
---Electric power	$0.284	$0.378	$0.422	$0.452	$0.444
---Gas supply	$0.177	$0.236	$0.263	$0.282	$0.277
---Transit	$0.008	$0.010	$0.012	$0.012	$0.012
--Liquor store revenue	$-	$-	$-	$-	$-
--Insurance trust revenue	$(0.001)	$(0.001)	$(0.001)	$(0.001)	$(0.001)
---Unemployment compensation	$-	$-	$-	$-	$-
---Employee retirement	$(0.001)	$(0.001)	$(0.001)	$(0.001)	$(0.001)
---Workers' compensation	$-	$-	$-	$-	$-
---Other insurance trust revenue	$-	$-	$-	$-	$-

Revenue Source (millions of dollars)	2018	2019	2020	2021	2022
All Revenue	$18.554	$19.687	$20.752	$21.981	$23.293
-General revenue	$17.099	$18.213	$19.226	$20.402	$21.667
--Intergovernmental revenue	$4.807	$4.870	$5.040	$5.213	$5.371
---From federal government	$0.362	$0.367	$0.380	$0.393	$0.405
---From state government	$4.445	$4.503	$4.660	$4.821	$4.966
---From local government	$-	$-	$-	$-	$-
--General revenue from own sources	$12.293	$13.343	$14.186	$15.189	$16.296
---Taxes	$8.706	$9.709	$10.425	$11.298	$12.289
----Property	$8.017	$9.011	$9.702	$10.551	$11.519
----Sales and gross receipts	$0.317	$0.321	$0.332	$0.344	$0.354
-----General sales	$0.119	$0.121	$0.125	$0.129	$0.133
-----Selective sales	$0.198	$0.200	$0.207	$0.215	$0.221
------Motor fuel	$-	$-	$-	$-	$-
------Alcoholic beverage	$-	$-	$-	$-	$-
------Tobacco products	$-	$-	$-	$-	$-
------Public utilities	$0.085	$0.086	$0.089	$0.092	$0.095
------Other selective sales	$0.113	$0.114	$0.118	$0.122	$0.126
----Individual income	$-	$-	$-	$-	$-
----Corporate income	$-	$-	$-	$-	$-
----License taxes	$0.023	$0.023	$0.024	$0.025	$0.026
-----Motor vehicle license	$0.023	$0.023	$0.024	$0.025	$0.026
-----Other license taxes	$-	$-	$-	$-	$-
----Other taxes	$0.349	$0.354	$0.366	$0.379	$0.390
---Charges and miscellaneous general revenue	$3.587	$3.634	$3.761	$3.890	$4.008
----Current charges	$2.687	$2.722	$2.817	$2.914	$3.002
-----Education	$0.024	$0.024	$0.025	$0.026	$0.027
------Institutions of higher education	$0.000	$0.000	$0.000	$0.000	$0.000
------School lunch sales (gross)	$0.009	$0.009	$0.010	$0.010	$0.010
------Other education	$0.015	$0.015	$0.015	$0.016	$0.016
-----Hospitals	$1.706	$1.728	$1.789	$1.850	$1.906
-----Highways	$-	$-	$-	$-	$-
-----Air transportation (airports)	$0.075	$0.076	$0.079	$0.082	$0.084
-----Parking facilities	$0.036	$0.037	$0.038	$0.040	$0.041
-----Sea and inland port facilities	$-	$-	$-	$-	$-
-----Natural resources	$0.000	$0.000	$0.000	$0.000	$0.000
-----Parks and recreation	$0.051	$0.051	$0.053	$0.055	$0.056
-----Housing and community development	$0.029	$0.029	$0.030	$0.031	$0.032
-----Sewerage	$0.311	$0.316	$0.327	$0.338	$0.348
-----Solid waste management	$0.163	$0.165	$0.171	$0.177	$0.182
-----Other charges	$0.292	$0.295	$0.306	$0.316	$0.326
----Miscellaneous general revenue	$0.900	$0.912	$0.944	$0.976	$1.006
-----Interest earnings	$0.486	$0.492	$0.510	$0.527	$0.543

Revenue Source (millions of dollars)	2018	2019	2020	2021	2022
-----Special assessments	$0.031	$0.032	$0.033	$0.034	$0.035
-----Sale of property	$0.018	$0.018	$0.018	$0.019	$0.020
-----Other general revenue	$0.365	$0.370	$0.383	$0.396	$0.408
-Other than general revenue	$1.455	$1.474	$1.526	$1.578	$1.626
--Utility revenue	$1.456	$1.475	$1.527	$1.580	$1.627
---Water supply	$0.669	$0.678	$0.701	$0.725	$0.747
---Electric power	$0.477	$0.483	$0.500	$0.517	$0.533
---Gas supply	$0.297	$0.301	$0.312	$0.323	$0.332
---Transit	$0.013	$0.013	$0.014	$0.014	$0.015
--Liquor store revenue	$-	$-	$-	$-	$-
--Insurance trust revenue	$(0.001)	$(0.001)	$(0.001)	$(0.001)	$(0.001)
---Unemployment compensation	$-	$-	$-	$-	$-
---Employee retirement	$(0.001)	$(0.001)	$(0.001)	$(0.001)	$(0.001)
---Workers' compensation	$-	$-	$-	$-	$-
---Other insurance trust revenue	$-	$-	$-	$-	$-

Revenue Source (millions of dollars)	2023	2024	2025	2026	2027
All Revenue	$24.517	$25.382	$26.065	$26.797	$27.041
-General revenue	$22.838	$23.675	$24.345	$25.047	$25.266
--Intergovernmental revenue	$5.544	$5.637	$5.680	$5.782	$5.864
---From federal government	$0.418	$0.425	$0.428	$0.435	$0.442
---From state government	$5.126	$5.212	$5.252	$5.346	$5.423
---From local government	$-	$-	$-	$-	$-
--General revenue from own sources	$17.295	$18.038	$18.665	$19.265	$19.401
---Taxes	$13.158	$13.831	$14.426	$14.951	$15.025
----Property	$12.363	$13.023	$13.612	$14.121	$14.184
----Sales and gross receipts	$0.365	$0.372	$0.374	$0.381	$0.387
-----General sales	$0.137	$0.140	$0.141	$0.143	$0.145
-----Selective sales	$0.228	$0.232	$0.234	$0.238	$0.241
------Motor fuel	$-	$-	$-	$-	$-
------Alcoholic beverage	$-	$-	$-	$-	$-
------Tobacco products	$-	$-	$-	$-	$-
------Public utilities	$0.098	$0.100	$0.101	$0.103	$0.104
------Other selective sales	$0.130	$0.132	$0.133	$0.135	$0.137
----Individual income	$-	$-	$-	$-	$-
----Corporate income	$-	$-	$-	$-	$-
----License taxes	$0.026	$0.027	$0.027	$0.028	$0.028
-----Motor vehicle license	$0.026	$0.027	$0.027	$0.028	$0.028
-----Other license taxes	$-	$-	$-	$-	$-
----Other taxes	$0.403	$0.410	$0.413	$0.420	$0.426
---Charges and miscellaneous general revenue	$4.137	$4.206	$4.239	$4.315	$4.376
----Current charges	$3.099	$3.151	$3.175	$3.232	$3.278

Revenue Source (millions of dollars)	2023	2024	2025	2026	2027
-----Education	$0.028	$0.028	$0.028	$0.029	$0.029
------Institutions of higher education	$0.000	$0.000	$0.000	$0.000	$0.000
------School lunch sales (gross)	$0.011	$0.011	$0.011	$0.011	$0.011
------Other education	$0.017	$0.017	$0.017	$0.018	$0.018
-----Hospitals	$1.967	$2.001	$2.016	$2.052	$2.081
-----Highways	$-	$-	$-	$-	$-
-----Air transportation (airports)	$0.087	$0.088	$0.089	$0.091	$0.092
-----Parking facilities	$0.042	$0.043	$0.043	$0.044	$0.044
-----Sea and inland port facilities	$-	$-	$-	$-	$-
-----Natural resources	$0.000	$0.000	$0.000	$0.000	$0.000
-----Parks and recreation	$0.058	$0.059	$0.060	$0.061	$0.062
-----Housing and community development	$0.033	$0.034	$0.034	$0.035	$0.035
-----Sewerage	$0.359	$0.365	$0.368	$0.375	$0.380
-----Solid waste management	$0.188	$0.191	$0.193	$0.196	$0.199
-----Other charges	$0.336	$0.342	$0.344	$0.351	$0.356
----Miscellaneous general revenue	$1.038	$1.055	$1.063	$1.083	$1.098
-----Interest earnings	$0.561	$0.570	$0.574	$0.585	$0.593
-----Special assessments	$0.036	$0.037	$0.037	$0.037	$0.038
-----Sale of property	$0.020	$0.021	$0.021	$0.021	$0.021
-----Other general revenue	$0.421	$0.428	$0.432	$0.439	$0.446
-Other than general revenue	$1.678	$1.707	$1.720	$1.751	$1.776
--Utility revenue	$1.680	$1.708	$1.721	$1.752	$1.777
---Water supply	$0.771	$0.784	$0.790	$0.804	$0.816
---Electric power	$0.550	$0.559	$0.564	$0.574	$0.582
---Gas supply	$0.343	$0.349	$0.351	$0.358	$0.363
---Transit	$0.015	$0.015	$0.015	$0.016	$0.016
--Liquor store revenue	$-	$-	$-	$-	$-
--Insurance trust revenue	$(0.001)	$(0.001)	$(0.001)	$(0.001)	$(0.001)
---Unemployment compensation	$-	$-	$-	$-	$-
---Employee retirement	$(0.001)	$(0.001)	$(0.001)	$(0.001)	$(0.001)
---Workers' compensation	$-	$-	$-	$-	$-
---Other insurance trust revenue	$-	$-	$-	$-	$-

Revenue Source (millions of dollars)	2028	2029	2030	2031	2032
All Revenue	$27.292	$27.542	$27.792	$28.042	$28.292
-General revenue	$25.491	$25.715	$25.940	$26.164	$26.388
--Intergovernmental revenue	$5.949	$6.034	$6.119	$6.203	$6.288
---From federal government	$0.448	$0.454	$0.461	$0.467	$0.474
---From state government	$5.501	$5.579	$5.658	$5.736	$5.814
---From local government	$-	$-	$-	$-	$-
--General revenue from own sources	$19.541	$19.681	$19.821	$19.961	$20.100
---Taxes	$15.102	$15.179	$15.255	$15.332	$15.408

Revenue Source (millions of dollars)	2028	2029	2030	2031	2032
----Property	$14.249	$14.314	$14.378	$14.442	$14.507
----Sales and gross receipts	$0.392	$0.398	$0.403	$0.409	$0.414
-----General sales	$0.147	$0.149	$0.152	$0.154	$0.156
-----Selective sales	$0.245	$0.248	$0.252	$0.255	$0.259
------Motor fuel	$-	$-	$-	$-	$-
------Alcoholic beverage	$-	$-	$-	$-	$-
------Tobacco products	$-	$-	$-	$-	$-
------Public utilities	$0.106	$0.107	$0.109	$0.110	$0.112
------Other selective sales	$0.139	$0.141	$0.143	$0.145	$0.147
----Individual income	$-	$-	$-	$-	$-
----Corporate income	$-	$-	$-	$-	$-
----License taxes	$0.028	$0.029	$0.029	$0.030	$0.030
-----Motor vehicle license	$0.028	$0.029	$0.029	$0.030	$0.030
-----Other license taxes	$-	$-	$-	$-	$-
----Other taxes	$0.433	$0.439	$0.445	$0.451	$0.457
---Charges and miscellaneous general revenue	$4.439	$4.503	$4.566	$4.629	$4.692
----Current charges	$3.326	$3.373	$3.420	$3.467	$3.515
-----Education	$0.030	$0.030	$0.031	$0.031	$0.031
------Institutions of higher education	$0.000	$0.000	$0.000	$0.000	$0.000
------School lunch sales (gross)	$0.011	$0.012	$0.012	$0.012	$0.012
------Other education	$0.018	$0.018	$0.019	$0.019	$0.019
-----Hospitals	$2.111	$2.141	$2.171	$2.201	$2.231
-----Highways	$-	$-	$-	$-	$-
-----Air transportation (airports)	$0.093	$0.095	$0.096	$0.097	$0.099
-----Parking facilities	$0.045	$0.046	$0.046	$0.047	$0.048
-----Sea and inland port facilities	$-	$-	$-	$-	$-
-----Natural resources	$0.000	$0.000	$0.000	$0.000	$0.000
-----Parks and recreation	$0.063	$0.063	$0.064	$0.065	$0.066
-----Housing and community development	$0.036	$0.036	$0.037	$0.037	$0.038
-----Sewerage	$0.385	$0.391	$0.396	$0.402	$0.407
-----Solid waste management	$0.202	$0.205	$0.207	$0.210	$0.213
-----Other charges	$0.361	$0.366	$0.371	$0.376	$0.381
----Miscellaneous general revenue	$1.114	$1.130	$1.146	$1.161	$1.177
-----Interest earnings	$0.602	$0.610	$0.619	$0.627	$0.636
-----Special assessments	$0.039	$0.039	$0.040	$0.040	$0.041
-----Sale of property	$0.022	$0.022	$0.022	$0.023	$0.023
-----Other general revenue	$0.452	$0.458	$0.465	$0.471	$0.478
-Other than general revenue	$1.801	$1.827	$1.852	$1.878	$1.904
--Utility revenue	$1.803	$1.828	$1.854	$1.879	$1.905
---Water supply	$0.828	$0.840	$0.851	$0.863	$0.875
---Electric power	$0.590	$0.599	$0.607	$0.616	$0.624
---Gas supply	$0.368	$0.373	$0.379	$0.384	$0.389

Revenue Source (millions of dollars)	2028	2029	2030	2031	2032
---Transit	$0.016	$0.016	$0.017	$0.017	$0.017
--Liquor store revenue	$-	$-	$-	$-	$-
--Insurance trust revenue	$(0.001)	$(0.001)	$(0.001)	$(0.001)	$(0.001)
---Unemployment compensation	$-	$-	$-	$-	$-
---Employee retirement	$(0.001)	$(0.001)	$(0.001)	$(0.001)	$(0.001)
---Workers' compensation	$-	$-	$-	$-	$-
---Other insurance trust revenue	$-	$-	$-	$-	$-

Revenue Source (millions of dollars)	2033	2034	2035	2036	2037
All Revenue	$28.541	$28.790	$29.039	$29.289	$29.538
-General revenue	$26.612	$26.835	$27.059	$27.283	$27.506
--Intergovernmental revenue	$6.372	$6.456	$6.541	$6.625	$6.709
---From federal government	$0.480	$0.486	$0.493	$0.499	$0.505
---From state government	$5.892	$5.970	$6.048	$6.126	$6.204
---From local government	$-	$-	$-	$-	$-
--General revenue from own sources	$20.240	$20.379	$20.518	$20.658	$20.797
---Taxes	$15.485	$15.561	$15.638	$15.714	$15.790
----Property	$14.571	$14.635	$14.700	$14.764	$14.828
----Sales and gross receipts	$0.420	$0.426	$0.431	$0.437	$0.442
-----General sales	$0.158	$0.160	$0.162	$0.164	$0.166
-----Selective sales	$0.262	$0.266	$0.269	$0.273	$0.276
------Motor fuel	$-	$-	$-	$-	$-
------Alcoholic beverage	$-	$-	$-	$-	$-
------Tobacco products	$-	$-	$-	$-	$-
------Public utilities	$0.113	$0.115	$0.116	$0.118	$0.119
------Other selective sales	$0.149	$0.151	$0.153	$0.155	$0.157
----Individual income	$-	$-	$-	$-	$-
----Corporate income	$-	$-	$-	$-	$-
----License taxes	$0.030	$0.031	$0.031	$0.032	$0.032
-----Motor vehicle license	$0.030	$0.031	$0.031	$0.032	$0.032
-----Other license taxes	$-	$-	$-	$-	$-
----Other taxes	$0.463	$0.469	$0.476	$0.482	$0.488
---Charges and miscellaneous general revenue	$4.755	$4.818	$4.881	$4.944	$5.007
----Current charges	$3.562	$3.609	$3.656	$3.703	$3.750
-----Education	$0.032	$0.032	$0.033	$0.033	$0.033
------Institutions of higher education	$0.000	$0.000	$0.000	$0.000	$0.000
------School lunch sales (gross)	$0.012	$0.012	$0.013	$0.013	$0.013
------Other education	$0.019	$0.020	$0.020	$0.020	$0.021
-----Hospitals	$2.261	$2.291	$2.321	$2.351	$2.381
-----Highways	$-	$-	$-	$-	$-
-----Air transportation (airports)	$0.100	$0.101	$0.103	$0.104	$0.105
-----Parking facilities	$0.048	$0.049	$0.050	$0.050	$0.051

Revenue Source (millions of dollars)	2033	2034	2035	2036	2037
-----Sea and inland port facilities	$-	$-	$-	$-	$-
-----Natural resources	$0.000	$0.000	$0.000	$0.000	$0.000
-----Parks and recreation	$0.067	$0.068	$0.069	$0.070	$0.071
-----Housing and community development	$0.038	$0.039	$0.039	$0.040	$0.040
-----Sewerage	$0.413	$0.418	$0.424	$0.429	$0.435
-----Solid waste management	$0.216	$0.219	$0.222	$0.225	$0.228
-----Other charges	$0.386	$0.392	$0.397	$0.402	$0.407
----Miscellaneous general revenue	$1.193	$1.209	$1.225	$1.240	$1.256
-----Interest earnings	$0.644	$0.653	$0.661	$0.670	$0.678
-----Special assessments	$0.041	$0.042	$0.042	$0.043	$0.044
-----Sale of property	$0.023	$0.024	$0.024	$0.024	$0.024
-----Other general revenue	$0.484	$0.491	$0.497	$0.503	$0.510
-Other than general revenue	$1.929	$1.955	$1.980	$2.006	$2.031
--Utility revenue	$1.931	$1.956	$1.982	$2.007	$2.033
---Water supply	$0.887	$0.898	$0.910	$0.922	$0.934
---Electric power	$0.632	$0.641	$0.649	$0.658	$0.666
---Gas supply	$0.394	$0.399	$0.405	$0.410	$0.415
---Transit	$0.017	$0.018	$0.018	$0.018	$0.018
--Liquor store revenue	$-	$-	$-	$-	$-
--Insurance trust revenue	$(0.001)	$(0.001)	$(0.001)	$(0.001)	$(0.001)
---Unemployment compensation	$-	$-	$-	$-	$-
---Employee retirement	$(0.001)	$(0.001)	$(0.001)	$(0.001)	$(0.001)
---Workers' compensation	$-	$-	$-	$-	$-
---Other insurance trust revenue	$-	$-	$-	$-	$-

THE FISCAL IMPACT OF KIAWAH RIVER PLANTATION ON CHARLESTON COUNTY

PREPARED FOR

KIAWAH RIVER PLANTATION, L.P.
CHARLESTON, SC

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COLUMBIA, SOUTH CAROLINA

DECEMBER 18, 2009

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EXECUTIVE SUMMARY

This study analyzes the projected revenues and expenditures which will be generated by Kiawah River Plantation during the build-out of the project and in subsequent years. The projected County expenditures include, among other things, a project list compiled from various department agencies and provided to the property owner by the County on December 7, 2009.

The study confirms that the expected revenues generated from the project are more than sufficient to cover the projected expenditures (including those items included in the referenced project list) of the County, the school district and other impacted governmental agencies during the build-out of the project. This study further confirms that the surplus to the County and other governmental agencies evaluated herein will be maintained throughout the build-out of the project. In other words, the project will more than pay for itself.

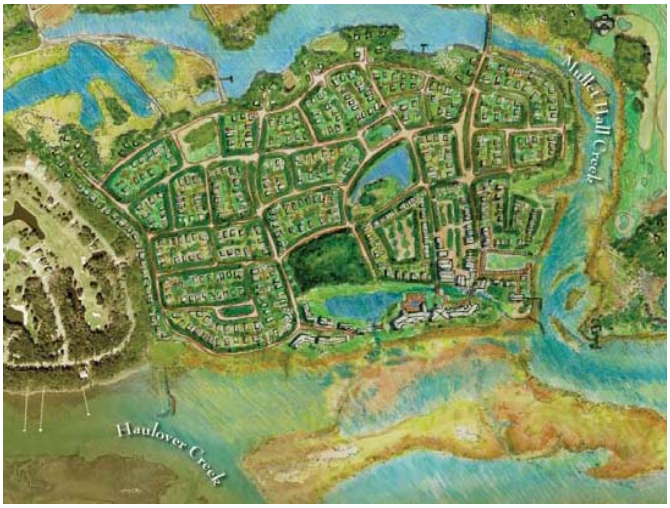
The Kiawah River Plantation project will increase the total tax base in Charleston County by more than $1.3 billion by the time the project is completed. This $1.3 billion includes an increase of $1.2 billion in the residential tax base and approximately $150 million in the commercial and retail tax base. Over the 20-year buildout period, the project generates a positive surplus of revenues over costs of $111.5 million. After the initial 20-year period, the positive surplus increases each year by about $10 million per year and is estimated to be approximately $160 million by the 25th year.

The project is expected to produce total tax revenues of approximately $147.4 million and about $35.9 million in total operating and capital expenditures over the 20-year period. The project will generate property taxes and other revenues for Charleston County general fund of more than $30.1 million over this 20-year period. The costs of services to the County will also increase during this period. It is estimated that the cost of services will total almost $20.3 million over this period.

As outlined in this analysis, it is clear that the Kiawah River Plantation project will have a positive net fiscal impact on Charleston County government operations. Over the 20-year period, the net fiscal benefits (Revenues minus Costs) to the County general fund are estimated to total almost $9.9 million. This net fiscal benefit is considered to be a conservative one. While the cost estimate is for all County services, this net surplus is based upon property tax revenue and only a portion of other County revenue sources. The revenue estimate does not include significant other revenue the County will receive such as, business personal property taxes, accommodation taxes and other revenues.

Kiawah River Plantation will generate a net surplus to the Charleston County School District of $81.4 million once the project is built out. The annual net benefit, from property taxes alone, will be more than $8.1 million at the project's build out.

Kiawah River Plantation will generate a net surplus to the St. Johns Fire District of more than $11.0 million once the project is built out. The annual net benefit, from property taxes alone, will be more than $1.0 million in the 20th year.



INTRODUCTION

This analysis evaluates the fiscal benefits of The Beach Company's proposed Kiawah River Plantation development on Johns Island on Charleston County's government, the Charleston County School District (CCSD) and the St. Johns Fire District. The study is intended to provide these governments with information that will facilitate the evaluation of the developments' projected impact on the community. This information will also help the County, CCSD and the St. Johns Fire District plan for changes in the demand for services that will occur over the project's buildout.

Kiawah River Plantation expects the buildout of the project to take up to twenty years to complete, dependent upon market conditions. This 20-year time period has been adopted for the purpose of this analysis. Some components will be completed within the next few years while others will be completed in latter years. However, regardless of Kiawah River Plantation's plans, unanticipated fluctuations in the national, international, state, and local economies can cause variations in the actual buildout schedule planned by Kiawah River Plantation. Substantial changes in market conditions and their impact on the buildout schedule planned by Kiawah River Plantation might alter the projected benefits and costs outlined in this analysis.

PROJECT DESCRIPTION

Kiawah River Plantation is planned as a mixed-use development with residential and commercial components. The master plan on the following pages includes a variety of mixed-use communities with residential, recreational, commercial and hotel components. In total, build out of the completed project would include up to 1,285 residential units (1,168 single family units and 117 workforce units). In addition, the project will include approximately 80,000 square feet of office/commercial/retail space. It is anticipated that the residential units will build out within 20 years with annual unit construction of about 60 units. Commercial and retail space is assumed to be built out over a 15-year period with approximately 8,000 square feet completed per year. There are 450 hotel rooms planned for the project that are anticipated to be built within the first 10 years.

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Table 1

Kiawah River Plantation
Major Development Components

Residential Units	**1,168**
Workforce Units	**117**
Total Residential Units	**1,285 Units**
Commercial/Retail	**80,000 sf**
Hotels	**450 rooms**
Golf Course/Club House	**1 Course**

FISCAL IMPACTS ON CHARLESTON COUNTY GENERAL FUND

REVENUE IMPACTS

The impacts of the Kiawah River Plantation project on the property tax revenues of Charleston County government are outlined in this section.

The primary revenues generated by the Kiawah River Plantation project will be from property taxes. In FY 2009-10, the County generated approximately 31.4% of total operating funds from property taxes ($101.7 mil/$324.5 mil). In that same year, the County generated 47.3% of General Fund Revenues from property taxes. (Property taxes were $74.9 million and total General Funds in FY 2009-10 totaled $158.3 million.)

In addition to property taxes, the residents and economic activity in the County generated approximately $83.6 million ($238 per capita) in other General Fund revenues in the form of fees, licenses, fines, intergovernmental transfers, etc. Likewise, the construction and ongoing activities and residents in Kiawah River Plantation will generate additional General Fund revenues in addition to property taxes. To be conservative, it is assumed in this analysis that the residents at Kiawah River Plantation generate only $198 per capita ($436 per household) of additional General Fund revenues. Over the 20-year period these revenues total approximately $5.2 million.

The estimated revenues from property taxes and other revenues from all components of the project generated over the 20-year period are provided in Table 2a. Annual Charleston County revenues grow from about $41,000 in Year 1 to more than $2.6 million a year in the 20th year – and total more than $24.8 million over the 20-year period (after deductions are made for the LOST credit of .00071). Total revenues from all sources and property taxes total $30.1 million over the 20-year period.

The residential property values in the Kiawah River Plantation project are expected to increase by $1.2 billion at buildout. The commercial and retail property values in the Kiawah River Plantation project are expected to increase by $144.6 million at buildout for a total increase in property values in the County of over $1.3 billion. Assessed values will increase by almost $90 million by the project's buildout.

As seen in Table 3, the Kiawah River Plantation project will generate a net benefit of more than $13.0 million for the County over the period (more detail estimates are included in the Appendix).

Table 2a
Kiawah River Plantation
Charleston County Fiscal Impacts
Revenues

Year	County Property Tax Revenues	LOST Credit (0.00071)	County Property Tax Revenues Net of LOST Credit	Other County GOF* Revenues**	Total County GOF* Revenues
1	$61,024	$19,759	$41,264	$0	$41,264
2	$183,901	$58,957	$124,944	$33,569	$158,513
3	$379,662	$118,133	$261,529	$55,368	$316,897
4	$508,264	$157,356	$350,908	$80,654	$431,562
5	$665,376	$203,966	$461,410	$117,275	$578,685
6	$818,649	$249,137	$569,512	$143,869	$713,381
7	$1,027,957	$308,355	$719,601	$165,232	$884,833
8	$1,188,943	$353,587	$835,356	$190,518	$1,025,874
9	$1,399,463	$411,561	$987,901	$217,112	$1,205,013
10	$1,673,722	$486,791	$1,186,931	$255,041	$1,441,972
11	$1,809,064	$521,558	$1,287,507	$280,327	$1,567,834
12	$1,962,905	$560,672	$1,402,233	$305,177	$1,707,410
13	$2,107,719	$596,645	$1,511,075	$333,515	$1,844,590
14	$2,335,103	$654,453	$1,680,650	$359,673	$2,040,323
15	$2,575,860	$715,468	$1,860,393	$393,242	$2,253,635
16	$2,798,027	$769,962	$2,028,065	$426,812	$2,454,877
17	$2,904,842	$791,732	$2,113,110	$441,199	$2,554,309
18	$3,125,661	$844,163	$2,281,498	$472,152	$2,753,650
19	$3,377,627	$903,909	$2,473,717	$507,466	$2,981,183
20	$3,594,119	$952,675	$2,641,444	$541,907	$3,183,351
Totals	$34,497,888	$9,678,840	$24,819,048	$5,320,108	$30,139,156

* GOF = General Operating Fund

** Other Revenues: Vebicle taxes, fines, fees, forfeitures, licenses, LOST rebate

EXPENDITURE IMPACTS – OPERATING

Along with the revenue impacts generated by the Kiawah River Plantation project, there will be increased demands on Charleston County to meet the needs of the residents of the development. This section of the report describes the Kiawah River Plantation project's impacts on the expenditures required of the County government to meet those needs. The expenditure analysis assumes the existing levels of service currently provided by Charleston County will be provided to all citizens and businesses in the Kiawah River Plantation development.

The analysis estimates the additional costs of the services to the County on a per capita basis for all major departments funded from General Fund Revenues. Based on discussions with the County, these services are delineated into three cost components: All Other services, Sheriff Department Law Enforcement, and EMS services. Together these three cost components comprise all County services funded from the County's General Fund. Table 2b highlights estimates of the annual costs at existing service levels to the County for the 20-year period for these three components. The "All Other" component costs are for all departments funded through the General Fund, including General Government, Judicial, Public Safety, Public Works, Debt Service, etc., except for Law Enforcement and EMS.[1]

All Other per capita costs are calculated from the County's FY2009-10 budget and are estimated to be $198 per person ($436 per household). Based on data from the Sheriff's Department, it is assumed that the department will need to add an additional deputy every three years at an annual cost of $125,493 per deputy. EMS services are assumed to be equal to the current level of service in the County and are estimated to be $34 per capita ($76 per household).

It is estimated that the Kiawah River Plantation project will result in the County's cost of services to increase by approximately $131,000 in Year 1 and increase to $1.8 million per year in the 20th year – totaling $20.3 million over the 20-year period.

EXPENDITURE IMPACTS – CAPITAL COSTS

The Kiawah Island Plantation will also require certain capital expenditures by the County, Fire District and the developer. The capital costs of the County are included in with other capital costs in a later section of this report that summarizes all capital costs for all jurisdictions.

[1] All other services includes costs identified by the County such as costs in the Assessor's office, Environmental Management and Consolidated Dispatch.

Table 2b
Kiawah River Plantation
Charleston County Fiscal Impacts
Operating Costs

Year	County GOF* Operating Costs All Other	County Operating Costs Sheriff Dept	County Operating Costs EMS	Total County GOF* Operating Costs
1	$0	$125,493	$5,828	$131,321
2	$66,024	$125,493	$9,612	$201,129
3	$108,897	$125,493	$14,001	$248,391
4	$158,629	$250,986	$20,358	$429,974
5	$230,656	$250,986	$24,975	$506,617
6	$282,961	$250,986	$28,683	$562,630
7	$324,976	$376,480	$33,073	$734,528
8	$374,708	$376,480	$37,690	$788,878
9	$427,013	$376,480	$44,274	$847,767
10	$501,612	$501,973	$48,663	$1,052,248
11	$551,344	$501,973	$52,977	$1,106,294
12	$600,219	$501,973	$57,897	$1,160,089
13	$655,954	$627,466	$62,438	$1,345,858
14	$707,401	$627,466	$68,265	$1,403,132
15	$773,425	$627,466	$74,093	$1,474,984
16	$839,450	$627,466	$76,590	$1,543,506
17	$867,746	$627,466	$81,963	$1,577,175
18	$928,625	$627,466	$88,094	$1,644,185
19	$998,079	$627,466	$94,073	$1,719,618
20	$1,065,818	$627,466	$97,251	$1,790,535
Totals	$10,463,538	$8,784,524	$1,020,797	$20,268,859

* GOF = General Operating Fund

As seen in Table 3, it is estimated that once Kiawah River Plantation is completed as anticipated, it will result in Charleston County realizing a net fiscal surplus of $1.4 million per year in the 20th year. As seen in Table 3, it is estimated that once Kiawah River Plantation is completed as anticipated, it will result in Charleston County realizing a net fiscal surplus of $9.9 million during the 20-year period.

Table 3

Net Fiscal Impacts -- Charleston County

20-Year Cumulative Totals

Year	Total County GOF* Revenues	Total County GOF* Operating Costs	Total County GOF* Surplus/Deficit
1	$41,264	$131,321	-$90,056
2	$158,513	$201,129	-$42,616
3	$316,897	$248,391	$68,506
4	$431,562	$429,974	$1,588
5	$578,685	$506,617	$72,068
6	$713,381	$562,630	$150,751
7	$884,833	$734,528	$150,304
8	$1,025,874	$788,878	$236,996
9	$1,205,013	$847,767	$357,246
10	$1,441,972	$1,052,248	$389,724
11	$1,567,834	$1,106,294	$461,539
12	$1,707,410	$1,160,089	$547,321
13	$1,844,590	$1,345,858	$498,732
14	$2,040,323	$1,403,132	$637,191
15	$2,253,635	$1,474,984	$778,651
16	$2,454,877	$1,543,506	$911,371
17	$2,554,309	$1,577,175	$977,134
18	$2,753,650	$1,644,185	$1,109,466
19	$2,981,183	$1,719,618	$1,261,566
20	$3,183,351	$1,790,535	$1,392,816
Totals	$30,139,156	$20,268,859	$9,870,297

* GOF = General Operating Fund

FISCAL IMPACTS ON CHARLESTON COUNTY SCHOOL DISTRICT

REVENUE IMPACTS - OPERATING

The impacts of the Kiawah River Plantation project on the operating revenues of the Charleston County School District are outlined in this section. The primary School District revenues generated by the Kiawah River Plantation project will be from property taxes on non-owner occupied residential units and commercial properties. These estimates do not include any state sales taxes that would be generated from the development of the project or the expenditures by the permanent residents in the residential communities once they are completed.

The estimated operating revenues from property taxes on all components of the project generated over the 20-years are provided in Table 4. Annual School District Operating revenues grow from about $120,000 in Year 1 to over $6.0 million a year in the 20th year and total $61.8 million for the 20-year period. (Twenty-five percent of the residential units are assumed to be owner occupied and therefore exempt from any school operating taxes.)

EXPENDITURE IMPACTS – OPERATING

Along with the substantial revenue impacts generated by the Kiawah River Plantation project, there will be relatively small increased demands on the Charleston County School District to meet the needs of the children of residents in the developments. This section of the report describes the Kiawah River Plantation project's impacts on the operating expenditures required of the Charleston County School District to meet those needs. The residential components of the Kiawah River Plantation communities will include 1,168 new dwelling units and 117 workforce units. The development is planned to be similar in scope and nature to the Kiawah Island and Seabrook communities. Based on the latest Census data available, the student generation rates (SGR) for these two communities are 0.019 and 0.013, respectively. In this analysis it is assumed that Kiawah River Plantation's SGR will be similar to the higher of these and is 0.019 per dwelling unit for the 1,168 units and 0.245 per workforce unit[2]. Based on a SGR of 0.019 and 0.245, respectively, it is estimated that 50 new students will be generated by Kiawah River Plantation and attend school in the District by the 20th year. The estimated cumulative increase in school enrollment is also shown in Table 4.

[2] The SGR for the entire Charleston District is estimated to be 0.245.

Table 4
Kiawah River Plantation
Estimated Fiscal Impacts - Operating
Charleston County School District

Year	Cumulative Student Enrollment	School Operating Costs ($7,500/pp)*	School Operating Property Tax Revenues	Net School Operating Property Tax Revenues
1	0	$0	$119,861	$119,861
2	1	$10,973	$357,638	$346,666
3	2	$18,098	$770,708	$752,610
4	4	$26,363	$1,008,639	$982,276
5	11	$79,013	$1,307,206	$1,228,194
6	12	$87,705	$1,581,215	$1,493,510
7	13	$94,688	$1,988,891	$1,894,204
8	14	$102,953	$2,269,728	$2,166,775
9	15	$111,645	$2,653,709	$2,542,064
10	24	$178,283	$3,151,564	$2,973,282
11	25	$186,548	$3,362,461	$3,175,914
12	26	$194,670	$3,606,192	$3,411,522
13	27	$203,933	$3,824,404	$3,620,471
14	28	$212,483	$4,195,263	$3,982,781
15	37	$277,695	$4,570,549	$4,292,854
16	38	$288,668	$4,907,579	$4,618,911
17	39	$293,370	$5,039,635	$4,746,265
18	40	$303,488	$5,357,688	$5,054,200
19	42	$315,030	$5,720,111	$5,405,081
20	50	$375,443	$6,020,610	$5,645,168
Totals		$3,361,043	$61,813,652	$58,452,609

*** pp = Per Pupil costs from local sources**

The current district-wide per pupil expenditure that is required from local sources is estimated to be $4,467.[3] However, based on discussions with the CCSD staff, $7,500 per pupil may be more appropriate for the Johns Island area and therefore is assumed in this analysis. Based on this per pupil cost from local sources and the estimated new enrollment, it is estimated that operating expenditures will increase for the District from about $11,000 in Year 2 to over $375,000 per year at the time of buildout. As seen in Table 4, total operating expenditures over the 20-year period to serve these students are estimated to total about $3.4 million.

REVENUE IMPACTS – CAPITAL CAPACITY

The Charleston County School District generates revenues for capital projects from debt service millage on all property classes. Property tax revenues for debt service on all components of the Kiawah River Plantation project are estimated to be about $42,000 in Year 1 and increase to $2.5 million per year in year 20 and total over $24.0 million over the 20-year period.

EXPENDITURE IMPACTS – CAPITAL CAPACITY

Capital costs for the District may increase to accommodate new students. However, given the relatively small number of new students generated per year and over the entire 20-year period, there may be no capital costs associated with the new students generated by Kiawah River Plantation. However, even at an estimated capital cost of $20,000 per student, the total capital cost for the 50 new students is about $1,000,000. Given that the debt service revenues generated by the project are almost $24 million, it is assumed that the net benefit to District will be positive (see Table 5).

[3] The total cost per pupil is much higher. However, only $4,467 is required from local sources. The balance of the cost is provided from state and federal sources. .

Table 5

Kiawah River Plantation
Estimated Fiscal Impacts - Capital
Charleston County School District

Year	School Debt Service Property Tax Revenues
1	$42,352
2	$127,633
3	$263,497
4	$352,751
5	$462,014
6	$568,392
7	$713,660
8	$825,392
9	$971,501
10	$1,162,160
11	$1,256,097
12	$1,362,872
13	$1,463,384
14	$1,621,200
15	$1,788,627
16	$1,942,827
17	$2,016,969
18	$2,170,233
19	$2,345,113
20	$2,495,688
Totals	$23,952,360

NET FISCAL IMPACTS ON THE CHARLESTON COUNTY SCHOOL DISTRICT

It is estimated that the Kiawah River Plantation project will result in the Charleston County School District realizing a net fiscal surplus (operating and capital). The net positive benefits to the District's budget are estimated to total more than $81 million over the 20-year period. As seen in Table 6, Kiawah River Plantation will result in substantial net benefits in operating and capital revenues for the school district over the 20-year period.

Table 6
Charleston County School District
20-Year Cumulative Totals

	Operating	Capital	Total
Revenues	**$ 61.8 M**	**$ 24.0 M**	**$ 85.8 M**
Expenditures	**$ 3.4 M**	**$ 1.0 M**	**$ 4.4 M**
Net Benefit	**$ 58.4 M**	**$ 23.0 M**	**$ 81.4 M**

M = Million

Totals may not add due to rounding

FISCAL IMPACTS ON ST JOHNS FIRE DISTRICT

REVENUE IMPACTS - OPERATING

The impacts of the Kiawah River Plantation project on the operating revenues of the St. Johns Fire District are outlined in this section. The primary Fire District revenues generated by the Kiawah River Plantation project will be from property taxes on residential units and commercial properties. Property tax revenues for operating purposes on all components of the Kiawah River Plantation project are estimated to be about $31,000 in Year 1 and increase to $1.8 million per year in year 20 and total over $17.3 million over the 20-year period.

Property tax revenues for debt service on all components of the Kiawah River Plantation project are estimated to be about $3,500 in Year 1 and increase to $200,000 per year in year 20 and total almost 2.0 million over the 20-year period.

EXPENDITURE IMPACTS – OPERATING

The St. Johns Fire District's estimated per housing unit cost is estimated to be $648. This is based on a household size of 2.2 persons and a per capita cost of $294.61. Based on the anticipated new housing units at Kiawah River Plantation, the projected cost to the Fire District will be almost $50,000 in Year 2 and increase to $805,000 in Year 20. Total costs to the District over the 20-year period are estimated to be $7.9 million.

NET FISCAL IMPACTS ON THE ST JOHNS FIRE DISTRICT

It is estimated that the Kiawah River Plantation project will result in the St Johns Fire District realizing a net fiscal surplus (revenues less expenditures). The net positive benefits to the District's budget are estimated to total approximately $11.4 million over the 20-year period.

Table 7

Net Fiscal Impacts

St. Johns Fire District

20-Year Cumulative Totals

Revenues	**$ 19.3 Million**
Expenditures	**$ 7.9 Million**
Net Benefit	**$ 11.4 Million**

Totals may not add due to rounding

SUMMARY -- FISCAL IMPACTS ON ALL JURISDICTIONS

This study analyzes the projected revenues and expenditures which will be generated by Kiawah River Plantation during the build-out of the project and in subsequent years. The projected County expenditures include, among other things, a project list compiled from various department agencies and provided to the property owner by the County on December 7, 2009.

The study confirms that the expected revenues generated from the project are more than sufficient to cover the projected expenditures (including those items included in the referenced project list) of the County, the school district and other impacted governmental agencies during the build-out of the project. This study further confirms that the surplus to the County and other governmental agencies evaluated herein will be maintained throughout the build-out of the project. In other words, the project will more than pay for itself.

The Kiawah River Plantation project will increase the total tax base in Charleston County by more than $1.3 billion by the time the project is completed. This $1.3 billion includes an increase of $1.2 billion in the residential tax base and approximately $144 million in the commercial and retail tax base.

The project is expected to produce total tax revenues of almost $147.4 million and about $35.9 million in total operating and capital expenditures over the a 20-year period – for a net positive fiscal benefit of more than $111.5 million over the 20-year period. This net benefit increases by about $10 million a year and is estimated to be approximately $160 million by the 25th year.

The project will generate property tax and other revenues for Charleston County General Fund of almost $30.1 million over this 20-year period. The costs of services to the County will also increase during this period. It is estimated that the cost of services will total almost $20.3 million over this period.

As outlined in this analysis, it is clear that the Kiawah River Plantation project will have a positive net fiscal impact on Charleston County government operations. Over the 20-year period, the net fiscal benefits (Revenues minus Costs) to the County are estimated to total more than $9.9 million.

Kiawah River Plantation will generate a net surplus to the Charleston County School District of more than $81.0 million once the project is built out. The annual net benefit will be almost $8.1 million at build out.

Kiawah River Plantation will generate a net surplus to the St. Johns Fire District of about $11.4 million once the project is built out. The annual net benefit will be more than $1.0 million in the 20th year.

Table 8 summarizes all of the property tax revenues for all jurisdictions for the initial 20-year period. Table 9 summarizes all operating costs for all jurisdictions for the initial 20-year period. Table 10 identifies all capital costs for all jurisdictions for the initial 20-year period. And finally, Table 11 summarizes the net fiscal benefits to the County, School District and Fire District from Kiawah River Plantation over the 20-year period.

Table 8

Total Tax Revenues – All Jurisdictions

20-Year Cumulative Totals

Summary Public Revenues Generated by Kiawah River Plantation

Jurisdiction/Department	Estimated 20-Year Revenues
Charleston County General Fund Operating	$30,139,156
Charleston County Bonds	$5,663,832
Parks and Recreation - Operating	$3,089,363
Parks and Recreation - Bonds	$1,716,313
Charleston County School District - Operating	$61,813,652
Charleston County School District - Debt Service	$23,942,564
St Johns Island Fire District -- Operating	$17,334,760
St Johns Island Fire District -- Bonds	$1,973,760
Trident Tech	$1,716,313
TOTAL	$147,389,712

Table 9
Total Operating Expenditures – All Jurisdictions
20-Year Cumulative Totals

Estimated Public Operating Costs to serve Kiawah River Plantation

Jurisdiction/Department	Estimated 20-Year Operating Costs
Charleston County General Fund Operating Costs	$10,463,538
Charleston County Sheriff Dept Costs	$8,784,524
Charleston County EMS Costs	$1,020,797
Charleston County School District - Operating	$3,361,043
St Johns Island Fire District -- Operating	$7,909,316
TOTAL	$31,539,218

Table 10
Total Capital Expenditures – All Jurisdictions
20-Year Cumulative Totals

Estimated Capital Costs for Kiawah River Plantation[1]

Facility		Estimated Capital Costs
Deputy Sheriff		
4 Officiers & Equipment	$488,176	
Satellite SubStation	$250,000	$738,176
St Johns Island Fire District -- Fire Station		$1,782,000
St Johns Island Fire District -- Ladder Truck		$800,000
Charleston County School District Allowance for New Pupils*		$1,000,000
TOTAL		$4,320,176

Source: Charleston County Sheriff's Department, St Johns Fire District, MGA

Notes:
1. These capital costs do not include extensive capital expenditures for internal roads, stormwater, water and sewer and other improvements that will be paid for by the developer and not the County.

* CCSD Capital costs per pupil of $20,000 times 50 students

Table 11

Summary -- Net Benefits to All Jurisdictions

20-Year Cumulative Totals

	All Jurisdictions/Departments
Estimated 20-Year Operating Costs (Table 9)	$31,539,218
Estimated Capital Costs (Table 10)	$4,320,176
Estimated Total Costs	$35,859,394
Estimated 20-Year Revenues (Table 8)	$147,389,712
Estimated 20-Year Net Benefit	$111,530,319

FISCAL IMPACT METHODOLOGY

The objective of fiscal impact analysis is to estimate the financial impacts of a development or land use change on the revenues and expenditures of the governmental units affected by the development. The analysis evaluates the fiscal characteristics of the proposed development and is designed to help Charleston County measure the estimated difference between anticipated revenues and the related costs of the new development.

All revenues and expenditures are based on constant, 2009 dollars and assume no inflation during the project's buildout. This assumption is based on the fact that over the buildout period, both net revenues and expenditures will rise proportionately, and therefore, inflation will have little if any affect on the net results of the analysis. The constant dollar assumption applies to all estimates in this analysis, including: County and School District revenues and expenditures. Property values are assumed to increase a modest 1% per year.

MAJOR ASSUMPTIONS

The rationale for each major assumption is outlined in this section.

AD VALOREM MILLAGE RATES - Millage rates adopted for the FY08-09 budget cycle were assumed for Charleston County as follows:

Charleston County	40.2	mills
Charleston County Bonds	6.6	mills
Parks & Recreation Operating	3.6	mills
Parks & Recreation Bonds	2.0	mills
Trident Tech	2.0	mills
St Johns FD Operating	20.2	mills
St Johns FD Bonds	2.3	mills
Charleston County School District		
Operating	98.7	mills
Debt Service	27.9	mills

Based on data from the Charleston County Finance Office, the LOST credit is assumed to be 0.00071 and is assumed to be constant throughout the 20-year period. The LOST credit is applied to the estimated total appraised value of the residential and commercial property.

In addition, it is assumed that these millage rates remain constant throughout the 20-year period.

CHARLESTON COUNTY POPULATION

The 2009 population for the County is estimated to be 351,157. This is extrapolated from the County's Comprehensive Plan.

PERSONS PER HOUSEHOLD

The number of persons per household is assumed to be 2.2 for the County (County's Comprehensive Plan).

GENERAL FUND REVENUE ASSUMPTIONS

The estimates for Charleston County General Fund revenues are based on property taxes generated by the improvements on property in Kiawah River Plantation. Real property is assessed at 4% for owner-occupied housing units, 6% for commercial and rental property. Given the recreational and second-home nature of the development, 25% of the homes are assumed to be owner-occupied and assessed at 4% and 75% of the units are assessed at 6%. Of the 25% of the homes that are assumed to be owner-occupied, it is further assumed that 80% of these homes will be eligible for the $50,000 homestead exemption.

In addition to property taxes, the County generated approximately $83.6 million ($238 per capita) in other General Fund revenues in the form of fees, licenses, fines, intergovernmental transfers, etc. The construction and ongoing activities and residents in Kiawah River Plantation will generate additional General Fund revenues in addition to property taxes. To be conservative, it is assumed in this analysis that the residents at Kiawah River Plantation generate only $198 per capita ($436 per household) of additional General Fund revenues. See Table 12 below for details of all other revenue categories.

Housing values were assumed to be constant during the buildout phase. The average price per residential unit assumed in the analysis varies from about $600,000 to $2.7 million and averages slightly more than $1.0 million. The average value of the 117 workforce units is $100,000. It is assumed that 24 units will be built in the 5th year, 32 units built in the 10th and 15th years and 29 units completed in year 20.

The average value for non-residential investment is assumed to be $200 sf.

Table 12

All Other General Fund Revenue Sources

2010 Total General Fund Revenues	**$158,362,916**
Motor Vehicle	$6,600,000
Sales Tax	$39,000,000
Licenses & Permits	$4,369,600
Charges & Fees	$17,634,100
Fines & Forfeitrures	$1,984,000
Subtotal All Other	$69,587,700
County Population	351,157
All Other Revenues Per Capita	$198
Household Size	2.2
Other Revenue Per HH	$436

GENERAL FUND EXPENDITURE ASSUMPTIONS

In order to estimate the additional cost to Charleston County for the services required for the new residents and employees of the Kiawah River Plantation project, it was necessary to estimate the per household costs of County services.

The expenditure analysis assumes the existing levels of service currently provided by Charleston County will be provided to all citizens and businesses in the Kiawah River Plantation development.

The analysis estimates the additional costs of the services to the County on a per capita basis for all major departments funded from General Fund Revenues. These services are delineated into three cost components: All Other services, Sheriff Department Law Enforcement, and EMS services. Together these three cost components comprise all County services funded from the County's General Fund. The "All Other" component costs are for all departments funded through the General Fund, including General Government, Judicial, Public Safety, Public Works, Debt Service, etc., except for Law Enforcement and EMS.

The total general fund budget for Charleston County in FY 2009-2010 is $158.4 million. Since the Law Enforcement Division of the Sheriff's Department is treated as a separate cost component, the budget of that department ($22.3 million) was deducted from the total General Fund of $158.4 million. The budget for the EMS department of $12.1 million was deducted as well, leaving $136.9 million. This equates to a per capita "all other" cost factor of $390 or $857 per household for County services other than Law Enforcement and EMS ($136.9 million/351,117 = $390). Based on data from the Sheriff's Department, the department will need to add an additional deputy every three years at an annual cost of $125,493 per deputy. Therefore, the cost of a new deputy is added every third year. EMS services are assumed to be equal to the current level of service in the County and are estimated to be $34 per capita or $76 per household ($12.1 million/351,157 = $34). The County population is estimated to be 351,157 based on in the County's Comprehensive Plan.

CHARLESTON COUNTY SCHOOL DISTRICT OPERATING REVENUE ASSUMPTIONS

The estimates for the Charleston County School District (CCSD) revenues are based on a similar methodology as the County revenues described above although with several modifications. The school district millages for operations of 98.7 mills and debt service 27.9 mills were assumed to be constant for the period.

Due to Act 388, the CCSD will not receive any revenues from the 98.7 mills on the 25% owner-occupied housing units. The law provides tax relief on owner-occupied units for all of the millage from school operations. It is assumed in this analysis that 25% of all the homes will be owner-occupied and thus exempt from paying operating millage. All other classes of property (non-owner occupied residential, commercial, etc.) will pay school operating taxes.

CHARLESTON COUNTY SCHOOL DISTRICT DEBT SERVICE REVENUE ASSUMPTIONS

For the purposes of debt service revenues, the exemption from Act 388 does not apply. Therefore, to estimate the debt service revenues to the CCSD, the total assessed value of the property in Kiawah River Plantation was multiplied by the millage rate for debt service (27.9 mills).

CHARLESTON COUNTY SCHOOL DISTRICT OPERATING EXPENDITURE ASSUMPTIONS

According to the latest Census data (2007), there were 164,788 housing units in Charleston County. According to the South Carolina Department of Education, the ADM for Charleston was 40,363 students. Thus the average student generation rate (SGR) for all housing in the Charleston County School District is approximately 0.245

However, Kiawah River Plantation is not a typical Charleston County residential development. The residential components of the Kiawah River Plantation communities will include 1,285 new dwelling units. The development is planned to be similar in scope and nature to the Kiawah Island and Seabrook communities. Based on the latest Census data available, the student generation rates (SGR) for these two communities are 0.019 and 0.013, respectively. It is assumed in this analysis that Kiawah River Plantation's SGR will be similar to the higher of these and is 0.019 per dwelling unit and 0.245 per workforce unit[4].

Table 13

Estimated Student Generation Rates

	Population 5-18	Housing Units	Estimated SGR
Kiawah Island	**58**	**3,070**	**0.019**
Seabrook Island	**22**	**1,649**	**0.013**
Charleston County*	**40,343**	**164,788**	**0.245**

Source: 2000 Census
* 135 ADM South Carolina Department of Education

[4] The SGR for the entire Charleston District is estimated to be 0.245.

Based on SGR's of 0.019 and 0.245, it is estimated that 50 new students will attend public schools in the District by the 20th year.

Based on the 2008-09 budget, the district will spend approximately $180.3 million from local sources. Based on the South Carolina Department of Education data, the CCSD had an ADM of 40,313 students in 2009. This results in an expenditure of $4,467 in local funds per pupil for operations. However, based on discussions with the CCSD staff, $7,500 per pupil is assumed in this analysis. The estimate for additional operating costs to the CCSD resulting from the Kiawah River Plantation projects was estimated by multiplying the estimated number of new students times the per student costs (local costs) of $7,500.

CHARLESTON COUNTY SCHOOL DISTRICT CAPITAL EXPENDITURE ASSUMPTIONS

The capital costs to the CCSD are estimated using a per student cost approach. However, given the relatively small number of new students generated per year and over the entire 20-year period, it is doubtful that there will be any capital costs associated with the new students. However, even at an estimated capital cost of $20,000 per student, the total capital cost for the 50 new students is about $1,000,000.

ST JOHNS FIRE DISTRICT OPERATING REVENUE ASSUMPTIONS

Revenue projections for the St Johns Fire District are based on the millage rates listed above and the assessed values included in the buildout of the project. The millage rate of 20.2 mills is assumed to be constant throughout the 20-year period.

ST JOHNS FIRE DISTRICT OPERATING EXPENDITURE ASSUMPTIONS

Expenditures for the St Johns Fire District are estimated using a per capita cost approach. The budget for the FY 2009-2010 budget year is projected to be $9,195,708. The District is comprised of four barrier islands covering a land mass of approximately 185 square miles. These islands are John's, Kiawah, Seabrook and Wadmalaw. The population of the District area is estimated to be 31,213. The results in a per capita cost of $294.61. Based on the household size of 2.2 persons per unit, the dwelling unit cost equals $648 per unit. This per unit cost is multiplied by the cumulative housing unit buildout anticipated by Kiawah River Plantation to estimate the annual operating costs for the District to serve Kiawah River Plantation.

Appendix A

Appendix A

Date	Year	Residential Assessed Value	Residential Appraised Value*	Commercial Assessed Value	Commercial Appraised Value	Total Assessed Value*	Total Assessed Value For CCSD Operating	County Property Tax Revenues	County LOST Credit 0.00071	Net County Property Tax Revenues	County Other Revenues $436 per HH	Total County Revenues
2011	1	$1,518,000	$27,830,000	$0	$0	$1,518,000	$1,214,400	$61,024	$19,759	$41,264	$0	$41,264
2012	2	$4,529,360	$83,038,267	$0	$0	$4,574,654	$3,623,488	$183,901	$58,957	$124,944	$33,569	$158,513
2013	3	$7,248,235	$132,884,308	$2,010,000	$33,500,000	$9,444,326	$7,808,588	$379,662	$118,133	$261,529	$55,368	$316,897
2014	4	$10,261,550	$188,128,417	$2,010,000	$33,500,000	$12,643,390	$10,219,240	$508,264	$157,356	$350,908	$80,654	$431,562
2015	5	$13,307,795	$243,976,242	$2,598,000	$43,300,000	$16,551,634	$13,244,236	$665,376	$203,966	$461,410	$117,275	$578,685
2016	6	$16,778,025	$307,597,125	$2,598,000	$43,300,000	$20,364,397	$16,020,420	$818,649	$249,137	$569,512	$143,869	$713,381
2017	7	$19,691,095	$361,003,408	$4,398,000	$73,300,000	$25,571,060	$20,150,876	$1,027,957	$308,355	$719,601	$165,232	$884,833
2018	8	$22,947,785	$420,709,392	$4,638,000	$77,300,000	$29,575,695	$22,996,228	$1,188,943	$353,587	$835,356	$190,518	$1,025,874
2019	9	$26,310,765	$482,364,025	$5,838,000	$97,300,000	$34,812,506	$26,886,612	$1,399,463	$411,561	$987,901	$217,112	$1,205,013
2020	10	$30,688,425	$562,621,125	$7,380,000	$123,000,000	$41,634,876	$31,930,740	$1,673,722	$486,791	$1,186,931	$255,041	$1,441,972
2021	11	$33,359,365	$611,588,358	$7,380,000	$123,000,000	$45,001,604	$34,067,492	$1,809,064	$521,558	$1,287,507	$280,327	$1,567,834
2022	12	$36,146,125	$662,678,958	$7,620,000	$127,000,000	$48,828,480	$36,536,900	$1,962,905	$560,672	$1,402,233	$305,177	$1,707,410
2023	13	$38,909,700	$713,344,500	$7,620,000	$127,000,000	$52,430,831	$38,747,760	$2,107,719	$596,645	$1,511,075	$333,515	$1,844,590
2024	14	$42,669,000	$782,265,000	$8,370,000	$139,500,000	$58,087,143	$42,505,200	$2,335,103	$654,453	$1,680,650	$359,673	$2,040,323
2025	15	$47,181,860	$865,000,767	$8,562,000	$142,700,000	$64,076,130	$46,307,488	$2,575,860	$715,468	$1,860,393	$393,242	$2,253,635
2026	16	$51,150,220	$937,754,033	$8,802,000	$146,700,000	$69,602,666	$49,722,176	$2,798,027	$769,962	$2,028,065	$426,812	$2,454,877
2027	17	$52,822,660	$968,415,433	$8,802,000	$146,700,000	$72,259,760	$51,060,128	$2,904,842	$791,732	$2,113,110	$441,199	$2,554,309
2028	18	$56,850,690	$1,042,262,650	$8,802,000	$146,700,000	$77,752,772	$54,282,552	$3,125,661	$844,163	$2,281,498	$472,152	$2,753,650
2029	19	$61,440,645	$1,126,411,825	$8,802,000	$146,700,000	$84,020,563	$57,954,516	$3,377,627	$903,909	$2,473,717	$507,466	$2,981,183
2030	20	$65,028,865	$1,192,195,858	$8,976,000	$149,600,000	$89,405,940	$60,999,092	$3,594,119	$952,675	$2,641,444	$541,907	$3,183,351
	Totals							$34,497,888	$9,678,840	$24,819,048	$5,320,108	$30,139,156

Major Assumptions:

* Net of $50,000 Homestead Exemption

** Total units = 1,285 --- 42 SF units will be built in year 21

Property Appreciation Rate =	1%	MGA
Millage Rate Annual Change =	0%	MGA
Single Family SGR =	0.019	2000 Census
Workforce Units SGR =	0.245	2000 Census
% Units with Children=	20%	KRP
Per Pupil Cost=	$7,500	Local GOF per pupil
HH Size =	2.2	County Comp Plan
Other County Revenue Per HH =	$436	County Budget 2009-10 (Motor Veh, LOST, Lic & Permits, Fines & Fort, Charges & Fees)
County Other GOF Costs Per HH=	$857	County Budget 2009-10
Sheriff Dept Costs Per FTE =	$ 125,493	Sheriff Dept
EMS Costs Per HH =	$76	County Budget 2009-10
County Pop 2009=	351,157	County Comp Plan/MGA
St Johns Fire District Cost/HH =	$648	St Johns FD, MGA

Appendix A (Cont'd)

Date	Year	Annual Housing Units**	Workplace Housing Units	Cumulative Housing Units	Homestead Exemption Assessed Value	County Costs GOF- All Other $857 Per HH	Sheriff Dept Costs 1 FTE every 3 Yrs	EMS Costs $76 per HH	Total County Costs	Net County GOF Surplus/Deficit	County Bonds	Parks & Rec Operating
2011	1	0		0	$0	$0	$125,493	$5,828	$131,321	-$90,056	$10,019	$5,465
2012	2	77		77	$24,640	$66,024	$125,493	$9,612	$201,129	-$42,616	$30,193	$16,469
2013	3	50		127	$40,640	$108,897	$125,493	$14,001	$248,391	$68,506	$62,333	$34,000
2014	4	58		185	$59,200	$158,629	$250,986	$20,358	$429,974	$1,588	$83,446	$45,516
2015	5	60	24	269	$86,080	$230,656	$250,986	$24,975	$506,617	$72,068	$109,241	$59,586
2016	6	61		330	$105,600	$282,961	$250,986	$28,683	$562,630	$150,751	$134,405	$73,312
2017	7	49		379	$121,280	$324,976	$376,480	$33,073	$734,528	$150,304	$168,769	$92,056
2018	8	58		437	$139,840	$374,708	$376,480	$37,690	$788,878	$236,996	$195,200	$106,473
2019	9	61		498	$159,360	$427,013	$376,480	$44,274	$847,767	$357,246	$229,763	$125,325
2020	10	55	32	585	$187,200	$501,612	$501,973	$48,663	$1,052,248	$389,724	$274,790	$149,886
2021	11	58		643	$205,760	$551,344	$501,973	$52,977	$1,106,294	$461,539	$297,011	$162,006
2022	12	57		700	$224,000	$600,219	$501,973	$57,897	$1,160,089	$547,321	$322,268	$175,783
2023	13	65		765	$244,800	$655,954	$627,466	$62,438	$1,345,858	$498,732	$346,043	$188,751
2024	14	60		825	$264,000	$707,401	$627,466	$68,265	$1,403,132	$637,191	$383,375	$209,114
2025	15	45	32	902	$288,640	$773,425	$627,466	$74,093	$1,474,984	$778,651	$422,902	$230,674
2026	16	77		979	$313,280	$839,450	$627,466	$76,590	$1,543,506	$911,371	$459,378	$250,570
2027	17	33		1,012	$323,840	$867,746	$627,466	$81,963	$1,577,175	$977,134	$476,914	$260,135
2028	18	71		1,083	$346,560	$928,625	$627,466	$88,094	$1,644,185	$1,109,466	$513,168	$279,910
2029	19	81		1,164	$372,480	$998,079	$627,466	$94,073	$1,719,618	$1,261,566	$554,536	$302,474
2030	20	50	29	1,243	$397,760	$1,065,818	$627,466	$97,251	$1,790,535	$1,392,816	$590,079	$321,861
	Totals	1,126	117	1,243**		$10,463,538	$8,784,524	$1,020,797	$20,268,859	$9,870,297	$5,663,832	$3,089,363

Major Assumptions:

* Net of $50,000 Homestead Exemption

** Total units = 1,285 --- 42 SF units will be built in year 21

Property Appreciation Rate =	1%	MGA
Millage Rate Annual Change =	0%	MGA
Single Family SGR =	0.019	2000 Census
Workforce Units SGR =	0.245	2000 Census
% Units with Children=	20%	KRP
Per Pupil Cost=	$7,500	Local GOF per pupil
HH Size =	2.2	County Comp Plan
Other County Revenue Per HH =	$436	County Budget 2009-10 (Motor Veh, LOST, Lic & Permits, Fines & Fort, Charges & Fees)
County Other GOF Costs Per HH=	$857	County Budget 2009-10
Sheriff Dept Costs Per FTE =	$ 125,493	Sheriff Dept
EMS Costs Per HH =	$76	County Budget 2009-10
County Pop 2009=	351,157	County Comp Plan/MGA
St Johns Fire District Cost/HH =	$648	St Johns FD, MGA

Appendix A (Cont'd)

Date	Year	Annual Enrollment SGR = .019	Cumulative Student Enrollment	School Operating Costs ($7,500/pp)	School Oper Property Tax Revenues	Net School Oper Property Tax Revenues	School DS Property Tax Revenues	St Johns FD Property Tax Oper Revenues	St Johns FD Oper Costs $648 per HH	St Johns FD Property Tax Bonds Revenues	Trident Tech	Potential Surplus Revenues (All Jurisdictions)
2011	1	0	0	$0	$119,861	$119,861	$42,352	$30,664	$0	$3,491	$3,036	$127,868
2012	2	1	1	$10,973	$357,638	$346,666	$127,633	$92,408	$49,907	$10,522	$9,149	$599,573
2013	3	1	2	$18,098	$770,708	$752,610	$263,497	$190,775	$82,314	$21,722	$18,889	$1,431,219
2014	4	1	4	$26,363	$1,008,639	$982,276	$352,751	$255,396	$119,907	$29,080	$25,287	$1,800,627
2015	5	7	11	$79,013	$1,307,206	$1,228,194	$461,791	$334,343	$174,351	$38,069	$33,103	$2,369,497
2016	6	1	12	$87,705	$1,581,215	$1,493,510	$568,167	$411,361	$213,888	$46,838	$40,729	$2,959,801
2017	7	1	13	$94,688	$1,988,891	$1,894,204	$713,433	$516,535	$245,647	$58,813	$51,142	$3,696,399
2018	8	1	14	$102,953	$2,269,728	$2,166,775	$825,162	$597,429	$283,239	$68,024	$59,151	$4,314,362
2019	9	1	15	$111,645	$2,653,709	$2,542,064	$971,269	$703,213	$322,776	$80,069	$69,625	$5,148,198
2020	10	9	24	$178,283	$3,151,564	$2,973,282	$1,161,613	$841,024	$379,165	$95,760	$83,270	$6,052,618
2021	11	1	25	$186,548	$3,362,461	$3,175,914	$1,255,545	$909,032	$416,757	$103,504	$90,003	$6,544,557
2022	12	1	26	$194,670	$3,606,192	$3,411,522	$1,362,315	$986,335	$453,702	$112,306	$97,657	$7,113,163
2023	13	1	27	$203,933	$3,824,404	$3,620,471	$1,462,820	$1,059,103	$495,831	$120,591	$104,862	$7,506,235
2024	14	1	28	$212,483	$4,195,263	$3,982,781	$1,620,631	$1,173,360	$534,720	$133,600	$116,174	$8,372,401
2025	15	9	37	$277,695	$4,570,549	$4,292,854	$1,787,724	$1,294,338	$584,627	$147,375	$128,152	$9,210,823
2026	16	1	38	$288,668	$4,907,579	$4,618,911	$1,941,914	$1,405,974	$634,534	$160,086	$139,205	$10,026,615
2027	17	1	39	$293,370	$5,039,635	$4,746,265	$2,016,047	$1,459,647	$655,923	$166,197	$144,520	$10,391,379
2028	18	1	40	$303,488	$5,357,688	$5,054,200	$2,169,302	$1,570,606	$701,941	$178,831	$155,506	$11,186,495
2029	19	2	42	$315,030	$5,720,111	$5,405,081	$2,344,174	$1,697,215	$754,441	$193,247	$168,041	$12,094,375
2030	20	8	50	$375,443	$6,020,610	$5,645,168	$2,494,426	$1,806,000	$805,645	$205,634	$178,812	$12,813,607
	Totals	50		$3,361,043	$61,813,652	$58,452,609	$23,942,564	$17,334,760	$7,909,316	$1,973,760	$1,716,313	$123,759,811

Major Assumptions:

* Net of $50,000 Homestead Exemption

** Total units = 1,285 --- 42 SF units will be built in year 21

Property Appreciation Rate =	1%	MGA
Millage Rate Annual Change =	0%	MGA
Single Family SGR =	0.019	2000 Census
Workforce Units SGR =	0.245	2000 Census
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County Pop 2009=	351,157	County Comp Plan/MGA
St Johns Fire District Cost/HH =	$648	St Johns FD, MGA

GENERAL LIMITING CONDITIONS

This economic impact analysis is not a budget or forecasting document and is not intended to depict a definitive course of action. Moreover, economic impact analysis is not designed as a space or facility-planning document. Many assumptions underlying fiscal and economic impact analyses are based on policy decisions which, if modified, would affect the overall results.

This study is based on estimates, assumptions and other information developed by Miley, Gallo & Associates, LLC from its independent research effort, consultations with the client and its representatives, and primary and secondary sources. We have utilized sources that are deemed to be reliable but cannot guarantee their accuracy. Moreover, estimates and analysis are based on trends and assumptions and, therefore, there will usually be differences between projected and actual results because events and circumstances frequently do not occur as expected, and those differences may be material. No responsibility is assumed for inaccuracies in reporting by the client, the client's agent and representatives or any other data source used in preparing this study.

This report is based on information that was current as of November 2009 and Miley, Gallo & Associates, LLC has not undertaken any update of its research effort since that date. We have no obligation, unless subsequently engaged, to update this report or revise this analysis as presented due to events or conditions occurring after the date of this report.

Possession of this study does not carry with it the right of publication thereof or to use the name of "Miley, Gallo & Associates, LLC" in any manner without first obtaining the prior written consent of Miley, Gallo & Associates, LLC. No abstracting, excerpting or summarization of this study may be made without first obtaining the prior written consent of Miley, Gallo & Associates, LLC. This report is not to be used in conjunction with any public or private offering of securities or other similar purpose. This study may not be used for purposes other than that for which it is prepared or for which prior written consent has first been obtained from Miley, Gallo & Associates, LLC.

This study is qualified in its entirety by, and should be considered in light of, these limitations, conditions and considerations.

MILEY, GALLO & ASSOCIATES, LLC

Miley, Gallo & Associates is one of the Southeast's leading economic and financial consulting firms. The firm specializes in economic impact analyses, fiscal impact analyses, feasibility reports, impact fee studies and benefit/cost modeling. Our clients include national and prominent local real estate developers, school districts, local governments, regional development agencies, and other private sector development firms. Miley, Gallo & Associates partners appear regularly before decision-makers at all levels of government and understand the values, needs and desires of the clients they represent. With offices located in Research Triangle Park, North Carolina and Columbia, South Carolina, the firm is well positioned to provide clients with hands-on service for projects throughout the entire Southeast region.

Miley, Gallo & Associates appreciates that every research project is unique and deserves a custom solution. Public policy decisions are not made overnight, and we excel at providing advice and counsel along the way. We represent our clients. Our business plan is simple: we focus on exceeding our client's expectations and building long-term relationships.

The roots of Miley, Gallo & Associates, LLC can be traced to 1993 when Harry W. Miley, Jr. Ph. D. founded Miley & Associates, Inc. After several years of successful client collaborations, Lucy L. Gallo and Dr. Harry Miley decided to leverage the depth of their experience in the accounting, finance and economic aspects of real estate transactions to form Miley, Gallo & Associates, LLC. The Company is an economic and financial consulting firm providing a range of analytical services to public and private sector clients. Miley, Gallo & Associates conducts fiscal and economic impact analyses of proposed new developments and has extensive experience in assisting clients with their economic development and community revitalization projects.

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TRAFFIC IMPACT ANALYSIS

KIAWAH RIVER PLANTATION

Betsy Kerrison Parkway/Bohicket Road & River Road
Johns Island, South Carolina

for:

Kiawah River Plantation, LP

November 2008

C08092.02

SOUTH CAROLINA
REGISTERED PROFESSIONAL ENGINEER
No. 14652
MARGARET ANN KUBILINS

Margaret A. Kubilins
11-2008

Access Management
Traffic Signal Design
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EXECUTIVE SUMMARY

Kiawah River Plantation, LP has proposed to develop a mixed use community with 319 single family detached homes, 955 recreation homes, 127 apartments, a 350 room hotel, 80,000 SF of Retail, and an 18-hole golf course. The development is proposed on a 2,003 acre parcel located on Mullet Hall Road, southeast of the intersection of Betsy Kerrison Parkway/Bohicket Road and River Road in Johns Island (Charleston County), SC. Full buildout of the site is expected to occur by 2031 (20 year build out plan).

This report provides analysis of the traffic operations within the area of influence as well as provides recommended access management for the site and intersection improvements needed for mitigating traffic impacts. This analysis presents a "worst case" scenario for the development of the Kiawah River Plantation assuming no regional roadway improvements across Johns Island. There are three regional initiatives listed below, in various stages of planning and programming that could have a direct impact on the regional travel characteristics and future operational conditions on Maybank Highway, River Road, Bohicket Road/Betsy Kerrison Parkway.

Eastbound Maybank Highway at River Road

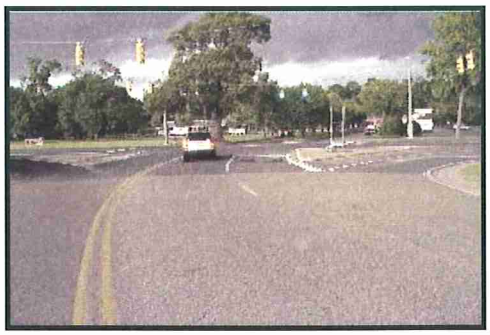
- Maybank Highway Widening/ "Pitchfork"
- I-526 Extension
- Cross Island Parkway

Since there are several firm proposals in play that can significantly change the complexion of travel conditions and network on Johns Island, this study is intended to stage the amount of development and resultant traffic that can be handled without significant operational impacts to the major facilities and intersections on Johns Island, and to reevaluate the traffic conditions at a later date when the regional roadway initiative program has been settled. In this way, the developer can be sure that nothing is done to preclude any of the proposed initiatives and to protect the character of the roads and context that makes Johns Island unique.

The area of influence of the study site as indicated by the South Carolina Department of Transportation (SCDOT) includes the following four existing and one proposed intersections:

1. Maybank Highway (SC 700) and River Road (S-10-91) (signalized)
2. Maybank Highway (SC 700) and Bohicket Road/Main Road (S-10-20) (signalized)
3. Bohicket Road/Betsy Kerrison Parkway and River Road (S-10-91) (signalized)
4. River Road (S-10-91) and Mullett Hall Road/Site Access (unsignalized)
5. Betsy Kerrison Parkway and Village Site Access (proposed signal)

According to the current site plan, the development will be served by two full movement access points. The proposed access along Betsy Kerrison Parkway (Main Site Access) will be constructed approximately 3,000 feet southwest of the intersection of Betsy Kerrison Parkway and River Road. Mullet Hall Road currently intersects River Road 4,200 feet east of Betsy Kerrison Parkway and will be extended into the proposed site for use as a second access point.



Westbound River Road at Bohicket Road/Betsy Kerrison Parkway

The trip generation results indicate that with full buildout of the development, the site has the potential to generate 791 new morning-peak-hour trips and 964 new afternoon-peak-hour trips. Neither SCDOT nor Charleston County staff identified any approved offsite developments for inclusion in this analysis. A 3% per year background growth was applied through year 2013, with a 1% per year growth rate applied from year 2013 to 2031.

Typically, a signalized intersection is said to be operating acceptably at a LOS "D" or better and is operating at capacity at a volume-to-capacity (v/c) ratio of 1.00. LOS for a two-way stop-controlled (TWSC) intersection is determined by the control delay and is defined for the minor movements. Control delay includes initial deceleration delay, queue move up time, stopped delay, and final acceleration delay. With respect to field measurements, control delay is defined as the total elapsed time from the time a vehicle stops at the end of the queue to the time the vehicle departs from the stop line. LOS is not defined for a TWSC intersection as a whole. For descriptive purposes, results between LOS "A" and LOS "C" for the side street approach are assumed to represent short delays. Results between LOS "D" and LOS "E" for the side street approach are assumed to represent moderate delays, and LOS "F" for the side street approach is assumed to represent long delays. It is typical for stop sign controlled side streets and driveways intersecting major streets to experience long delays during peak hours, particularly for left-turn movements. The majority of the traffic moving through the intersection on the major street experiences little or no delay.

Currently, as indicated by the 2008 Existing Conditions analyses, all of the existing intersections operate at a LOS of "C" or better during both the morning and afternoon peak hours. Per the SCDOT Access and Roadside Management Standards, 2008 Edition, *"The traffic impact study shall include proposed improvements or access management techniques that will mitigate any changes in the levels of service."*

This study analyzed the amount of development and resultant traffic that can be handled without operational impacts to the major facilities and intersections on Johns Island. The analysis determined that the following amount of development could be constructed over the next ten years without any significant impact to the intersections or roadway network that would require improvements:

- 105 Single Family Homes
- 315 Recreation Homes

- 40 Workforce Apartments
- 350 Room Hotel
- 35,000 SF Commercial (entry)
- 20,000 SF Commercial (village)
- 18 Hole Golf Course

Under the phased development plan above, the trip generation results indicate that the site has the potential to generate 478 new morning-peak-hour trips and 527 new afternoon-peak-hour trips.

Under the 2018 No Build Conditions analyses, with the growth in the background traffic, all of the intersections continue to operate at acceptable conditions, with the exception of the signalized intersection of Maybank Highway (SC 700) and River Road, which operates at a LOS "E" and 11% over capacity during the afternoon peak hour.

Under the 2018 Build analyses, with the addition of the phased site development and access management by the developer, all of the existing intersections continue to operate at the same LOS as they do in the 2018 No Build analyses.

The two full movement access driveways operate below capacity and at acceptable LOS in both the morning and afternoon peak hours. There are no improvements recommended for the access connection to Mullet Hall Road; however, to ensure proper site access at the main access driveway to Betsy Kerrison Parkway, the following improvements are recommended to be constructed:

- Construct a full movement access drive with one ingress lane and two egress lanes. The egress lanes should be configured as a separate left turn lane with 150 feet of storage and the through lane shall terminate as a right turn lane. 150 feet of internal protected storage should also be provided for.
- Construct a dedicated left turn lane on the southbound approach of Betsy Kerrison Parkway with 150 feet of storage with appropriate tapers.
- Construct a dedicated right turn lane on the northbound approach of Betsy Kerrison Parkway with 100 feet of storage with appropriate tapers.
- Install traffic signal control upon meeting the appropriate MUTCD and SCDOT traffic signal control warrants.

Mullet Hall Road at River Road

PROPOSED DEVELOPMENT

Kiawah River Plantation, LP has proposed to develop a mixed use community with 319 single family detached homes, 955 recreation homes, 127 apartments, a 350 room hotel, 80,000 SF of Retail, and an 18-hole golf course. The development is proposed on a 2,003 acre parcel located on Mullet Hall Road, southeast of the intersection of Betsy Kerrison Parkway/Bohicket Road and River Road in Johns Island (Charleston County), SC (Figure 1 – Vicinity Map). Full buildout of the site is expected to occur by 2031 (20 year build out plan).

According to the current site plan, the development will be served by two full movement access points. The proposed access along Betsy Kerrison Parkway (Main Site Access) will be constructed approximately 3,000 feet southwest of the intersection of Betsy Kerrison Parkway and River Road. Mullet Hall Road currently intersects River Road 4,200 feet east of Betsy Kerrison Parkway and will be extended into the proposed site for use as a second access point (Figure 2 – Site Plan).

This analysis presents a "worst case" scenario for the development of the Kiawah River Plantation assuming no regional roadway improvements across Johns Island. There are three regional initiatives in various stages of planning and programming that could have a direct impact on the regional travel characteristics and future operational conditions on Maybank Highway, River Road, Bohicket Road/Betsy Kerrison Parkway. Each potential regional initiative is described below:

- Maybank Highway Widening/ "Pitchfork" - SCDOT and Charleston County had previously identified the widening of Maybank Highway to a five-lane section between the Stono River Bridge and Bohicket/Main Road. The proposal has been met with much opposition from the residents of Johns Island and the City of Charleston due to the impacts the widening would have in the tree canopy and character of Johns Island. Recently, the City has commissioned a study that has developed an alternative to the widening; called the "Pitchfork Plan," the proposal replaces the multiple lanes on Maybank with a series of parallel 2-lane roadways designed to carry the projected traffic loadings for Maybank Highway. Funding is committed for one of the projects and coordination among all parties is continuing to decide on which alternative will be adopted and constructed; either way, the project will greatly improve the operational situation along Maybank and at the intersections with River Road and Main Road/Bohicket Road.
- I-526 Extension – This proposal includes an initiative to extend I-526 from its current terminus at US 17 in West Ashley south through the eastern shore of Johns Island and across the Stono River to James Island. Some funding is currently programmed and available; pre-NEPA activities have begun with a recently-completed purpose and need statement. Some right-of-way has been purchased along the eastern shore of Johns Island as well. Considered as a four-lane Parkway, the project will allow for quick movement of vehicles from North Charleston to Johns and James Islands, with current projections assuming as many as 60,000 vehicles per day using the roadway by 2030. The project has one interchange on Johns Island, east of River Road on Maybank Highway, and

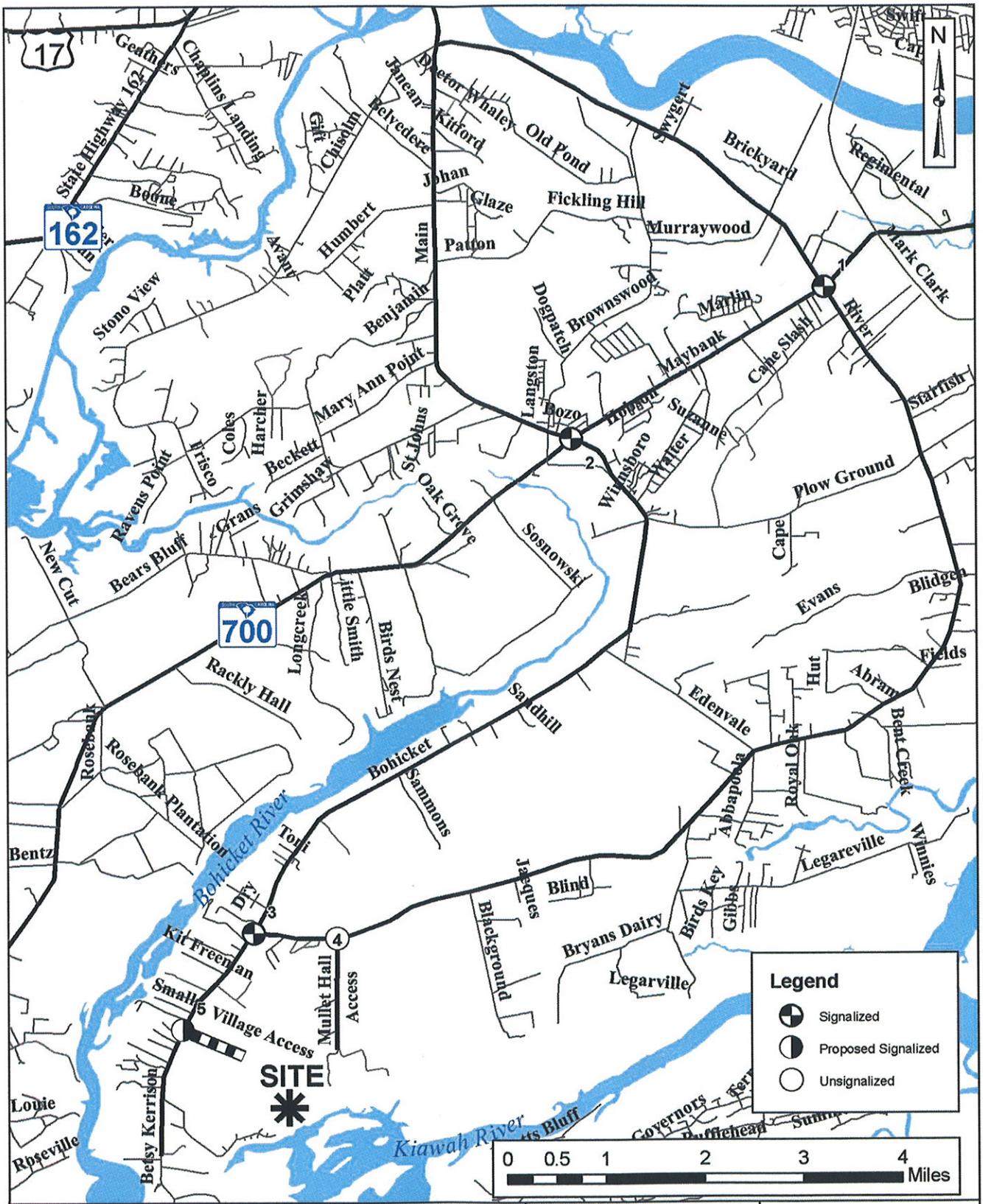
its construction would put significant amounts of additional traffic on Maybank Highway; however, both the Maybank widening and Pitchfork proposals account for the additional traffic.

- Cross Island Parkway - Conceived as a way of moving traffic quickly and safely from the Stono River Bridge south to Kiawah and Seabrook Islands, the Cross Island Parkway is being pushed by Kiawah and Seabrook residents and stakeholders as an alternative to Maybank, River, and Bohicket Roads. Initial projections show that if the Cross Island Parkway were constructed, reductions of more than 50% of the traffic currently using the other Johns Island roads could be realized. The project is currently unfunded and is even being considered as a tolled facility in order to advance its construction.

As demonstrated above, there are several firm proposals in play that can significantly change the complexion of travel conditions and network on Johns Island. For that reason, this study is intended to stage the amount of development and resultant traffic that can be handled without significant operational impacts to the major facilities and intersections on Johns Island, and to reevaluate the traffic conditions at a later date when the regional roadway initiative program has been settled. In this way, the Developer can be sure that nothing is done to preclude any of the proposed initiatives and to protect the character of the roads and context that makes Johns Island unique.

Northbound River Road at Maybank Highway (SC 700)

Northbound Betsy Kerrison Parkway at River Road



Kubilins TRANSPORTATION GROUP, INC.	Kiawah River Plantation TIA	Vicinity Map	Figure 1

SCHEDULE OF ACCOMMODATION

RIVER VILLAGE

Homes	687
Inn	250-275 rooms
Cottages	25-50
Shops	35,000-50,000 sf

RURAL RESIDENTIAL

Homes	587

BETSY KERRISON

Workforce Homes	300
Shops	75,000 - 100,000 sf

TOTAL SITE AREA	**2,003.3**
TOTAL OPEN SPACE	**1,610.4 (80%)**
HIGHLAND OPEN SPACE	**690.1 (65%)**

OPEN SPACE SCHEDULE

	RIVER VILLAGE	RURAL RESIDENTIAL	BETSY KERRISON		
CRITICAL	129.8	551.0	-	=	680.8
WETLANDS	149.1	90.4	-	=	239.5
LAKES	2.6	45.6	2.3	=	50.5
MARSH ISLANDS	-	36.7	-	=	36.7
PARKS	29.0	86.0	4.4	=	119.4
GOLF	-	245.8	-	=	245.8
50' BUFFER	7.0	6.9	6.8	=	20.7
RESTRICTED NATURAL AREAS	-	217.0	-	=	217.0
TOTAL OPEN SPACE =	317.5 (20%)	1,279.4 (79%)	13.5 (1%)	=	1,610.4 (100%)

Kiawah River Plantation

Johns Island, SC

PREPARED FOR:
Kiawah River Plantation, LP
211 King Street
Charleston, SC 29401
843.722.2615

PREPARED BY:
DesignWorks
50 George Street
Charleston, SC 29401
843.723.5525

SCALE 0 200 400 800

AUG 04 2008

CONCEPT MASTER PLAN

Figure 2

Concept Master Plan

Kiawah River Plantation TIA

Kubilins TRANSPORTATION GROUP, INC.

AREA CONDITIONS

The area of influence of the study site as indicated by the SCDOT includes the following four existing and one proposed intersections:

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3. Bohicket Road/Betsy Kerrison Parkway and River Road (S-10-91) (signalized)
4. River Road (S-10-91) and Mullett Hall Road/Site Access (unsignalized)
5. Betsy Kerrison Parkway and Village Site Access (proposed signal or roundabout)

Maybank Highway (SC 700) is a two-lane, rural arterial with a posted speed limit of 45 mph in the vicinity of the site. The Annual Average Daily Traffic (AADT) between River Road and Main Road on Maybank Highway is about 15,000 vehicles per day (2007 AADT data provided by the South Carolina Department of Transportation). Maybank Highway has no sidewalks, no curb and gutter, and no apparent sight distance issues at either of the two intersections potentially affected by the proposed development.

Bohicket Road (S-10-20) is a rural arterial with a posted speed limit of 50 mph in the vicinity of the site. The road name "Bohicket Road" is only applicable to the portion of road between Maybank Highway and River Road. Northeast of Maybank Highway it is known as "Main Road", and southwest of River Road it is known as "Betsy Kerrison Parkway."

Nearest the site, particularly between River Road and the proposed Village Access, Betsy Kerrison Parkway exists as a four-lane divided road with a posted speed limit of 50 mph and an Annual Average Daily Traffic (AADT) of about 12,000 vehicles per day. Other than a few brief sections of sidewalk on the southbound portion of Betsy Kerrison Parkway near the proposed site access, the roadway has no sidewalks, no curb and gutter, and no apparent sight distance issues.

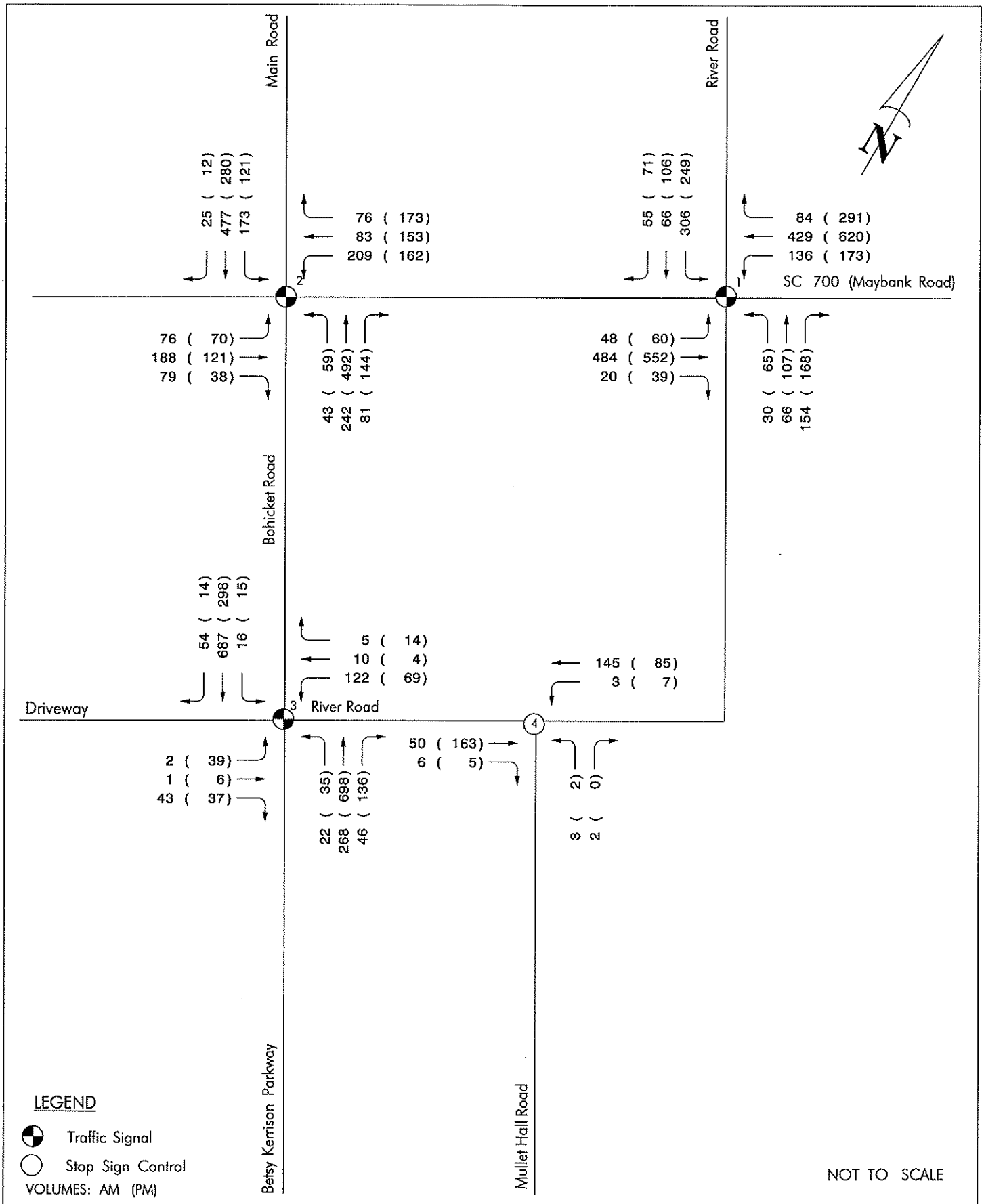
River Road (S-10-91) is a two-lane, undivided, rural facility with a posted speed limit of 45 mph in the vicinity of the site. The road serves many homes and small neighborhoods and supports over 5000 vehicles per day between Maybank Highway (SC 700) and Bohicket Road. It has no sidewalks, no curb and gutter, and no apparent sight distance issues at the major intersections within the vicinity of the site.

Mullet Hall Road is a local street with no posted speed limit and limited amounts of daily traffic. The pavement is in poor condition and there is no striping on the roadway. The road has no sidewalks, no curb and gutter, and no apparent sight distance issues at its stop-sign controlled intersection with River Road. Currently, Mullet Hall Road is a dead-end street, but it is proposed that this roadway be extended into the Kiawah River Plantation Development to serve as a secondary access point.

Morning (7-9 AM) and afternoon (4-6 PM) peak period turning movement counts were conducted at the intersections of Maybank Highway and River Road Maybank Highway and Bohicket Road/Main Road on July 9th, 2008. Peak hour turning movement counts were conducted at the intersections of Bohicket Road and River Road and River Road and Mullet Hall Road on July 10th, 2008.

Count data is provided in the Appendix. Figure 3 shows the existing 2008 traffic volumes for the morning and afternoon peak hours.

Southbound River Road at Maybank Highway (SC 700)



Kubilins TRANSPORTATION GROUP, INC.	Kiawah River Plantation TIA	2008 Existing Traffic Volumes	Figure 3

PROJECTED TRAFFIC

The projected background traffic volumes used in the analyses were developed from the existing peak-hour turning-movement count data. The existing intersection turning-movement volumes were increased using a 3 percent assumed growth rate until 2013 with a 1 percent growth rate for the remaining years (2013-2031) in order to obtain the background volumes.

The daily and peak-hour-trip-generation data for full buildout of the site development is presented in Table 1a. Trip generation for the site land use is estimated from the equations provided in the Institute of Transportation Engineers, Trip Generation Manual, 7th Edition, 2003.

Table 1a: Site Trip Generation – Full Buildout

Land Use			AM Peak Hour			PM Peak Hour		
			Enter	Exit	Total	Enter	Exit	Total
Single Family Detached Home (LUC 210) [EQUATIONS]	319	DUs	58	175	233	192	113	305
Recreation Homes (LUC 260) [RATES][1]	955	DUs	105	48	153	105	143	248
Apartments (LUC 220) [EQUATIONS]	127	DUs	13	53	66	57	31	88
Hotel (LUC 310) [RATES]	350	Rooms	119	77	196	109	98	207
Commercial {Entry} (LUC 820) [EQUATIONS]	50,000	SF	63	40	103	190	206	396
Commercial {Village} (LUC 820) [EQUATIONS][2]	30,000	SF	46	30	76	136	147	283
Golf Course (LUC 430) [RATES]	18	Holes	32	8	40	22	28	50
Subtotal			436	431	867	811	766	1,577
Internal Capture		*retail*	*0*	*0*	*0*	*-29*	*-42*	*-71*
		residential	*0*	*0*	*0*	*-42*	*-29*	*-71*
*PassBy Reduction (PM Retail)**			*0*	*0*	*0*	*-90*	*-98*	*-188*
Total New Trips			**390**	**401**	**791**	**514**	**450**	**964**

References:

Trip Generation, 7th Edition, Institute of Transportation Engineers, Washington, DC. 2003.

* Passby taken in accordance with ITE Trip Generation Guidelines.

AM peak hour pass-by & internal capture not applicable per the 2003 ITE Trip Generation Manual.

[1]Recreational Homes LUC corresponds with the proposed development program (resort second homes) and is typical of the majority of homes in the Kiawah Island Area

[2]The Village commercial is anticipated to only serve residents of the homes and patrons of the hotel. No trips from the external network are anticipated. Therefore, these trips are included for internal capture purposes. They are not included in the pass-by calculations. They are subtracted from the final total of new trips.

The trip generation results indicate that with full buildout of the development, the site has the potential to generate 791 new morning-peak-hour trips and 964 new afternoon-peak-hour trips. Under the phased development plan, the trip generation results indicate that the site has the potential to generate 478 new morning-peak-hour trips and 527 new afternoon-peak-hour trips. This information is presented in Table 1b.

Table 1b: Site Trip Generation – Phased

Land Use			AM Peak Hour			PM Peak Hour		
			Enter	Exit	Total	Enter	Exit	Total
Single Family Detached Home (LUC 210) [EQUATIONS]	105	DUs	21	62	83	71	41	112
Recreation Homes (LUC 260) [RATES][1]	315	DUs	35	16	51	35	47	82
Apartments (LUC 220) [EQUATIONS]	40	DUs	5	19	24	26	14	40
Hotel (LUC 310) [RATES]	350	Rooms	119	77	196	109	98	207
Commercial {Entry} (LUC 820) [EQUATIONS]	35,000	SF	51	33	84	150	163	313
Commercial {Village} (LUC 820) [EQUATIONS][2]	20,000	SF	36	23	59	104	113	217
Golf Course (LUC 430) [RATES]	18	Holes	32	8	40	22	28	50
Subtotal			299	238	537	517	504	1,021
Internal Capture		*retail*	*0*	*0*	*0*	*-23*	*-33*	*-56*
		residential	*0*	*0*	*0*	*-33*	*-23*	*-56*
*PassBy Reduction (PM Retail)**			*0*	*0*	*0*	*-79*	*-86*	*-165*
Total New Trips			**263**	**215**	**478**	**278**	**249**	**527**

References:

Trip Generation, 7th Edition, Institute of Transportation Engineers, Washington, DC. 2003.

* Passby taken in accordance with ITE Trip Generation Guidelines.

AM peak hour pass-by & internal capture not applicable per the 2003 ITE Trip Generation Manual.

[1]Recreational Homes LUC corresponds with the proposed development program (resort second homes) and is typical of the majority of homes in the Kiawah Island Area

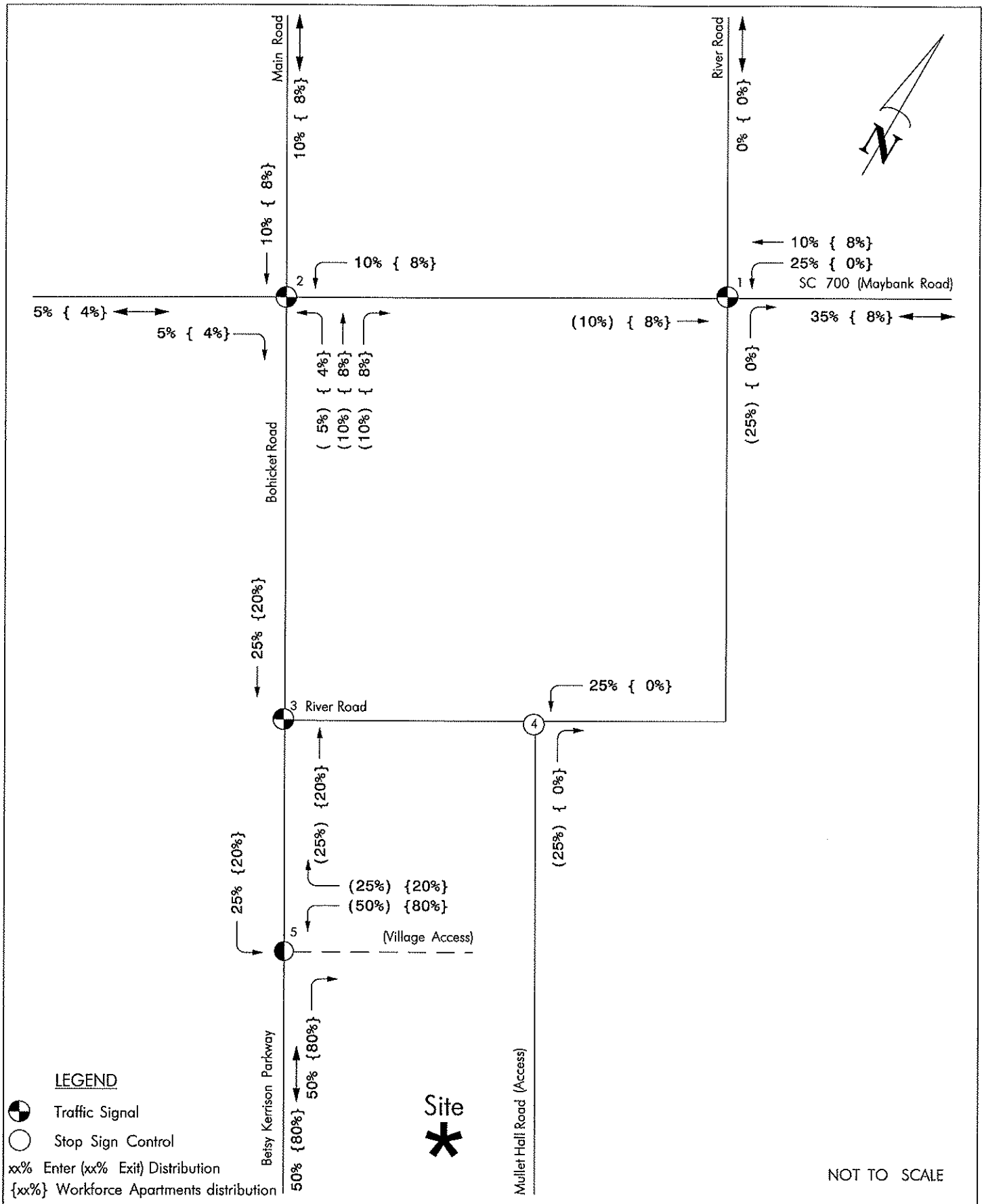
[2]The Village commercial is anticipated to only serve residents of the homes and patrons of the hotel. No trips from the external network are anticipated. Therefore, these trips are included for internal capture purposes. They are not included in the pass-by calculations. They are subtracted from the final total of new trips.

The retail component is expected to attract some of its trips from drivers currently using the adjacent streets. These trips are termed pass-by trips. The trips are diverted into the site as they travel the adjacent street to an alternate destination. There are two locations for the retail development for the Kiawah River Plantation Site. The village commercial is anticipated to only serve residents of the homes and patrons of the hotel. No trips from the external network are anticipated. Therefore, are not included in the pass-by calculations. The pass-by reductions were taken in accordance with the ITE Trip Generation Handbook.

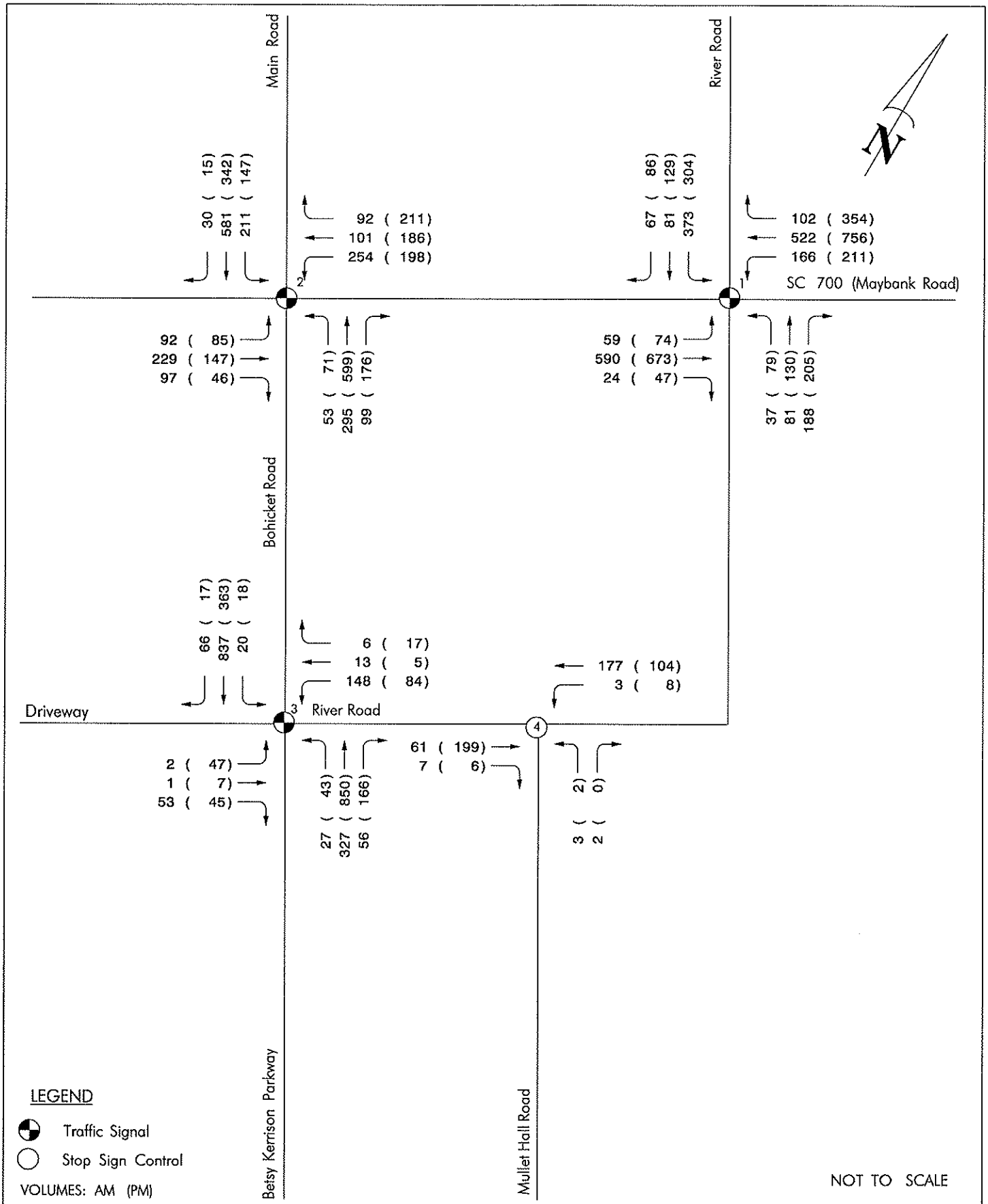
Having mixed land uses in close proximity to each other encourages one trip to the development combining multiple destinations. The residential and retail components are combined where the origin and destination are within the neighborhood center development. This adjustment is termed internal capture. The internal capture reductions were taken in accordance to the ITE Trip Generation Handbook.

Neither SCDOT nor Charleston County staff identified any approved offsite developments for inclusion in this analysis.

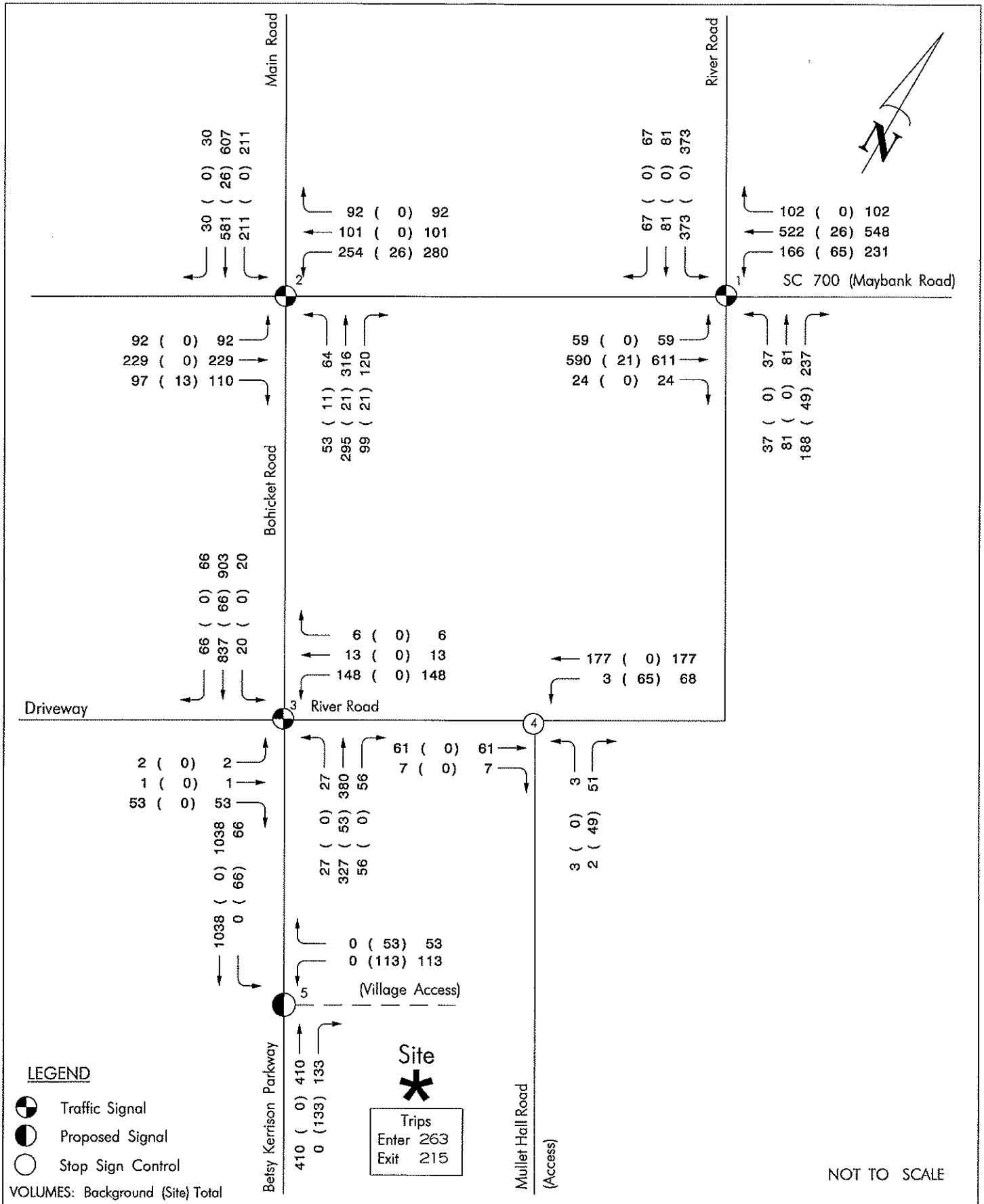
Figure 4 depicts the directional distribution for the site that has been submitted to SCDOT and Charleston County. Figure 5 depicts the 2018 No Build Traffic Volumes. The trip assignments for the 2018 Build morning and afternoon peak hour traffic volumes are presented in Figures 6a and 6b.



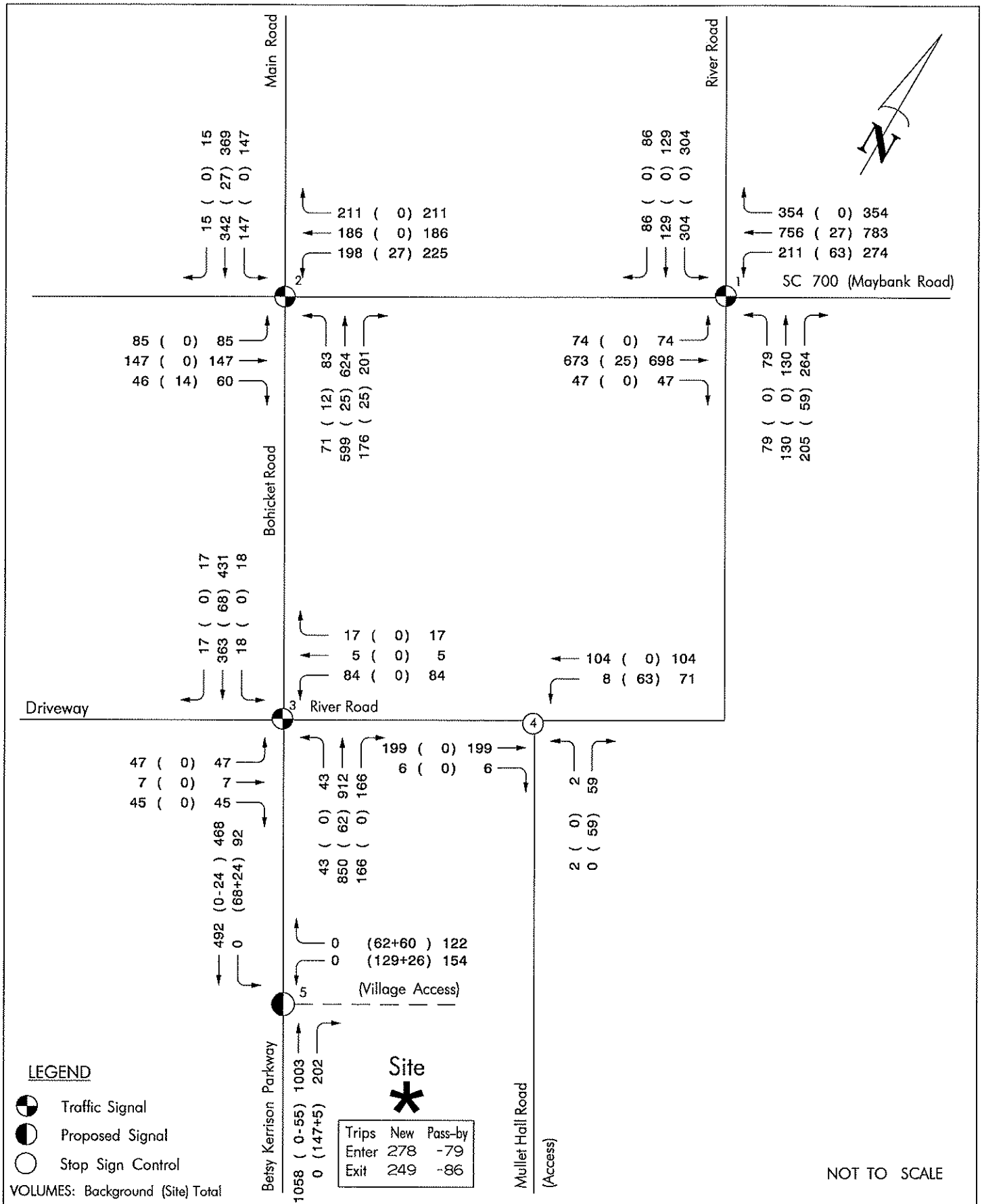
Kubilins TRANSPORTATION GROUP, INC.	Kiawah River Plantation TIA	Directional Distribution	Figure 4



Kubilins TRANSPORTATION GROUP, INC.	Kiawah River Plantation TIA	2018 No Build Traffic Volumes	Figure 5



Kubilins TRANSPORTATION GROUP, INC.	Kiawah River Plantation TIA	2018 AM Build Traffic Volumes	Figure 6a



Kubilins TRANSPORTATION GROUP, INC.	Kiawah River Plantation TIA	2018 PM Build Traffic Volumes	Figure 6b

TRAFFIC ANALYSIS

The intersections identified within the area of influence were analyzed to identify the traffic impact that the site development has under different scenarios. Recommendations for roadway improvements to accommodate the traffic are a result of the analysis. The traffic analysis is based on the LOS analysis at the identified intersections.

LOS is a qualitative measurement of traffic operations. It is a measure of delay time. The Transportation Research Board's Highway Capacity Manual[1] (HCM) defines six levels of service for intersections with LOS "A" representing the best operating condition and LOS "F" the worst. Table 16-2 of the HCM gives the criteria for signalized intersections and Table 17-2 gives the criteria for stop sign controlled intersections.

HCM Table 16-2

Signalized Level of Service	Signal Delay per Vehicle (sec/veh)
A	≤ 10.0
B	> 10.0 and ≤ 20.0
C	> 20.0 and ≤ 35.0
D	> 35.0 and ≤ 55.0
E	> 55.0 and ≤ 80.0
F	> 80.0

HCM Table 17-2

Unsignalized Level of Service	Stopped Delay per Vehicle (sec/veh)
A	≤ 10.0
B	> 10.0 and ≤ 15.0
C	> 15.0 and ≤ 25.0
D	> 25.0 and ≤ 35.0
E	> 35.0 and ≤ 50.0
F	> 50.0

SYNCHRO Pro 7.0 was the software package used in determining the delay, capacity and corresponding level of service at the signalized and unsignalized intersections. This software is based on the analysis procedures defined in the Highway Capacity Manual. The analysis optimizes the intersection splits for the approach volumes. The intersection worksheet reports are provided in the Appendix.

Typically, a signalized intersection is said to be operating acceptably at a LOS "D" or better and is operating at capacity at a volume-to-capacity (v/c) ratio of 1.00. LOS for a two-way stop-controlled (TWSC) intersection is determined by the control delay and is defined for the minor movements. Control delay includes initial deceleration delay, queue move up time, stopped delay, and final acceleration delay. With respect to field measurements, control delay is defined as the total elapsed time from the time a vehicle stops at the end of the queue to the time the vehicle departs from the stop line. LOS is not defined for a TWSC intersection as a whole. For descriptive purposes, results between LOS "A" and LOS "C" for the side street approach are assumed to represent short delays. Results between LOS "D" and LOS "E" for the side street approach are assumed to represent moderate delays, and LOS "F" for the side street approach is assumed to represent long delays. It is typical for stop sign controlled side streets and driveways intersecting major streets to experience long delays during peak hours, particularly for left-turn movements. The majority of the traffic moving through the intersection on the major street experiences little or no delay.

[1] National Research Council. Transportation Research Board. Highway Capacity Manual, Washington, DC. 2002. Chapters 2, 16, and 17.

Currently, as indicated by the 2008 Existing Conditions analyses, all of the existing intersections operate at a LOS of "C" or better during both the morning and afternoon peak hours. Per the SCDOT Access and Roadside Management Standards, 2008 Edition, *"The traffic impact study shall include proposed improvements or access management techniques that will mitigate any changes in the levels of service."*

This study analyzed the amount of development and resultant traffic that can be handled without operational impacts to the major facilities and intersections on Johns Island. The analysis determined that the following amount of development could be constructed over the next ten years without any significant impact to the intersections or roadway network that would require improvements:

- 105 Single Family Homes
- 315 Recreation Homes
- 40 Workforce Apartments
- 350 Room Hotel
- 35,000 SF Commercial (entry)
- 20,000 SF Commercial (village)
- 18 Hole Golf Course

Under the phased development plan above, the trip generation results indicate that the site has the potential to generate 478 new morning-peak-hour trips and 527 new afternoon-peak-hour trips.

Under the 2018 No Build Conditions analyses, with the growth in the background traffic, all of the intersections continue to operate at acceptable conditions, with the exception of the signalized intersection of Maybank Highway (SC 700) and River Road, which operates at a LOS "E" and 11% over capacity during the afternoon peak hour.

Under the 2018 Build analyses, with the addition of the phased site development and access management by the developer, all of the existing intersections continue to operate at the same LOS as they do in the 2018 No Build analyses.

In all future cases (both No Build and Build), the intersection of Maybank Highway with River Road is projected to operate above the minimal acceptable LOS "D" threshold. However, it is anticipated that either the Maybank Widening or "Pitchfork" implementation will address these operational constraints. It is also important to note that these initiatives are the most imminent of that discussed from a funding and approval standpoint.

The two full movement access driveways operate below capacity and at acceptable LOS in both the morning and afternoon peak hours. There are no improvements recommended for the access connection to Mullet Hall Road; however, to ensure proper site access at the main access driveway to Betsy Kerrison Parkway, improvements are recommended.

The delay, capacity and LOS results are indicated for each of the intersections in Table 2.

Table 2: Levels of Service

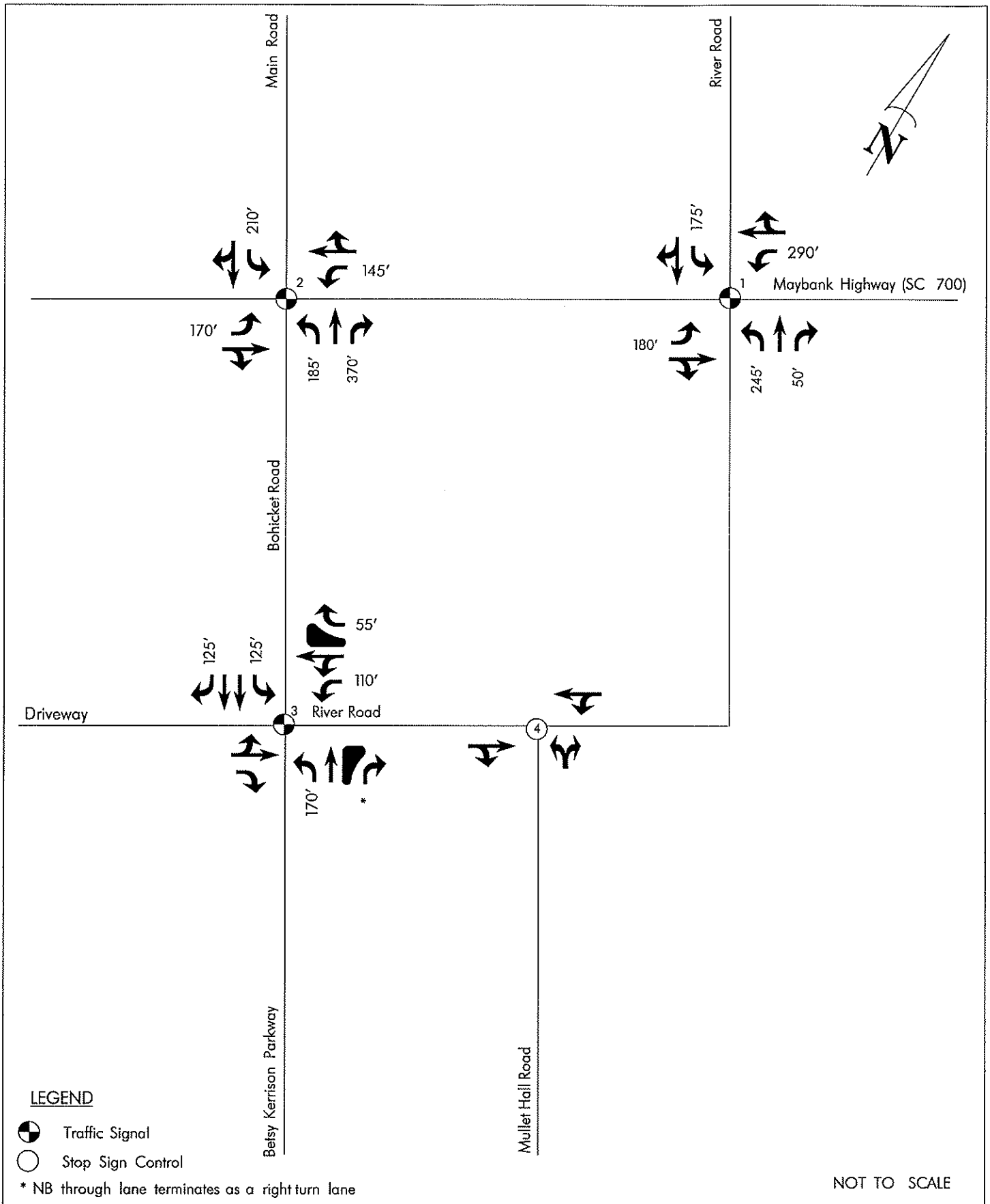
Intersection	AM Peak			PM Peak		
	Delay (sec/veh)	Capacity (v/c)	Level Of Service	Delay (sec/veh)	Capacity (v/c)	Level Of Service
2008 Existing Conditions						
1. Maybank Highway (SC 700) and River Road	26.2	0.74	C	32.8	0.89	C
2. Maybank Highway (SC 700) and Bohicket Road/Main Road	23.8	0.67	C	27.8	0.72	C
3. Bohicket Road/Betsy Kerrison Pkwy and River Road	11.8	0.40	B	13.8	0.59	B
4. River Road and Mullet Hall Road[1]	9.3	0.01	A	10.2	0.01	B
2018 No Build						
1. Maybank Highway (SC 700) and River Road	35.6	0.85	D	72.6	1.11	E
2. Maybank Highway (SC 700) and Bohicket Road/Main Road	29.3	0.81	C	36.7	0.87	D
3. Bohicket Road/Betsy Kerrison Pkwy and River Road	12.2	0.47	B	16.8	0.70	B
4. River Road and Mullet Hall Road[1]	9.5	0.01	A	10.7	0.01	B
2018 Build - Phase I						
1. Maybank Highway (SC 700) and River Road	41.3	0.96	D	78.3	1.13	E
2. Maybank Highway (SC 700) and Bohicket Road/Main Road	32.8	0.86	C	38.6	0.89	D
3. Bohicket Road/Betsy Kerrison Pkwy and River Road	12.2	0.49	B	19.4	0.74	B
4. River Road and Mullet Hall Road (Access)[1]	9.0	0.06	A	9.9	0.08	A
5. Betsy Kerrison Pkwy and Village Site Access[2]	7.1	0.51	A	9	0.51	A

* The results are not meaningful.

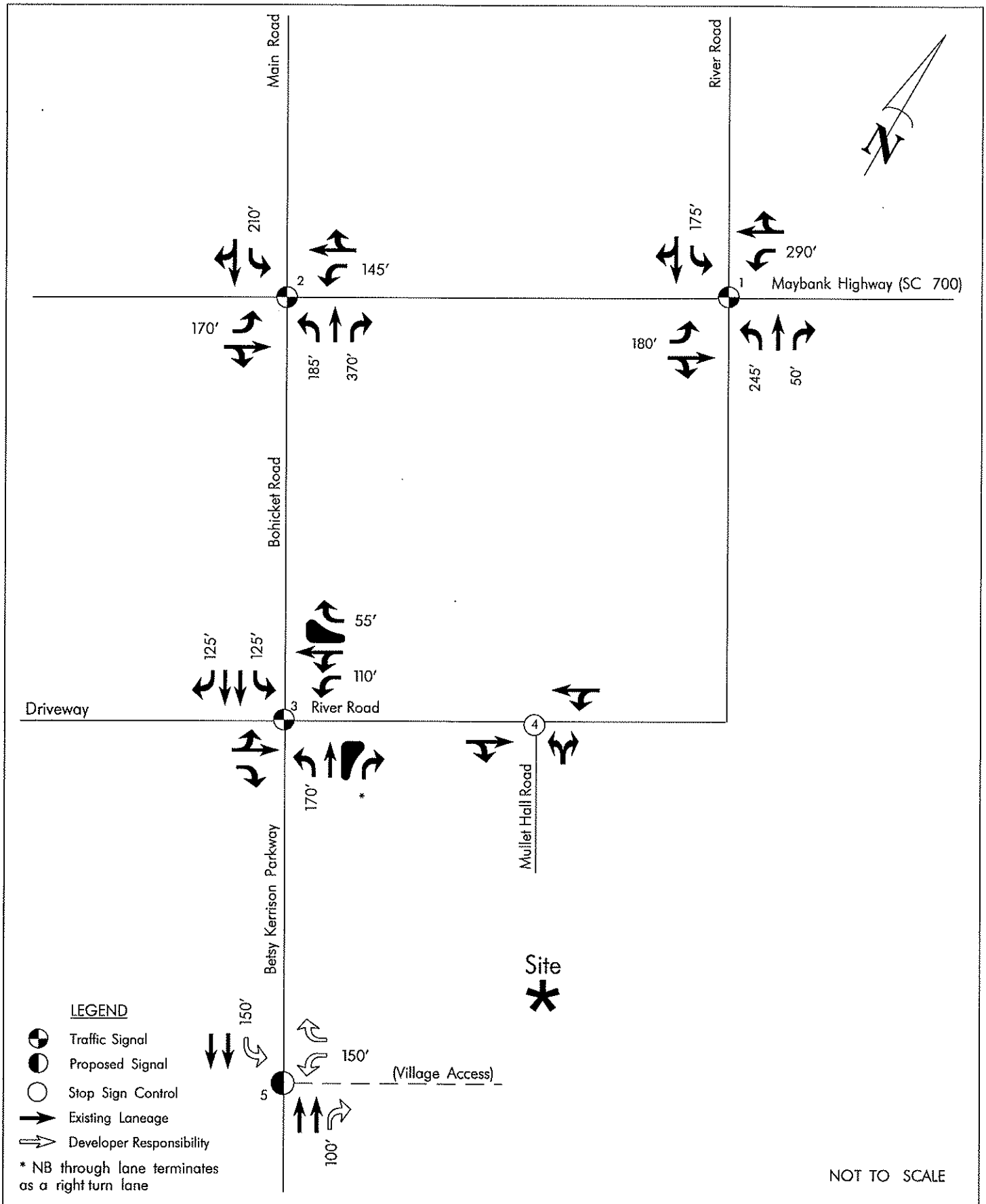
[1] Flow Rate/Capacity and LOS correspond to the most critical movement of the unsignalized intersection.

[2] Improvements to the Village Access include left and right turn lane into and out of the site along with traffic signal control.

The 2008 existing and 2018 future laneage conditions are presented schematically in Figures 7a and 7b.



Kubilins TRANSPORTATION GROUP, INC.	Kiawah River Plantation TIA	2008 Existing Laneage	Figure 7a



Kubilins TRANSPORTATION GROUP, INC.	Kiawah River Plantation TIA	2018 Recommended Laneage	Figure 7b

CONCLUSIONS

In conclusion, this study recommends the following development plan be approved with no road improvements to the existing network since there are several firm proposals in play that can significantly change the complexion of travel conditions and network on Johns Island:

- 105 Single Family Homes
- 315 Recreation Homes
- 40 Workforce Apartments
- 350 Room Hotel
- 35,000 SF Commercial (entry)
- 20,000 SF Commercial (village)
- 18 Hole Golf Course

The existing roadway network and infrastructure can accommodate this amount of development without any significant operational impacts to the major facilities and intersections on Johns Island. It is recommended that the traffic conditions be reevaluated at a later date when the regional roadway initiative program has been settled and/or when the remainder of the Kiawah River Plantation development is at a point to move forward with completion.

There are no improvements recommended for the access connection to Mullet Hall Road, however, to ensure proper site access at the main access driveway to Betsy Kerrison Parkway the following improvements are recommended to be constructed:

- Construct a full movement access drive with one ingress lane and two egress lanes. The egress lanes should be configured as a separate left turn lane with 150 feet of storage and the through lane shall terminate as a right turn lane. 150 feet of internal protected storage should also be provided for.
- Construct a dedicated left turn lane on the southbound approach of Betsy Kerrison Parkway with 150 feet of storage with appropriate tapers.
- Construct a dedicated right turn lane on the northbound approach of Betsy Kerrison Parkway with 100 feet of storage with appropriate tapers.
- Install traffic signal control upon meeting the appropriate MUTCD and SCDOT traffic signal control warrants.

APPENDIX

TRAFFIC DATA COLLECTION, INC.

Atlanta - Hilton Head
www.trafficdatacollection.com

Counter: 1934
Counted By: JFU
Weather: Mild
Other: KTG

File Name : 08523-01
Site Code : 00852301
Start Date : 7/9/2008
Page No : 1

Groups Printed- Cars - Trucks & Buses

	River Rd Northbound					River Rd Southbound					Maybank Hwy Eastbound					Maybank Hwy Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	6	14	31	0	51	58	23	7	0	88	6	100	4	0	110	21	81	15	0	117	366
07:15 AM	4	12	48	0	64	55	13	20	0	88	2	118	3	0	123	24	90	30	0	144	419
07:30 AM	4	18	49	0	71	76	20	7	0	103	5	99	6	0	110	20	96	12	0	128	412
07:45 AM	1	24	47	0	72	82	15	11	0	108	9	118	10	0	137	26	132	21	0	179	496
Total	15	68	175	0	258	271	71	45	0	387	22	435	23	0	480	91	399	78	0	568	1693
08:00 AM	7	17	44	0	68	90	24	13	1	128	11	124	8	0	143	48	110	21	0	179	518
08:15 AM	7	10	36	0	53	70	19	11	0	100	8	104	2	0	114	27	108	20	0	155	422
08:30 AM	9	26	29	0	64	74	10	13	0	97	14	127	3	0	144	23	97	13	2	135	440
08:45 AM	7	13	45	0	65	72	13	18	1	104	15	129	7	0	151	38	114	30	0	182	502
Total	30	66	154	0	250	306	66	55	2	429	48	484	20	0	552	136	429	84	2	651	1882
Break																					
04:00 PM	15	28	38	0	81	58	25	17	0	100	15	148	8	0	171	43	161	72	0	276	628
04:15 PM	17	25	41	0	83	63	22	21	0	106	11	144	11	0	166	49	158	74	0	281	636
04:30 PM	14	25	48	0	87	61	28	18	0	107	16	90	9	0	115	47	166	71	0	284	593
04:45 PM	16	27	46	0	89	63	29	16	0	108	14	146	9	0	169	37	159	78	0	274	640
Total	62	105	173	0	340	245	104	72	0	421	56	528	37	0	621	176	644	295	0	1115	2497
05:00 PM	17	22	47	0	86	65	25	19	0	109	13	138	11	0	162	40	155	78	2	275	632
05:15 PM	14	28	44	0	86	64	31	19	0	114	16	140	10	0	166	32	159	68	1	260	626
05:30 PM	18	30	31	0	79	57	21	17	0	95	17	128	9	0	154	64	147	67	0	278	606
05:45 PM	7	31	29	0	67	46	32	18	0	96	26	89	6	0	121	51	156	74	0	281	565
Total	56	111	151	0	318	232	109	73	0	414	72	495	36	0	603	187	617	287	3	1094	2429
06:00 PM	15	18	32	0	65	37	11	18	0	66	17	99	4	0	120	44	149	83	0	276	527
Grand Total	178	368	685	0	1231	1091	361	263	2	1717	215	2041	120	0	2376	634	2238	827	5	3704	9028
Apprch %	14.5	29.9	55.6	0		63.5	21	15.3	0.1		9	85.9	5.1	0		17.1	60.4	22.3	0.1		
Total %	2	4.1	7.6	0	13.6	12.1	4	2.9	0	19	2.4	22.6	1.3	0	26.3	7	24.8	9.2	0.1	41	
Cars	174	337	673	0	1184	1082	348	258	2	1690	207	2011	114	0	2332	617	2196	805	5	3623	8829
% Cars	97.8	91.6	98.2	0	96.2	99.2	96.4	98.1	100	98.4	96.3	98.5	95	0	98.1	97.3	98.1	97.3	100	97.8	97.8
Trucks & Buses	4	31	12	0	47	9	13	5	0	27	8	30	6	0	44	17	42	22	0	81	199
% Trucks & Buses	2.2	8.4	1.8	0	3.8	0.8	3.6	1.9	0	1.6	3.7	1.5	5	0	1.9	2.7	1.9	2.7	0	2.2	2.2

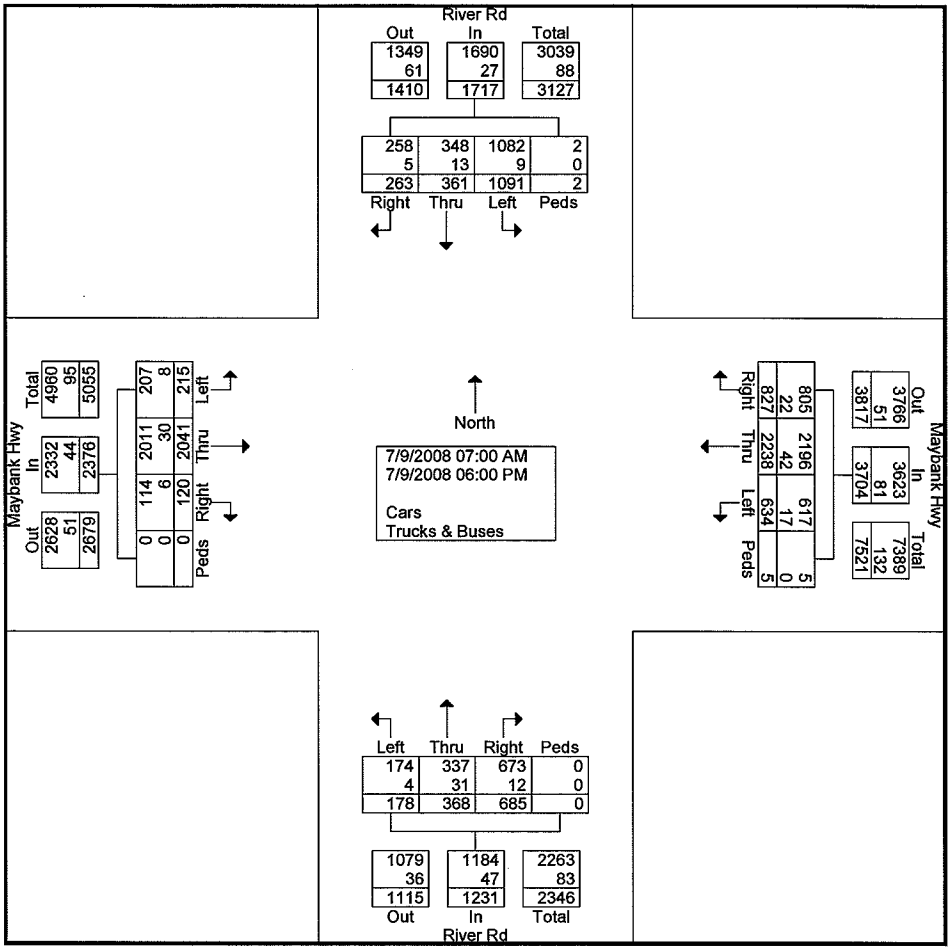
Note: Pedestrian data shown for each approach is crossing the approach from either direction combined.

TRAFFIC DATA COLLECTION, INC.

Atlanta - Hilton Head
www.trafficdatacollection.com

Counter: 1934
Counted By: JFU
Weather: Mild
Other: KTG

File Name : 08523-01
Site Code : 00852301
Start Date : 7/9/2008
Page No : 2



TRAFFIC DATA COLLECTION, INC.

Atlanta - Hilton Head
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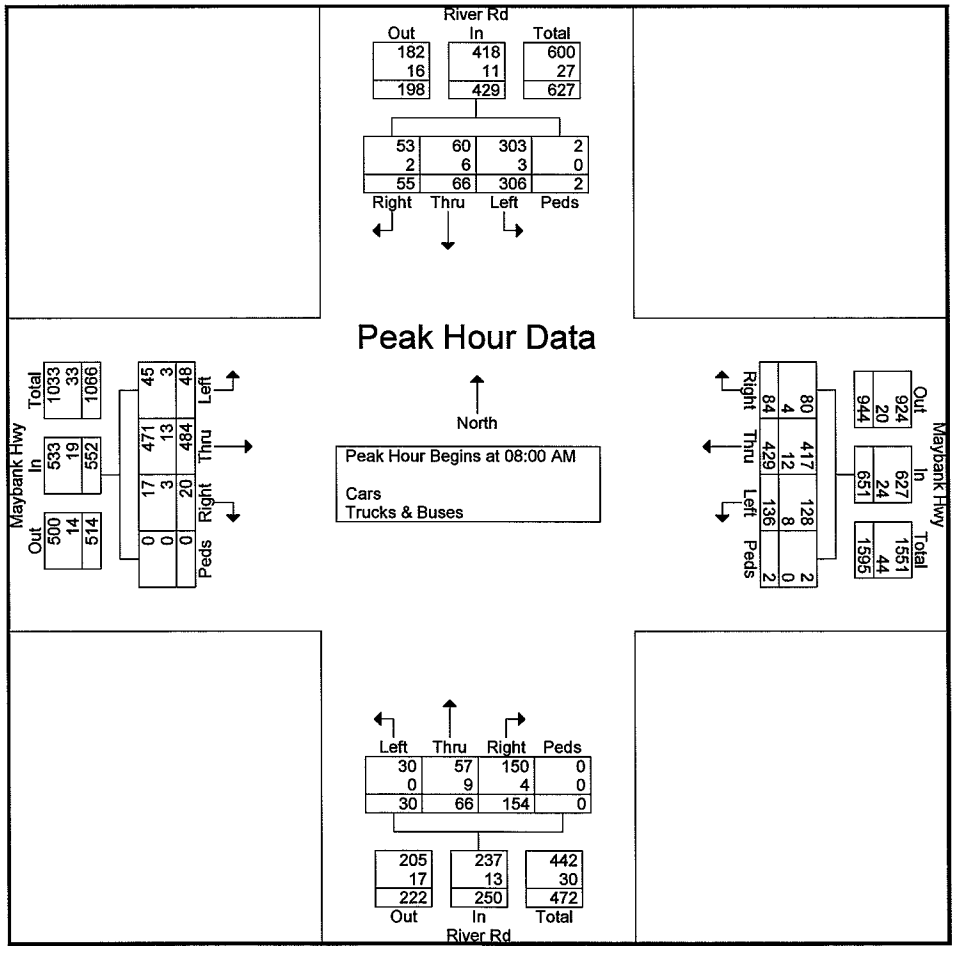
Counter: 1934
Counted By: JFU
Weather: Mild
Other: KTG

File Name : 08523-01
Site Code : 00852301
Start Date : 7/9/2008
Page No : 3

	River Rd Northbound					River Rd Southbound					Maybank Hwy Eastbound					Maybank Hwy Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	7	17	44	0	**68**	**90**	**24**	13	**1**	**128**	11	124	**8**	0	143	**48**	110	21	0	179	**518**
08:15 AM	7	10	36	0	53	70	19	11	0	100	8	104	2	0	114	27	108	20	0	155	422
08:30 AM	**9**	**26**	29	0	64	74	10	13	0	97	14	127	3	0	144	23	97	13	**2**	135	440
08:45 AM	7	13	**45**	0	65	72	13	**18**	1	104	**15**	**129**	7	0	**151**	38	**114**	**30**	0	**182**	502
Total Volume	30	66	154	0	250	306	66	55	2	429	48	484	20	0	552	136	429	84	2	651	1882
% App. Total	12	26.4	61.6	0		71.3	15.4	12.8	0.5		8.7	87.7	3.6	0		20.9	65.9	12.9	0.3		
PHF	.833	.635	.856	.000	.919	.850	.688	.764	.500	.838	.800	.938	.625	.000	.914	.708	.941	.700	.250	.894	.908
Cars	30	57	150	0	237	303	60	53	2	418	45	471	17	0	533	128	417	80	2	627	1815
% Cars	100	86.4	97.4	0	94.8	99.0	90.9	96.4	100	97.4	93.8	97.3	85.0	0	96.6	94.1	97.2	95.2	100	96.3	96.4
Trucks & Buses																					
% Trucks & Buses	0	13.6	2.6	0	5.2	1.0	9.1	3.6	0	2.6	6.3	2.7	15.0	0	3.4	5.9	2.8	4.8	0	3.7	3.6



TRAFFIC DATA COLLECTION, INC.

Atlanta - Hilton Head
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Counter: 1934
Counted By: JFU
Weather: Mild
Other: KTG

File Name : 08523-01
Site Code : 00852301
Start Date : 7/9/2008
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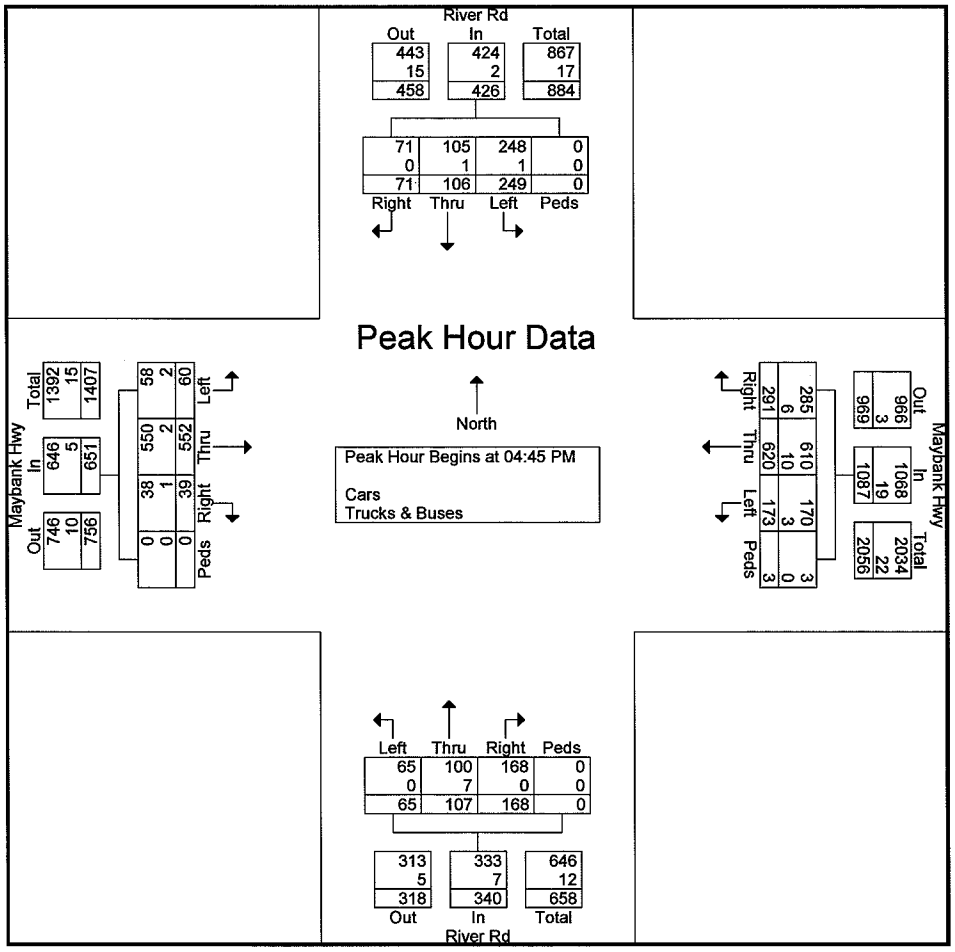
	River Rd Northbound					River Rd Southbound					Maybank Hwy Eastbound					Maybank Hwy Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 06:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	16	27	46	0	**89**	63	29	16	0	108	14	**146**	9	0	**169**	37	**159**	**78**	0	274	**640**
05:00 PM	17	22	**47**	0	86	**65**	25	**19**	0	109	13	138	**11**	0	162	40	155	78	**2**	275	632
05:15 PM	14	28	44	0	86	64	**31**	19	0	**114**	16	140	10	0	166	32	159	68	1	260	626
05:30 PM	**18**	**30**	31	0	79	57	21	17	0	95	**17**	128	9	0	154	**64**	147	67	0	**278**	606
Total Volume	65	107	168	0	340	249	106	71	0	426	60	552	39	0	651	173	620	291	3	1087	2504
% App. Total	19.1	31.5	49.4	0		58.5	24.9	16.7	0		9.2	84.8	6	0		15.9	57	26.8	0.3		
PHF	.903	.892	.894	.000	.955	.958	.855	.934	.000	.934	.882	.945	.886	.000	.963	.676	.975	.933	.375	.978	.978
Cars	65	100	168	0	333	248	105	71	0	424	58	550	38	0	646	170	610	285	3	1068	2471
% Cars	100	93.5	100	0	97.9	99.6	99.1	100	0	99.5	96.7	99.6	97.4	0	99.2	98.3	98.4	97.9	100	98.3	98.7
Trucks & Buses																					
% Trucks & Buses	0	6.5	0	0	2.1	0.4	0.9	0	0	0.5	3.3	0.4	2.6	0	0.8	1.7	1.6	2.1	0	1.7	1.3



TRAFFIC DATA COLLECTION, INC.

Atlanta - Hilton Head
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Counter: 1935
Counted By: JRM
Weather: Mild
Other: KTG

File Name : 08523-02
Site Code : 00852302
Start Date : 7/9/2008
Page No : 1

Groups Printed- Cars - Trucks & Buses

	Bohicket Rd Northbound					Main Rd Southbound					Maybank Hwy Eastbound					Maybank Hwy Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	9	43	12	0	64	26	125	3	0	154	14	30	15	0	59	31	16	22	0	69	346
07:15 AM	10	51	13	0	74	43	134	6	0	183	22	37	9	0	68	43	15	15	1	74	399
07:30 AM	4	39	7	0	50	40	130	3	0	173	19	46	18	0	83	55	23	18	0	96	402
07:45 AM	9	57	21	0	87	42	120	8	0	170	26	45	18	0	89	57	20	16	0	93	439
Total	32	190	53	0	275	151	509	20	0	680	81	158	60	0	299	186	74	71	1	332	1586
08:00 AM	9	58	12	0	79	52	118	9	0	179	20	40	24	0	84	40	18	25	0	83	425
08:15 AM	9	71	18	0	98	34	114	3	0	151	18	45	21	0	84	63	23	22	1	109	442
08:30 AM	16	56	30	0	102	45	125	5	0	175	12	58	16	0	86	49	22	13	0	84	447
08:45 AM	10	83	26	0	119	48	86	1	0	135	17	35	19	0	71	52	14	24	0	90	415
Total	44	268	86	0	398	179	443	18	0	640	67	178	80	0	325	204	77	84	1	366	1729
Break																					
04:00 PM	15	81	28	0	124	35	73	4	0	112	17	35	12	0	64	37	41	36	1	115	415
04:15 PM	12	134	54	0	200	42	79	2	0	123	17	26	10	0	53	44	38	35	0	117	493
04:30 PM	16	152	31	0	199	21	67	3	0	91	11	27	4	0	42	31	46	50	0	127	459
04:45 PM	16	125	31	0	172	23	61	3	0	87	25	33	12	0	70	50	28	52	0	130	459
Total	59	492	144	0	695	121	280	12	0	413	70	121	38	0	229	162	153	173	1	489	1826
05:00 PM	13	89	32	0	134	31	57	3	0	91	15	27	9	0	51	43	36	45	1	125	401
05:15 PM	16	118	39	0	173	37	66	4	0	107	12	23	15	0	50	46	39	51	0	136	466
05:30 PM	15	100	41	0	156	23	78	6	0	107	13	28	8	0	49	52	45	35	0	132	444
05:45 PM	21	91	49	0	161	32	72	7	0	111	17	21	14	0	52	44	26	47	3	120	444
Total	65	398	161	0	624	123	273	20	0	416	57	99	46	0	202	185	146	178	4	513	1755
Grand Total	200	1348	444	0	1992	574	1505	70	0	2149	275	556	224	0	1055	737	450	506	7	1700	6896
Apprch %	10	67.7	22.3	0		26.7	70	3.3	0		26.1	52.7	21.2	0		43.4	26.5	29.8	0.4		
Total %	2.9	19.5	6.4	0	28.9	8.3	21.8	1	0	31.2	4	8.1	3.2	0	15.3	10.7	6.5	7.3	0.1	24.7	
Cars	198	1320	433	0	1951	562	1460	68	0	2090	273	556	224	0	1053	728	446	500	7	1681	6775
% Cars	99	97.9	97.5	0	97.9	97.9	97	97.1	0	97.3	99.3	100	100	0	99.8	98.8	99.1	98.8	100	98.9	98.2
Trucks & Buses	2	28	11	0	41	12	45	2	0	59	2	0	0	0	2	9	4	6	0	19	121
% Trucks & Buses	1	2.1	2.5	0	2.1	2.1	3	2.9	0	2.7	0.7	0	0	0	0.2	1.2	0.9	1.2	0	1.1	1.8

Note: Pedestrian data shown for each approach is crossing the approach from either direction combined.

TRAFFIC DATA COLLECTION, INC.

Atlanta - Hilton Head

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Weather: Mild
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File Name : 08523-02
Site Code : 00852302
Start Date : 7/9/2008
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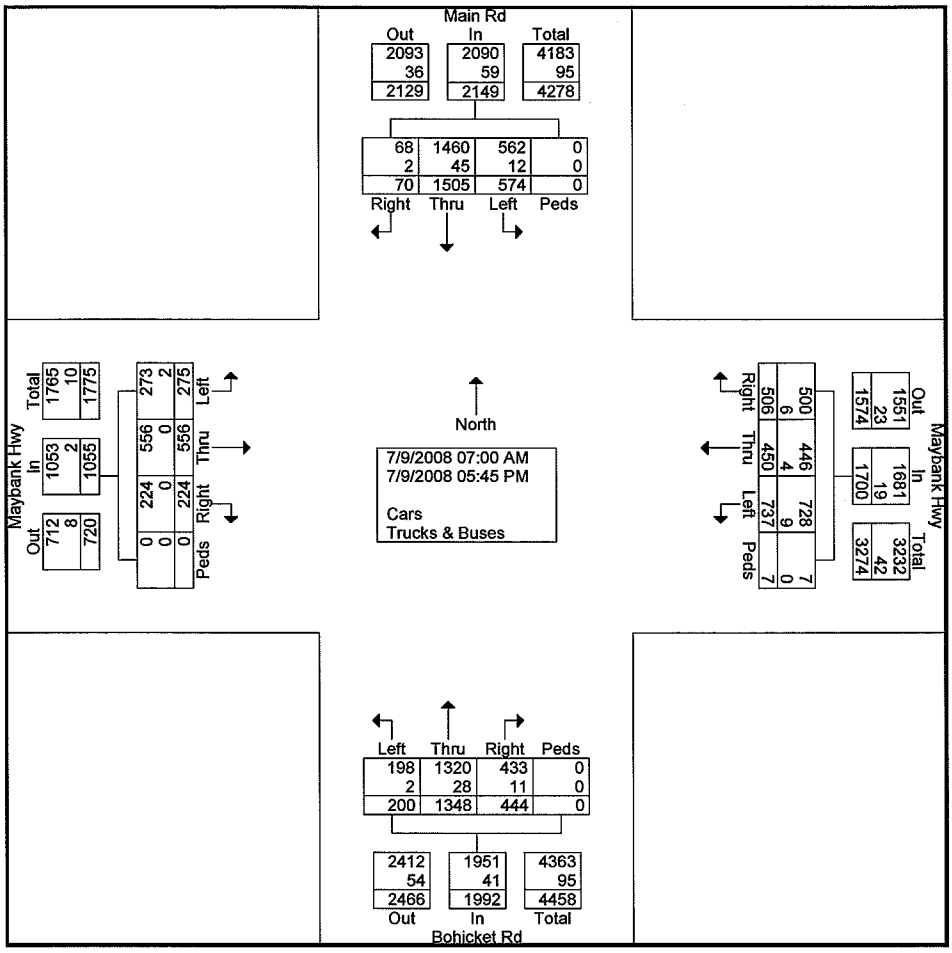

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Counter: 1935
Counted By: JRM
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File Name : 08523-02
Site Code : 00852302
Start Date : 7/9/2008
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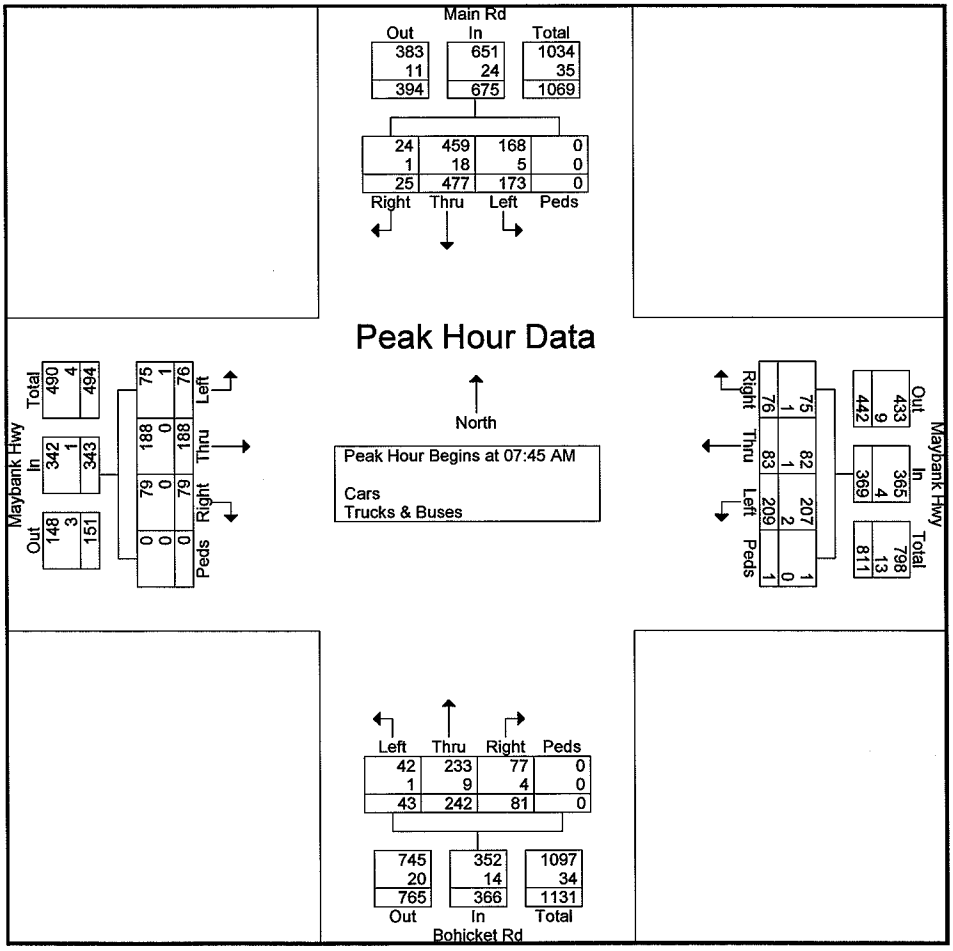
	Bohicket Rd Northbound					Main Rd Southbound					Maybank Hwy Eastbound					Maybank Hwy Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	9	57	21	0	87	42	120	8	0	170	**26**	45	18	0	**89**	57	20	16	0	93	439
08:00 AM	9	58	12	0	79	**52**	118	**9**	0	**179**	20	40	**24**	0	84	40	18	**25**	0	83	425
08:15 AM	9	**71**	18	0	98	34	114	3	0	151	18	45	21	0	84	**63**	**23**	22	**1**	**109**	442
08:30 AM	**16**	56	**30**	0	**102**	45	**125**	5	0	175	12	**58**	16	0	86	49	22	13	0	84	**447**
Total Volume	43	242	81	0	366	173	477	25	0	675	76	188	79	0	343	209	83	76	1	369	1753
% App. Total	11.7	66.1	22.1	0		25.6	70.7	3.7	0		22.2	54.8	23	0		56.6	22.5	20.6	0.3		
PHF	.672	.852	.675	.000	.897	.832	.954	.694	.000	.943	.731	.810	.823	.000	.963	.829	.902	.760	.250	.846	.980
Cars	42	233	77	0	352	168	459	24	0	651	75	188	79	0	342	207	82	75	1	365	1710
% Cars	97.7	96.3	95.1	0	96.2	97.1	96.2	96.0	0	96.4	98.7	100	100	0	99.7	99.0	98.8	98.7	100	98.9	97.5
Trucks & Buses																					
% Trucks & Buses	2.3	3.7	4.9	0	3.8	2.9	3.8	4.0	0	3.6	1.3	0	0	0	0.3	1.0	1.2	1.3	0	1.1	2.5



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Counter: 1935
Counted By: JRM
Weather: Mild
Other: KTG

File Name : 08523-02
Site Code : 00852302
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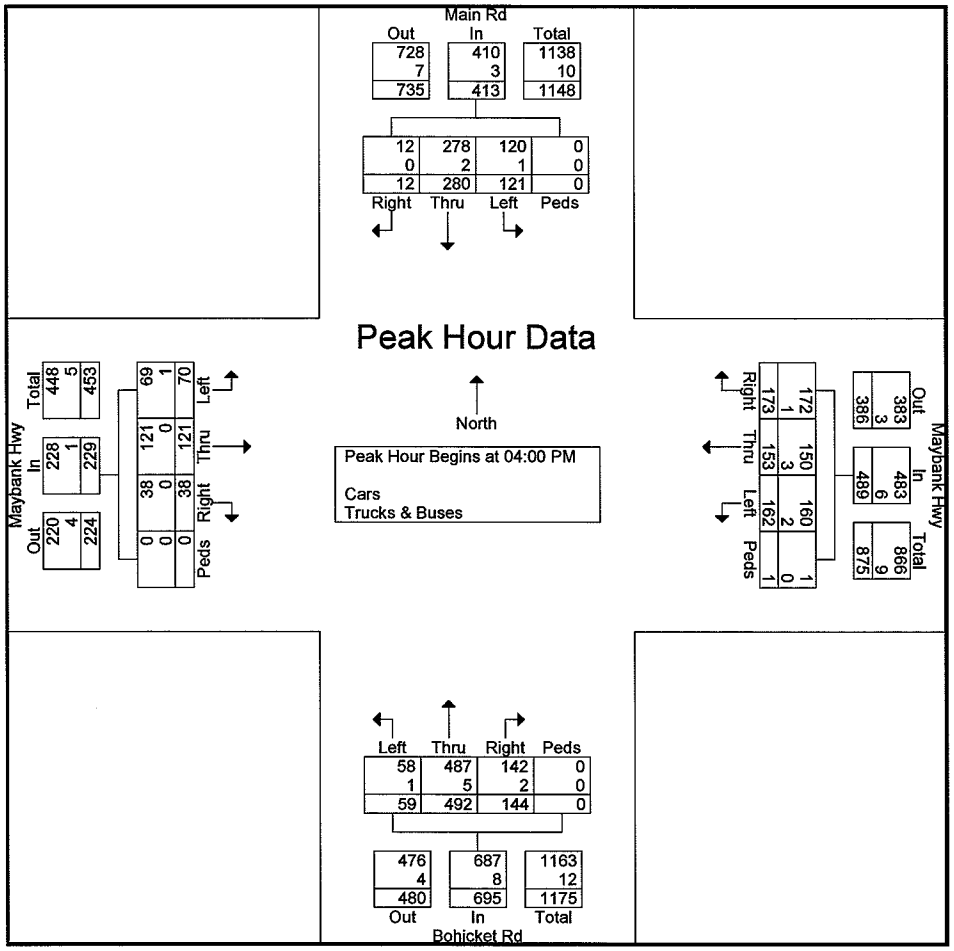
	Bohicket Rd Northbound					Main Rd Southbound					Maybank Hwy Eastbound					Maybank Hwy Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	15	81	28	0	124	35	73	**4**	0	112	17	**35**	**12**	0	64	37	41	36	**1**	115	415
04:15 PM	12	134	**54**	0	**200**	**42**	**79**	2	0	**123**	17	26	10	0	53	44	38	35	0	117	**493**
04:30 PM	**16**	**152**	31	0	199	21	67	3	0	91	11	27	4	0	42	31	**46**	50	0	127	459
04:45 PM	16	125	31	0	172	23	61	3	0	87	**25**	33	12	0	**70**	**50**	28	**52**	0	**130**	459
Total Volume	59	492	144	0	695	121	280	12	0	413	70	121	38	0	229	162	153	173	1	489	1826
% App. Total	8.5	70.8	20.7	0		29.3	67.8	2.9	0		30.6	52.8	16.6	0		33.1	31.3	35.4	0.2		
PHF	.922	.809	.667	.000	.869	.720	.886	.750	.000	.839	.700	.864	.792	.000	.818	.810	.832	.832	.250	.940	.926
Cars	58	487	142	0	687	120	278	12	0	410	69	121	38	0	228	160	150	172	1	483	1808
% Cars	98.3	99.0	98.6	0	98.8	99.2	99.3	100	0	99.3	98.6	100	100	0	99.6	98.8	98.0	99.4	100	98.8	99.0
Trucks & Buses																					
% Trucks & Buses	1.7	1.0	1.4	0	1.2	0.8	0.7	0	0	0.7	1.4	0	0	0	0.4	1.2	2.0	0.6	0	1.2	1.0



TRAFFIC DATA COLLECTION, INC.

Atlanta - Hilton Head
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Counter: 1935
Counted By: JRM
Weather: Mild
Other: KTG

File Name : 08523-03
Site Code : 00852303
Start Date : 7/10/2008
Page No : 1

Groups Printed- Cars - Trucks & Buses

	Bohicket Rd Northbound					Bohicket Rd Southbound					River Rd Eastbound					River Rd Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:15 AM	3	46	9	0	58	2	157	5	0	164	1	0	3	0	4	30	2	3	0	35	261
07:30 AM	2	49	11	0	62	1	163	4	0	168	1	0	2	0	3	38	0	5	0	43	276
07:45 AM	4	58	11	0	73	3	174	9	0	186	0	1	3	0	4	34	4	0	0	38	301
Total	9	153	31	0	193	6	494	18	0	518	2	1	8	0	11	102	6	8	0	116	838
08:00 AM	4	67	11	0	82	3	169	17	0	189	1	1	11	0	13	36	3	1	0	40	324
08:15 AM	3	74	12	0	89	2	182	15	0	199	1	0	8	0	9	23	2	1	0	26	323
08:30 AM	4	63	14	0	81	6	107	10	0	123	0	0	8	0	8	30	1	2	0	33	245
08:45 AM	11	64	9	0	84	5	229	12	0	246	0	0	16	0	16	33	4	1	0	38	384
Total	22	268	46	0	336	16	687	54	0	757	2	1	43	0	46	122	10	5	0	137	1276
09:00 AM	7	81	14	0	102	8	160	8	0	176	1	0	10	0	11	26	1	2	0	29	318
09:15 AM	9	80	18	0	107	3	123	6	0	132	1	2	6	0	9	21	1	5	0	27	275
Break																					
Total	16	161	32	0	209	11	283	14	0	308	2	2	16	0	20	47	2	7	0	56	593
Break																					
04:00 PM	15	200	38	0	253	0	74	4	0	78	11	2	9	0	22	16	2	4	0	22	375
04:15 PM	7	185	31	0	223	4	77	4	0	85	9	0	12	0	21	22	0	3	0	25	354
04:30 PM	8	177	33	0	218	7	92	4	0	103	14	2	10	0	26	15	0	3	0	18	365
04:45 PM	5	136	34	0	175	4	55	2	0	61	5	2	6	0	13	16	2	4	0	22	271
Total	35	698	136	0	869	15	298	14	0	327	39	6	37	0	82	69	4	14	0	87	1365
05:00 PM	4	186	39	0	229	6	64	7	0	77	7	4	14	0	25	12	1	10	0	23	354
05:15 PM	2	175	37	0	214	6	58	2	0	66	9	4	5	0	18	13	0	10	0	23	321
05:30 PM	4	121	27	0	152	7	78	4	0	89	4	1	6	0	11	21	1	6	0	28	280
05:45 PM	4	104	17	0	125	3	64	1	0	68	5	0	5	0	10	13	0	2	0	15	218
Total	14	586	120	0	720	22	264	14	0	300	25	9	30	0	64	59	2	28	0	89	1173
Grand Total	96	1866	365	0	2327	70	2026	114	0	2210	70	19	134	0	223	399	24	62	0	485	5245
Apprch %	4.1	80.2	15.7	0		3.2	91.7	5.2	0		31.4	8.5	60.1	0		82.3	4.9	12.8	0		
Total %	1.8	35.6	7	0	44.4	1.3	38.6	2.2	0	42.1	1.3	0.4	2.6	0	4.3	7.6	0.5	1.2	0	9.2	
Cars	94	1810	347	0	2251	69	1973	113	0	2155	69	18	133	0	220	378	24	62	0	464	5090
% Cars	97.9	97	95.1	0	96.7	98.6	97.4	99.1	0	97.5	98.6	94.7	99.3	0	98.7	94.7	100	100	0	95.7	97
Trucks & Buses	2	56	18	0	76	1	53	1	0	55	1	1	1	0	3	21	0	0	0	21	155
% Trucks & Buses	2.1	3	4.9	0	3.3	1.4	2.6	0.9	0	2.5	1.4	5.3	0.7	0	1.3	5.3	0	0	0	4.3	3

Note: Pedestrian data shown for each approach is crossing the approach from either direction combined.

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Counter: 1935
Counted By: JRM
Weather: Mild
Other: KTG

File Name : 08523-03
Site Code : 00852303
Start Date : 7/10/2008
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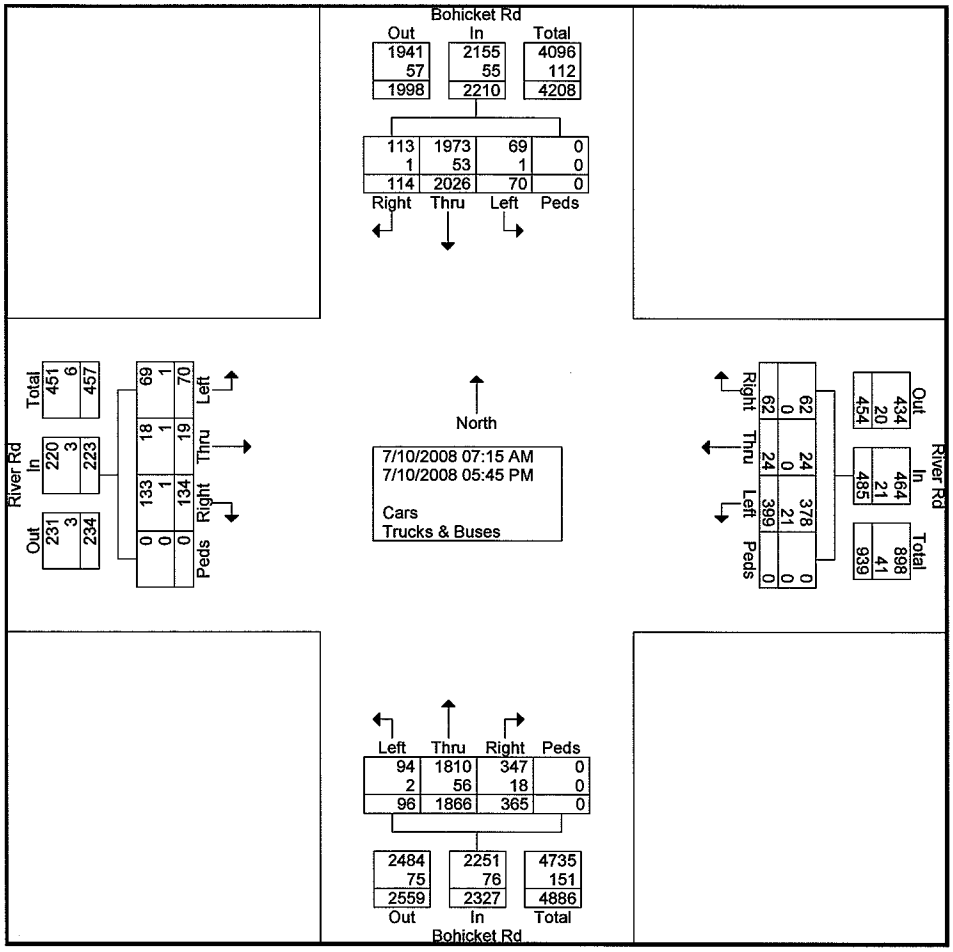

TRAFFIC DATA COLLECTION, INC.

Atlanta - Hilton Head
www.trafficdatacollection.com

Counter: 1935
Counted By: JRM
Weather: Mild
Other: KTG

File Name : 08523-03
Site Code : 00852303
Start Date : 7/10/2008
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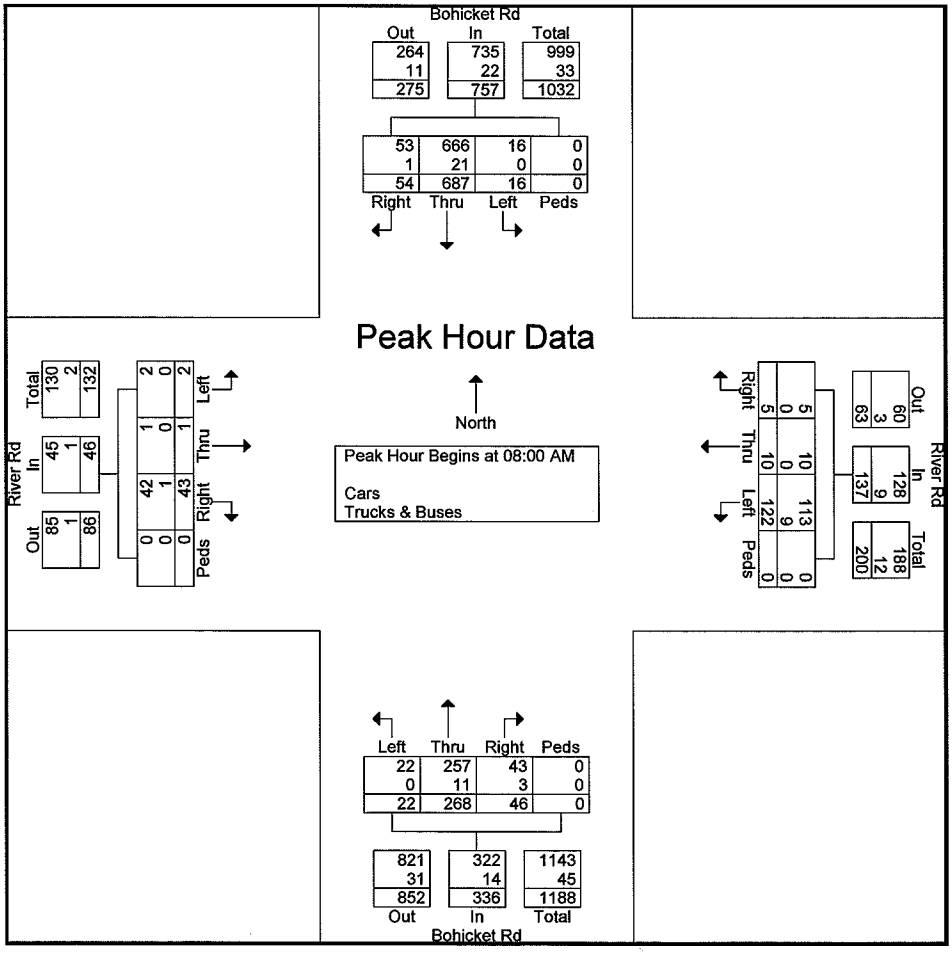
	Bohicket Rd Northbound					Bohicket Rd Southbound					River Rd Eastbound					River Rd Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:15 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	4	67	11	0	82	3	169	**17**	0	189	**1**	**1**	11	0	13	**36**	3	1	0	**40**	324
08:15 AM	3	**74**	12	0	**89**	2	182	15	0	199	1	0	8	0	9	23	2	1	0	26	323
08:30 AM	4	63	**14**	0	81	**6**	107	10	0	123	0	0	8	0	8	30	1	**2**	0	33	245
08:45 AM	**11**	64	9	0	84	5	**229**	12	0	**246**	0	0	**16**	0	**16**	33	**4**	1	0	38	**384**
Total Volume	22	268	46	0	336	16	687	54	0	757	2	1	43	0	46	122	10	5	0	137	1276
% App. Total	6.5	79.8	13.7	0		2.1	90.8	7.1	0		4.3	2.2	93.5	0		89.1	7.3	3.6	0		
PHF	.500	.905	.821	.000	.944	.667	.750	.794	.000	.769	.500	.250	.672	.000	.719	.847	.625	.625	.000	.856	.831
Cars	22	257	43	0	322	16	666	53	0	735	2	1	42	0	45	113	10	5	0	128	1230
% Cars	100	95.9	93.5	0	95.8	100	96.9	98.1	0	97.1	100	100	97.7	0	97.8	92.6	100	100	0	93.4	96.4
Trucks & Buses																					
% Trucks & Buses	0	4.1	6.5	0	4.2	0	3.1	1.9	0	2.9	0	0	2.3	0	2.2	7.4	0	0	0	6.6	3.6



TRAFFIC DATA COLLECTION, INC.

Atlanta - Hilton Head
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Counter: 1935
Counted By: JRM
Weather: Mild
Other: KTG

File Name : 08523-03
Site Code : 00852303
Start Date : 7/10/2008
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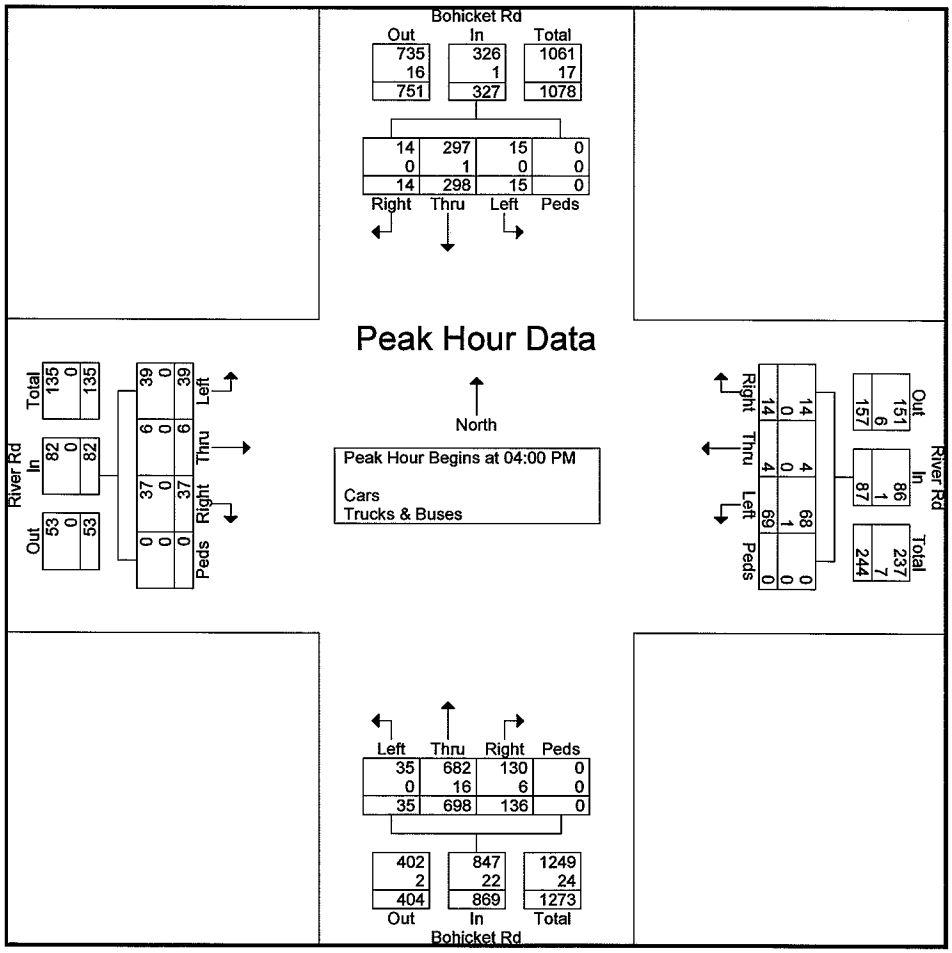
	Bohicket Rd Northbound					Bohicket Rd Southbound					River Rd Eastbound					River Rd Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	**15**	**200**	**38**	0	**253**	0	74	**4**	0	78	11	**2**	9	0	22	16	**2**	**4**	0	22	**375**
04:15 PM	7	185	31	0	223	4	77	4	0	85	9	0	**12**	0	21	**22**	0	3	0	**25**	354
04:30 PM	8	177	33	0	218	**7**	**92**	4	0	**103**	**14**	2	10	0	**26**	15	0	3	0	18	365
04:45 PM	5	136	34	0	175	4	55	2	0	61	5	2	6	0	13	16	2	4	0	22	271
Total Volume	35	698	136	0	869	15	298	14	0	327	39	6	37	0	82	69	4	14	0	87	1365
% App. Total	4	80.3	15.7	0		4.6	91.1	4.3	0		47.6	7.3	45.1	0		79.3	4.6	16.1	0		
PHF	.583	.873	.895	.000	.859	.536	.810	.875	.000	.794	.696	.750	.771	.000	.788	.784	.500	.875	.000	.870	.910
Cars	35	682	130	0	847	15	297	14	0	326	39	6	37	0	82	68	4	14	0	86	1341
% Cars	100	97.7	95.6	0	97.5	100	99.7	100	0	99.7	100	100	100	0	100	98.6	100	100	0	98.9	98.2
Trucks & Buses																					
% Trucks & Buses	0	2.3	4.4	0	2.5	0	0.3	0	0	0.3	0	0	0	0	0	1.4	0	0	0	1.1	1.8



TDC

TRAFFIC DATA COLLECTION, INC.

Atlanta - Hilton Head
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Counter: 1934
Counted By: JFU
Weather: Mild
Other: KTG

File Name : 08523-04
Site Code : 00852304
Start Date : 7/10/2008
Page No : 1

Groups Printed- Cars - Trucks & Buses

	Mullett Hall Rd Northbound					Southbound					River Rd Eastbound					River Rd Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	7	0	0	7	0	28	0	0	28	35
07:15 AM	1	0	1	0	2	0	0	0	0	0	0	8	0	0	8	0	33	0	0	33	43
07:30 AM	1	0	0	0	1	0	0	0	0	0	0	10	1	0	11	1	41	0	0	42	54
07:45 AM	0	0	1	0	1	0	0	0	0	0	0	15	1	0	16	1	39	0	0	40	57
Total	2	0	2	0	4	0	0	0	0	0	0	40	2	0	42	2	141	0	0	143	189
08:00 AM	1	0	0	0	1	0	0	0	0	0	0	14	0	0	14	0	37	0	0	37	52
08:15 AM	1	0	1	0	2	0	0	0	0	0	0	11	4	0	15	1	28	0	0	29	46
08:30 AM	2	0	1	0	3	0	0	0	0	0	0	16	0	0	16	3	31	0	0	34	53
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	11	3	0	14	2	35	0	0	37	51
Total	4	0	2	0	6	0	0	0	0	0	0	52	7	0	59	6	131	0	0	137	202
09:00 AM	1	0	0	0	1	0	0	0	0	0	0	14	1	0	15	0	27	0	0	27	43
Break																					
Total	1	0	0	0	1	0	0	0	0	0	0	14	1	0	15	0	27	0	0	27	43
Break																					
04:00 PM	1	0	1	0	2	0	0	0	0	0	0	38	2	0	40	1	21	0	0	22	64
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	34	0	0	34	1	24	0	0	25	59
04:30 PM	1	0	1	0	2	0	0	0	0	0	0	40	1	0	41	1	17	0	0	18	61
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	37	2	0	39	0	22	0	0	22	61
Total	2	0	2	0	4	0	0	0	0	0	0	149	5	0	154	3	84	0	0	87	245
05:00 PM	1	0	0	0	1	0	0	0	0	0	0	48	1	0	49	3	18	0	0	21	71
05:15 PM	1	0	0	0	1	0	0	0	0	0	0	45	0	0	45	1	21	0	0	22	68
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	33	2	0	35	3	24	0	0	27	62
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	19	1	0	20	1	13	0	0	14	34
Total	2	0	0	0	2	0	0	0	0	0	0	145	4	0	149	8	76	0	0	84	235
Grand Total	11	0	6	0	17	0	0	0	0	0	0	400	19	0	419	19	459	0	0	478	914
Apprch %	64.7	0	35.3	0		0	0	0	0		0	95.5	4.5	0		4	96	0	0		
Total %	1.2	0	0.7	0	1.9	0	0	0	0	0	0	43.8	2.1	0	45.8	2.1	50.2	0	0	52.3	
Cars	11	0	6	0	17	0	0	0	0	0	0	385	19	0	404	19	435	0	0	454	875
% Cars	100	0	100	0	100	0	0	0	0	0	0	96.2	100	0	96.4	100	94.8	0	0	95	95.7
Trucks & Buses	0	0	0	0	0	0	0	0	0	0	0	15	0	0	15	0	24	0	0	24	39
% Trucks & Buses	0	0	0	0	0	0	0	0	0	0	0	3.8	0	0	3.6	0	5.2	0	0	5	4.3

Note: Pedestrian data shown for each approach is crossing the approach from either direction combined.

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File Name : 08523-04
Site Code : 00852304
Start Date : 7/10/2008
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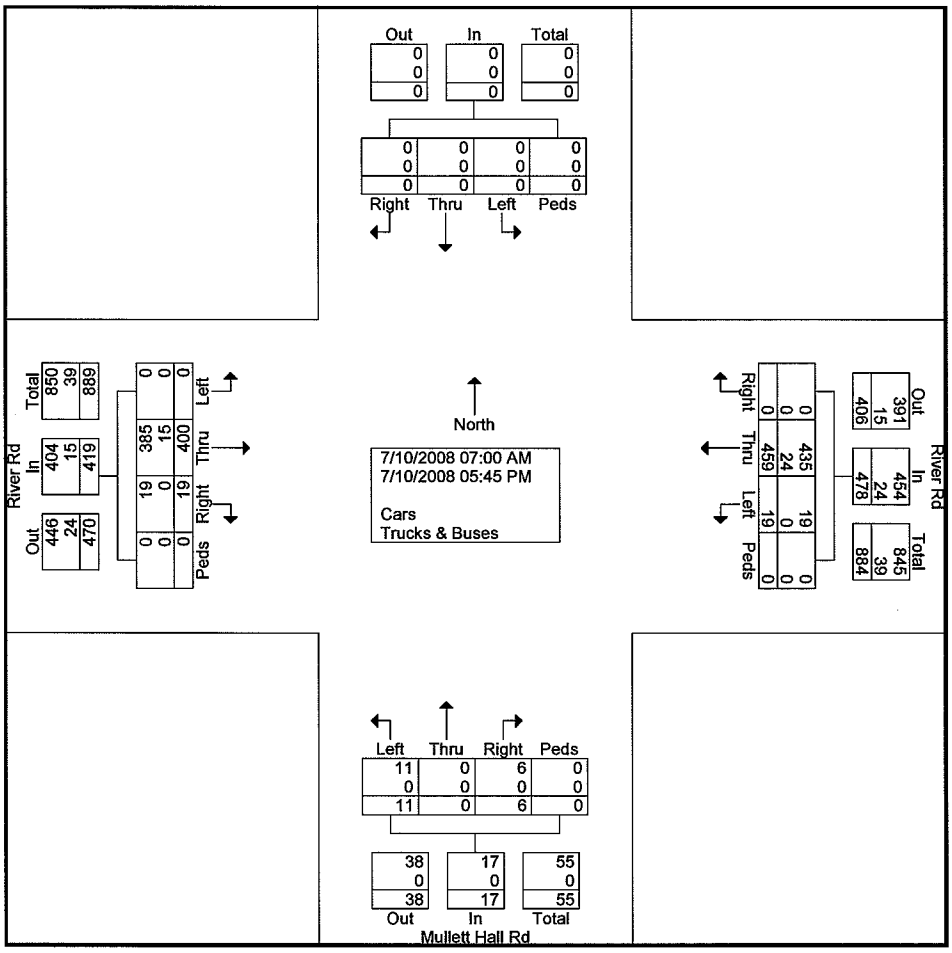

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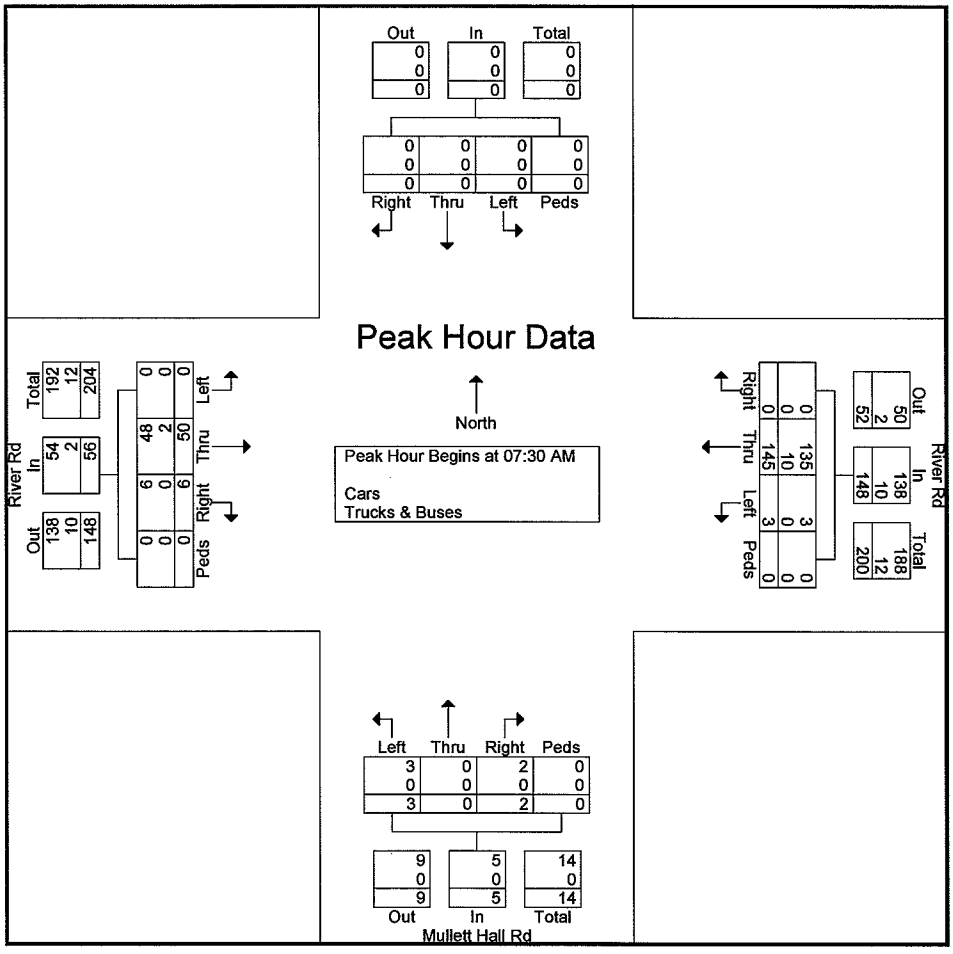
File Name : 08523-04
Site Code : 00852304
Start Date : 7/10/2008
Page No : 3

	Mullett Hall Rd Northbound					Southbound					River Rd Eastbound					River Rd Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	1	0	0	0	1	0	0	0	0	0	0	10	1	0	11	1	41	0	0	42	54
07:45 AM	0	0	1	0	1	0	0	0	0	0	0	15	1	0	16	1	39	0	0	40	57
08:00 AM	1	0	0	0	1	0	0	0	0	0	0	14	0	0	14	0	37	0	0	37	52
08:15 AM	1	0	1	0	2	0	0	0	0	0	0	11	4	0	15	1	28	0	0	29	46
Total Volume	3	0	2	0	5	0	0	0	0	0	0	50	6	0	56	3	145	0	0	148	209
% App. Total	60	0	40	0		0	0	0	0		0	89.3	10.7	0		2	98	0	0		
PHF	.750	.000	.500	.000	.625	.000	.000	.000	.000	.000	.000	.833	.375	.000	.875	.750	.884	.000	.000	.881	.917
Cars	3	0	2	0	5	0	0	0	0	0	0	48	6	0	54	3	135	0	0	138	197
% Cars	100	0	100	0	100	0	0	0	0	0	0	96.0	100	0	96.4	100	93.1	0	0	93.2	94.3
Trucks & Buses																					
% Trucks & Buses	0	0	0	0	0	0	0	0	0	0	0	4.0	0	0	3.6	0	6.9	0	0	6.8	5.7



TRAFFIC DATA COLLECTION, INC.

Atlanta - Hilton Head
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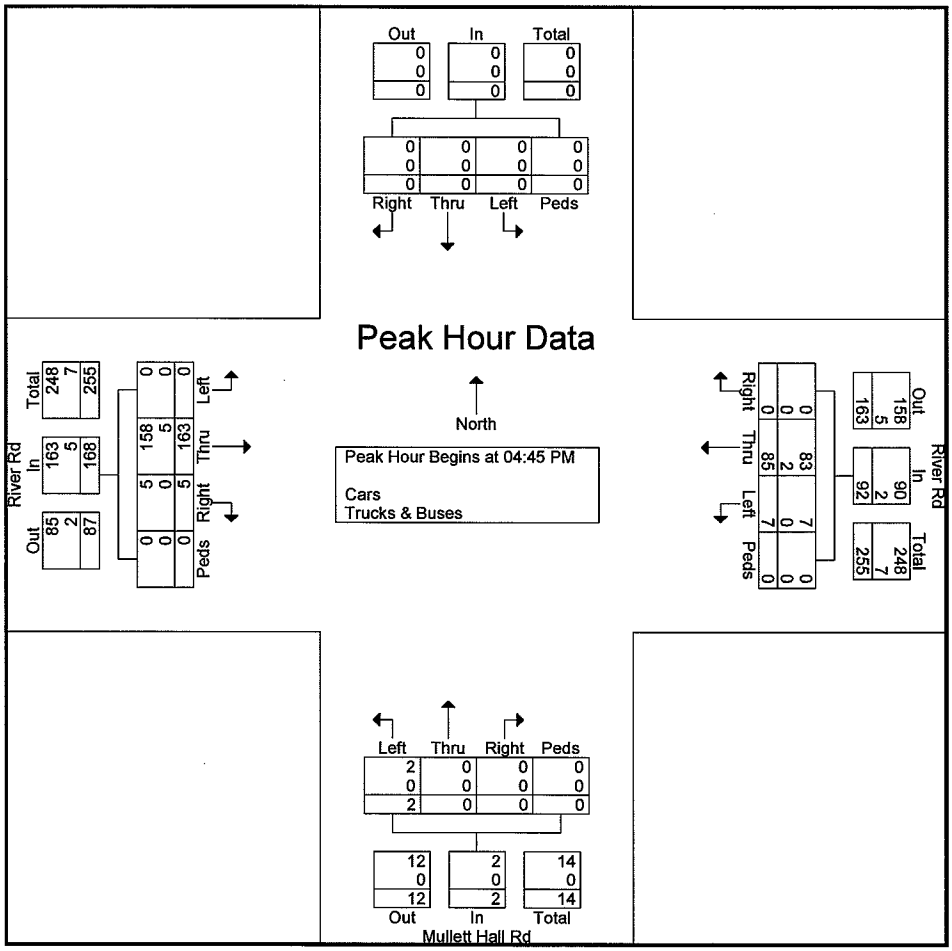
Counter: 1934
Counted By: JFU
Weather: Mild
Other: KTG

File Name : 08523-04
Site Code : 00852304
Start Date : 7/10/2008
Page No : 4

	Mullett Hall Rd Northbound					Southbound					River Rd Eastbound					River Rd Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	37	**2**	0	39	0	22	0	0	22	61
05:00 PM	**1**	0	0	0	**1**	0	0	0	0	0	0	**48**	1	0	**49**	**3**	18	0	0	21	**71**
05:15 PM	1	0	0	0	1	0	0	0	0	0	0	45	0	0	45	1	21	0	0	22	68
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	33	2	0	35	3	**24**	0	0	**27**	62
Total Volume	2	0	0	0	2	0	0	0	0	0	0	163	5	0	168	7	85	0	0	92	262
% App. Total	100	0	0	0		0	0	0	0		0	97	3	0		7.6	92.4	0	0		
PHF	.500	.000	.000	.000	.500	.000	.000	.000	.000	.000	.000	.849	.625	.000	.857	.583	.885	.000	.000	.852	.923
Cars	2	0	0	0	2	0	0	0	0	0	0	158	5	0	163	7	83	0	0	90	255
% Cars	100	0	0	0	100	0	0	0	0	0	0	96.9	100	0	97.0	100	97.6	0	0	97.8	97.3
Trucks & Buses																					
% Trucks & Buses	0	0	0	0	0	0	0	0	0	0	0	3.1	0	0	3.0	0	2.4	0	0	2.2	2.7



KRP - 2018
Summary of Multi-Use Trip Generation
Average Weekday Driveway Volumes
October 31, 2008

Land Use	Size	24 Hour Two-Way Volume	AM Pk Hour Enter	AM Pk Hour Exit	PM Pk Hour Enter	PM Pk Hour Exit
Single Family Detached Housing	105 Dwelling Units	1088	21	62	71	41
Recreation Homes	315 Dwelling Units	995	35	16	35	47
Apartments	40 Dwelling Units	391	5	19	26	14
Hotel	350 Rooms	2860	119	77	109	98
Shopping Center	35.000 T.G.L.A.	3432	51	33	150	163
Shopping Center	20.000 T.G.L.A.	2386	36	23	104	113
Golf Course	18 Holes	643	32	8	22	28
Total		11795	299	238	517	504

Note: A zero indicates no data available.

TRIP GENERATION BY MICROTRANS

Passby
Summary of Pass-By Trips
For 35.000 T.G.L.A. of Shopping Center
October 31, 2008

	Driveway Volume	Pass-By Trips	Volume Added to Adjacent Streets
Average Weekday			
7-9 AM Peak Hour Enter	51	0	51
7-9 AM Peak Hour Exit	33	0	33
7-9 AM Peak Hour Total	83	0	83
4-6 PM Peak Hour Enter	150	79	71
4-6 PM Peak Hour Exit	163	86	77
4-6 PM Peak Hour Total	313	165	148
Saturday			
Saturday Peak Hour Enter	227	86	141
Saturday Peak Hour Exit	210	79	131
Saturday Peak Hour Total	437	165	272

Note: A zero indicates no data available.
Source: Institute of Transportation Engineers
Trip Generation Handbook, March, 2001

TRIP GENERATION BY MICROTRANS

Approach		SITE Entering / Exiting Percentages Movement			Workforce Apartments Entering / Exiting Percentages Movement			2008 Movement AM Peak			2013 Growth: 3% per year Movement AM Peak			2018 Growth: 1% per year Movement AM Peak			Site Traffic Full Buildout AM		
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
1.Maybank Highway (SC 700) and River Road																			
River Road	NB			25%				30	66	154	35	77	179	37	81	188			49
Maybank Highway (SC 700)	EB		10%			8%		48	484	20	56	561	23	59	590	24		21	
River Road	SB							306	66	55	355	77	64	373	81	67			
Maybank Highway (SC 700)	WB	25%	10%			8%		136	429	84	158	497	97	166	522	102	65	26	
2. Maybank Highway (SC 700) and Main Road/Bohicket Road																			
Bohicket Road	NB	5%	10%	10%	4%	8%	8%	43	242	81	50	281	94	53	295	99	11	21	21
Maybank Highway (SC 700)	EB			5%			4%	76	188	79	88	218	92	92	229	97			13
Main Road	SB		10%			8%		173	477	25	201	553	29	211	581	30		26	
Maybank Highway (SC 700)	WB	10%			8%			209	83	76	242	96	88	254	101	92	26		
3. Bohicket Road/Betsy Kerrison Parkway and River Road																			
Betsy Kerrison Parkway	NB		25%			20%		22	268	46	26	311	53	27	327	56		53	
Driveway	EB							2	1	43	2	1	50	2	1	53			
Bohicket Road	SB		25%			20%		16	687	54	19	796	63	20	837	66		66	
River Road	WB							122	10	5	141	12	6	148	13	6			
4. River Road and Mullet Hall Road																			
Mullet Hall Road	NB			25%				3	0	2	3	0	2	3	0	2			49
River Road	EB							0	50	6	0	58	7	0	61	7			
River Road	WB	25%						3	145	0	3	168	0	3	177	0	65		
5. Village Access & Betsy Kerrison Parkway																			
Mullet Hall Road	NB			50%			80%		336			390			410				133
River Road	EB	50%		25%	80%		20%										113		53
River Road	SB	25%			20%				852			988			1038		66		

	AM	PM	passby
Entering Workforce Apartments	5	26	
Exiting Workforce Apartments	19	14	
Entering Remainder of Site	258	252	-79
Exiting Remainder of Site	196	235	-86
total enter	263	278	
total exit	215	249	

enter site	263
exit site	215

2008			2013 Growth: 3% per year			2018 Growth: 1% per year			Site Traffic Full Buildout PM			Pass By Traffic Full Buildout PM				TOTAL AM Peak 2018 Movement			TOTAL PM Peak 2018 Movement		
Movement PM Peak			Movement PM Peak			Movement PM Peak															
Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right
65	107	168	75	124	195	79	130	205			59				NB	37	81	237	79	130	264
60	552	39	70	640	45	74	673	47		25					EB	59	611	24	74	698	47
249	106	71	289	123	82	304	129	86							SB	373	81	67	304	129	86
173	620	291	201	719	337	211	756	354	63	27					WB	231	548	102	274	783	354
59	492	144	68	570	167	71	599	176	12	25	25				NB	64	316	120	83	624	201
70	121	38	81	140	44	85	147	46			14				EB	92	229	110	85	147	60
121	280	12	140	325	14	147	342	15		27					SB	211	607	30	147	369	15
162	153	173	188	177	201	198	186	211	27						WB	280	101	92	225	186	211
35	698	136	41	809	158	43	850	166		62					NB	27	380	56	43	912	166
39	6	37	45	7	43	47	7	45							EB	2	1	53	47	7	45
15	298	14	17	345	16	18	363	17		68					SB	20	903	66	18	431	17
69	4	14	80	5	16	84	5	17							WB	148	13	6	84	5	17
2	0	0	2	0	0	2	0	0			59				NB	3	0	51	2	0	59
0	163	5	0	189	6	0	199	6							EB	0	61	7	0	199	6
7	85	0	8	99	0	8	104	0	63						WB	68	177	0	71	104	0
	869			1007			1058				147		-55	55	NB	0	410	133	0	1003	202
									129		62	26		60	EB	113	0	53	154	0	122
	404			468			492		68			24	-24		SB	66	1038	0	92	468	0
									enter site	278		passby enter	79								
									exit site	249		passby exit	86								

	996
NB	70%
SB	30%
passby distribution calc	

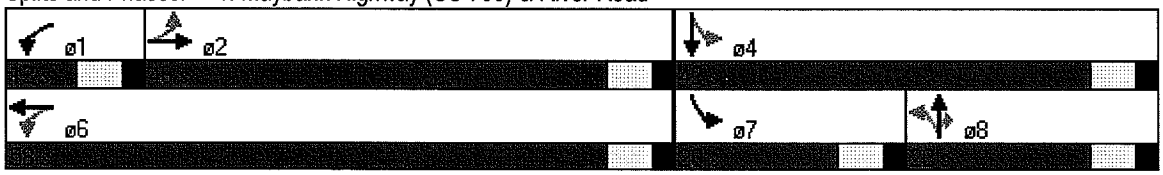
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	48	484	20	136	429	84	30	66	154	306	66	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	290		0	180		0	245		50	175		0
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (ft)	100		100	100		100	100		100	100		100
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.994			0.976				0.850		0.932	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1852	0	1770	1818	0	1770	1863	1583	1770	1736	0
Flt Permitted	0.400			0.142			0.671			0.528		
Satd. Flow (perm)	745	1852	0	265	1818	0	1250	1863	1583	984	1736	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		4802			2003			1572			1313	
Travel Time (s)		72.8			30.3			23.8			19.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	53	538	22	151	477	93	33	73	171	340	73	61
Shared Lane Traffic (%)												
Lane Group Flow (vph)	53	560	0	151	570	0	33	73	171	340	134	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm			pm+pt			Perm		Perm	pm+pt		
Protected Phases		2		1	6			8		7	4	
Permitted Phases	2			6			8		8	4		
Detector Phase	2	2		1	6		8	8	8	7	4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	12.0	12.0		5.0	12.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	20.0	20.0		12.0	20.0		20.0	20.0	20.0	12.0	20.0	
Total Split (s)	46.0	46.0	0.0	12.0	58.0	0.0	22.0	22.0	22.0	20.0	42.0	0.0
Total Split (%)	46.0%	46.0%	0.0%	12.0%	58.0%	0.0%	22.0%	22.0%	22.0%	20.0%	42.0%	0.0%
Maximum Green (s)	40.0	40.0		6.0	52.0		16.0	16.0	16.0	14.0	36.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0	5.0	5.0	5.0	3.0
Lead/Lag	Lag	Lag		Lead			Lag	Lag	Lag	Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None		None	None		Min	Min	Min	None	None	
Act Effct Green (s)	32.1	32.1		44.3	44.3		14.4	14.4	14.4	34.6	34.6	
Actuated g/C Ratio	0.36	0.36		0.50	0.50		0.16	0.16	0.16	0.39	0.39	
v/c Ratio	0.20	0.84		0.60	0.63		0.16	0.24	0.67	0.66	0.20	
Control Delay	21.5	38.4		22.8	20.1		36.7	37.0	50.4	29.6	20.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	21.5	38.4		22.8	20.1		36.7	37.0	50.4	29.6	20.8	
LOS	C	D		C	C		D	D	D	C	C	
Approach Delay		36.9			20.6			45.2			27.1	
Approach LOS		D			C			D			C	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 89.1
Natural Cycle: 70
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.84
Intersection Signal Delay: 30.1
Intersection LOS: C
Intersection Capacity Utilization 75.1%
ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 1: Maybank Highway (SC 700) & River Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	48	484	20	136	429	84	30	66	154	306	66	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.99		1.00	0.98		1.00	1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1852		1770	1817		1770	1863	1583	1770	1736	
Flt Permitted	0.40	1.00		0.14	1.00		0.67	1.00	1.00	0.53	1.00	
Satd. Flow (perm)	745	1852		264	1817		1250	1863	1583	983	1736	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	53	538	22	151	477	93	33	73	171	340	73	61
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	53	560	0	151	570	0	33	73	171	340	134	0
Turn Type	Perm			pm+pt			Perm		Perm	pm+pt		
Protected Phases		2		1	6			8		7	4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	31.2	31.2		43.3	43.3		13.5	13.5	13.5	33.6	33.6	
Effective Green, g (s)	32.2	32.2		44.3	44.3		14.5	14.5	14.5	34.6	34.6	
Actuated g/C Ratio	0.36	0.36		0.50	0.50		0.16	0.16	0.16	0.39	0.39	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	270	671		252	905		204	304	258	516	676	
v/s Ratio Prot		c0.30		0.05	c0.31			0.04		c0.11	0.08	
v/s Ratio Perm	0.07			0.25			0.03		0.11	c0.14		
v/c Ratio	0.20	0.83		0.60	0.63		0.16	0.24	0.66	0.66	0.20	
Uniform Delay, d1	19.5	25.9		16.7	16.3		32.0	32.4	34.9	20.7	18.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.4	8.8		3.8	1.4		0.4	0.4	6.3	3.0	0.1	
Delay (s)	19.8	34.7		20.5	17.7		32.4	32.8	41.2	23.8	18.1	
Level of Service	B	C		C	B		C	C	D	C	B	
Approach Delay (s)		33.4			18.3			37.9			22.2	
Approach LOS		C			B			D			C	

Intersection Summary

HCM Average Control Delay	26.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	88.9	Sum of lost time (s)	15.0
Intersection Capacity Utilization	75.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

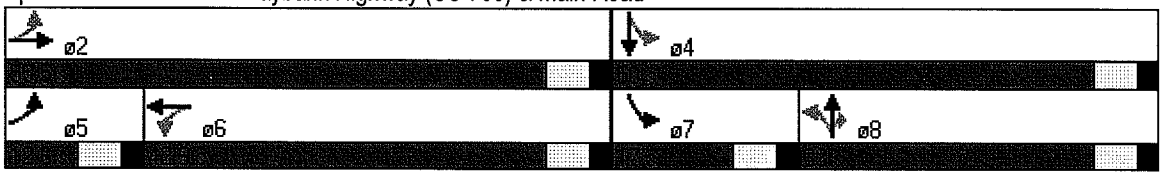
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	76	188	79	209	83	76	43	242	81	173	477	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	170		0	145		0	185		370	210		0
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (ft)	100		100	100		100	100		100	100		100
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.956			0.928				0.850		0.992	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1781	0	1770	1729	0	1770	1863	1583	1770	1848	0
Flt Permitted	0.531			0.579			0.421			0.311		
Satd. Flow (perm)	989	1781	0	1079	1729	0	784	1863	1583	579	1848	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		1276			4802			919			3477	
Travel Time (s)		19.3			72.8			13.9			52.7	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	84	209	88	232	92	84	48	269	90	192	530	28
Shared Lane Traffic (%)												
Lane Group Flow (vph)	84	297	0	232	176	0	48	269	90	192	558	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt			Perm			Perm		Perm	pm+pt		
Protected Phases	5	2			6			8		7	4	
Permitted Phases	2			6			8		8	4		
Detector Phase	5	2		6	6		8	8	8	7	4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	5.0	25.0		25.0	25.0		10.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	12.5	32.5		32.5	32.5		20.0	20.0	20.0	12.0	20.0	
Total Split (s)	12.6	55.5	0.0	42.9	42.9	0.0	33.0	33.0	33.0	17.0	50.0	0.0
Total Split (%)	11.9%	52.6%	0.0%	40.7%	40.7%	0.0%	31.3%	31.3%	31.3%	16.1%	47.4%	0.0%
Maximum Green (s)	6.6	49.5		36.9	36.9		27.0	27.0	27.0	11.0	44.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0	5.0	5.0	5.0	3.0
Lead/Lag	Lead			Lag	Lag		Lag	Lag	Lag	Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	4.0		4.0	4.0		4.0	4.0	4.0	3.0	4.0	
Recall Mode	None	Min		Min	Min		None	None	None	None	None	
Act Effct Green (s)	39.5	39.5		29.9	29.9		19.6	19.6	19.6	36.2	36.2	
Actuated g/C Ratio	0.46	0.46		0.35	0.35		0.23	0.23	0.23	0.42	0.42	
v/c Ratio	0.16	0.36		0.62	0.29		0.27	0.63	0.25	0.48	0.72	
Control Delay	15.0	17.2		34.3	24.3		33.7	38.6	31.0	21.7	27.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	15.0	17.2		34.3	24.3		33.7	38.6	31.0	21.7	27.9	
LOS	B	B		C	C		C	D	C	C	C	
Approach Delay		16.7			30.0			36.3			26.3	
Approach LOS		B			C			D			C	

Intersection Summary

Area Type: Other
Cycle Length: 105.5
Actuated Cycle Length: 86
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.72
Intersection Signal Delay: 27.3 — Intersection LOS: C
Intersection Capacity Utilization 93.3% — ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 2: Maybank Highway (SC 700) & Main Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	76	188	79	209	83	76	43	242	81	173	477	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	0.93		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1780		1770	1729		1770	1863	1583	1770	1849	
Flt Permitted	0.53	1.00		0.58	1.00		0.42	1.00	1.00	0.31	1.00	
Satd. Flow (perm)	990	1780		1078	1729		785	1863	1583	579	1849	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	84	209	88	232	92	84	48	269	90	192	530	28
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	84	297	0	232	176	0	48	269	90	192	558	0
Turn Type	pm+pt			Perm			Perm		Perm	pm+pt		
Protected Phases	5	2			6			8		7	4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	39.9	39.9		28.9	28.9		18.8	18.8	18.8	35.2	35.2	
Effective Green, g (s)	40.9	40.9		29.9	29.9		19.8	19.8	19.8	36.2	36.2	
Actuated g/C Ratio	0.47	0.47		0.34	0.34		0.23	0.23	0.23	0.42	0.42	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	4.0		4.0	4.0		4.0	4.0	4.0	3.0	4.0	
Lane Grp Cap (vph)	519	836		370	594		178	424	360	397	768	
v/s Ratio Prot	0.01	c0.17			0.10			0.14		0.06	c0.30	
v/s Ratio Perm	0.06			c0.22			0.06		0.06	0.14		
v/c Ratio	0.16	0.36		0.63	0.30		0.27	0.63	0.25	0.48	0.73	
Uniform Delay, d1	13.1	14.7		23.9	20.9		27.7	30.4	27.6	17.7	21.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	0.4		3.7	0.4		1.1	3.5	0.5	0.9	3.7	
Delay (s)	13.2	15.1		27.7	21.3		28.8	33.9	28.1	18.6	25.0	
Level of Service	B	B		C	C		C	C	C	B	C	
Approach Delay (s)		14.7			24.9			32.0			23.3	
Approach LOS		B			C			C			C	

Intersection Summary

HCM Average Control Delay	23.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	87.1	Sum of lost time (s)	15.0
Intersection Capacity Utilization	93.3%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

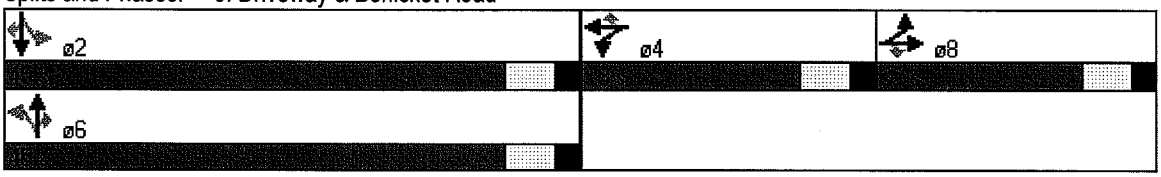
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	1	43	122	10	5	22	268	46	16	687	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	110		55	170		0	125		125
Storage Lanes	0		0	1		1	1		0	1		1
Taper Length (ft)	100		100	100		100	100		100	100		100
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected		0.968		0.950	0.959		0.950			0.950		
Satd. Flow (prot)	0	1803	1583	1681	1697	1583	1770	1863	1583	1770	3539	1583
Flt Permitted		0.968		0.950	0.959		0.310			0.556		
Satd. Flow (perm)	0	1803	1583	1681	1697	1583	577	1863	1583	1036	3539	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		25			45			50			50	
Link Distance (ft)		482			1366			2053			2154	
Travel Time (s)		13.1			20.7			28.0			29.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	2	1	48	136	11	6	24	298	51	18	763	60
Shared Lane Traffic (%)				46%								
Lane Group Flow (vph)	0	3	48	73	74	6	24	298	51	18	763	60
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Split		Perm	Split		Perm	Perm		Perm	Perm		Perm
Protected Phases	8	8		4	4			6			2	
Permitted Phases			8			4	6		6	2		2
Detector Phase	8	8	8	4	4	4	6	6	6	2	2	2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	15.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0	21.7	21.7	21.7	21.7	21.7	21.7
Total Split (s)	22.0	22.0	22.0	23.0	23.0	23.0	45.0	45.0	45.0	45.0	45.0	45.0
Total Split (%)	24.4%	24.4%	24.4%	25.6%	25.6%	25.6%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Maximum Green (s)	16.0	16.0	16.0	17.0	17.0	17.0	39.0	39.0	39.0	39.0	39.0	39.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	Min	Min	Min	Min	Min	Min
Act Effct Green (s)		11.7	11.7	11.8	11.8	11.8	26.5	26.5	26.5	26.5	26.5	26.5
Actuated g/C Ratio		0.23	0.23	0.23	0.23	0.23	0.52	0.52	0.52	0.52	0.52	0.52
v/c Ratio		0.01	0.13	0.19	0.19	0.02	0.08	0.31	0.06	0.03	0.42	0.07
Control Delay		21.7	22.2	22.0	22.0	21.0	13.1	13.3	11.9	12.0	13.0	12.0
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		21.7	22.2	22.0	22.0	21.0	13.1	13.3	11.9	12.0	13.0	12.0
LOS		C	C	C	C	C	B	B	B	B	B	B
Approach Delay		22.2			22.0			13.1			12.9	
Approach LOS		C			C			B			B	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 51.1
Natural Cycle: 65
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.42
Intersection Signal Delay: 14.2 — Intersection LOS: B
Intersection Capacity Utilization 48.2% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Driveway & Bohicket Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	1	43	122	10	5	22	268	46	16	687	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1803	1583	1681	1697	1583	1770	1863	1583	1770	3539	1583
Flt Permitted		0.97	1.00	0.95	0.96	1.00	0.31	1.00	1.00	0.56	1.00	1.00
Satd. Flow (perm)		1803	1583	1681	1697	1583	577	1863	1583	1036	3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	2	1	48	136	11	6	24	298	51	18	763	60
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	3	48	73	74	6	24	298	51	18	763	60
Turn Type	Split		Perm	Split		Perm	Perm		Perm	Perm		Perm
Protected Phases	8	8		4	4			6			2	
Permitted Phases			8			4	6		6	2		2
Actuated Green, G (s)		5.1	5.1	7.9	7.9	7.9	24.0	24.0	24.0	24.0	24.0	24.0
Effective Green, g (s)		6.1	6.1	8.9	8.9	8.9	25.0	25.0	25.0	25.0	25.0	25.0
Actuated g/C Ratio		0.11	0.11	0.16	0.16	0.16	0.45	0.45	0.45	0.45	0.45	0.45
Clearance Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		200	176	272	275	256	262	847	720	471	1609	720
v/s Ratio Prot		0.00		0.04	c0.04			0.16			c0.22	
v/s Ratio Perm			c0.03			0.00	0.04		0.03	0.02		0.04
v/c Ratio		0.02	0.27	0.27	0.27	0.02	0.09	0.35	0.07	0.04	0.47	0.08
Uniform Delay, d1		21.8	22.4	20.2	20.2	19.4	8.5	9.7	8.5	8.3	10.4	8.5
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.0	0.8	0.5	0.5	0.0	0.2	0.3	0.0	0.0	0.2	0.0
Delay (s)		21.8	23.3	20.7	20.7	19.4	8.7	10.0	8.5	8.4	10.7	8.6
Level of Service		C	C	C	C	B	A	A	A	A	B	A
Approach Delay (s)		23.2			20.7			9.7			10.5	
Approach LOS		C			C			A			B	

Intersection Summary

HCM Average Control Delay	11.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	55.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	48.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	50	6	3	145	3	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.985				0.946	
Flt Protected				0.999	0.971	
Satd. Flow (prot)	1835	0	0	1861	1711	0
Flt Permitted				0.999	0.971	
Satd. Flow (perm)	1835	0	0	1861	1711	0
Link Speed (mph)	45			45	45	
Link Distance (ft)	1366			1051	1134	
Travel Time (s)	20.7			15.9	17.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	56	7	3	161	3	2
Shared Lane Traffic (%)						
Lane Group Flow (vph)	63	0	0	164	5	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 20.0% ICU Level of Service A
Analysis Period (min) 15

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	50	6	3	145	3	2
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	56	7	3	161	3	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			62		227	59
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			62		227	59
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1541		760	1007

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	62	164	6
Volume Left	0	3	3
Volume Right	7	0	2
cSH	1700	1541	843
Volume to Capacity	0.04	0.00	0.01
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.2	9.3
Lane LOS		A	A
Approach Delay (s)	0.0	0.2	9.3
Approach LOS			A

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	20.0%	ICU Level of Service	A
Analysis Period (min)	15		

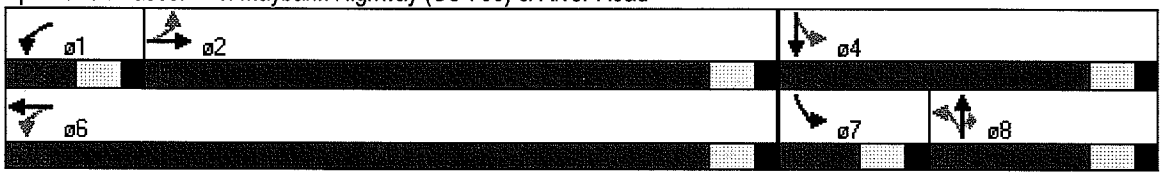
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	552	39	173	620	291	65	107	168	249	106	71
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	290		0	180		0	245		50	175		0
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (ft)	100		0	100		0	100		100	100		0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.990			0.952				0.850		0.940	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1844	0	1770	1773	0	1770	1863	1583	1770	1751	0
Flt Permitted	0.095			0.182			0.634			0.479		
Satd. Flow (perm)	177	1844	0	339	1773	0	1181	1863	1583	892	1751	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		4802			2003			1572			1313	
Travel Time (s)		72.8			30.3			23.8			19.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	67	613	43	192	689	323	72	119	187	277	118	79
Shared Lane Traffic (%)												
Lane Group Flow (vph)	67	656	0	192	1012	0	72	119	187	277	197	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm			pm+pt			Perm		Perm	pm+pt		
Protected Phases		2		1	6			8		7	4	
Permitted Phases	2			6			8		8	4		
Detector Phase	2	2		1	6		8	8	8	7	4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	12.0	12.0		5.0	12.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	20.0	20.0		12.0	20.0		20.0	20.0	20.0	12.0	20.0	
Total Split (s)	55.0	55.0	0.0	12.0	67.0	0.0	20.0	20.0	20.0	13.0	33.0	0.0
Total Split (%)	55.0%	55.0%	0.0%	12.0%	67.0%	0.0%	20.0%	20.0%	20.0%	13.0%	33.0%	0.0%
Maximum Green (s)	49.0	49.0		6.0	61.0		14.0	14.0	14.0	7.0	27.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0	5.0	5.0	5.0	3.0
Lead/Lag	Lag	Lag		Lead			Lag	Lag	Lag	Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None		None	None		Min	Min	Min	None	None	
Act Effct Green (s)	45.5	45.5		57.6	57.6		14.3	14.3	14.3	27.4	27.4	
Actuated g/C Ratio	0.48	0.48		0.61	0.61		0.15	0.15	0.15	0.29	0.29	
v/c Ratio	0.79	0.74		0.62	0.94		0.41	0.42	0.79	0.83	0.39	
Control Delay	79.1	26.1		17.3	35.1		46.1	43.4	64.2	54.3	31.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	79.1	26.1		17.3	35.1		46.1	43.4	64.2	54.3	31.2	
LOS	E	C		B	D		D	D	E	D	C	
Approach Delay		31.0			32.3			54.2			44.7	
Approach LOS		C			C			D			D	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 95.1
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 37.0 — Intersection LOS: D
Intersection Capacity Utilization 96.5% — ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 1: Maybank Highway (SC 700) & River Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	552	39	173	620	291	65	107	168	249	106	71
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.99		1.00	0.95		1.00	1.00	0.85	1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1844		1770	1774		1770	1863	1583	1770	1751	
Flt Permitted	0.10	1.00		0.18	1.00		0.63	1.00	1.00	0.48	1.00	
Satd. Flow (perm)	178	1844		339	1774		1181	1863	1583	892	1751	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	67	613	43	192	689	323	72	119	187	277	118	79
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	67	656	0	192	1012	0	72	119	187	277	197	0
Turn Type	Perm			pm+pt			Perm		Perm	pm+pt		
Protected Phases		2		1	6			8		7	4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	44.5	44.5		56.6	56.6		13.3	13.3	13.3	26.4	26.4	
Effective Green, g (s)	45.5	45.5		57.6	57.6		14.3	14.3	14.3	27.4	27.4	
Actuated g/C Ratio	0.48	0.48		0.61	0.61		0.15	0.15	0.15	0.29	0.29	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	85	883		312	1076		178	280	238	332	505	
v/s Ratio Prot		0.36		0.05	c0.57			0.06		c0.07	0.11	
v/s Ratio Perm	0.38			0.33			0.06		0.12	c0.17		
v/c Ratio	0.79	0.74		0.62	0.94		0.40	0.42	0.79	0.83	0.39	
Uniform Delay, d1	20.7	20.0		13.9	17.1		36.5	36.6	38.9	30.9	27.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	37.0	3.4		3.6	15.2		1.5	1.0	15.6	16.3	0.5	
Delay (s)	57.7	23.4		17.5	32.4		38.0	37.7	54.4	47.2	27.6	
Level of Service	E	C		B	C		D	D	D	D	C	
Approach Delay (s)		26.6			30.0			46.0			39.0	
Approach LOS		C			C			D			D	

Intersection Summary

HCM Average Control Delay	32.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	95.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	96.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

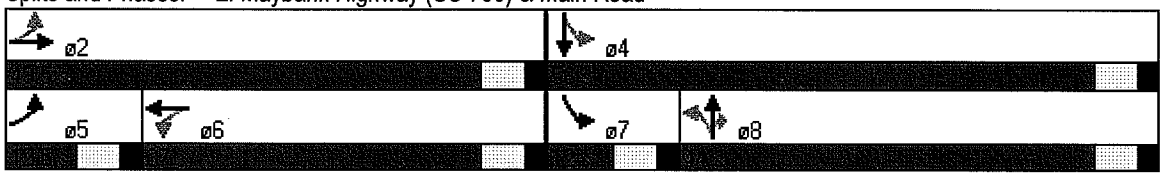
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	121	38	162	153	173	59	492	144	121	280	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	170		0	145		0	185		370	210		0
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (ft)	100		0	100		0	100		100	100		0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.964			0.920				0.850		0.994	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1796	0	1770	1714	0	1770	1863	1583	1770	1852	0
Flt Permitted	0.279			0.646			0.564			0.136		
Satd. Flow (perm)	520	1796	0	1203	1714	0	1051	1863	1583	253	1852	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		1276			4802			919			3477	
Travel Time (s)		19.3			72.8			13.9			52.7	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	78	134	42	180	170	192	66	547	160	134	311	13
Shared Lane Traffic (%)												
Lane Group Flow (vph)	78	176	0	180	362	0	66	547	160	134	324	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt			Perm			Perm		Perm	pm+pt		
Protected Phases	5	2			6			8		7	4	
Permitted Phases	2			6			8		8	4		
Detector Phase	5	2		6	6		8	8	8	7	4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	5.0	25.0		25.0	25.0		10.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	12.5	32.5		32.5	32.5		20.0	20.0	20.0	12.0	20.0	
Total Split (s)	12.5	49.5	0.0	37.0	37.0	0.0	44.0	44.0	44.0	12.0	56.0	0.0
Total Split (%)	11.8%	46.9%	0.0%	35.1%	35.1%	0.0%	41.7%	41.7%	41.7%	11.4%	53.1%	0.0%
Maximum Green (s)	6.5	43.5		31.0	31.0		38.0	38.0	38.0	6.0	50.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0	5.0	5.0	5.0	3.0
Lead/Lag	Lead			Lag	Lag		Lag	Lag	Lag	Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	4.0		4.0	4.0		4.0	4.0	4.0	3.0	4.0	
Recall Mode	None	Min		Min	Min		None	None	None	None	None	
Act Effct Green (s)	38.8	38.8		29.4	29.4		33.6	33.6	33.6	45.9	45.9	
Actuated g/C Ratio	0.41	0.41		0.31	0.31		0.35	0.35	0.35	0.48	0.48	
v/c Ratio	0.25	0.24		0.48	0.68		0.18	0.83	0.29	0.57	0.36	
Control Delay	20.6	20.2		34.5	38.6		23.6	40.9	24.4	24.6	17.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	20.6	20.2		34.5	38.6		23.6	40.9	24.4	24.6	17.5	
LOS	C	C		C	D		C	D	C	C	B	
Approach Delay		20.3			37.2			36.0			19.6	
Approach LOS		C			D			D			B	

Intersection Summary

Area Type: Other
Cycle Length: 105.5
Actuated Cycle Length: 95
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.83
Intersection Signal Delay: 30.6 — Intersection LOS: C
Intersection Capacity Utilization 90.9% — ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 2: Maybank Highway (SC 700) & Main Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	121	38	162	153	173	59	492	144	121	280	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	0.92		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1796		1770	1715		1770	1863	1583	1770	1852	
Flt Permitted	0.28	1.00		0.65	1.00		0.56	1.00	1.00	0.14	1.00	
Satd. Flow (perm)	519	1796		1204	1715		1052	1863	1583	253	1852	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	78	134	42	180	170	192	66	547	160	134	311	13
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	78	176	0	180	362	0	66	547	160	134	324	0
Turn Type	pm+pt			Perm			Perm		Perm	pm+pt		
Protected Phases	5	2			6			8		7	4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	39.3	39.3		28.4	28.4		32.7	32.7	32.7	44.9	44.9	
Effective Green, g (s)	40.3	40.3		29.4	29.4		33.7	33.7	33.7	45.9	45.9	
Actuated g/C Ratio	0.42	0.42		0.31	0.31		0.35	0.35	0.35	0.48	0.48	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	4.0		4.0	4.0		4.0	4.0	4.0	3.0	4.0	
Lane Grp Cap (vph)	294	752		368	524		369	653	555	234	884	
v/s Ratio Prot	0.02	c0.10			c0.21			c0.29		c0.04	0.17	
v/s Ratio Perm	0.09			0.15			0.06		0.10	0.23		
v/c Ratio	0.27	0.23		0.49	0.69		0.18	0.84	0.29	0.57	0.37	
Uniform Delay, d1	18.6	18.0		27.3	29.4		21.7	28.7	22.6	18.8	15.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.5	0.2		1.4	4.2		0.3	9.6	0.4	3.4	0.4	
Delay (s)	19.1	18.2		28.7	33.6		22.0	38.3	23.0	22.2	16.3	
Level of Service	B	B		C	C		C	D	C	C	B	
Approach Delay (s)		18.5			32.0			33.7			18.0	
Approach LOS		B			C			C			B	

Intersection Summary

HCM Average Control Delay	27.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	96.2	Sum of lost time (s)	20.0
Intersection Capacity Utilization	90.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

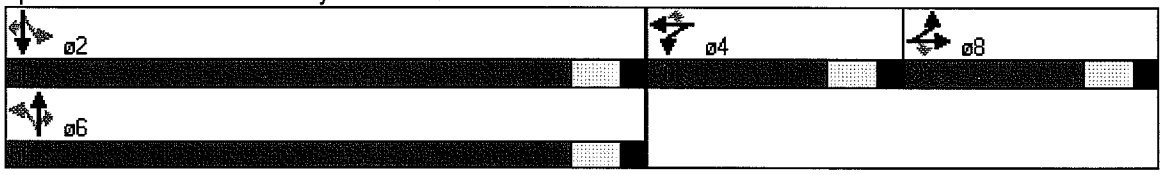
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	39	6	37	69	4	14	35	698	136	15	298	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	110		55	170		0	125		125
Storage Lanes	0		0	1		1	1		0	1		1
Taper Length (ft)	0		0	100		100	100		0	100		100
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected		0.959		0.950	0.957		0.950			0.950		
Satd. Flow (prot)	0	1786	1583	1681	1694	1583	1770	1863	1583	1770	3539	1583
Flt Permitted		0.959		0.950	0.957		0.552			0.201		
Satd. Flow (perm)	0	1786	1583	1681	1694	1583	1028	1863	1583	374	3539	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		25			45			50			50	
Link Distance (ft)		482			1366			2053			2154	
Travel Time (s)		13.1			20.7			28.0			29.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	43	7	41	77	4	16	39	776	151	17	331	16
Shared Lane Traffic (%)				48%								
Lane Group Flow (vph)	0	50	41	40	41	16	39	776	151	17	331	16
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Split		Perm	Split		Perm	Perm		Perm	Perm		Perm
Protected Phases	8	8		4	4			6			2	
Permitted Phases			8			4	6		6	2		2
Detector Phase	8	8	8	4	4	4	6	6	6	2	2	2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	15.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0	21.7	21.7	21.7	21.7	21.7	21.7
Total Split (s)	20.0	20.0	20.0	20.0	20.0	20.0	50.0	50.0	50.0	50.0	50.0	50.0
Total Split (%)	22.2%	22.2%	22.2%	22.2%	22.2%	22.2%	55.6%	55.6%	55.6%	55.6%	55.6%	55.6%
Maximum Green (s)	14.0	14.0	14.0	14.0	14.0	14.0	44.0	44.0	44.0	44.0	44.0	44.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	Min	Min	Min	Min	Min	Min
Act Effct Green (s)		12.2	12.2	12.1	12.1	12.1	42.9	42.9	42.9	42.9	42.9	42.9
Actuated g/C Ratio		0.18	0.18	0.17	0.17	0.17	0.62	0.62	0.62	0.62	0.62	0.62
v/c Ratio		0.16	0.15	0.14	0.14	0.06	0.06	0.67	0.15	0.07	0.15	0.02
Control Delay		32.2	32.3	32.1	32.1	31.4	9.4	17.6	10.2	10.1	9.3	8.7
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		32.2	32.3	32.1	32.1	31.4	9.4	17.6	10.2	10.1	9.3	8.7
LOS		C	C	C	C	C	A	B	B	B	A	A
Approach Delay		32.2			32.0			16.1			9.3	
Approach LOS		C			C			B			A	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 69.5
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.67
Intersection Signal Delay: 16.5 Intersection LOS: B
Intersection Capacity Utilization 65.9% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 3: Driveway & Bohicket Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	39	6	37	69	4	14	35	698	136	15	298	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1786	1583	1681	1693	1583	1770	1863	1583	1770	3539	1583
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.55	1.00	1.00	0.20	1.00	1.00
Satd. Flow (perm)		1786	1583	1681	1693	1583	1028	1863	1583	374	3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	43	7	41	77	4	16	39	776	151	17	331	16
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	50	41	40	41	16	39	776	151	17	331	16
Turn Type	Split		Perm	Split		Perm	Perm		Perm	Perm		Perm
Protected Phases	8	8		4	4			6			2	
Permitted Phases			8			4	6		6	2		2
Actuated Green, G (s)		7.2	7.2	7.2	7.2	7.2	39.9	39.9	39.9	39.9	39.9	39.9
Effective Green, g (s)		8.2	8.2	8.2	8.2	8.2	40.9	40.9	40.9	40.9	40.9	40.9
Actuated g/C Ratio		0.11	0.11	0.11	0.11	0.11	0.57	0.57	0.57	0.57	0.57	0.57
Clearance Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		203	180	191	192	180	582	1054	896	212	2002	896
v/s Ratio Prot		c0.03		0.02	c0.02			c0.42			0.09	
v/s Ratio Perm			0.03			0.01	0.04		0.10	0.05		0.01
v/c Ratio		0.25	0.23	0.21	0.21	0.09	0.07	0.74	0.17	0.08	0.17	0.02
Uniform Delay, d1		29.2	29.2	29.1	29.1	28.7	7.1	11.7	7.5	7.1	7.5	6.9
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.6	0.6	0.5	0.6	0.2	0.0	2.7	0.1	0.2	0.0	0.0
Delay (s)		29.9	29.8	29.7	29.7	28.9	7.1	14.4	7.6	7.3	7.6	6.9
Level of Service		C	C	C	C	C	A	B	A	A	A	A
Approach Delay (s)		29.8			29.5			13.0			7.5	
Approach LOS		C			C			B			A	

Intersection Summary

HCM Average Control Delay	13.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	72.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	65.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	163	5	7	85	2	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.996					
Flt Protected				0.996	0.950	
Satd. Flow (prot)	1855	0	0	1855	1770	0
Flt Permitted				0.996	0.950	
Satd. Flow (perm)	1855	0	0	1855	1770	0
Link Speed (mph)	45			45	45	
Link Distance (ft)	1366			330	1134	
Travel Time (s)	20.7			5.0	17.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	181	6	8	94	2	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	187	0	0	102	2	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 20.3% ICU Level of Service A
Analysis Period (min) 15

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	163	5	7	85	2	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	181	6	8	94	2	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			187		294	184
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			187		294	184
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		100	100
cM capacity (veh/h)			1388		693	858

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	187	102	2
Volume Left	0	8	2
Volume Right	6	0	0
cSH	1700	1388	693
Volume to Capacity	0.11	0.01	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.6	10.2
Lane LOS		A	B
Approach Delay (s)	0.0	0.6	10.2
Approach LOS			B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	20.3%	ICU Level of Service	A
Analysis Period (min)	15		

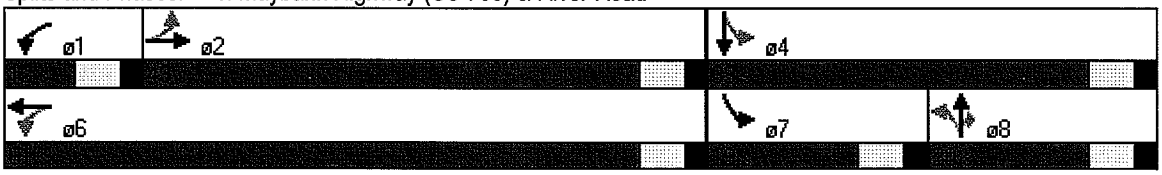
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	59	590	24	166	522	102	37	81	188	373	81	67
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	290		0	180		0	245		50	175		0
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (ft)	100		100	100		100	100		100	100		100
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.994			0.976				0.850		0.932	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1852	0	1770	1818	0	1770	1863	1583	1770	1736	0
Flt Permitted	0.294			0.093			0.653			0.522		
Satd. Flow (perm)	548	1852	0	173	1818	0	1216	1863	1583	972	1736	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		4802			2003			1572			1313	
Travel Time (s)		72.8			30.3			23.8			19.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	66	656	27	184	580	113	41	90	209	414	90	74
Shared Lane Traffic (%)												
Lane Group Flow (vph)	66	683	0	184	693	0	41	90	209	414	164	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm			pm+pt			Perm		Perm	pm+pt		
Protected Phases		2		1	6			8		7	4	
Permitted Phases	2			6			8		8	4		
Detector Phase	2	2		1	6		8	8	8	7	4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	12.0	12.0		5.0	12.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	20.0	20.0		12.0	20.0		20.0	20.0	20.0	12.0	20.0	
Total Split (s)	49.0	49.0	0.0	12.0	61.0	0.0	20.0	20.0	20.0	19.0	39.0	0.0
Total Split (%)	49.0%	49.0%	0.0%	12.0%	61.0%	0.0%	20.0%	20.0%	20.0%	19.0%	39.0%	0.0%
Maximum Green (s)	43.0	43.0		6.0	55.0		14.0	14.0	14.0	13.0	33.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0	5.0	5.0	5.0	3.0
Lead/Lag	Lag	Lag		Lead			Lag	Lag	Lag	Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None		None	None		Min	Min	Min	None	None	
Act Effct Green (s)	39.3	39.3		51.4	51.4		14.8	14.8	14.8	33.9	33.9	
Actuated g/C Ratio	0.41	0.41		0.54	0.54		0.16	0.16	0.16	0.36	0.36	
v/c Ratio	0.29	0.89		0.87	0.71		0.22	0.31	0.85	0.89	0.27	
Control Delay	22.4	41.8		55.1	21.0		40.5	40.8	71.3	52.1	24.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	22.4	41.8		55.1	21.0		40.5	40.8	71.3	52.1	24.6	
LOS	C	D		E	C		D	D	E	D	C	
Approach Delay		40.1			28.1			59.5			44.3	
Approach LOS		D			C			E			D	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 95.3
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 39.5 Intersection LOS: D
Intersection Capacity Utilization 85.3% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 1: Maybank Highway (SC 700) & River Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	59	590	24	166	522	102	37	81	188	373	81	67
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.99		1.00	0.98		1.00	1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1852		1770	1817		1770	1863	1583	1770	1737	
Flt Permitted	0.29	1.00		0.09	1.00		0.65	1.00	1.00	0.52	1.00	
Satd. Flow (perm)	548	1852		172	1817		1217	1863	1583	973	1737	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	66	656	27	184	580	113	41	90	209	414	90	74
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	66	683	0	184	693	0	41	90	209	414	164	0
Turn Type	Perm			pm+pt			Perm		Perm	pm+pt		
Protected Phases		2		1	6			8		7	4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	38.3	38.3		50.3	50.3		13.8	13.8	13.8	32.9	32.9	
Effective Green, g (s)	39.3	39.3		51.3	51.3		14.8	14.8	14.8	33.9	33.9	
Actuated g/C Ratio	0.41	0.41		0.54	0.54		0.16	0.16	0.16	0.36	0.36	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	226	765		210	979		189	290	246	465	619	
v/s Ratio Prot		0.37		0.06	c0.38			0.05		c0.13	0.09	
v/s Ratio Perm	0.12			c0.41			0.03		0.13	c0.19		
v/c Ratio	0.29	0.89		0.88	0.71		0.22	0.31	0.85	0.89	0.26	
Uniform Delay, d1	18.7	26.0		20.8	16.4		35.1	35.7	39.1	27.3	21.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.7	12.8		30.9	2.4		0.6	0.6	23.0	18.8	0.2	
Delay (s)	19.4	38.8		51.7	18.7		35.7	36.3	62.1	46.1	22.0	
Level of Service	B	D		D	B		D	D	E	D	C	
Approach Delay (s)		37.1			25.7			52.1			39.3	
Approach LOS		D			C			D			D	

Intersection Summary

HCM Average Control Delay	35.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	95.2	Sum of lost time (s)	10.0
Intersection Capacity Utilization	85.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

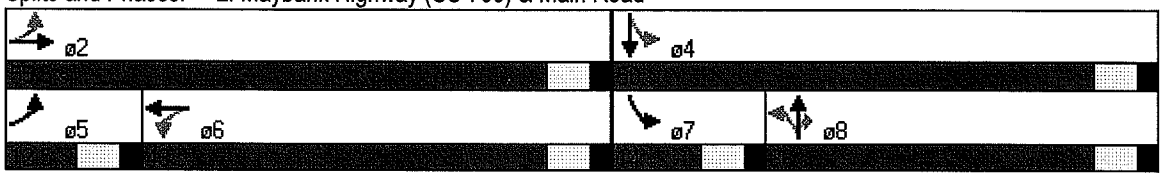
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	92	229	97	254	101	92	53	295	99	211	581	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	170		0	145		0	185		370	210		0
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (ft)	100		100	100		100	100		100	100		100
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.955			0.929				0.850		0.993	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1779	0	1770	1730	0	1770	1863	1583	1770	1850	0
Flt Permitted	0.491			0.545			0.190			0.283		
Satd. Flow (perm)	915	1779	0	1015	1730	0	354	1863	1583	527	1850	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		1276			4802			919			3477	
Travel Time (s)		19.3			72.8			13.9			52.7	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	102	254	108	282	112	102	59	328	110	234	646	33
Shared Lane Traffic (%)												
Lane Group Flow (vph)	102	362	0	282	214	0	59	328	110	234	679	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt			Perm			Perm		Perm	pm+pt		
Protected Phases	5	2			6			8		7	4	
Permitted Phases	2			6			8		8	4		
Detector Phase	5	2		6	6		8	8	8	7	4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	5.0	25.0		25.0	25.0		10.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	12.5	32.5		32.5	32.5		20.0	20.0	20.0	12.0	20.0	
Total Split (s)	12.5	55.5	0.0	43.0	43.0	0.0	36.0	36.0	36.0	14.0	50.0	0.0
Total Split (%)	11.8%	52.6%	0.0%	40.8%	40.8%	0.0%	34.1%	34.1%	34.1%	13.3%	47.4%	0.0%
Maximum Green (s)	6.5	49.5		37.0	37.0		30.0	30.0	30.0	8.0	44.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0	5.0	5.0	5.0	3.0
Lead/Lag	Lead			Lag	Lag		Lag	Lag	Lag	Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	4.0		4.0	4.0		4.0	4.0	4.0	3.0	4.0	
Recall Mode	None	Min		Min	Min		None	None	None	None	None	
Act Effct Green (s)	43.1	43.1		33.7	33.7		25.8	25.8	25.8	40.3	40.3	
Actuated g/C Ratio	0.46	0.46		0.36	0.36		0.28	0.28	0.28	0.43	0.43	
v/c Ratio	0.21	0.44		0.77	0.34		0.61	0.64	0.25	0.67	0.85	
Control Delay	16.2	19.5		44.8	25.7		59.9	37.4	29.7	30.6	37.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	16.2	19.5		44.8	25.7		59.9	37.4	29.7	30.6	37.7	
LOS	B	B		D	C		E	D	C	C	D	
Approach Delay		18.8			36.6			38.3			35.9	
Approach LOS		B			D			D			D	

Intersection Summary

Area Type: Other
Cycle Length: 105.5
Actuated Cycle Length: 93.7
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 33.2 — Intersection LOS: C
Intersection Capacity Utilization 99.1% — ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 2: Maybank Highway (SC 700) & Main Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	92	229	97	254	101	92	53	295	99	211	581	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	0.93		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1779		1770	1730		1770	1863	1583	1770	1849	
Flt Permitted	0.49	1.00		0.55	1.00		0.19	1.00	1.00	0.28	1.00	
Satd. Flow (perm)	915	1779		1016	1730		355	1863	1583	527	1849	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	102	254	108	282	112	102	59	328	110	234	646	33
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	102	362	0	282	214	0	59	328	110	234	679	0
Turn Type	pm+pt			Perm			Perm		Perm	pm+pt		
Protected Phases	5	2			6			8		7	4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	43.6	43.6		32.7	32.7		24.9	24.9	24.9	39.2	39.2	
Effective Green, g (s)	44.6	44.6		33.7	33.7		25.9	25.9	25.9	40.2	40.2	
Actuated g/C Ratio	0.47	0.47		0.36	0.36		0.27	0.27	0.27	0.42	0.42	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	4.0		4.0	4.0		4.0	4.0	4.0	3.0	4.0	
Lane Grp Cap (vph)	484	837		361	615		97	509	432	345	784	
v/s Ratio Prot	0.01	c0.20			0.12			0.18		0.07	c0.37	
v/s Ratio Perm	0.09			c0.28			0.17		0.07	0.22		
v/c Ratio	0.21	0.43		0.78	0.35		0.61	0.64	0.25	0.68	0.87	
Uniform Delay, d1	14.5	16.7		27.3	22.5		30.0	30.4	26.9	19.7	24.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	0.5		11.1	0.5		11.9	3.1	0.4	5.2	10.2	
Delay (s)	14.7	17.2		38.3	22.9		41.9	33.5	27.3	24.9	35.1	
Level of Service	B	B		D	C		D	C	C	C	D	
Approach Delay (s)		16.6			31.7			33.1			32.5	
Approach LOS		B			C			C			C	

Intersection Summary

HCM Average Control Delay	29.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	94.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	99.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

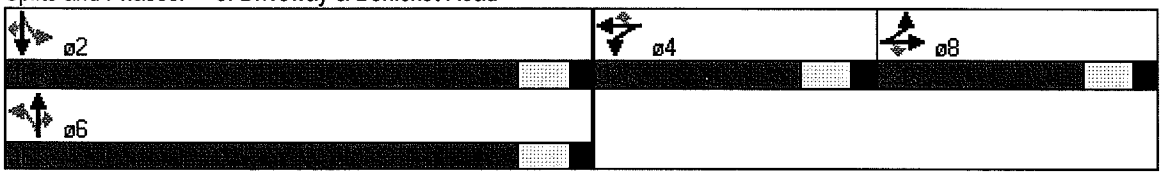
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	1	53	148	13	6	27	327	56	20	837	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	110		55	170		0	125		125
Storage Lanes	0		0	1		1	1		0	1		1
Taper Length (ft)	100		100	100		100	100		100	100		100
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected		0.968		0.950	0.960		0.950			0.950		
Satd. Flow (prot)	0	1803	1583	1681	1699	1583	1770	1863	1583	1770	3539	1583
Flt Permitted		0.968		0.950	0.960		0.241			0.495		
Satd. Flow (perm)	0	1803	1583	1681	1699	1583	449	1863	1583	922	3539	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		25			45			50			50	
Link Distance (ft)		482			1366			2053			2154	
Travel Time (s)		13.1			20.7			28.0			29.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	2	1	59	164	14	7	30	363	62	22	930	73
Shared Lane Traffic (%)				46%								
Lane Group Flow (vph)	0	3	59	89	89	7	30	363	62	22	930	73
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Split		Perm	Split		Perm	Perm		Perm	Perm		Perm
Protected Phases	8	8		4	4			6			2	
Permitted Phases			8			4	6		6	2		2
Detector Phase	8	8	8	4	4	4	6	6	6	2	2	2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	15.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0	21.7	21.7	21.7	21.7	21.7	21.7
Total Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	46.0	46.0	46.0	46.0	46.0	46.0
Total Split (%)	24.4%	24.4%	24.4%	24.4%	24.4%	24.4%	51.1%	51.1%	51.1%	51.1%	51.1%	51.1%
Maximum Green (s)	16.0	16.0	16.0	16.0	16.0	16.0	40.0	40.0	40.0	40.0	40.0	40.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	Min	Min	Min	Min	Min	Min
Act Effct Green (s)		12.1	12.1	12.4	12.4	12.4	31.2	31.2	31.2	31.2	31.2	31.2
Actuated g/C Ratio		0.22	0.22	0.22	0.22	0.22	0.56	0.56	0.56	0.56	0.56	0.56
v/c Ratio		0.01	0.17	0.24	0.24	0.02	0.12	0.35	0.07	0.04	0.47	0.08
Control Delay		25.0	25.8	25.6	25.5	24.3	13.6	13.1	11.5	11.8	13.1	11.5
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		25.0	25.8	25.6	25.5	24.3	13.6	13.1	11.5	11.8	13.1	11.5
LOS		C	C	C	C	C	B	B	B	B	B	B
Approach Delay		25.8			25.5			12.9			13.0	
Approach LOS		C			C			B			B	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 56.1
Natural Cycle: 65
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.47
Intersection Signal Delay: 14.8 — Intersection LOS: B
Intersection Capacity Utilization 52.3% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Driveway & Bohicket Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	1	53	148	13	6	27	327	56	20	837	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1803	1583	1681	1698	1583	1770	1863	1583	1770	3539	1583
Flt Permitted		0.97	1.00	0.95	0.96	1.00	0.24	1.00	1.00	0.50	1.00	1.00
Satd. Flow (perm)		1803	1583	1681	1698	1583	449	1863	1583	922	3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	2	1	59	164	14	7	30	363	62	22	930	73
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	3	59	89	89	7	30	363	62	22	930	73
Turn Type	Split		Perm	Split		Perm	Perm		Perm	Perm		Perm
Protected Phases	8	8		4	4			6			2	
Permitted Phases			8			4	6		6	2		2
Actuated Green, G (s)		5.2	5.2	8.2	8.2	8.2	28.5	28.5	28.5	28.5	28.5	28.5
Effective Green, g (s)		6.2	6.2	9.2	9.2	9.2	29.5	29.5	29.5	29.5	29.5	29.5
Actuated g/C Ratio		0.10	0.10	0.15	0.15	0.15	0.49	0.49	0.49	0.49	0.49	0.49
Clearance Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		187	164	258	261	243	221	918	780	454	1743	780
v/s Ratio Prot		0.00		c0.05	0.05			0.19			c0.26	
v/s Ratio Perm			c0.04			0.00	0.07		0.04	0.02		0.05
v/c Ratio		0.02	0.36	0.34	0.34	0.03	0.14	0.40	0.08	0.05	0.53	0.09
Uniform Delay, d1		24.1	25.0	22.7	22.6	21.6	8.3	9.6	8.0	7.9	10.5	8.1
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.0	1.4	0.8	0.8	0.0	0.3	0.3	0.0	0.0	0.3	0.1
Delay (s)		24.1	26.4	23.5	23.4	21.6	8.5	9.9	8.1	7.9	10.8	8.1
Level of Service		C	C	C	C	C	A	A	A	A	B	A
Approach Delay (s)		26.2			23.4			9.5			10.5	
Approach LOS		C			C			A			B	

Intersection Summary

HCM Average Control Delay	12.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	59.9	Sum of lost time (s)	15.0
Intersection Capacity Utilization	52.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	61	7	3	177	3	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.986				0.946	
Flt Protected				0.999	0.971	
Satd. Flow (prot)	1837	0	0	1861	1711	0
Flt Permitted				0.999	0.971	
Satd. Flow (perm)	1837	0	0	1861	1711	0
Link Speed (mph)	45			45	45	
Link Distance (ft)	1366			1051	1134	
Travel Time (s)	20.7			15.9	17.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	68	8	3	197	3	2
Shared Lane Traffic (%)						
Lane Group Flow (vph)	76	0	0	200	5	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 21.7% ICU Level of Service A
Analysis Period (min) 15

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	61	7	3	177	3	2
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	68	8	3	197	3	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			76		275	72
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			76		275	72
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1524		713	991

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	76	200	6
Volume Left	0	3	3
Volume Right	8	0	2
cSH	1700	1524	803
Volume to Capacity	0.04	0.00	0.01
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.0	0.1	9.5
Lane LOS		A	A
Approach Delay (s)	0.0	0.1	9.5
Approach LOS			A

Intersection Summary			
Average Delay		0.3	
Intersection Capacity Utilization		21.7%	ICU Level of Service A
Analysis Period (min)		15	

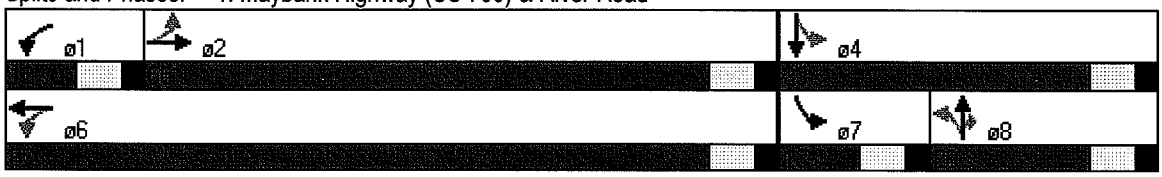
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	74	673	47	211	756	354	79	130	205	304	129	86
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	290		0	180		0	245		50	175		0
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (ft)	100		0	100		0	100		100	100		0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.990			0.952				0.850		0.940	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1844	0	1770	1773	0	1770	1863	1583	1770	1751	0
Flt Permitted	0.080			0.099			0.610			0.419		
Satd. Flow (perm)	149	1844	0	184	1773	0	1136	1863	1583	780	1751	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		4802			2003			1572			1313	
Travel Time (s)		72.8			30.3			23.8			19.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	82	748	52	234	840	393	88	144	228	338	143	96
Shared Lane Traffic (%)												
Lane Group Flow (vph)	82	800	0	234	1233	0	88	144	228	338	239	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm			pm+pt			Perm		Perm	pm+pt		
Protected Phases		2		1	6			8		7	4	
Permitted Phases	2			6			8		8	4		
Detector Phase	2	2		1	6		8	8	8	7	4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	12.0	12.0		5.0	12.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	20.0	20.0		12.0	20.0		20.0	20.0	20.0	12.0	20.0	
Total Split (s)	55.0	55.0	0.0	12.0	67.0	0.0	20.0	20.0	20.0	13.0	33.0	0.0
Total Split (%)	55.0%	55.0%	0.0%	12.0%	67.0%	0.0%	20.0%	20.0%	20.0%	13.0%	33.0%	0.0%
Maximum Green (s)	49.0	49.0		6.0	61.0		14.0	14.0	14.0	7.0	27.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0	5.0	5.0	5.0	3.0
Lead/Lag	Lag	Lag		Lead			Lag	Lag	Lag	Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None		None	None		Min	Min	Min	None	None	
Act Effct Green (s)	50.0	50.0		62.0	62.0		15.0	15.0	15.0	28.0	28.0	
Actuated g/C Ratio	0.50	0.50		0.62	0.62		0.15	0.15	0.15	0.28	0.28	
v/c Ratio	1.09	0.87		1.04	1.12		0.52	0.52	0.96	1.13	0.49	
Control Delay	163.0	34.1		91.0	88.4		51.1	46.5	93.5	126.7	34.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	163.0	34.1		91.0	88.4		51.1	46.5	93.5	126.7	34.1	
LOS	F	C		F	F		D	D	F	F	C	
Approach Delay		46.1			88.8			70.7			88.3	
Approach LOS		D			F			E			F	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Natural Cycle: 110
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.13
Intersection Signal Delay: 75.1 Intersection LOS: E
Intersection Capacity Utilization 111.7% ICU Level of Service H
Analysis Period (min) 15

Splits and Phases: 1: Maybank Highway (SC 700) & River Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	74	673	47	211	756	354	79	130	205	304	129	86
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.99		1.00	0.95		1.00	1.00	0.85	1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1845		1770	1774		1770	1863	1583	1770	1751	
Flt Permitted	0.08	1.00		0.10	1.00		0.61	1.00	1.00	0.42	1.00	
Satd. Flow (perm)	149	1845		185	1774		1136	1863	1583	781	1751	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	82	748	52	234	840	393	88	144	228	338	143	96
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	82	800	0	234	1233	0	88	144	228	338	239	0
Turn Type	Perm			pm+pt			Perm		Perm	pm+pt		
Protected Phases		2		1	6			8		7	4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	49.0	49.0		61.0	61.0		14.0	14.0	14.0	27.0	27.0	
Effective Green, g (s)	50.0	50.0		62.0	62.0		15.0	15.0	15.0	28.0	28.0	
Actuated g/C Ratio	0.50	0.50		0.62	0.62		0.15	0.15	0.15	0.28	0.28	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	75	923		226	1100		170	279	237	298	490	
v/s Ratio Prot		0.43		0.07	c0.70			0.08		c0.09	0.14	
v/s Ratio Perm	0.55			0.57			0.08		0.14	c0.23		
v/c Ratio	1.09	0.87		1.04	1.12		0.52	0.52	0.96	1.13	0.49	
Uniform Delay, d1	25.0	22.1		24.5	19.0		39.2	39.2	42.2	35.3	30.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	131.7	8.6		69.4	66.8		2.6	1.6	47.6	93.4	0.8	
Delay (s)	156.7	30.7		93.9	85.8		41.8	40.8	89.8	128.7	30.8	
Level of Service	F	C		F	F		D	D	F	F	C	
Approach Delay (s)		42.4			87.1			65.3			88.1	
Approach LOS		D			F			E			F	

Intersection Summary

HCM Average Control Delay	72.6	HCM Level of Service	E
HCM Volume to Capacity ratio	1.11		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	111.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

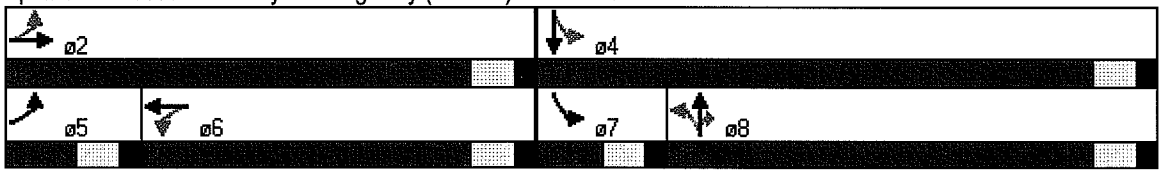
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	147	46	198	186	211	71	599	176	147	342	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	170		0	145		0	185		370	210		0
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (ft)	100		0	100		0	100		100	100		0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.964			0.920				0.850		0.994	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1796	0	1770	1714	0	1770	1863	1583	1770	1852	0
Flt Permitted	0.172			0.624			0.528			0.092		
Satd. Flow (perm)	320	1796	0	1162	1714	0	984	1863	1583	171	1852	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		1276			4802			919			3477	
Travel Time (s)		19.3			72.8			13.9			52.7	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	94	163	51	220	207	234	79	666	196	163	380	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	94	214	0	220	441	0	79	666	196	163	397	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt			Perm			Perm		Perm	pm+pt		
Protected Phases	5	2			6			8		7	4	
Permitted Phases	2			6			8		8	4		
Detector Phase	5	2		6	6		8	8	8	7	4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	5.0	25.0		25.0	25.0		10.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	12.5	32.5		32.5	32.5		20.0	20.0	20.0	12.0	20.0	
Total Split (s)	12.5	48.5	0.0	36.0	36.0	0.0	45.0	45.0	45.0	12.0	57.0	0.0
Total Split (%)	11.8%	46.0%	0.0%	34.1%	34.1%	0.0%	42.7%	42.7%	42.7%	11.4%	54.0%	0.0%
Maximum Green (s)	6.5	42.5		30.0	30.0		39.0	39.0	39.0	6.0	51.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0	5.0	5.0	5.0	3.0
Lead/Lag	Lead			Lag	Lag		Lag	Lag	Lag	Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	4.0		4.0	4.0		4.0	4.0	4.0	3.0	4.0	
Recall Mode	None	Min		Min	Min		None	None	None	None	None	
Act Effct Green (s)	39.6	39.6		30.1	30.1		38.4	38.4	38.4	50.5	50.5	
Actuated g/C Ratio	0.39	0.39		0.30	0.30		0.38	0.38	0.38	0.50	0.50	
v/c Ratio	0.40	0.30		0.63	0.86		0.21	0.93	0.32	0.82	0.43	
Control Delay	24.6	22.2		41.2	51.9		24.1	52.7	24.6	50.9	18.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	24.6	22.2		41.2	51.9		24.1	52.7	24.6	50.9	18.4	
LOS	C	C		D	D		C	D	C	D	B	
Approach Delay		22.9			48.4			44.4			27.8	
Approach LOS		C			D			D			C	

Intersection Summary

Area Type: Other
Cycle Length: 105.5
Actuated Cycle Length: 100.3
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.93
Intersection Signal Delay: 39.0 Intersection LOS: D
Intersection Capacity Utilization 98.0% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 2: Maybank Highway (SC 700) & Main Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	147	46	198	186	211	71	599	176	147	342	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	0.92		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1796		1770	1714		1770	1863	1583	1770	1851	
Flt Permitted	0.17	1.00		0.62	1.00		0.53	1.00	1.00	0.09	1.00	
Satd. Flow (perm)	320	1796		1163	1714		983	1863	1583	171	1851	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	94	163	51	220	207	234	79	666	196	163	380	17
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	94	214	0	220	441	0	79	666	196	163	397	0
Turn Type	pm+pt			Perm			Perm		Perm	pm+pt		
Protected Phases	5	2			6			8		7	4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	40.0	40.0		29.1	29.1		37.5	37.5	37.5	49.6	49.6	
Effective Green, g (s)	41.0	41.0		30.1	30.1		38.5	38.5	38.5	50.6	50.6	
Actuated g/C Ratio	0.40	0.40		0.30	0.30		0.38	0.38	0.38	0.50	0.50	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	4.0		4.0	4.0		4.0	4.0	4.0	3.0	4.0	
Lane Grp Cap (vph)	213	725		345	508		372	706	600	197	922	
v/s Ratio Prot	c0.03	0.12			c0.26			c0.36		c0.06	0.21	
v/s Ratio Perm	0.15			0.19			0.08		0.12	0.35		
v/c Ratio	0.44	0.30		0.64	0.87		0.21	0.94	0.33	0.83	0.43	
Uniform Delay, d1	22.0	20.5		31.0	33.9		21.3	30.5	22.4	22.0	16.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.5	0.3		4.3	15.0		0.4	21.2	0.4	23.9	0.4	
Delay (s)	23.5	20.8		35.3	48.8		21.7	51.7	22.8	45.8	16.7	
Level of Service	C	C		D	D		C	D	C	D	B	
Approach Delay (s)		21.6			44.3			43.2			25.2	
Approach LOS		C			D			D			C	

Intersection Summary

HCM Average Control Delay	36.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	101.6	Sum of lost time (s)	20.0
Intersection Capacity Utilization	98.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

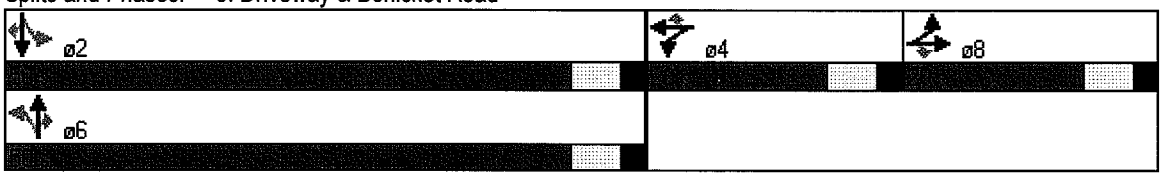
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	47	7	45	84	5	17	43	850	166	18	363	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	110		55	170		0	125		125
Storage Lanes	0		0	1		1	1		0	1		1
Taper Length (ft)	0		0	100		100	100		0	100		100
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected		0.958		0.950	0.958		0.950			0.950		
Satd. Flow (prot)	0	1785	1583	1681	1695	1583	1770	1863	1583	1770	3539	1583
Flt Permitted		0.958		0.950	0.958		0.515			0.114		
Satd. Flow (perm)	0	1785	1583	1681	1695	1583	959	1863	1583	212	3539	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		25			45			50			50	
Link Distance (ft)		482			1366			2053			2154	
Travel Time (s)		13.1			20.7			28.0			29.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	52	8	50	93	6	19	48	944	184	20	403	19
Shared Lane Traffic (%)				47%								
Lane Group Flow (vph)	0	60	50	49	50	19	48	944	184	20	403	19
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Split		Perm	Split		Perm	Perm		Perm	Perm		Perm
Protected Phases	8	8		4	4			6			2	
Permitted Phases			8			4	6		6	2		2
Detector Phase	8	8	8	4	4	4	6	6	6	2	2	2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	15.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0	21.7	21.7	21.7	21.7	21.7	21.7
Total Split (s)	20.0	20.0	20.0	20.0	20.0	20.0	50.0	50.0	50.0	50.0	50.0	50.0
Total Split (%)	22.2%	22.2%	22.2%	22.2%	22.2%	22.2%	55.6%	55.6%	55.6%	55.6%	55.6%	55.6%
Maximum Green (s)	14.0	14.0	14.0	14.0	14.0	14.0	44.0	44.0	44.0	44.0	44.0	44.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	Min	Min	Min	Min	Min	Min
Act Effct Green (s)		11.4	11.4	11.4	11.4	11.4	49.1	49.1	49.1	49.1	49.1	49.1
Actuated g/C Ratio		0.15	0.15	0.15	0.15	0.15	0.64	0.64	0.64	0.64	0.64	0.64
v/c Ratio		0.23	0.21	0.20	0.20	0.08	0.08	0.80	0.18	0.15	0.18	0.02
Control Delay		34.3	34.4	34.1	34.2	32.4	9.6	22.9	9.9	13.2	9.0	8.9
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		34.3	34.4	34.1	34.2	32.4	9.6	22.9	9.9	13.2	9.0	8.9
LOS		C	C	C	C	C	A	C	A	B	A	A
Approach Delay		34.4			33.9			20.3			9.2	
Approach LOS		C			C			C			A	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 77.1
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 19.3 — Intersection LOS: B
Intersection Capacity Utilization 73.9% — ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 3: Driveway & Bohicket Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	47	7	45	84	5	17	43	850	166	18	363	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1785	1583	1681	1695	1583	1770	1863	1583	1770	3539	1583
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.51	1.00	1.00	0.11	1.00	1.00
Satd. Flow (perm)		1785	1583	1681	1695	1583	959	1863	1583	212	3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	52	8	50	93	6	19	48	944	184	20	403	19
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	60	50	49	50	19	48	944	184	20	403	19
Turn Type	Split		Perm	Split		Perm	Perm		Perm	Perm		Perm
Protected Phases	8	8		4	4			6			2	
Permitted Phases			8			4	6		6	2		2
Actuated Green, G (s)		7.7	7.7	7.6	7.6	7.6	46.7	46.7	46.7	46.7	46.7	46.7
Effective Green, g (s)		8.7	8.7	8.6	8.6	8.6	47.7	47.7	47.7	47.7	47.7	47.7
Actuated g/C Ratio		0.11	0.11	0.11	0.11	0.11	0.60	0.60	0.60	0.60	0.60	0.60
Clearance Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		194	172	181	182	170	572	1111	944	126	2110	944
v/s Ratio Prot		c0.03		0.03	c0.03			c0.51			0.11	
v/s Ratio Perm			0.03			0.01	0.05		0.12	0.09		0.01
v/c Ratio		0.31	0.29	0.27	0.27	0.11	0.08	0.85	0.19	0.16	0.19	0.02
Uniform Delay, d1		32.9	32.8	32.8	32.8	32.2	6.9	13.2	7.4	7.2	7.4	6.6
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.9	0.9	0.8	0.8	0.3	0.1	6.2	0.1	0.6	0.0	0.0
Delay (s)		33.8	33.8	33.6	33.7	32.5	6.9	19.5	7.5	7.8	7.4	6.6
Level of Service		C	C	C	C	C	A	B	A	A	A	A
Approach Delay (s)		33.8			33.5			17.1			7.4	
Approach LOS		C			C			B			A	

Intersection Summary

HCM Average Control Delay	16.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	73.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	199	6	8	104	2	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.996					
Flt Protected				0.996	0.950	
Satd. Flow (prot)	1855	0	0	1855	1770	0
Flt Permitted				0.996	0.950	
Satd. Flow (perm)	1855	0	0	1855	1770	0
Link Speed (mph)	45			45	45	
Link Distance (ft)	1366			330	1134	
Travel Time (s)	20.7			5.0	17.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	221	7	9	116	2	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	228	0	0	125	2	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 22.1% ICU Level of Service A
Analysis Period (min) 15

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	199	6	8	104	2	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	221	7	9	116	2	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			228		358	224
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			228		358	224
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		100	100
cM capacity (veh/h)			1340		636	815

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	228	124	2
Volume Left	0	9	2
Volume Right	7	0	0
cSH	1700	1340	636
Volume to Capacity	0.13	0.01	0.00
Queue Length 95th (ft)	0	1	0
Control Delay (s)	0.0	0.6	10.7
Lane LOS		A	B
Approach Delay (s)	0.0	0.6	10.7
Approach LOS			B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	22.1%	ICU Level of Service	A
Analysis Period (min)	15		

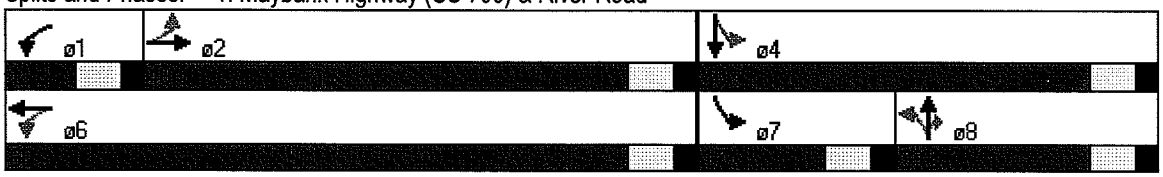
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	59	611	24	231	548	102	37	81	237	373	81	67
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	290		0	180		0	245		50	175		0
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (ft)	100		100	100		100	100		100	100		100
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.994			0.977				0.850		0.932	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1852	0	1770	1820	0	1770	1863	1583	1770	1736	0
Flt Permitted	0.257			0.092			0.653			0.577		
Satd. Flow (perm)	479	1852	0	171	1820	0	1216	1863	1583	1075	1736	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		4802			2003			1572			3100	
Travel Time (s)		72.8			30.3			23.8			47.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	66	679	27	257	609	113	41	90	263	414	90	74
Shared Lane Traffic (%)												
Lane Group Flow (vph)	66	706	0	257	722	0	41	90	263	414	164	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm			pm+pt			Perm		Perm	pm+pt		
Protected Phases		2		1	6			8		7	4	
Permitted Phases	2			6			8		8	4		
Detector Phase	2	2		1	6		8	8	8	7	4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	12.0	12.0		5.0	12.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	20.0	20.0		12.0	20.0		20.0	20.0	20.0	12.0	20.0	
Total Split (s)	48.0	48.0	0.0	12.0	60.0	0.0	23.0	23.0	23.0	17.0	40.0	0.0
Total Split (%)	48.0%	48.0%	0.0%	12.0%	60.0%	0.0%	23.0%	23.0%	23.0%	17.0%	40.0%	0.0%
Maximum Green (s)	42.0	42.0		6.0	54.0		17.0	17.0	17.0	11.0	34.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-3.0	-3.0	-1.0	-1.0	-1.0	-1.0	-2.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	3.0	3.0	3.0	3.0	5.0	5.0	5.0	4.0	5.0	3.0
Lead/Lag	Lag	Lag		Lead			Lag	Lag	Lag	Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None		None	None		Min	Min	Min	None	None	
Act Effct Green (s)	40.2	40.2		54.2	54.2		17.9	17.9	17.9	35.9	34.9	
Actuated g/C Ratio	0.41	0.41		0.56	0.56		0.18	0.18	0.18	0.37	0.36	
v/c Ratio	0.33	0.92		1.05	0.71		0.18	0.26	0.90	0.84	0.26	
Control Delay	24.9	46.1		97.6	20.4		37.2	37.5	73.9	44.6	24.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	24.9	46.1		97.6	20.4		37.2	37.5	73.9	44.6	24.3	
LOS	C	D		F	C		D	D	E	D	C	
Approach Delay		44.3			40.7			61.7			38.9	
Approach LOS		D			D			E			D	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 97.2
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.05
Intersection Signal Delay: 44.4 Intersection LOS: D
Intersection Capacity Utilization 86.3% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 1: Maybank Highway (SC 700) & River Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	59	611	24	231	548	102	37	81	237	373	81	67
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		3.0	3.0		5.0	5.0	5.0	4.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.99		1.00	0.98		1.00	1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1852		1770	1819		1770	1863	1583	1770	1737	
Flt Permitted	0.26	1.00		0.09	1.00		0.65	1.00	1.00	0.58	1.00	
Satd. Flow (perm)	479	1852		171	1819		1217	1863	1583	1074	1737	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	66	679	27	257	609	113	41	90	263	414	90	74
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	66	706	0	257	722	0	41	90	263	414	164	0
Turn Type	Perm			pm+pt			Perm		Perm	pm+pt		
Protected Phases		2		1	6			8		7	4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	39.2	39.2		51.2	51.2		16.9	16.9	16.9	33.9	33.9	
Effective Green, g (s)	40.2	40.2		54.2	54.2		17.9	17.9	17.9	35.9	34.9	
Actuated g/C Ratio	0.41	0.41		0.56	0.56		0.18	0.18	0.18	0.37	0.36	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	198	767		244	1015		224	343	292	490	624	
v/s Ratio Prot		0.38		c0.10	0.40			0.05		c0.11	0.09	
v/s Ratio Perm	0.14			c0.49			0.03		0.17	c0.20		
v/c Ratio	0.33	0.92		1.05	0.71		0.18	0.26	0.90	0.84	0.26	
Uniform Delay, d1	19.3	26.9		26.8	15.7		33.4	33.9	38.7	26.7	22.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.0	16.3		72.3	2.4		0.4	0.4	28.6	12.6	0.2	
Delay (s)	20.3	43.2		99.2	18.1		33.8	34.4	67.4	39.3	22.2	
Level of Service	C	D		F	B		C	C	E	D	C	
Approach Delay (s)		41.3			39.4			56.3			34.5	
Approach LOS		D			D			E			C	

Intersection Summary

HCM Average Control Delay	41.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	97.1	Sum of lost time (s)	7.0
Intersection Capacity Utilization	86.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

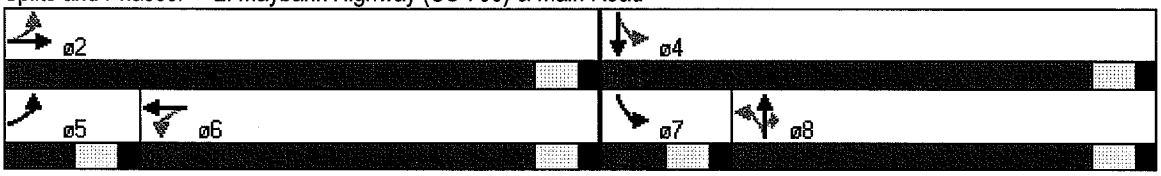
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	92	229	110	280	101	92	64	316	120	211	607	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	170		0	145		0	185		370	210		0
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (ft)	100		100	100		100	100		100	100		100
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.951			0.929				0.850		0.993	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1771	0	1770	1730	0	1770	1863	1583	1770	1850	0
Flt Permitted	0.490			0.538			0.152			0.296		
Satd. Flow (perm)	913	1771	0	1002	1730	0	283	1863	1583	551	1850	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		1276			4802			919			3477	
Travel Time (s)		19.3			72.8			13.9			52.7	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	102	254	122	311	112	102	71	351	133	234	674	33
Shared Lane Traffic (%)												
Lane Group Flow (vph)	102	376	0	311	214	0	71	351	133	234	707	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt			Perm			Perm		Perm	pm+pt		
Protected Phases	5	2			6			8		7	4	
Permitted Phases	2			6			8		8	4		
Detector Phase	5	2		6	6		8	8	8	7	4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	5.0	25.0		25.0	25.0		10.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	12.5	32.5		32.5	32.5		20.0	20.0	20.0	12.0	20.0	
Total Split (s)	12.5	54.5	0.0	42.0	42.0	0.0	39.0	39.0	39.0	12.0	51.0	0.0
Total Split (%)	11.8%	51.7%	0.0%	39.8%	39.8%	0.0%	37.0%	37.0%	37.0%	11.4%	48.3%	0.0%
Maximum Green (s)	6.5	48.5		36.0	36.0		33.0	33.0	33.0	6.0	45.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0	5.0	5.0	5.0	3.0
Lead/Lag	Lead			Lag	Lag		Lag	Lag	Lag	Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	4.0		4.0	4.0		4.0	4.0	4.0	3.0	4.0	
Recall Mode	None	Min		Min	Min		None	None	None	None	None	
Act Effct Green (s)	44.2	44.2		35.0	35.0		30.3	30.3	30.3	42.7	42.7	
Actuated g/C Ratio	0.45	0.45		0.36	0.36		0.31	0.31	0.31	0.44	0.44	
v/c Ratio	0.21	0.47		0.86	0.34		0.81	0.61	0.27	0.70	0.87	
Control Delay	16.9	20.8		55.9	26.5		90.2	34.4	28.1	33.6	39.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	16.9	20.8		55.9	26.5		90.2	34.4	28.1	33.6	39.3	
LOS	B	C		E	C		F	C	C	C	D	
Approach Delay		20.0			43.9			40.0			37.9	
Approach LOS		B			D			D			D	

Intersection Summary

Area Type: Other
Cycle Length: 105.5
Actuated Cycle Length: 97.3
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 36.2 — Intersection LOS: D
Intersection Capacity Utilization 100.4% — ICU Level of Service G
Analysis Period (min) 15

Splits and Phases: 2: Maybank Highway (SC 700) & Main Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	92	229	110	280	101	92	64	316	120	211	607	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.95		1.00	0.93		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1772		1770	1730		1770	1863	1583	1770	1850	
Flt Permitted	0.49	1.00		0.54	1.00		0.15	1.00	1.00	0.30	1.00	
Satd. Flow (perm)	913	1772		1003	1730		282	1863	1583	551	1850	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	102	254	122	311	112	102	71	351	133	234	674	33
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	102	376	0	311	214	0	71	351	133	234	707	0
Turn Type	pm+pt			Perm			Perm		Perm	pm+pt		
Protected Phases	5	2			6			8		7	4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	44.7	44.7		33.9	33.9		29.5	29.5	29.5	41.7	41.7	
Effective Green, g (s)	45.7	45.7		34.9	34.9		30.5	30.5	30.5	42.7	42.7	
Actuated g/C Ratio	0.46	0.46		0.35	0.35		0.31	0.31	0.31	0.43	0.43	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	4.0		4.0	4.0		4.0	4.0	4.0	3.0	4.0	
Lane Grp Cap (vph)	475	823		356	614		87	577	491	328	803	
v/s Ratio Prot	0.01	c0.21			0.12			0.19		0.05	c0.38	
v/s Ratio Perm	0.09			c0.31			0.25		0.08	0.26		
v/c Ratio	0.21	0.46		0.87	0.35		0.82	0.61	0.27	0.71	0.88	
Uniform Delay, d1	15.4	17.9		29.7	23.4		31.4	28.9	25.6	21.8	25.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	0.6		20.9	0.5		44.0	2.1	0.4	7.2	11.3	
Delay (s)	15.6	18.5		50.6	23.8		75.4	31.0	26.0	29.0	36.9	
Level of Service	B	B		D	C		E	C	C	C	D	
Approach Delay (s)		17.9			39.7			35.5			34.9	
Approach LOS		B			D			D			C	

Intersection Summary

HCM Average Control Delay	32.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	98.4	Sum of lost time (s)	15.0
Intersection Capacity Utilization	100.4%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

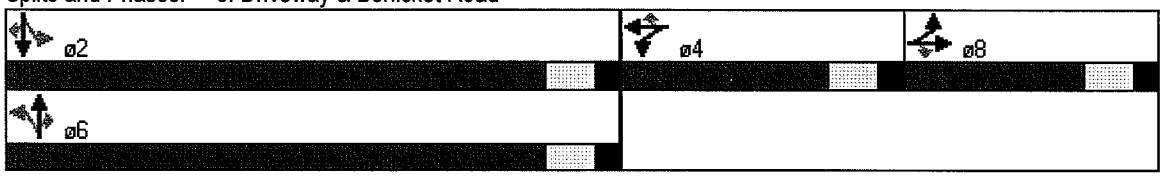
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	1	53	148	13	6	27	380	56	20	903	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	110		55	170		0	125		125
Storage Lanes	0		0	1		1	1		0	1		1
Taper Length (ft)	100		100	100		100	100		100	100		100
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected		0.968		0.950	0.960		0.950			0.950		
Satd. Flow (prot)	0	1803	1583	1681	1699	1583	1770	1863	1583	1770	3539	1583
Flt Permitted		0.968		0.950	0.960		0.218			0.446		
Satd. Flow (perm)	0	1803	1583	1681	1699	1583	406	1863	1583	831	3539	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		25			45			50			50	
Link Distance (ft)		482			1366			2983			2154	
Travel Time (s)		13.1			20.7			40.7			29.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	2	1	59	164	14	7	30	422	62	22	1003	73
Shared Lane Traffic (%)				46%								
Lane Group Flow (vph)	0	3	59	89	89	7	30	422	62	22	1003	73
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Split		Perm	Split		Perm	Perm		Perm	Perm		Perm
Protected Phases	8	8		4	4			6			2	
Permitted Phases			8			4	6		6	2		2
Detector Phase	8	8	8	4	4	4	6	6	6	2	2	2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	15.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0	21.7	21.7	21.7	21.7	21.7	21.7
Total Split (s)	20.0	20.0	20.0	22.0	22.0	22.0	48.0	48.0	48.0	48.0	48.0	48.0
Total Split (%)	22.2%	22.2%	22.2%	24.4%	24.4%	24.4%	53.3%	53.3%	53.3%	53.3%	53.3%	53.3%
Maximum Green (s)	14.0	14.0	14.0	16.0	16.0	16.0	42.0	42.0	42.0	42.0	42.0	42.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	Min	Min	Min	Min	Min	Min
Act Effct Green (s)		12.2	12.2	12.6	12.6	12.6	33.6	33.6	33.6	33.6	33.6	33.6
Actuated g/C Ratio		0.21	0.21	0.22	0.22	0.22	0.57	0.57	0.57	0.57	0.57	0.57
v/c Ratio		0.01	0.18	0.25	0.24	0.02	0.13	0.39	0.07	0.05	0.49	0.08
Control Delay		26.7	27.5	27.2	27.2	25.8	13.5	13.2	11.0	11.5	13.0	11.1
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		26.7	27.5	27.2	27.2	25.8	13.5	13.2	11.0	11.5	13.0	11.1
LOS		C	C	C	C	C	B	B	B	B	B	B
Approach Delay		27.4			27.1			13.0			12.9	
Approach LOS		C			C			B			B	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 58.5
Natural Cycle: 65
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.49
Intersection Signal Delay: 14.8 — Intersection LOS: B
Intersection Capacity Utilization 54.1% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Driveway & Bohicket Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	1	53	148	13	6	27	380	56	20	903	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1803	1583	1681	1698	1583	1770	1863	1583	1770	3539	1583
Flt Permitted		0.97	1.00	0.95	0.96	1.00	0.22	1.00	1.00	0.45	1.00	1.00
Satd. Flow (perm)		1803	1583	1681	1698	1583	405	1863	1583	831	3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	2	1	59	164	14	7	30	422	62	22	1003	73
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	3	59	89	89	7	30	422	62	22	1003	73
Turn Type	Split		Perm	Split		Perm	Perm		Perm	Perm		Perm
Protected Phases	8	8		4	4			6			2	
Permitted Phases			8			4	6		6	2		2
Actuated Green, G (s)		5.2	5.2	8.2	8.2	8.2	30.9	30.9	30.9	30.9	30.9	30.9
Effective Green, g (s)		6.2	6.2	9.2	9.2	9.2	31.9	31.9	31.9	31.9	31.9	31.9
Actuated g/C Ratio		0.10	0.10	0.15	0.15	0.15	0.51	0.51	0.51	0.51	0.51	0.51
Clearance Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		179	158	248	251	234	207	954	811	426	1812	811
v/s Ratio Prot		0.00		c0.05	0.05			0.23			c0.28	
v/s Ratio Perm			c0.04			0.00	0.07		0.04	0.03		0.05
v/c Ratio		0.02	0.37	0.36	0.35	0.03	0.14	0.44	0.08	0.05	0.55	0.09
Uniform Delay, d1		25.3	26.2	23.9	23.9	22.7	8.0	9.6	7.7	7.6	10.4	7.8
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.0	1.5	0.9	0.9	0.1	0.3	0.3	0.0	0.1	0.4	0.0
Delay (s)		25.3	27.7	24.8	24.7	22.8	8.3	9.9	7.8	7.7	10.7	7.8
Level of Service		C	C	C	C	C	A	A	A	A	B	A
Approach Delay (s)		27.6			24.7			9.6			10.5	
Approach LOS		C			C			A			B	

Intersection Summary

HCM Average Control Delay	12.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	62.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	61	7	68	177	3	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.986				0.872	
Flt Protected				0.986	0.998	
Satd. Flow (prot)	1837	0	0	1837	1621	0
Flt Permitted				0.986	0.998	
Satd. Flow (perm)	1837	0	0	1837	1621	0
Link Speed (mph)	45			45	45	
Link Distance (ft)	1366			1051	1134	
Travel Time (s)	20.7			15.9	17.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	68	8	76	197	3	57
Shared Lane Traffic (%)						
Lane Group Flow (vph)	76	0	0	273	60	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 29.7% ICU Level of Service A
Analysis Period (min) 15

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	61	7	68	177	3	51
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	68	8	76	197	3	57
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			76		419	72
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			76		419	72
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		99	94
cM capacity (veh/h)			1524		561	991

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	76	272	60
Volume Left	0	76	3
Volume Right	8	0	57
cSH	1700	1524	950
Volume to Capacity	0.04	0.05	0.06
Queue Length 95th (ft)	0	4	5
Control Delay (s)	0.0	2.4	9.0
Lane LOS		A	A
Approach Delay (s)	0.0	2.4	9.0
Approach LOS			A

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	29.7%	ICU Level of Service	A
Analysis Period (min)	15		

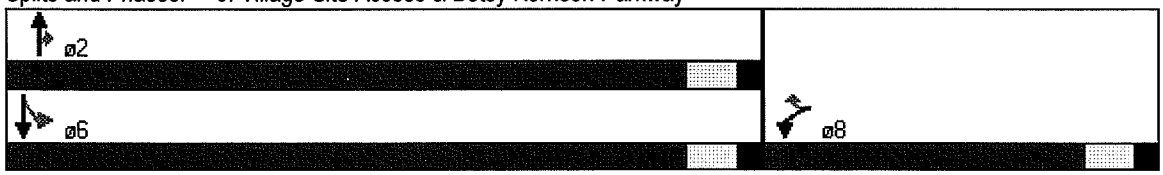
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	113	53	410	133	68	1038
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150	0		150	150	
Storage Lanes	1	1		1	1	
Taper Length (ft)	100	100		100	100	
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	3539	1583	1770	3539
Flt Permitted	0.950				0.489	
Satd. Flow (perm)	1770	1583	3539	1583	911	3539
Right Turn on Red		No		No		
Satd. Flow (RTOR)						
Link Speed (mph)	25		45			45
Link Distance (ft)	657		2050			2983
Travel Time (s)	17.9		31.1			45.2
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	126	59	456	148	76	1153
Shared Lane Traffic (%)						
Lane Group Flow (vph)	126	59	456	148	76	1153
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Number of Detectors	1	1	2	1	1	2
Detector Template	Left	Right	Thru	Right	Left	Thru
Leading Detector (ft)	20	20	100	20	20	100
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	20	6	20	20	6
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)			94			94
Detector 2 Size(ft)			6			6
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type		Perm		Perm	Perm	
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Switch Phase						
Minimum Initial (s)	12.0	12.0	12.0	12.0	8.0	8.0
Minimum Split (s)	27.0	27.0	27.0	27.0	20.0	20.0
Total Split (s)	31.0	31.0	59.0	59.0	59.0	59.0
Total Split (%)	34.4%	34.4%	65.6%	65.6%	65.6%	65.6%
Maximum Green (s)	25.0	25.0	53.0	53.0	53.0	53.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	Min	Min	Min	Min
Act Effct Green (s)	13.7	13.7	29.8	29.8	29.8	29.8
Actuated g/C Ratio	0.29	0.29	0.63	0.63	0.63	0.63
v/c Ratio	0.25	0.13	0.20	0.15	0.13	0.52
Control Delay	17.5	16.6	5.9	6.3	6.5	8.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.5	16.6	5.9	6.3	6.5	8.1
LOS	B	B	A	A	A	A
Approach Delay	17.2		6.0			8.0
Approach LOS	B		A			A

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 47.3
Natural Cycle: 55
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.52
Intersection Signal Delay: 8.2 — Intersection LOS: A
Intersection Capacity Utilization 47.0% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 5: Village Site Access & Betsy Kerrison Parkway



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	113	53	410	133	68	1038
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	3539	1583	1770	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.49	1.00
Satd. Flow (perm)	1770	1583	3539	1583	911	3539
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	126	59	456	148	76	1153
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	126	59	456	148	76	1153
Turn Type		Perm		Perm	Perm	
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Actuated Green, G (s)	9.2	9.2	27.4	27.4	27.4	27.4
Effective Green, g (s)	10.2	10.2	28.4	28.4	28.4	28.4
Actuated g/C Ratio	0.21	0.21	0.58	0.58	0.58	0.58
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	371	332	2068	925	532	2068
v/s Ratio Prot	c0.07		0.13			c0.33
v/s Ratio Perm		0.04		0.09	0.08	
v/c Ratio	0.34	0.18	0.22	0.16	0.14	0.56
Uniform Delay, d1	16.3	15.8	4.8	4.6	4.6	6.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	0.3	0.1	0.1	0.1	0.3
Delay (s)	16.9	16.0	4.9	4.7	4.7	6.6
Level of Service	B	B	A	A	A	A
Approach Delay (s)	16.6		4.8			6.4
Approach LOS	B		A			A

Intersection Summary

HCM Average Control Delay	6.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	48.6	Sum of lost time (s)	10.0
Intersection Capacity Utilization	47.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

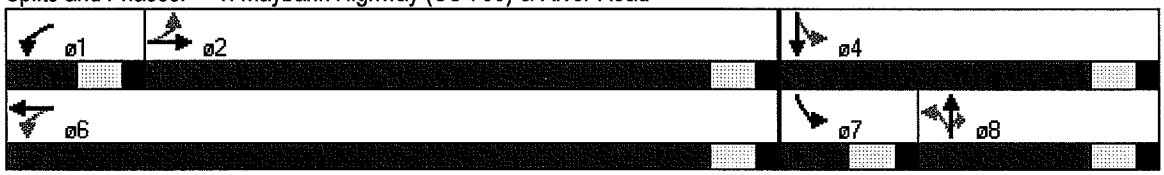
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	74	698	47	274	783	354	79	130	264	304	129	86
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	290		0	180		0	245		50	175		0
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (ft)	100		100	100		100	100		100	100		100
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.991			0.953				0.850		0.940	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1846	0	1770	1775	0	1770	1863	1583	1770	1751	0
Flt Permitted	0.080			0.093			0.610			0.466		
Satd. Flow (perm)	149	1846	0	173	1775	0	1136	1863	1583	868	1751	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		4802			2003			1572			3100	
Travel Time (s)		72.8			30.3			23.8			47.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	82	776	52	304	870	393	88	144	293	338	143	96
Shared Lane Traffic (%)												
Lane Group Flow (vph)	82	828	0	304	1263	0	88	144	293	338	239	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm			pm+pt			Perm		Perm	pm+pt		
Protected Phases		2		1	6			8		7	4	
Permitted Phases	2			6			8		8	4		
Detector Phase	2	2		1	6		8	8	8	7	4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	12.0	12.0		5.0	12.0		5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	20.0	20.0		12.0	20.0		20.0	20.0	20.0	12.0	20.0	
Total Split (s)	55.0	55.0	0.0	12.0	67.0	0.0	21.0	21.0	21.0	12.0	33.0	0.0
Total Split (%)	55.0%	55.0%	0.0%	12.0%	67.0%	0.0%	21.0%	21.0%	21.0%	12.0%	33.0%	0.0%
Maximum Green (s)	49.0	49.0		6.0	61.0		15.0	15.0	15.0	6.0	27.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-3.0	-3.0	-3.0	-1.0	-1.0	-1.0	-2.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	3.0	3.0	3.0	1.0	5.0	5.0	5.0	4.0	5.0	3.0
Lead/Lag	Lag	Lag		Lead			Lag	Lag	Lag	Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None		None	None		Min	Min	Min	None	None	
Act Effct Green (s)	50.0	50.0		64.0	64.0		16.0	16.0	16.0	29.0	28.0	
Actuated g/C Ratio	0.50	0.50		0.64	0.64		0.16	0.16	0.16	0.29	0.28	
v/c Ratio	1.09	0.90		1.20	1.11		0.48	0.48	1.16	1.04	0.49	
Control Delay	163.0	37.1		143.2	83.3		48.2	44.4	145.3	96.3	34.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	163.0	37.1		143.2	83.3		48.2	44.4	145.3	96.3	34.1	
LOS	F	D		F	F		D	D	F	F	C	
Approach Delay		48.5			94.9			101.3			70.5	
Approach LOS		D			F			F			E	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Natural Cycle: 120
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.20
Intersection Signal Delay: 80.1 Intersection LOS: F
Intersection Capacity Utilization 111.5% ICU Level of Service H
Analysis Period (min) 15

Splits and Phases: 1: Maybank Highway (SC 700) & River Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	74	698	47	274	783	354	79	130	264	304	129	86
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		3.0	3.0		5.0	5.0	5.0	4.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.99		1.00	0.95		1.00	1.00	0.85	1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1845		1770	1776		1770	1863	1583	1770	1751	
Flt Permitted	0.08	1.00		0.09	1.00		0.61	1.00	1.00	0.47	1.00	
Satd. Flow (perm)	149	1845		173	1776		1136	1863	1583	867	1751	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	82	776	52	304	870	393	88	144	293	338	143	96
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	82	828	0	304	1263	0	88	144	293	338	239	0
Turn Type	Perm			pm+pt			Perm		Perm	pm+pt		
Protected Phases		2		1	6			8		7	4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	49.0	49.0		61.0	61.0		15.0	15.0	15.0	27.0	27.0	
Effective Green, g (s)	50.0	50.0		64.0	64.0		16.0	16.0	16.0	29.0	28.0	
Actuated g/C Ratio	0.50	0.50		0.64	0.64		0.16	0.16	0.16	0.29	0.28	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	75	923		254	1137		182	298	253	324	490	
v/s Ratio Prot		0.45		c0.11	0.71			0.08		c0.08	0.14	
v/s Ratio Perm	0.55			c0.66			0.08		0.19	c0.22		
v/c Ratio	1.09	0.90		1.20	1.11		0.48	0.48	1.16	1.04	0.49	
Uniform Delay, d1	25.0	22.7		27.7	18.0		38.2	38.2	42.0	34.9	30.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	131.7	11.3		120.3	62.5		2.0	1.2	106.1	61.7	0.8	
Delay (s)	156.7	33.9		148.0	80.5		40.3	39.5	148.1	96.7	30.8	
Level of Service	F	C		F	F		D	D	F	F	C	
Approach Delay (s)		45.0			93.6			100.2			69.4	
Approach LOS		D			F			F			E	

Intersection Summary

HCM Average Control Delay	78.3	HCM Level of Service	E
HCM Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	111.5%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

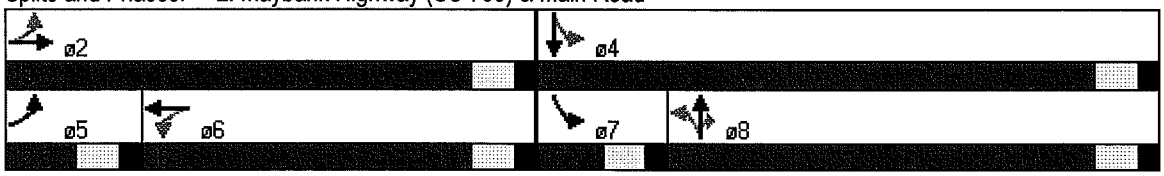
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	147	60	225	186	211	83	624	201	147	369	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	170		0	145		0	185		370	210		0
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (ft)	100		100	100		100	100		100	100		100
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.956			0.920				0.850		0.994	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1781	0	1770	1714	0	1770	1863	1583	1770	1852	0
Flt Permitted	0.163			0.615			0.514			0.089		
Satd. Flow (perm)	304	1781	0	1146	1714	0	957	1863	1583	166	1852	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		1276			4802			2503			3477	
Travel Time (s)		19.3			72.8			37.9			52.7	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	94	163	67	250	207	234	92	693	223	163	410	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	94	230	0	250	441	0	92	693	223	163	427	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt			Perm			Perm		Perm	pm+pt		
Protected Phases	5	2			6			8		7	4	
Permitted Phases	2			6			8		8	4		
Detector Phase	5	2		6	6		8	8	8	7	4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	5.0	25.0		25.0	25.0		10.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	12.5	32.5		32.5	32.5		20.0	20.0	20.0	12.0	20.0	
Total Split (s)	12.5	48.5	0.0	36.0	36.0	0.0	45.0	45.0	45.0	12.0	57.0	0.0
Total Split (%)	11.8%	46.0%	0.0%	34.1%	34.1%	0.0%	42.7%	42.7%	42.7%	11.4%	54.0%	0.0%
Maximum Green (s)	6.5	42.5		30.0	30.0		39.0	39.0	39.0	6.0	51.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0	5.0	5.0	5.0	3.0
Lead/Lag	Lead			Lag	Lag		Lag	Lag	Lag	Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	4.0		4.0	4.0		4.0	4.0	4.0	3.0	4.0	
Recall Mode	None	Min		Min	Min		None	None	None	None	None	
Act Effct Green (s)	39.7	39.7		30.0	30.0		40.1	40.1	40.1	52.2	52.2	
Actuated g/C Ratio	0.39	0.39		0.29	0.29		0.39	0.39	0.39	0.51	0.51	
v/c Ratio	0.42	0.33		0.74	0.87		0.24	0.95	0.36	0.83	0.45	
Control Delay	25.2	22.9		48.1	54.3		24.6	54.5	25.1	53.3	18.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	25.2	22.9		48.1	54.3		24.6	54.5	25.1	53.3	18.7	
LOS	C	C		D	D		C	D	C	D	B	
Approach Delay		23.6			52.1			45.3			28.3	
Approach LOS		C			D			D			C	

Intersection Summary

Area Type: Other
Cycle Length: 105.5
Actuated Cycle Length: 101.9
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.95
Intersection Signal Delay: 40.6 — Intersection LOS: D
Intersection Capacity Utilization 99.3% — ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 2: Maybank Highway (SC 700) & Main Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	147	60	225	186	211	83	624	201	147	369	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	0.92		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1781		1770	1714		1770	1863	1583	1770	1852	
Flt Permitted	0.16	1.00		0.62	1.00		0.51	1.00	1.00	0.09	1.00	
Satd. Flow (perm)	304	1781		1146	1714		957	1863	1583	165	1852	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	94	163	67	250	207	234	92	693	223	163	410	17
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	94	230	0	250	441	0	92	693	223	163	427	0
Turn Type	pm+pt			Perm			Perm		Perm	pm+pt		
Protected Phases	5	2			6			8		7	4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	40.0	40.0		29.0	29.0		39.1	39.1	39.1	51.1	51.1	
Effective Green, g (s)	41.0	41.0		30.0	30.0		40.1	40.1	40.1	52.1	52.1	
Actuated g/C Ratio	0.40	0.40		0.29	0.29		0.39	0.39	0.39	0.51	0.51	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	4.0		4.0	4.0		4.0	4.0	4.0	3.0	4.0	
Lane Grp Cap (vph)	206	708		333	499		372	725	616	192	936	
v/s Ratio Prot	c0.03	0.13			c0.26			c0.37		c0.06	0.23	
v/s Ratio Perm	0.15			0.22			0.10		0.14	0.37		
v/c Ratio	0.46	0.32		0.75	0.88		0.25	0.96	0.36	0.85	0.46	
Uniform Delay, d1	22.8	21.5		33.2	34.9		21.3	30.6	22.4	22.5	16.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.6	0.4		9.7	17.2		0.5	23.1	0.5	27.8	0.5	
Delay (s)	24.4	21.8		42.9	52.1		21.8	53.8	22.9	50.3	16.9	
Level of Service	C	C		D	D		C	D	C	D	B	
Approach Delay (s)		22.6			48.7			44.0			26.1	
Approach LOS		C			D			D			C	

Intersection Summary

HCM Average Control Delay	38.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	103.1	Sum of lost time (s)	20.0
Intersection Capacity Utilization	99.3%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

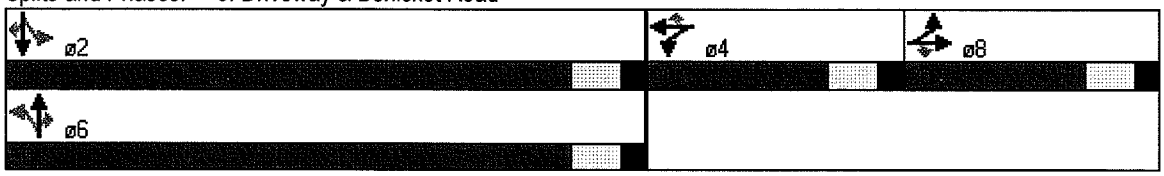
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	47	7	45	84	5	17	43	912	166	18	431	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	110		55	170		0	125		125
Storage Lanes	0		0	1		1	1		0	1		1
Taper Length (ft)	100		100	100		100	100		100	100		100
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected		0.958		0.950	0.958		0.950			0.950		
Satd. Flow (prot)	0	1785	1583	1681	1695	1583	1770	1863	1583	1770	3539	1583
Flt Permitted		0.958		0.950	0.958		0.475			0.082		
Satd. Flow (perm)	0	1785	1583	1681	1695	1583	885	1863	1583	153	3539	1583
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		25			45			50			50	
Link Distance (ft)		482			1366			3001			2154	
Travel Time (s)		13.1			20.7			40.9			29.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	52	8	50	93	6	19	48	1013	184	20	479	19
Shared Lane Traffic (%)				47%								
Lane Group Flow (vph)	0	60	50	49	50	19	48	1013	184	20	479	19
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Right	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Split		Perm	Split		Perm	Perm		Perm	Perm		Perm
Protected Phases	8	8		4	4			6			2	
Permitted Phases			8			4	6		6	2		2
Detector Phase	8	8	8	4	4	4	6	6	6	2	2	2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	15.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0	21.7	21.7	21.7	21.7	21.7	21.7
Total Split (s)	20.0	20.0	20.0	20.0	20.0	20.0	50.0	50.0	50.0	50.0	50.0	50.0
Total Split (%)	22.2%	22.2%	22.2%	22.2%	22.2%	22.2%	55.6%	55.6%	55.6%	55.6%	55.6%	55.6%
Maximum Green (s)	14.0	14.0	14.0	14.0	14.0	14.0	44.0	44.0	44.0	44.0	44.0	44.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	Min	Min	Min	Min	Min	Min
Act Effct Green (s)		11.3	11.3	11.2	11.2	11.2	50.3	50.3	50.3	50.3	50.3	50.3
Actuated g/C Ratio		0.14	0.14	0.14	0.14	0.14	0.64	0.64	0.64	0.64	0.64	0.64
v/c Ratio		0.24	0.22	0.21	0.21	0.08	0.09	0.85	0.18	0.21	0.21	0.02
Control Delay		34.5	34.6	34.3	34.3	32.4	9.7	26.6	9.8	17.0	9.1	8.9
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		34.5	34.6	34.3	34.3	32.4	9.7	26.6	9.8	17.0	9.1	8.9
LOS		C	C	C	C	C	A	C	A	B	A	A
Approach Delay		34.5			34.0			23.5			9.4	
Approach LOS		C			C			C			A	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 78.9
Natural Cycle: 100
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 21.1 Intersection LOS: C
Intersection Capacity Utilization 77.2% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 3: Driveway & Bohicket Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	47	7	45	84	5	17	43	912	166	18	431	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1785	1583	1681	1695	1583	1770	1863	1583	1770	3539	1583
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.48	1.00	1.00	0.08	1.00	1.00
Satd. Flow (perm)		1785	1583	1681	1695	1583	885	1863	1583	152	3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	52	8	50	93	6	19	48	1013	184	20	479	19
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	60	50	49	50	19	48	1013	184	20	479	19
Turn Type	Split		Perm	Split		Perm	Perm		Perm	Perm		Perm
Protected Phases	8	8		4	4			6			2	
Permitted Phases			8			4	6		6	2		2
Actuated Green, G (s)		7.9	7.9	7.8	7.8	7.8	48.0	48.0	48.0	48.0	48.0	48.0
Effective Green, g (s)		8.9	8.9	8.8	8.8	8.8	49.0	49.0	49.0	49.0	49.0	49.0
Actuated g/C Ratio		0.11	0.11	0.11	0.11	0.11	0.60	0.60	0.60	0.60	0.60	0.60
Clearance Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		194	172	181	183	171	531	1117	949	91	2123	949
v/s Ratio Prot		c0.03		0.03	c0.03			c0.54			0.14	
v/s Ratio Perm			0.03			0.01	0.05		0.12	0.13		0.01
v/c Ratio		0.31	0.29	0.27	0.27	0.11	0.09	0.91	0.19	0.22	0.23	0.02
Uniform Delay, d1		33.6	33.5	33.5	33.5	32.9	6.9	14.3	7.4	7.5	7.6	6.6
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.9	0.9	0.8	0.8	0.3	0.1	10.5	0.1	1.2	0.1	0.0
Delay (s)		34.5	34.4	34.3	34.3	33.2	7.0	24.9	7.5	8.8	7.6	6.6
Level of Service		C	C	C	C	C	A	C	A	A	A	A
Approach Delay (s)		34.5			34.1			21.6			7.6	
Approach LOS		C			C			C			A	

Intersection Summary

HCM Average Control Delay	19.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	81.7	Sum of lost time (s)	15.0
Intersection Capacity Utilization	77.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	199	6	71	104	2	59
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.996				0.869	
Flt Protected				0.980	0.999	
Satd. Flow (prot)	1855	0	0	1825	1617	0
Flt Permitted				0.980	0.999	
Satd. Flow (perm)	1855	0	0	1825	1617	0
Link Speed (mph)	45			45	45	
Link Distance (ft)	1366			1051	1134	
Travel Time (s)	20.7			15.9	17.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	221	7	79	116	2	66
Shared Lane Traffic (%)						
Lane Group Flow (vph)	228	0	0	195	68	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 34.0% ICU Level of Service A
Analysis Period (min) 15

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	199	6	71	104	2	59
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	221	7	79	116	2	66
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			228		498	224
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			228		498	224
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		100	92
cM capacity (veh/h)			1340		501	815

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	228	194	68
Volume Left	0	79	2
Volume Right	7	0	66
cSH	1700	1340	799
Volume to Capacity	0.13	0.06	0.08
Queue Length 95th (ft)	0	5	7
Control Delay (s)	0.0	3.5	9.9
Lane LOS		A	A
Approach Delay (s)	0.0	3.5	9.9
Approach LOS			A

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	34.0%	ICU Level of Service	A
Analysis Period (min)	15		

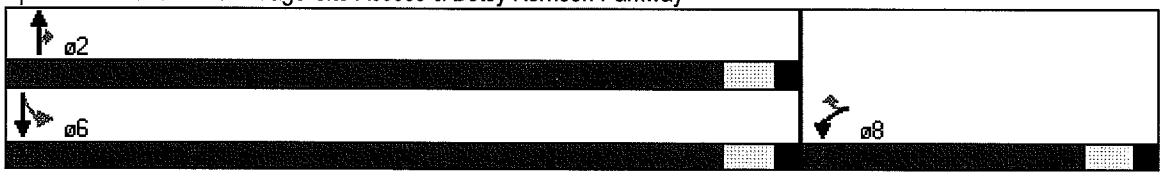
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	154	122	1003	202	92	468
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150	0		150	150	
Storage Lanes	1	1		1	1	
Taper Length (ft)	100	100		100	100	
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	3539	1583	1770	3539
Flt Permitted	0.950				0.194	
Satd. Flow (perm)	1770	1583	3539	1583	361	3539
Right Turn on Red		No		No		
Satd. Flow (RTOR)						
Link Speed (mph)	25		45			45
Link Distance (ft)	657		2529			3001
Travel Time (s)	17.9		38.3			45.5
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	171	136	1114	224	102	520
Shared Lane Traffic (%)						
Lane Group Flow (vph)	171	136	1114	224	102	520
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Number of Detectors	1	1	2	1	1	2
Detector Template	Left	Right	Thru	Right	Left	Thru
Leading Detector (ft)	20	20	100	20	20	100
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	20	6	20	20	6
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)			94			94
Detector 2 Size(ft)			6			6
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type		Perm		Perm	Perm	
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Detector Phase	8	8	2	2	6	6

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Switch Phase						
Minimum Initial (s)	12.0	12.0	12.0	12.0	8.0	8.0
Minimum Split (s)	27.0	27.0	27.0	27.0	20.0	20.0
Total Split (s)	28.0	28.0	62.0	62.0	62.0	62.0
Total Split (%)	31.1%	31.1%	68.9%	68.9%	68.9%	68.9%
Maximum Green (s)	22.0	22.0	56.0	56.0	56.0	56.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	Min	Min	Min	Min
Act Effct Green (s)	13.8	13.8	27.2	27.2	27.2	27.2
Actuated g/C Ratio	0.27	0.27	0.53	0.53	0.53	0.53
v/c Ratio	0.36	0.32	0.59	0.27	0.53	0.28
Control Delay	19.4	19.3	9.6	7.3	19.7	6.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.4	19.3	9.6	7.3	19.7	6.9
LOS	B	B	A	A	B	A
Approach Delay	19.4		9.2			9.0
Approach LOS	B		A			A

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 51.2
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.59
Intersection Signal Delay: 10.5 Intersection LOS: B
Intersection Capacity Utilization 56.9% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 5: Village Site Access & Betsy Kerrison Parkway



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	154	122	1003	202	92	468
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	3539	1583	1770	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.19	1.00
Satd. Flow (perm)	1770	1583	3539	1583	362	3539
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	171	136	1114	224	102	520
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	171	136	1114	224	102	520
Turn Type		Perm		Perm	Perm	
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Actuated Green, G (s)	12.8	12.8	26.1	26.1	26.1	26.1
Effective Green, g (s)	13.8	13.8	27.1	27.1	27.1	27.1
Actuated g/C Ratio	0.27	0.27	0.53	0.53	0.53	0.53
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	480	429	1884	843	193	1884
v/s Ratio Prot	c0.10		c0.31			0.15
v/s Ratio Perm		0.09		0.14	0.28	
v/c Ratio	0.36	0.32	0.59	0.27	0.53	0.28
Uniform Delay, d1	15.0	14.8	8.1	6.5	7.7	6.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	0.4	0.5	0.2	2.6	0.1
Delay (s)	15.4	15.2	8.6	6.7	10.3	6.6
Level of Service	B	B	A	A	B	A
Approach Delay (s)	15.3		8.3			7.2
Approach LOS	B		A			A

Intersection Summary

HCM Average Control Delay	9.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	50.9	Sum of lost time (s)	10.0
Intersection Capacity Utilization	56.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Land Use Equivalency Matrix
Kiawah River Plantation - Full Buildout

		TO					
		Single Fam Home	Rec Home	Apartments	Hotel	Comm	Golf Course
FROM	ITE Code	(DU)	(DU)	(DU)	(Rooms)	(KSF)	(Holes)
Single Family Detached Home	210	1.00	3.68	1.38	1.62	0.11	0.34
Recreational Homes	260	0.27	1.00	0.37	0.44	0.03	0.09
Apartments	220	0.72	2.67	1.00	1.17	0.08	0.25
Hotel	310	0.62	2.28	0.85	1.00	0.07	0.21
Commercial	820	8.88	32.68	12.25	14.35	1.00	3.06
Golf Course	430	2.91	10.70	4.01	4.70	0.33	1.00

Land Use	Unit Size	Units	PM Peak Hr. Trips	Rate
Single Family Detached Home	1	DUs	305	0.96 trips/DU (based on 319 DU)
Recreational Homes	1	DUs	248	0.26 trips/DU (based on 955 DU)
Apartments	1	DUs	88	0.69 trips/DU (based on 127 DU)
Hotel	1	Rooms	207	0.59 trips/Room (based on 350 Rooms)
Commercial	1	KSF	679	8.49 trips/KSF (based on 80 KSF)
Golf Course	1	Holes	50	2.78 trips/Hole (based on 18 Holes)

Full Buildout Devm't Program	
319	DUs
955	DUs
127	DUs
350	Rooms
80	KSF
18	Holes

Example Application of Equivalency Matrix

30 KSF Commercial = 30 KSF commercial x 12.25 DU/commerical KSF= 368 apartment units OR
= 30 KSF commercial x 8.88 DU/commercial KSF= 266 single family homes

Kubilins TRANSPORTATION GROUP, INC.

Prepared by Kubilins Transportation Group, Inc
8-Dec-08

SCDOT
South Carolina
Department of Transportation

March 13, 2009

Mr. Kevin O'Neill
The Beach Company
PO Box 242
Charleston, SC 29401

RE: Kiawah River Plantation Development on Betsy Kerrison Parkway (S-10-20)

Dear Mr. O'Neill:

This letter is to inform you that we have reviewed the preliminary submittal for the above project and the SCDOT has determined the proposed plan to be feasible in scope. SCDOT looks favorably on a design that allows for connections to/from adjacent properties as well as a potential ingress/egress on Mullet Hall Rd. (S-10- 2146). Please note that improvements may be deemed necessary to Mullet Hall Rd. due to the potential increase in traffic loads.

Please be aware that a full review has not been performed nor has an SCDOT Encroachment Permit been approved. Also, please note that only the southbound side of Betsy Kerrison Parkway is owned and maintained by the Department. The northbound side from Kiawah/Seabrook to River Road is owned and maintained by Charleston County and subject to review through the Charleston County Planning Office. When the plans for this development are finalized, please submit (2) full size sets and (1) half-size set for a full review by the Department.

If you have any questions or concerns, please contact me at (843) 740-1655.

Respectfully,

Marcie S. Timmons

Marcie Timmons, EIT
Assistant Resident Maintenance Engineer
Permit Coordinator

Charleston Maintenance
3401 Maintenance Way
North Charleston, South Carolina 29406

Phone: (843) 740-1655
Fax: (843) 740-1648

South Carolina
Department of Transportation

Beaufort County
Berkeley County
Charleston County
Colleton County
Dorchester County
Jasper County

February 5, 2009

Mr. Kevin O'Neill
The Beach Company
PO Box 242
Charleston, South Carolina 29401

Re: S-10-20 – Betsy Kerrison Parkway – Kiawah River Plantation - Draft Traffic Impact Analysis

Dear Mr. O'Neill:

Thank you for recently providing us with a copy of the draft traffic impact study for the future development known at the Kiawah River Plantation. I have reviewed the study and have the following comments.

The study recommends that both right and left auxiliary turn lanes be constructed on Betsy Kerrison Parkway. Please note that only the southbound side of Betsy Kerrison Parkway is owned and maintained by the State. The northbound side from Kiawah/Seabrook to River Road is owned and maintained by Charleston County. You will most likely be required to obtain an encroachment permit from the County as well as the State for this project.

It is unclear exactly where the new road will connect with Betsy Kerrison Parkway. It is assumed the intent is to use the existing median cut located about 400' south of the median cut at Holy Spirit Catholic Church. The study states that signalization may be warranted at this location in the future. When and if the SCDOT authorizes a signal at this location, all costs associated with the design, equipment, and construction of the signal will be the responsibility of the developer.

The study does not recommend any geometric improvements to the River Road and Mullet Hall Road intersection as a result of this development. It is recommended that the SCDOT Charleston maintenance office review the existing condition of Mullet Hall Road and determine if any improvements due to the increased traffic loads might be required.

As you have plans developed please feel free to send them to me for preliminary review. If you have any questions, please call me at 843-740-1667 ext 118.

Sincerely,

D. Mark Nesbit, P.E.
District Traffic Engineer

DMN:nsr
cc: Richard Turner, Resident Maintenance Engineer
Jim Neal, Charleston County Public Works Director
File: D6/Charleston/NSR

District Six Engineering
6355 Fain Boulevard
North Charleston, SC 29406-4889

Phone: (843) 740-1665
Fax: (843) 740-1660

BCDCOG Berkeley-Charleston-Dorchester Council of Governments

CHAIRMAN: R. Keith Summey · VICE CHAIRMAN: Larry Hargett · SECRETARY: Michael J. Heitzler · TREASURER: Mary R. Miller · EXECUTIVE DIRECTOR: Ronald E. Mitchum

July 21, 2009

Mr. Dan Pennick , Planning Director
Charleston County
4045 Bridgeview Drive
Charleston, SC 29405

Re: Kiawah River Plantation, John's Island, Charleston County, SC
TMS# 212-00-00-001
Letter of Coordination

Dear Dan:

We are aware that The Beach Company proposes to develop a 2003 acre property on John's Island, Charleston County, as a new mixed use community to be known as Kiawah River Plantation. We are also aware that The Beach Company is working to identify an acceptable mechanism for providing wastewater treatment for the development.

In this respect, we confirm that the Berkeley-Charleston-Dorchester Council of Governments (BCDCOG) has met with Thomas and Hutton and members of The Beach Company regarding the development of a wastewater treatment facility. Further, we are currently reviewing a draft policy on privately owned wastewater treatment facilities that was prepared by Thomas and Hutton -- "Special Requirements for Privately Owned Facilities."The document sets out requirements for approval of private utilities as well as specific criteria for their management, operation, maintenance and financial guarantees. It is my intent to discuss this issue at our next Committee meeting currently scheduled for August 11th.

The Beach Company has continued to coordinate with BCDCOG regarding the proposed Kiawah River Plantation community. The BCDCOG is committed to working with The Beach Company to find an acceptable wastewater treatment solution for the project. Therefore, the BCDCOG would encourage Charleston County to proceed with the review of the proposed development agreement.

Sincerely,

Ronald E. Mitchum
Executive Director

1362 McMillan Avenue, Suite 100 • North Charleston, SC 29405
Tel: (843) 529-0400 • Fax: (843) 529-0305
www.bcdcog.com

ST. JOHN'S WATER COMPANY, INC.
Post Office Box 629
John's Island, South Carolina 29457-0629
(843) 559-0186

Original: August 13, 2008
Reissued: May 6, 2009

Ms. Ashley Hamlett
Thomas & Hutton Engineering
935 Houston Northcutt Boulevard
Mt. Pleasant, SC 29464

Re: Kiawah River Plantation at TMS Number 212-00-00-001
Water Availability and Willingness to Serve Letter
Letter of Coordination

Dear Ms. Hamlett:

This letter is to confirm that Kiawah River Plantation at TMS number 212-00-00-001 proposing to develop approximately 1,554 residential units, 275 inn rooms, 50 cottages, and 150,000 square feet of commercial units off Mullet Hall Road and Betsy Kerrison Parkway on Johns Island are within the water service area of the St. John's Water Company, Inc. (SJWC). SJWC does have water available from an existing 24-inch water line located on Betsy Kerrison Parkway and a 6-inch water line located on Mullet Hall Road. Our system is SC DHEC approved and we have the capacity and willingness to provide potable water service to the above referenced development.

If you have any questions, please feel free to give me a call.

Sincerely,

Colleen Schild

Colleen Schild
Assistant Manager/Engineer

Suburban Disposal Service, Inc.

150 Suburban Lane • P.O. Box 2748 • Summerville, SC 29484 • Telephone: (843) 873-4810 • Fax: (843) 873-2173

April 23, 2009

To Whom It May Concern:

Suburban Disposal is able to service this property (TMS#212-00-00-001), once it is developed. We would service this area for household waste removal. If you have further questions please feel free to contact me directly.

Sincerely,

Laura Joyner
Suburban Disposal Service
843-285-2784 office
843-873-2173 fax

Charleston County SCHOOL DISTRICT

May 22, 2009

Ms. Ashley Hamlett
Thomas & Hutton Engineering Co.
965 Houston Northcutt Boulevard
Mount Pleasant, South Carolina 29465-1522

Dear Ms. Hamlett:

This is an updated response to your letter of August 7, 2008 which proposes to develop approximately 1624 residences off Betsy Kerrison Parkway, John's Island. Mt. Zion Elementary, Haut Gap Middle and St. John's High School will serve this site. All the above schools currently have capacity on site to serve students in their attendance zones; however there are mobile classrooms currently at Mt. Zion. This letter will serve as your "Proof of Coordination" letter to meet County of Charleston requirements.

This District is required by state law to provide educational services to all county residents without regard to potential impact from future development. Therefore, public educational services at the above listed schools will be provided to residents who will reside in the new development.

Please call me if you need additional information.

Sincerely,

Terri H. Nichols
Associate Superintendent

TN/ggh

c: Dr. Nancy McGinley
Dr. J. Douglas Gepford
Mr. Ralph Watkins
Mr. Bill Lewis

J. Al Cannon, Jr., Esq.
Sheriff, Charleston County

3505 Pinehaven Drive
Charleston Heights, SC 29405-7789

June 1, 2009

Thomas & Hutton Engineering Co.
935 Houston Northcutt Boulevard
P.O. Box 1522
Mt. Pleasant, SC 29465

RE: Letter of Coordination
Kiawah River Plantation
TMS #212-00-00-001

Dear Ms. Hamlett:

I have reviewed the proposed development for the 2,000.3 acre Planned Development District "Kiawah River Plantation" proposed by Thomas and Hutton Engineering Company.

It has been our experience that thefts and vandalism would impact the agency during the construction phase. Additionally, trucks, supplies and other large equipment would impact traffic on River and Bohicket Roads. The roads in the area are rural and two-lane, and are easily adversely affected by delays and obstructions.

Once the project is completed, burglaries, larcenies and other calls for service can be anticipated. Additionally, complaints regarding speeding and stop signs can also be anticipated, and may require the application of Selective Traffic Enforcement. The presence or absence of a gate will not have a great impact on operations. If an unmanned gate is planned, the Sheriff's Office should be provided with access cards or codes. Golf carts may be operated on right of-ways in compliance with South Carolina Code, Section 56-3-115, which requires a licensed driver, and a permit from the Department of Motor Vehicles, as well as proof of financial responsibility. Operation is restricted to daylight hours.

While response times may not be significantly affected, the proposed district is located within a large response area, with patrol units being responsible for all 75,000 acres. Due to the extensive response area, Kiawah contracts for full time law enforcement presence on the island. If you have any further questions feel free to contact me for any further information you may need.

Best wishes for success.
Sincerely,

Major Tom Horan
Operations
Charleston County Sheriff's Office
(843) 554-2449/ (843) 308-7354

ST. JOHN'S FIRE DISTRICT

P.O. BOX 56
JOHNS ISLAND, S.C. 29457
PHONE: (843) 559-9194
FAX: (843) 559-3687

KARL E. RISTOW, Fire Chief

1 Jun 2009

Ms. Ashley Hamlett
Permit Coordinator
Thomas & Hutton Engineering Co.
935 Houston Northcutt Blvd.
Mt. Pleasant, SC 29464

Re: Letter of Coordination

Dear Ms. Hamlett:

Thank you for giving St. Johns Fire District the opportunity to serve you. I have reviewed your proposal for a new development of single family dwellings, TMS Nos. 212-00-00-001 off of Mullet Hall Rd on Johns Island. All proposed family single dwellings shall be constructed in accordance with the International Residential Code, 2003 Edition and planned development shall be constructed in accordance with NFPA 1141, Standard for Fire Protection on Infrastructure and Land Development in Suburban and Rural Areas, 2008 Edition. Additionally, adequate fire flow (available water supply for structure firefighting) shall be required from the established water supply to ratify size and access to any prospective commercial or residential structures.

If you require any additional assistance regarding this issue or any further explanation regarding these requirements, please contact the St. Johns Fire Prevention Division.

Sincerely,

C.W. Waffington
Chief Fire Inspector

c.c. Karl E. Ristow
Chief of Department

Captain Cliff Parker
EMS Safety Office
cparker@charlestoncounty.org

Lonnie Hamilton, III Public Services Building
Office: 843.202.671
Fax: 843.202.671
4045 Bridge View Drive
North Charleston, SC 29405-746

EMERGENCY SERVICES

22 April, 2009

Ms. Ashley Hamlett;
Thomas & Hutton Engineering Co.
935 Houston Northcutt Blvd.
Mount Pleasant, SC 29464-3448
(843) 725-5324
(843) 849-0203 Fax
Hamlett.a@thomas-hutton.com

Proof of Coordination Letter
Kiawah River Plantation project
Mullet Hall Road, Johns Island, SC

Dear Ms. Hamlett;

Charleston County Emergency Medical Service (EMS) has the responsibility for providing 911 emergency medical responses to the Kiawah River Plantation project area, off Mullet Hall Road, Johns Island, SC.

Charleston County EMS is a 24 hour/day, 7 day/week operation, always ready to respond to the emergency medical needs of the citizens and guests of Charleston County.

There are two EMS stations located on Johns Island. One is located at 1527 Main Rd., near St. Johns High School, and the other located at 4305 Bohicket Rd., near the entrance to Kiawah River Estates.

Additionally, Charleston County EMS has a long standing *Medical First Responder* program relationship with both the City of Charleston Fire Department and the St. Johns Fire-Rescue Department. Both departments have trained emergency medical personnel who respond to assist at the request of EMS.

An emergency response for medical care by Charleston County EMS can be activated by dialing "911" from the project location on Mullet Hall Road.

If we can be of further assistance, please do not hesitate to call.

Sincerely.

Cliff Parker
Captain

BERKELEY
ELECTRIC COOPERATIVE, INC.

Your Touchstone Energy® Partner

June 1, 2009

Thomas & Hutton Engineering Co.
C/o: Ashley Hamlett
935 Houston Northcutt Blvd.
Mt. Pleasant, SC 29464

RE: Power Availability – Kiawah River Plantation – Charleston County
TMS #: 212-00-00-001

Dear Ashley:

Berkeley Electric Cooperative, Inc. is willing and able to provide the electric energy requirements to the above referenced project.

Berkeley Electric will supply electrical service to the development. A Contribution in Aid of Construction will be required. A written utility agreement must be entered into by the developer and Berkeley Electric Cooperative, Inc. Service will be governed by our Service Rules and Regulations. All services provided will be extended as outlined in our Service Rules and Regulations, which are in effect at the time of service rendered. Enclosed is a copy of our Service Rules and Regulations.

If you have any questions, please don't hesitate to give me a call.

Sincerely,

Richard L. Walker/lc
Richard L. Walker
Superintendent of Field Engineering

c: Timothy Mobley

RLW/lc

Encl.

Post Office Box 1234
Moncks Corner, SC 29461
(843) 761-8200
(843) 825-3383
Fax (843) 572-1280

Post Office Box 128
Johns Island, SC 29457
(843) 559-2458
Fax (843) 559-3876

Post Office Box 1549
Goose Creek, SC 29445
(843) 553-5020
Fax (843) 553-6761

3745 N. Highway 17
Awendaw, SC 29429
(843) 884-7525
Fax (843) 884-3044

Comcast
Business Class

April 21, 2009

Ashley Hamlett
Permit Coordinator
Thomas & Hutton Engineering Co.
935 Houston Northcutt Blvd.
Mt. Pleasant, SC 29464

RE: Klawah River Plantation TMS #212-00-00-001

Dear Ms. Hamlett:

Comcast Cable will be able and willing to provide cable television, digital telephone and high speed internet service to the above referenced development.

Depending on the type of construction required, Comcast may pass some of or all of the cost to build this plant extension to the developer.

Should you have any questions, please don't hesitate to give me a call.

Sincerely,

Charles Yonkman

Charles Yonkman
Bulk/MDU Coordinator
Comcast of Carolina, Inc.
4400 Belle Oaks Drive
North Charleston, SC 29405

(843) 266-3094
Charles_yonkman@cable.comcast.com

BELLSOUTH

BellSouth Telecommunications, Inc.
2600 Meeting Street Road
Charleston, SC 29405-8307

April 22, 2009

Thomas & Hutton Engineering Co.
% Ashley Hamlett
935 Houston Northoutt Blvd.
Mount Pleasant, SC 29464

Re: Letter of Coordination

To Ashley Hamlett:

This is to confirm that AT&T will be able to provide telephone service to the property of Charleston tax ID# 212-00-00-001 in the Johns Island area for 2,000 acres. Service is contingent upon our receiving detailed plans of the development with utility easements granted, proper lead-time to install these services (three months), the correct 911 street addresses, and 30 x 30 easement for remote equipment to provide service (if needed). Plans should be submitted to Alan Squires (tel.# 843-722-5179) at the following address 2600 Meeting St., Charleston, S.C. 29405-8307

Should you have any questions or concerns, please contact me.

Sincerely,

Alan Squires

Alan Squires
Designer-AT&T

TOWN OF KIAWAH ISLAND
21 BEACHWALKER DRIVE • KIAWAH ISLAND, SC 29455 • (843) 768-9166 • FAX (843) 768-4764

OCT 14 2009

October 12, 2009

Mr. John C.L. Darby,
Chief Executive Officer,
The Beach Company
211 King Street, Suite 300
Charleston, SC 29401

Re: Kiawah River Plantation

Dear John:

Thank you for discussing the plans for Kiawah River Plantation and for providing me an opportunity to comment.

I believe Kiawah River Plantation will compliment the Town of Kiawah Island and provide a much needed boost to the local economy. I look forward to the day construction begins.

I will be sure to monitor the approval process. In that regard, if I can be of any assistance, please do not hesitate to let me know.

The Beach Company and Darby/Way families have created a wonderful environment at Kiawah Island. I am sure Kiawah River Plantation will be as impressive. For all those reasons, I am excited about your plans and am pleased to offer my support.

With kindest regards,

William G. Wert
Mayor
Town of Kiawah Island

CHARLESTON COUNTY PARK & RECREATION COMMISSION

May 28, 2009

Mr. Kevin O'Neill
Vice President
Beach Development
211 King Street
Suite 300
Charleston, SC 29401

Via email: koneill@thebeachcompany.com

Re: Project Coordination – Kiawah River Plantation

Dear Kevin,

I would like to thank you for working with the Charleston County Park and Recreation Commission staff on your Kiawah River Plantation project to create a community vision that is compatible with our future park plans.

Additionally, we would welcome the opportunity to accept any parkland that the Beach Company might be willing to dedicate, provided that it is consistent with our goals and objectives.

Please continue to keep us informed as your plans progress, and we will do the same as we proceed with master planning our adjacent property. We look forward to the opportunity to continue to work together as our plans proceed for the future Johns Island County Park.

Best regards,

Julie Hensley
Director, Planning Division

Copy: Tom O'Rourke, David Bennett, Cynthia Montague

861 Riverland Drive
Charleston, SC 29412
843-762-2172
www.ccprc.com

CHARLESTON COUNTY PARK & RECREATION COMMISSION

September 30, 2009

Mr. Kevin O'Neill
Vice President
Beach Development
211 King Street
Suite 300
Charleston, SC 29401

Via email: koneill@thebeachcompany.com

Re: Project Coordination – Kiawah River Plantation

Dear Kevin,

Charleston County Park and Recreation Commission understands without objection that it will be necessary for Mullet Hall Road to be utilized as a construction access for the Kiawah River Plantation project. This will not present a problem for our adjacent property, provided that the road is maintained throughout the course of the project, and later repaired or rebuilt to SCDOT standards at a minimum.

Please continue to keep us informed of your progress.

Best regards,

Julie Hensley
Director, Planning Division

Copy: Tom O'Rourke, David Bennett, Cynthia Montague

861 Riverland Drive
Charleston, SC 29412
843-762-2172
www.ccprc.com

TOWN OF SEABROOK ISLAND

2001 Seabrook Island Road • Seabrook Island, SC 29455
Phone: (843) 768-9121 • Fax: (843) 768-9830

August 24, 2009

AUG 26 2009

Mr. John C.L. Darby
The Beach Company
P.O. Box 242
Charleston, SC 29402

Dear Mr. Darby:

Thank you for taking the time to share your Master Plan for Kiawah River Plantation with us. I have reviewed your plans with Town Council and we have no further questions at this time.

Sincerely,

Frank W. McNulty
Mayor

FWM:jfa

STORMWATER MASTER PLAN

FOR

KIAWAH RIVER PLANTATION

PREPARED FOR

KIAWAH RIVER PLANTATION, LP

MAY 29, 2009

J – 17091

THOMAS & HUTTON ENGINEERING CO.

SAVANNAH, GEORGIA ◆ BRUNSWICK, GEORGIA
CHARLESTON, SOUTH CAROLINA ◆ MYRTLE BEACH, SOUTH CAROLINA
WILMINGTON, NORTH CAROLINA

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BACKGROUND AND INTRODUCTION

Kiawah River Plantation is located in Charleston County, South Carolina on Johns Island. The property is roughly bounded by the Charleston County Parks and Recreation Commission (CCPRC) Equestrian Center to the north, the Kiawah River to the south, marshland to the east and Hope Plantation to the west. Kiawah River Plantation is located approximately 20 miles from downtown Charleston, and approximately 4 miles from Kiawah Island, a popular resort and golf course community.

The property was intensely farmed from Colonial days until the 1970's. An extensive network of agricultural ditches was installed to drain the property. Many of these ditches are now considered wetlands. The road system necessary for farming operations provides vehicular access throughout the property. The existing impoundments provide habitat for a wide variety of wildlife. In recent years, the property has been used for farming and as a hunting preserve.

PROJECT NARRATIVE

Kiawah River Plantation is part of a 4,600-acre drainage basin that discharges to the Kiawah River. Of this total area, 1,384 acres is Kiawah River Plantation property. To see these areas graphically, refer to the large pre and post development exhibits at the end of this report.

PURPOSE

The purposes of this report are:

1. To define the existing drainage basins affected by this project.
    - To determine the Pre Development runoff rate from the Kiawah River Plantation Site for 2, 10, 25, 50, and 100 year storm events.
    - To determine and document compliance with the State of South Carolina regulations for Pre development and Post development runoff.

PRE DEVELOPMENT DRAINAGE SYSTEM

The most significant aspect of the existing Kiawah River Plantation drainage system is the presence of several large impoundments. A single impoundment on the western portion of the property is about 170 acres. It discharges to a creek that flows into the Kiawah River. On the eastern portion of the property, an interconnected network of five impoundments discharges to two separate creeks that flow into the Kiawah River. In addition to the two large impoundments, two smaller independent impoundments discharge to marshes of the Kiawah River. Most of the drainage basin flows into one of these impoundments. The portion of the basin that does not flow into an impoundment discharges directly to marshes of the Kiawah River through existing channels.

POST DEVELOPMENT DRAINAGE SYSTEM

The proposed Kiawah River Plantation community includes multifamily residential, single family residential and an 18-hole golf course. The existing impoundments serve both as amenities and as part of the stormwater management system. The post developed drainage system, as anticipated at build out, includes a series of interconnected lakes that detain the post development runoff and release stormwater to the existing impoundments and tributaries of the Kiawah River. All developed areas including roads, residential properties, and golf course areas, drain to proposed or existing ponds and impoundments. Water levels in these ponds and impoundments are regulated by control structures which provide detention and water quality control.

METHODOLOGY

The pre development and post development conditions were analyzed using the Advanced Interconnected Channel and Pond Routing (ICPR) computer program developed by Streamline Technologies. The program is used to model rainfall and stormwater runoff and to perform hydraulic routing through the storm drainage system. The ICPR program is a FEMA-approved model that has undergone extensive testing and application. ICPR has the ability to analyze complex interconnected drainage systems dynamically over extended time periods.

The hydrologic input data consists of information for each drainage basin, or subwatershed, within the project. Input variables include runoff curve number, rainfall distribution pattern, hydrograph peaking factor, area of each drainage basin, and time of concentration. The ICPR program generates runoff hydrographs for each subwatershed based on the user-specified variables. Hydrographs are generated by ICPR using the SCS Unit Hydrograph Method.

The model hydraulic input data consists of a system of nodes and links. Nodes represent locations where flows enter or exit the system, pipe or channel characteristics change, or where stage/storage/time relationships are provided. Links represent traditional types of hydraulic conveyance such as pipes, channels, drop structures, weirs, etc. The sizes, inverts, lengths, and Mannings “n” values for all pipes connecting the ponds or lakes are input into the model. In addition to pipe information, all pond, lake, and detention area stage-area information and the respective outfall structure information is input into the model. The node and link conditions are analyzed within the model for a given storm, and flow conditions are determined.

The basic equation used by ICPR to route flows through the system is:

$$\Delta s = (Q_{in} - Q_{out})\ \Delta t$$

Where:

Δs =Change in storage for time step
Q_{in} =Flow into a node at time "t"
Q_{out} =Flow out of a node at time "t"
Δt =Length of time step

Hydrographs for each drainage area are merged within the ICPR program, and the hydrologic results are then combined with the hydraulic information to model the hydraulic interactions of the entire drainage system. The results include pond area and discharge rates and stage/storage information during the design storm.

For the design of the storm drainage system, a warning stage elevation is set for each pond and node location to check for flooding during the various storm events. In addition, the ultimate discharge rate from the system cannot exceed the pre-developed runoff rate.

HYDROLOGY

The following hydrologic parameters have been used as input to the ICPR models:

1. The SCS Unit Hydrograph Method is used.

2. The depth of rainfall for each storm frequency was obtained from the *South Carolina Stormwater Management and Sediment Control Handbook for Land Disturbance Activities* (August, 2003) – Appendix C, South Carolina Rainfall Data for Charleston County (South). The following rainfall depths were used in the model simulations:

    a. 2-year, 24-hour Design Storm = 4.6 inches
    b. 10-year, 24-hour Design Storm = 6.8 inches
    c. 25-year, 24-hour Design Storm = 7.8 inches
    d. 50-year, 24-hour Design Storm = 8.8 inches
    e. 100-year, 24-hour Design Storm = 10.0 inches

3. The SCS Type III Statistical Rainfall Distribution is used. This distribution pattern is determined by the Soil Conservation Service comparing regional rain gauge data.

4. A 323 Hydrograph Peaking Factor is used. The 323 Factor is based on statistical analysis of actual rainfall and runoff data from the Southeastern United States, and is typical for coastal areas.

5. All A/D and B/D soils are assumed A or B when located within a developed areas and D in undeveloped areas, due to the presence of a drainage system in developed areas.

WATER QUALITY

The drainage basin analyzed in this study is contained within the Santee Watershed. The South Carolina Department of Health and Environmental Control (DHEC) maintains a network of water quality monitoring stations within this watershed. The stations immediately downstream of Kiawah River Plantation are 11-28, 11-29, and 11-30. See the exhibit in back of the report for the location of these stations with respect to the Kiawah River Plantation property. None of these stations appears on the 2008 South Carolina List of Impaired Waters.

While DHEC does not consider the water bodies to which the Kiawah River Plantation discharges impaired, the developers are eager to minimize the impact of this project on the natural environment. Much of the property's value lies in the existing impoundments and surrounding marshes and rivers. To minimize impact on these assets, the project will seek to implement principles of Low Impact Development (LID). Practices like infiltration, evapotranspiration, grass swales, and bioretention will be used to minimize disruption of the property's natural water cycle and to minimize discharge of pollutants into receiving water bodies.

CONCLUSIONS

This study demonstrates that the stormwater management system for Kiawah River Plantation can be designed to meet applicable Federal, State, and Local regulations. The results of this study are preliminary in nature. The data used to create the pre and post models should be refined with additional field survey data before the model results are used for design purposes. We recommend a careful review of the drainage study for Hope Plantation in order to more accurately quantify the stormwater runoff discharging into the large impoundment on the western portion of the property. We also recommend that detailed survey data be obtained on the many existing rice trunks and other impoundment control structures. The post development model should be revised to reflect changes in the proposed land plan as they occur.

N:\1709\Drawings\1709I Location Map.dwg Jun 3, 2009 - 3:23:53

QUADRANGLE MAP
LEGAREVILLE, ROCKVILLE,
KIAWAH ISLAND, WADMALAW ISLAND QUADRANGLE

KIAWAH RIVER PLANTATION
CHARLESTON COUNTY, SOUTH CAROLINA

DATE: 5/29/09

SCALE: 1" = 4000'

PROPOSED ACTIVITY:
LOCATION MAP

COUNTY: CHARLESTON

APPLICANT:
KIAWAH RIVER PLANTATION, LP

Table 1

Kiawah River Plantation

Summary of Results / Peak Flows

Date: 5/29/2009

Peak Runoff (cfs)		Storm Event (Year)				
		2	**10**	**25**	**50**	**100**
Pre Development	Boundary	293	563	669	829	992
Post Development	Boundary	165	324	395	466	551

Pond Elevations (ft-NAVD88)		Normal Water Elevation (ft)	Storm Event (Year)				
			2	**10**	**25**	**50**	**100**
Pre Development	Pond 01	4.0	5.6	6.3	6.5	6.8	7.1
	Pond 02	3.5	3.7	4.0	4.1	4.2	4.4
	Pond 03	3.5	3.8	4.1	4.2	4.3	4.5
	Pond 04	3.5	3.8	4.1	4.2	4.4	4.5
	Pond 05	3.5	4.1	4.7	4.9	5.2	5.5
	Pond 06	3.5	4.1	4.7	4.9	5.2	5.5
	Pond 07	3.7	4.5	5.1	5.3	5.6	5.9
	Pond 08	3.7	3.9	4.1	4.2	4.3	4.4
Post Development	Pond 01	4.0	5.5	6.1	6.4	6.6	6.9
	Pond 02	3.5	3.9	4.4	4.6	4.8	5.0
	Pond 03	3.5	3.9	4.3	4.5	4.7	5.0
	Pond 04	3.5	3.9	4.2	4.4	4.6	4.8
	Pond 05	3.5	4.0	4.5	4.7	5.0	5.3
	Pond 06	3.5	4.1	4.7	5.0	5.3	5.6
	Pond 07	3.7	5.3	6.3	6.7	7.1	7.6
	Pond 08	3.7	4.0	4.2	4.3	4.5	4.6
	Future Pond 04A	5.0	5.6	6.3	6.7	7.1	7.6
	Future Pond 07A	5.0	5.5	6.2	6.6	7.0	7.5
	Future Pond 09A	4.5	5.5	6.1	6.4	6.6	6.9
	Future Pond 10A	5.0	5.5	6.1	6.4	6.8	7.2
	Future Pond 12	7.0	7.8	8.7	9.2	9.7	10.3
	Future Pond 14	8.0	8.4	9.2	9.7	10.3	11.1
	Future Pond 15	7.0	7.8	8.7	9.2	9.7	10.3
	Future Pond 15A	4.5	7.0	8.0	8.4	8.8	9.2
	Future Pond 16	7.0	7.8	8.7	9.2	9.7	10.3
	Future Pond 20	4.5	5.5	6.5	6.9	7.4	8.0
	Future Pond 20A	4.5	5.6	6.7	7.2	7.7	8.3
	Future Pond 22	4.5	5.8	6.6	7.0	7.4	7.9
	Future Pond 23	4.5	5.7	6.3	6.7	7.1	7.6

KIAWAH RIVER PLANTATION
DRAINAGE BASIN STUDY

Appendix A

PRE-DEVELOPMENT ICPR MODEL INPUT

PREPARED BY

THOMAS & HUTTON ENGINEERING CO.

==========
==== Basins ==========
==========

Name: BASIN 01 Node: NODE 01 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 149.00
Area(ac): 132.790 Time Shift(hrs): 0.00
Curve Number: 74.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 02 Node: NODE 02 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 332.00
Area(ac): 640.020 Time Shift(hrs): 0.00
Curve Number: 75.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 03 Node: NODE 03 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 356.00
Area(ac): 359.670 Time Shift(hrs): 0.00
Curve Number: 75.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 04 Node: POND 01 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 138.00
Area(ac): 228.730 Time Shift(hrs): 0.00
Curve Number: 76.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 05 Node: POND 01 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 98.00
Area(ac): 49.050 Time Shift(hrs): 0.00
Curve Number: 76.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 06 Node: POND 01 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 98.00
Area(ac): 84.000 Time Shift(hrs): 0.00
Curve Number: 76.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 07 Node: POND 01 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 101.00
Area(ac): 104.930 Time Shift(hrs): 0.00
Curve Number: 75.00 Max Allowable Q(cfs): 999999.000

DCIA(%): 0.00

Name: BASIN 08 Node: NODE 04 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 188.00
Area(ac): 498.350 Time Shift(hrs): 0.00
Curve Number: 69.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 09 Node: POND 01 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 180.00
Area(ac): 662.590 Time Shift(hrs): 0.00
Curve Number: 72.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 09A Node: POND 01 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 78.00
Area(ac): 18.540 Time Shift(hrs): 0.00
Curve Number: 77.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 10 Node: POND 01 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 79.00
Area(ac): 156.800 Time Shift(hrs): 0.00
Curve Number: 76.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 11 Node: NODE 05 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 119.00
Area(ac): 145.130 Time Shift(hrs): 0.00
Curve Number: 77.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 12 Node: NODE 08 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 85.00
Area(ac): 79.540 Time Shift(hrs): 0.00
Curve Number: 78.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 13 Node: BOUNDARY Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 118.00
Area(ac): 247.070 Time Shift(hrs): 0.00
Curve Number: 78.00 Max Allowable Q(cfs): 999999.000

DCIA(%): 0.00

Name: BASIN 14 Node: BOUNDARY Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 88.00
Area(ac): 141.520 Time Shift(hrs): 0.00
Curve Number: 77.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 15 Node: NODE 06 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 89.00
Area(ac): 38.500 Time Shift(hrs): 0.00
Curve Number: 76.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 16 Node: NODE 07 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 86.00
Area(ac): 35.690 Time Shift(hrs): 0.00
Curve Number: 76.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 17 Node: NODE 08 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 92.00
Area(ac): 31.960 Time Shift(hrs): 0.00
Curve Number: 77.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 18 Node: POND 02 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 68.00
Area(ac): 18.480 Time Shift(hrs): 0.00
Curve Number: 39.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 19 Node: POND 03 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 68.00
Area(ac): 9.120 Time Shift(hrs): 0.00
Curve Number: 46.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 20 Node: POND 04 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 68.00
Area(ac): 24.820 Time Shift(hrs): 0.00
Curve Number: 77.00 Max Allowable Q(cfs): 999999.000

DCIA(%): 0.00

Name: BASIN 21 Node: POND 01 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 24.00
Area(ac): 315.520 Time Shift(hrs): 0.00
Curve Number: 64.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 22 Node: BOUNDARY Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 80.00
Area(ac): 73.260 Time Shift(hrs): 0.00
Curve Number: 76.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 23 Node: POND 07 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 68.00
Area(ac): 42.130 Time Shift(hrs): 0.00
Curve Number: 77.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 24 Node: BOUNDARY Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 68.00
Area(ac): 11.490 Time Shift(hrs): 0.00
Curve Number: 77.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 25 Node: POND 05 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 61.00
Area(ac): 36.400 Time Shift(hrs): 0.00
Curve Number: 77.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 26 Node: POND 04 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 64.00
Area(ac): 30.340 Time Shift(hrs): 0.00
Curve Number: 77.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 27 Node: POND 08 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 65.00
Area(ac): 12.270 Time Shift(hrs): 0.00
Curve Number: 77.00 Max Allowable Q(cfs): 999999.000

DCIA(%): 0.00

Name: BASIN 28 Node: BOUNDARY Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 61.00
Area(ac): 18.650 Time Shift(hrs): 0.00
Curve Number: 77.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 29 Node: POND 06 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 61.00
Area(ac): 33.100 Time Shift(hrs): 0.00
Curve Number: 77.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: POND 01 Node: POND 01 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 5.00
Area(ac): 172.130 Time Shift(hrs): 0.00
Curve Number: 98.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: POND 02 Node: POND 02 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 5.00
Area(ac): 6.490 Time Shift(hrs): 0.00
Curve Number: 98.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: POND 03 Node: POND 03 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 5.00
Area(ac): 7.730 Time Shift(hrs): 0.00
Curve Number: 98.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: POND 04 Node: POND 04 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 5.00
Area(ac): 58.820 Time Shift(hrs): 0.00
Curve Number: 98.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: POND 05 Node: POND 05 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 5.00
Area(ac): 3.820 Time Shift(hrs): 0.00
Curve Number: 98.00 Max Allowable Q(cfs): 999999.000

DCIA(%): 0.00

Name: POND 06 Node: POND 06 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 5.00
Area(ac): 8.040 Time Shift(hrs): 0.00
Curve Number: 98.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: POND 07 Node: POND 07 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 5.00
Area(ac): 4.250 Time Shift(hrs): 0.00
Curve Number: 98.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: POND 08 Node: POND 08 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 5.00
Area(ac): 18.460 Time Shift(hrs): 0.00
Curve Number: 98.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

==========
==== Nodes ==========
==========

Name: BOUNDARY Base Flow(cfs): 0.000 Init Stage(ft): 3.000
Group: BASE Warn Stage(ft): 4.000
Type: Time/Stage

Boundary stages determined by NOAA elevation information; the NAVD 88 elevations related to MLLW were computed from Bench Mark, Station I

Time(hrs)	Stage(ft)
0.00	3.000
1.00	2.500
2.00	2.000
3.00	1.500
4.00	1.000
5.00	0.500
6.00	0.000
7.00	0.500
8.00	1.000
9.00	1.500
10.00	2.000
11.00	2.500
12.00	3.000
13.00	2.500
14.00	2.000
15.00	1.500
16.00	1.000
17.00	0.500
18.00	0.000
19.00	0.500
20.00	1.000
21.00	1.500
22.00	2.000
23.00	2.500
24.00	3.000
25.00	2.500
26.00	2.000
27.00	1.500
28.00	1.000
29.00	0.500
30.00	0.000
31.00	0.500
32.00	1.000
33.00	1.500
34.00	2.000
35.00	2.500

36.00	3.000
37.00	2.500
38.00	2.000
39.00	1.500
40.00	1.000
41.00	0.500
42.00	0.000
43.00	0.500
44.00	1.000
45.00	1.500
46.00	2.000
47.00	2.500
48.00	3.000
49.00	2.500
50.00	2.000
51.00	1.500
52.00	1.000
53.00	0.500
54.00	0.000
55.00	0.500
56.00	1.000
57.00	1.500
58.00	2.000
59.00	2.500
60.00	3.000
61.00	2.500
62.00	2.000
63.00	1.500
64.00	1.000
65.00	0.500
66.00	0.000
67.00	0.500
68.00	1.000
69.00	1.500
70.00	2.000
71.00	2.500
72.00	3.000
73.00	2.500
74.00	2.000
75.00	1.500
76.00	1.000
77.00	0.500
78.00	0.000
79.00	0.500
80.00	1.000
81.00	1.500
82.00	2.000
83.00	2.500
84.00	3.000
85.00	2.500
86.00	2.000
87.00	1.500
88.00	1.000
89.00	0.500
90.00	0.000
91.00	0.500
92.00	1.000
93.00	1.500
94.00	2.000
95.00	2.500
96.00	3.000
97.00	2.500
98.00	2.000
99.00	1.500
100.00	1.000
101.00	0.500
102.00	0.000
103.00	0.500
104.00	1.000
105.00	1.500
106.00	2.000
107.00	2.500
108.00	3.000
109.00	2.500
110.00	2.000
111.00	1.500
112.00	1.000
113.00	0.500
114.00	0.000
115.00	0.500
116.00	1.000
117.00	1.500
118.00	2.000
119.00	2.500
120.00	3.000
121.00	2.500
122.00	2.000
123.00	1.500
124.00	1.000
125.00	0.500
126.00	0.000

127.00	0.500
128.00	1.000
129.00	1.500
130.00	2.000
131.00	2.500
132.00	3.000
133.00	2.500
134.00	2.000
135.00	1.500
136.00	1.000
137.00	0.500
138.00	0.000
139.00	0.500
140.00	1.000
141.00	1.500
142.00	2.000
143.00	2.500
144.00	3.000
145.00	2.500
146.00	2.000
147.00	1.500
148.00	1.000
149.00	0.500
150.00	0.000
151.00	0.500
152.00	1.000
153.00	1.500
154.00	2.000
155.00	2.500
156.00	3.000
157.00	2.500
158.00	2.000
159.00	1.500
160.00	1.000
161.00	0.500
162.00	0.000
163.00	0.500
164.00	1.000
165.00	1.500
166.00	2.000
167.00	2.500
168.00	3.000
169.00	2.500
170.00	2.000
171.00	1.500
172.00	1.000
173.00	0.500
174.00	0.000
175.00	0.500
176.00	1.000
177.00	1.500
178.00	2.000
179.00	2.500
180.00	3.000
181.00	2.500
182.00	2.000
183.00	1.500
184.00	1.000
185.00	0.500
186.00	0.000
187.00	0.500
188.00	1.000
189.00	1.500
190.00	2.000
191.00	2.500
192.00	3.000
193.00	2.500
194.00	2.000
195.00	1.500
196.00	1.000
197.00	0.500
198.00	0.000
199.00	0.500
200.00	1.000
201.00	1.500
202.00	2.000
203.00	2.500
204.00	3.000
205.00	2.500
206.00	2.000
207.00	1.500
208.00	1.000
209.00	0.500
210.00	0.000
211.00	0.500
212.00	1.000
213.00	1.500
214.00	2.000
215.00	2.500
216.00	3.000
217.00	2.500

218.00	2.000
219.00	1.500
220.00	1.000
221.00	0.500
222.00	0.000
223.00	0.500
224.00	1.000
225.00	1.500
226.00	2.000
227.00	2.500
228.00	3.000
229.00	2.500
230.00	2.000
231.00	1.500
232.00	1.000
233.00	0.500
234.00	0.000
235.00	0.500
236.00	1.000
237.00	1.500
238.00	2.000
239.00	2.500
240.00	3.000
241.00	2.500
242.00	2.000
243.00	1.500
244.00	1.000
245.00	0.500
246.00	0.000
247.00	0.500
248.00	1.000
249.00	1.500
250.00	2.000
251.00	2.500
252.00	3.000
253.00	2.500
254.00	2.000
255.00	1.500
256.00	1.000
257.00	0.500
258.00	0.000
259.00	0.500
260.00	1.000
261.00	1.500
262.00	2.000
263.00	2.500
264.00	3.000
265.00	2.500
266.00	2.000
267.00	1.500
268.00	1.000
269.00	0.500
270.00	0.000
271.00	0.500
272.00	1.000
273.00	1.500
274.00	2.000
275.00	2.500
276.00	3.000
277.00	2.500
278.00	2.000
279.00	1.500
280.00	1.000
281.00	0.500
282.00	0.000
283.00	0.500
284.00	1.000
285.00	1.500
286.00	2.000
287.00	2.500
288.00	3.000
289.00	2.500
290.00	2.000
291.00	1.500
292.00	1.000
293.00	0.500
294.00	0.000
295.00	0.500
296.00	1.000
297.00	1.500
298.00	2.000
299.00	2.500
300.00	3.000

Name: NODE 01 Base Flow(cfs): 0.000 Init Stage(ft): 10.500
Group: BASE Warn Stage(ft): 15.000
Type: Stage/Area

Stage(ft)	Area(ac)
10.500	5.0000
11.500	10.0000
12.500	20.0000
13.500	40.0000
14.500	60.0000

Name: NODE 01A Base Flow(cfs): 0.000 Init Stage(ft): 10.500
Group: BASE Warn Stage(ft): 15.000
Type: Stage/Area

Stage(ft)	Area(ac)

Name: NODE 02 Base Flow(cfs): 0.000 Init Stage(ft): 10.500
Group: BASE Warn Stage(ft): 15.000
Type: Stage/Area

Stage(ft)	Area(ac)
10.500	5.0000
11.500	10.0000
12.500	40.0000
13.000	80.0000
14.000	168.7100

Name: NODE 02A Base Flow(cfs): 0.000 Init Stage(ft): 10.500
Group: BASE Warn Stage(ft): 15.000
Type: Stage/Area

Stage(ft)	Area(ac)

Name: NODE 03 Base Flow(cfs): 0.000 Init Stage(ft): 10.500
Group: BASE Warn Stage(ft): 15.000
Type: Stage/Area

Stage(ft)	Area(ac)
10.500	5.0000
11.500	10.0000
12.500	20.0000
13.000	60.0000
14.000	166.3900

Name: NODE 03A Base Flow(cfs): 0.000 Init Stage(ft): 10.500
Group: BASE Warn Stage(ft): 15.000
Type: Stage/Area

Stage(ft)	Area(ac)

Name: NODE 04 Base Flow(cfs): 0.000 Init Stage(ft): 5.000
Group: BASE Warn Stage(ft): 8.000
Type: Stage/Area

Stage(ft)	Area(ac)
5.000	55.7400
8.000	100.7200

Name: NODE 04A Base Flow(cfs): 0.000 Init Stage(ft): 5.000
Group: BASE Warn Stage(ft): 8.000
Type: Stage/Area

Stage(ft)	Area(ac)

Name: NODE 05 Base Flow(cfs): 0.000 Init Stage(ft): 7.000
Group: BASE Warn Stage(ft): 11.000
Type: Stage/Area

Stage(ft)	Area(ac)
7.000	0.5000
8.000	1.0000
9.000	3.0000
10.000	10.0000
11.000	23.4500

Name: NODE 05A Base Flow(cfs): 0.000 Init Stage(ft): 7.000
Group: BASE Warn Stage(ft): 11.000
Type: Stage/Area

Stage(ft)	Area(ac)

Name: NODE 06 Base Flow(cfs): 0.000 Init Stage(ft): 5.000
Group: BASE Warn Stage(ft): 7.000
Type: Stage/Area

Stage(ft)	Area(ac)
5.000	1.4900
6.000	2.0000
7.000	4.4000
8.000	5.0000

Name: NODE 07 Base Flow(cfs): 0.000 Init Stage(ft): 5.000
Group: BASE Warn Stage(ft): 7.000
Type: Stage/Area

Stage(ft)	Area(ac)
5.000	2.8900
6.000	3.5000
7.000	5.0000

Name: NODE 08 Base Flow(cfs): 0.000 Init Stage(ft): 5.000
Group: BASE Warn Stage(ft): 7.000
Type: Stage/Area

Stage(ft)	Area(ac)
5.000	6.0000
6.000	8.0000
7.000	15.3400
8.000	17.9500

Name: POND 01 Base Flow(cfs): 0.000 Init Stage(ft): 3.850
Group: BASE Warn Stage(ft): 6.000
Type: Stage/Area

Stage(ft)	Area(ac)
3.850	156.8000
4.500	172.1300
5.000	223.0200
6.000	539.0900
7.000	647.7100

Name: POND 02 Base Flow(cfs): 0.000 Init Stage(ft): 3.250
Group: BASE Warn Stage(ft): 6.000
Type: Stage/Area

Stage(ft)	Area(ac)
3.250	6.4900
6.000	7.4900

```
--------------------------------------------------------------------------------------------
      Name: POND 03             Base Flow(cfs): 0.000          Init Stage(ft): 3.250
     Group: BASE                                              Warn Stage(ft): 6.000
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
          3.250          7.7300
          6.000          8.7300

--------------------------------------------------------------------------------------------
      Name: POND 04             Base Flow(cfs): 0.000          Init Stage(ft): 3.250
     Group: BASE                                              Warn Stage(ft): 6.000
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
          3.250         58.8200
          6.000         60.8200

--------------------------------------------------------------------------------------------
      Name: POND 05             Base Flow(cfs): 0.000          Init Stage(ft): 3.250
     Group: BASE                                              Warn Stage(ft): 6.000
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
          3.250          3.8200
          6.000          4.8200

--------------------------------------------------------------------------------------------
      Name: POND 06             Base Flow(cfs): 0.000          Init Stage(ft): 3.250
     Group: BASE                                              Warn Stage(ft): 6.000
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
          3.250          8.0400
          6.000         10.0400

--------------------------------------------------------------------------------------------
      Name: POND 07             Base Flow(cfs): 0.000          Init Stage(ft): 3.500
     Group: BASE                                              Warn Stage(ft): 6.000
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
          3.500          4.2500
          6.000          5.0000

--------------------------------------------------------------------------------------------
      Name: POND 08             Base Flow(cfs): 0.000          Init Stage(ft): 3.500
     Group: BASE                                              Warn Stage(ft): 6.000
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
          3.500         18.4600
          6.000         19.4600

============================================================================================
==== Pipes =================================================================================
============================================================================================

        Name: PIPE 01            From Node: NODE 01           Length(ft): 40.00
       Group: BASE                 To Node: NODE 01A             Count: 1
                                                       Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                Solution Algorithm: Most Restrictive
    Geometry: Circular       Circular                        Flow: Both
    Span(in): 36.00          36.00                     Entrance Loss Coef: 0.00
    Rise(in): 36.00          36.00                         Exit Loss Coef: 1.00
  Invert(ft): 10.500         10.500                        Bend Loss Coef: 0.00
 Manning's N: 0.013000       0.013000                    Outlet Ctrl Spec: Use dc or tw
Top Clip(in): 0.000          0.000                         Inlet Ctrl Spec: Use dc
Bot Clip(in): 6.000          6.000                      Stabilizer Option: None
```

Upstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Downstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Name: PIPE 02		From Node: NODE 02	Length(ft): 40.00	
Group: BASE		To Node: NODE 02A	Count: 1	
			Friction Equation: Automatic	
	UPSTREAM	DOWNSTREAM	Solution Algorithm: Most Restrictive	
Geometry:	Circular	Circular	Flow: Both	
Span(in):	36.00	36.00	Entrance Loss Coef: 0.00	
Rise(in):	36.00	36.00	Exit Loss Coef: 1.00	
Invert(ft):	10.500	10.500	Bend Loss Coef: 0.00	
Manning's N:	0.013000	0.013000	Outlet Ctrl Spec: Use dc or tw	
Top Clip(in):	0.000	0.000	Inlet Ctrl Spec: Use dc	
Bot Clip(in):	0.000	0.000	Stabilizer Option: None	

Upstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Downstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Name: PIPE 03		From Node: NODE 03	Length(ft): 40.00	
Group: BASE		To Node: NODE 03A	Count: 1	
			Friction Equation: Automatic	
	UPSTREAM	DOWNSTREAM	Solution Algorithm: Most Restrictive	
Geometry:	Circular	Circular	Flow: Both	
Span(in):	36.00	36.00	Entrance Loss Coef: 0.00	
Rise(in):	36.00	36.00	Exit Loss Coef: 1.00	
Invert(ft):	10.500	10.500	Bend Loss Coef: 0.00	
Manning's N:	0.013000	0.013000	Outlet Ctrl Spec: Use dc or tw	
Top Clip(in):	0.000	0.000	Inlet Ctrl Spec: Use dc	
Bot Clip(in):	0.000	0.000	Stabilizer Option: None	

Upstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Downstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Name: PIPE 04		From Node: NODE 04	Length(ft): 30.00	
Group: BASE		To Node: NODE 04A	Count: 2	
			Friction Equation: Automatic	
	UPSTREAM	DOWNSTREAM	Solution Algorithm: Most Restrictive	
Geometry:	Circular	Circular	Flow: Both	
Span(in):	48.00	48.00	Entrance Loss Coef: 0.00	
Rise(in):	48.00	48.00	Exit Loss Coef: 1.00	
Invert(ft):	5.000	5.000	Bend Loss Coef: 0.00	
Manning's N:	0.013000	0.013000	Outlet Ctrl Spec: Use dc or tw	
Top Clip(in):	0.000	0.000	Inlet Ctrl Spec: Use dc	
Bot Clip(in):	0.000	0.000	Stabilizer Option: None	

Upstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Downstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Name: PIPE 05		From Node: NODE 05	Length(ft): 30.00	
Group: BASE		To Node: NODE 05A	Count: 1	
			Friction Equation: Automatic	
	UPSTREAM	DOWNSTREAM	Solution Algorithm: Most Restrictive	
Geometry:	Circular	Circular	Flow: Both	
Span(in):	18.00	18.00	Entrance Loss Coef: 0.00	
Rise(in):	18.00	18.00	Exit Loss Coef: 1.00	
Invert(ft):	7.000	7.000	Bend Loss Coef: 0.00	
Manning's N:	0.013000	0.013000	Outlet Ctrl Spec: Use dc or tw	
Top Clip(in):	0.000	0.000	Inlet Ctrl Spec: Use dc	
Bot Clip(in):	0.000	0.000	Stabilizer Option: None	

Upstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Downstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Name: PIPE 6 From Node: POND 02 Length(ft): 450.00
Group: BASE To Node: BOUNDARY Count: 1
Friction Equation: Automatic
Solution Algorithm: Most Restrictive
Flow: Both
Entrance Loss Coef: 0.00
Exit Loss Coef: 0.00
Bend Loss Coef: 0.00
Outlet Ctrl Spec: Use dc or tw
Inlet Ctrl Spec: Use dc
Stabilizer Option: None

	UPSTREAM	DOWNSTREAM
Geometry:	Circular	Circular
Span(in):	48.00	48.00
Rise(in):	48.00	48.00
Invert(ft):	3.250	3.000
Manning's N:	0.013000	0.013000
Top Clip(in):	0.000	0.000
Bot Clip(in):	0.000	0.000

Upstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Downstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

==========
==== Channels ==========
==========

Name: CHANNEL 01 From Node: NODE 01A Length(ft): 2700.00
Group: BASE To Node: POND 01 Count: 1
Friction Equation: Automatic
Solution Algorithm: Automatic
Flow: Both
Contraction Coef: 0.100
Expansion Coef: 0.300
Entrance Loss Coef: 0.000
Exit Loss Coef: 0.000
Outlet Ctrl Spec: Use dc or tw
Inlet Ctrl Spec: Use dc
Stabilizer Option: None

	UPSTREAM	DOWNSTREAM
Geometry:	Trapezoidal	Trapezoidal
Invert(ft):	10.500	4.100
TClpInitZ(ft):	9999.000	9999.000
Manning's N:	0.040000	0.040000
Top Clip(ft):	0.000	0.000
Bot Clip(ft):	0.000	0.000
Main XSec:		
AuxElev1(ft):		
Aux XSec1:		
AuxElev2(ft):		
Aux XSec2:		
Top Width(ft):		
Depth(ft):		
Bot Width(ft):	5.000	5.000
LtSdSlp(h/v):	1.00	1.00
RtSdSlp(h/v):	1.00	1.00

Name: CHANNEL 02 From Node: NODE 02A Length(ft): 2200.00
Group: BASE To Node: POND 01 Count: 1
Friction Equation: Automatic
Solution Algorithm: Automatic
Flow: Both
Contraction Coef: 0.100
Expansion Coef: 0.300
Entrance Loss Coef: 0.000
Exit Loss Coef: 0.000
Outlet Ctrl Spec: Use dc or tw
Inlet Ctrl Spec: Use dc
Stabilizer Option: None

	UPSTREAM	DOWNSTREAM
Geometry:	Trapezoidal	Trapezoidal
Invert(ft):	10.500	4.100
TClpInitZ(ft):	9999.000	9999.000
Manning's N:	0.040000	0.040000
Top Clip(ft):	0.000	0.000
Bot Clip(ft):	0.000	0.000
Main XSec:		
AuxElev1(ft):		
Aux XSec1:		
AuxElev2(ft):		
Aux XSec2:		
Top Width(ft):		
Depth(ft):		
Bot Width(ft):	5.000	5.000
LtSdSlp(h/v):	2.00	2.00
RtSdSlp(h/v):	2.00	2.00

Name: CHANNEL 03 From Node: NODE 03A Length(ft): 2400.00
Group: BASE To Node: POND 01 Count: 1
Friction Equation: Automatic
Solution Algorithm: Automatic
Flow: Both
Contraction Coef: 0.100

	UPSTREAM	DOWNSTREAM
Geometry:	Trapezoidal	Trapezoidal
Invert(ft):	10.500	4.100
TClpInitZ(ft):	9999.000	9999.000

Manning's N:	0.040000	0.040000	Expansion Coef:	0.300
Top Clip(ft):	0.000	0.000	Entrance Loss Coef:	0.000
Bot Clip(ft):	0.000	0.000	Exit Loss Coef:	0.000
Main XSec:			Outlet Ctrl Spec:	Use dc or tw
AuxElev1(ft):			Inlet Ctrl Spec:	Use dc
Aux XSec1:			Stabilizer Option:	None
AuxElev2(ft):				
Aux XSec2:				
Top Width(ft):				
Depth(ft):				
Bot Width(ft):	5.000	5.000		
LtSdSlp(h/v):	2.00	2.00		
RtSdSlp(h/v):	2.00	2.00		

Name:	CHANNEL 04	From Node: NODE 04A	Length(ft):	2300.00
Group:	BASE	To Node: POND 01	Count:	1

	UPSTREAM	DOWNSTREAM		
			Friction Equation:	Automatic
Geometry:	Trapezoidal	Trapezoidal	Solution Algorithm:	Automatic
Invert(ft):	5.000	4.100	Flow:	Both
TClpInitZ(ft):	9999.000	9999.000	Contraction Coef:	0.100
Manning's N:	0.015000	0.015000	Expansion Coef:	0.300
Top Clip(ft):	0.000	0.000	Entrance Loss Coef:	0.000
Bot Clip(ft):	0.000	0.000	Exit Loss Coef:	0.000
Main XSec:			Outlet Ctrl Spec:	Use dc or tw
AuxElev1(ft):			Inlet Ctrl Spec:	Use dc
Aux XSec1:			Stabilizer Option:	None
AuxElev2(ft):				
Aux XSec2:				
Top Width(ft):				
Depth(ft):				
Bot Width(ft):	10.000	10.000		
LtSdSlp(h/v):	2.00	2.00		
RtSdSlp(h/v):	2.00	2.00		

Name:	CHANNEL 05	From Node: NODE 05A	Length(ft):	2600.00
Group:	BASE	To Node: POND 01	Count:	1

	UPSTREAM	DOWNSTREAM		
			Friction Equation:	Automatic
Geometry:	Trapezoidal	Trapezoidal	Solution Algorithm:	Automatic
Invert(ft):	7.000	4.100	Flow:	Both
TClpInitZ(ft):	9999.000	9999.000	Contraction Coef:	0.100
Manning's N:	0.030000	0.030000	Expansion Coef:	0.300
Top Clip(ft):	0.000	0.000	Entrance Loss Coef:	0.000
Bot Clip(ft):	0.000	0.000	Exit Loss Coef:	0.000
Main XSec:			Outlet Ctrl Spec:	Use dc or tw
AuxElev1(ft):			Inlet Ctrl Spec:	Use dc
Aux XSec1:			Stabilizer Option:	None
AuxElev2(ft):				
Aux XSec2:				
Top Width(ft):				
Depth(ft):				
Bot Width(ft):	8.000	8.000		
LtSdSlp(h/v):	2.00	2.00		
RtSdSlp(h/v):	2.00	2.00		

Name:	CHANNEL 06	From Node: NODE 06	Length(ft):	2250.00
Group:	BASE	To Node: BOUNDARY	Count:	1

	UPSTREAM	DOWNSTREAM		
			Friction Equation:	Automatic
Geometry:	Trapezoidal	Trapezoidal	Solution Algorithm:	Automatic
Invert(ft):	5.000	3.000	Flow:	Both
TClpInitZ(ft):	9999.000	9999.000	Contraction Coef:	0.100
Manning's N:	0.030000	0.030000	Expansion Coef:	0.300
Top Clip(ft):	0.000	0.000	Entrance Loss Coef:	0.000
Bot Clip(ft):	0.000	0.000	Exit Loss Coef:	0.000
Main XSec:			Outlet Ctrl Spec:	Use dc or tw
AuxElev1(ft):			Inlet Ctrl Spec:	Use dc
Aux XSec1:			Stabilizer Option:	None
AuxElev2(ft):				
Aux XSec2:				
Top Width(ft):				
Depth(ft):				
Bot Width(ft):	10.000	10.000		
LtSdSlp(h/v):	8.00	8.00		
RtSdSlp(h/v):	8.00	8.00		

Name:	CHANNEL 07	From Node: NODE 07	Length(ft):	2700.00
Group:	BASE	To Node: NODE 08	Count:	1

	UPSTREAM	DOWNSTREAM		
Geometry:	Trapezoidal	Trapezoidal	Friction Equation:	Automatic
Invert(ft):	5.000	5.000	Solution Algorithm:	Automatic
TClpInitZ(ft):	9999.000	9999.000	Flow:	Both
Manning's N:	0.030000	0.030000	Contraction Coef:	0.100
Top Clip(ft):	0.000	0.000	Expansion Coef:	0.300
Bot Clip(ft):	0.000	0.000	Entrance Loss Coef:	0.000
Main XSec:			Exit Loss Coef:	0.000
AuxElev1(ft):			Outlet Ctrl Spec:	Use dc or tw
Aux XSec1:			Inlet Ctrl Spec:	Use dc
AuxElev2(ft):			Stabilizer Option:	None
Aux XSec2:				
Top Width(ft):				
Depth(ft):				
Bot Width(ft):	10.000	10.000		
LtSdSlp(h/v):	8.00	8.00		
RtSdSlp(h/v):	8.00	8.00		

Name: CHANNEL 08 | From Node: NODE 08 | Length(ft): 4100.00
Group: BASE | To Node: BOUNDARY | Count: 1

	UPSTREAM	DOWNSTREAM		
Geometry:	Trapezoidal	Trapezoidal	Friction Equation:	Automatic
Invert(ft):	5.000	3.000	Solution Algorithm:	Automatic
TClpInitZ(ft):	9999.000	9999.000	Flow:	Both
Manning's N:	0.030000	0.030000	Contraction Coef:	0.100
Top Clip(ft):	0.000	0.000	Expansion Coef:	0.300
Bot Clip(ft):	0.000	0.000	Entrance Loss Coef:	0.000
Main XSec:			Exit Loss Coef:	0.000
AuxElev1(ft):			Outlet Ctrl Spec:	Use dc or tw
Aux XSec1:			Inlet Ctrl Spec:	Use dc
AuxElev2(ft):			Stabilizer Option:	None
Aux XSec2:				
Top Width(ft):				
Depth(ft):				
Bot Width(ft):	10.000	10.000		
LtSdSlp(h/v):	8.00	8.00		
RtSdSlp(h/v):	8.00	8.00		

Name: CHANNEL 6-7 | From Node: NODE 07 | Length(ft): 50.00
Group: BASE | To Node: NODE 06 | Count: 1

	UPSTREAM	DOWNSTREAM		
Geometry:	Trapezoidal	Trapezoidal	Friction Equation:	Automatic
Invert(ft):	5.000	5.000	Solution Algorithm:	Automatic
TClpInitZ(ft):	9999.000	9999.000	Flow:	Both
Manning's N:	0.040000	0.040000	Contraction Coef:	0.100
Top Clip(ft):	0.000	0.000	Expansion Coef:	0.300
Bot Clip(ft):	0.000	0.000	Entrance Loss Coef:	0.000
Main XSec:			Exit Loss Coef:	0.000
AuxElev1(ft):			Outlet Ctrl Spec:	Use dc or tw
Aux XSec1:			Inlet Ctrl Spec:	Use dc
AuxElev2(ft):			Stabilizer Option:	None
Aux XSec2:				
Top Width(ft):				
Depth(ft):				
Bot Width(ft):	10.000	10.000		
LtSdSlp(h/v):	8.00	8.00		
RtSdSlp(h/v):	8.00	8.00		

==========
==== Drop Structures ==========
==========

Name: CS 01 | From Node: POND 03 | Length(ft): 35.00
Group: BASE | To Node: POND 02 | Count: 1

	UPSTREAM	DOWNSTREAM		
Geometry:	Rectangular	Rectangular	Friction Equation:	Average Conveyance
Span(in):	48.00	48.00	Solution Algorithm:	Automatic
Rise(in):	36.00	36.00	Flow:	Both
Invert(ft):	3.250	3.250	Entrance Loss Coef:	0.200
Manning's N:	0.020000	0.020000	Exit Loss Coef:	1.000
Top Clip(in):	0.000	0.000	Outlet Ctrl Spec:	Use dc or tw
Bot Clip(in):	0.000	0.000	Inlet Ctrl Spec:	Use dn
			Solution Incs:	10

Upstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Downstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Spillway Box

*** Weir 1 of 1 for Drop Structure CS 01 ***

TABLE

Count:	1	Bottom Clip(in):	0.000
Type:	Vertical: Mavis	Top Clip(in):	0.000
Flow:	Both	Weir Disc Coef:	3.200
Geometry:	Rectangular	Orifice Disc Coef:	0.600
Span(in):	48.00	Invert(ft):	3.250
Rise(in):	12.00	Control Elev(ft):	3.250

Name:	CS 02	From Node:	POND 04	Length(ft):	35.00
Group:	BASE	To Node:	BOUNDARY	Count:	1

	UPSTREAM	DOWNSTREAM		
Geometry:	Rectangular	Rectangular	Friction Equation:	Average Conveyance
Span(in):	48.00	48.00	Solution Algorithm:	Automatic
Rise(in):	36.00	36.00	Flow:	Both
Invert(ft):	3.250	3.250	Entrance Loss Coef:	0.200
Manning's N:	0.020000	0.020000	Exit Loss Coef:	1.000
Top Clip(in):	0.000	0.000	Outlet Ctrl Spec:	Use dc or tw
Bot Clip(in):	0.000	0.000	Inlet Ctrl Spec:	Use dn
			Solution Incs:	10

Upstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Downstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Rice Trunk

*** Weir 1 of 1 for Drop Structure CS 02 ***

TABLE

Count:	1	Bottom Clip(in):	0.000
Type:	Vertical: Mavis	Top Clip(in):	0.000
Flow:	Both	Weir Disc Coef:	3.200
Geometry:	Rectangular	Orifice Disc Coef:	0.600
Span(in):	48.00	Invert(ft):	3.250
Rise(in):	10.00	Control Elev(ft):	3.250

Name:	CS 03	From Node:	POND 04	Length(ft):	35.00
Group:	BASE	To Node:	BOUNDARY	Count:	1

	UPSTREAM	DOWNSTREAM		
Geometry:	Rectangular	Rectangular	Friction Equation:	Average Conveyance
Span(in):	48.00	48.00	Solution Algorithm:	Automatic
Rise(in):	36.00	36.00	Flow:	Both
Invert(ft):	3.250	3.250	Entrance Loss Coef:	0.200
Manning's N:	0.020000	0.020000	Exit Loss Coef:	1.000
Top Clip(in):	0.000	0.000	Outlet Ctrl Spec:	Use dc or tw
Bot Clip(in):	0.000	0.000	Inlet Ctrl Spec:	Use dn
			Solution Incs:	10

Upstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Downstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Rice Trunk

*** Weir 1 of 1 for Drop Structure CS 03 ***

TABLE

Count:	1	Bottom Clip(in):	0.000
Type:	Vertical: Mavis	Top Clip(in):	0.000
Flow:	Both	Weir Disc Coef:	3.200
Geometry:	Rectangular	Orifice Disc Coef:	0.600
Span(in):	48.00	Invert(ft):	3.250
Rise(in):	10.00	Control Elev(ft):	3.250

Name:	CS 04	From Node:	POND 08	Length(ft):	35.00
Group:	BASE	To Node:	BOUNDARY	Count:	1

	UPSTREAM	DOWNSTREAM		
Geometry:	Rectangular	Rectangular	Friction Equation:	Average Conveyance
Span(in):	48.00	48.00	Solution Algorithm:	Automatic
Rise(in):	36.00	36.00	Flow:	Both
Invert(ft):	3.500	3.500	Entrance Loss Coef:	0.200
Manning's N:	0.020000	0.020000	Exit Loss Coef:	1.000
Top Clip(in):	0.000	0.000	Outlet Ctrl Spec:	Use dc or tw
Bot Clip(in):	0.000	0.000	Inlet Ctrl Spec:	Use dn
			Solution Incs:	10

Upstream FHWA Inlet Edge Description:

Rectangular Box: 0° wingwall flares

Downstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Existing Rice Trunk

*** Weir 1 of 1 for Drop Structure CS 04 ***

TABLE

Count:	1	Bottom Clip(in):	0.000
Type:	Vertical: Mavis	Top Clip(in):	0.000
Flow:	Both	Weir Disc Coef:	3.200
Geometry:	Rectangular	Orifice Disc Coef:	0.600
Span(in):	48.00	Invert(ft):	3.500
Rise(in):	10.00	Control Elev(ft):	3.500

Name:	CS 05	From Node:	POND 08	Length(ft):	35.00
Group:	BASE	To Node:	BOUNDARY	Count:	1

	UPSTREAM	DOWNSTREAM		
Geometry:	Rectangular	Rectangular	Friction Equation:	Average Conveyance
Span(in):	48.00	48.00	Solution Algorithm:	Automatic
Rise(in):	36.00	36.00	Flow:	Positive
Invert(ft):	3.500	3.500	Entrance Loss Coef:	0.200
Manning's N:	0.020000	0.020000	Exit Loss Coef:	1.000
Top Clip(in):	0.000	0.000	Outlet Ctrl Spec:	Use dc or tw
Bot Clip(in):	0.000	0.000	Inlet Ctrl Spec:	Use dn
			Solution Incs:	10

Upstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Downstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Spillway Box

*** Weir 1 of 1 for Drop Structure CS 05 ***

TABLE

Count:	1	Bottom Clip(in):	0.000
Type:	Vertical: Mavis	Top Clip(in):	0.000
Flow:	Both	Weir Disc Coef:	3.200
Geometry:	Rectangular	Orifice Disc Coef:	0.600
Span(in):	48.00	Invert(ft):	3.500
Rise(in):	10.00	Control Elev(ft):	3.500

Name:	CS 06	From Node:	POND 07	Length(ft):	35.00
Group:	BASE	To Node:	BOUNDARY	Count:	1

	UPSTREAM	DOWNSTREAM		
Geometry:	Rectangular	Rectangular	Friction Equation:	Average Conveyance
Span(in):	48.00	48.00	Solution Algorithm:	Automatic
Rise(in):	36.00	36.00	Flow:	Positive
Invert(ft):	3.500	3.500	Entrance Loss Coef:	0.200
Manning's N:	0.020000	0.020000	Exit Loss Coef:	1.000
Top Clip(in):	0.000	0.000	Outlet Ctrl Spec:	Use dc or tw
Bot Clip(in):	0.000	0.000	Inlet Ctrl Spec:	Use dn
			Solution Incs:	10

Upstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Downstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Rice Trunk

*** Weir 1 of 1 for Drop Structure CS 06 ***

TABLE

Count:	1	Bottom Clip(in):	0.000
Type:	Vertical: Mavis	Top Clip(in):	0.000
Flow:	Both	Weir Disc Coef:	3.200
Geometry:	Rectangular	Orifice Disc Coef:	0.600
Span(in):	48.00	Invert(ft):	3.500
Rise(in):	12.00	Control Elev(ft):	3.500

Name:	CS 07	From Node:	BOUNDARY	Length(ft):	35.00
Group:	BASE	To Node:	POND 07	Count:	1

	UPSTREAM	DOWNSTREAM		
Geometry:	Rectangular	Rectangular	Friction Equation:	Average Conveyance
Span(in):	48.00	48.00	Solution Algorithm:	Automatic
Rise(in):	36.00	36.00	Flow:	Both
Invert(ft):	3.500	3.500	Entrance Loss Coef:	0.200
			Exit Loss Coef:	1.000

```
  Manning's N: 0.020000       0.020000                  Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                      Inlet Ctrl Spec: Use dn
 Bot Clip(in): 0.000          0.000                        Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Downstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Spillway Box

*** Weir 1 of 1 for Drop Structure CS 07  ***
                                                                                        TABLE
                  Count: 1                      Bottom Clip(in): 0.000
                   Type: Horizontal                Top Clip(in): 0.000
                   Flow: Both                   Weir Disc Coef: 3.200
              Geometry: Rectangular          Orifice Disc Coef: 0.600

              Span(in): 48.00                       Invert(ft): 3.500
              Rise(in): 48.00                Control Elev(ft): 3.500


-------------------------------------------------------------------------------------------------------
         Name: CS 08              From Node: POND 06           Length(ft): 35.00
        Group: BASE                 To Node: POND 05                Count: 1

              UPSTREAM       DOWNSTREAM                Friction Equation: Average Conveyance
    Geometry: Rectangular    Rectangular              Solution Algorithm: Automatic
    Span(in): 48.00          48.00                                Flow: Both
    Rise(in): 36.00          36.00                    Entrance Loss Coef: 0.200
   Invert(ft): 3.250         3.250                        Exit Loss Coef: 1.000
  Manning's N: 0.020000      0.020000                   Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000         0.000                       Inlet Ctrl Spec: Use dn
 Bot Clip(in): 0.000         0.000                         Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Downstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Spillway Box

*** Weir 1 of 1 for Drop Structure CS 08  ***
                                                                                        TABLE
                  Count: 1                      Bottom Clip(in): 0.000
                   Type: Vertical: Mavis           Top Clip(in): 0.000
                   Flow: Both                   Weir Disc Coef: 3.200
              Geometry: Rectangular          Orifice Disc Coef: 0.600

              Span(in): 48.00                       Invert(ft): 3.250
              Rise(in): 10.00                Control Elev(ft): 3.250


-------------------------------------------------------------------------------------------------------
         Name: CS 09              From Node: POND 03           Length(ft): 35.00
        Group: BASE                 To Node: POND 04                Count: 1

              UPSTREAM       DOWNSTREAM                Friction Equation: Average Conveyance
    Geometry: Rectangular    Rectangular              Solution Algorithm: Automatic
    Span(in): 48.00          48.00                                Flow: Both
    Rise(in): 36.00          36.00                    Entrance Loss Coef: 0.200
   Invert(ft): 3.250         3.250                        Exit Loss Coef: 1.000
  Manning's N: 0.020000      0.020000                   Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000         0.000                       Inlet Ctrl Spec: Use dn
 Bot Clip(in): 0.000         0.000                         Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Downstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Spillway Box

*** Weir 1 of 1 for Drop Structure CS 09  ***
                                                                                        TABLE
                  Count: 1                      Bottom Clip(in): 0.000
                   Type: Vertical: Mavis           Top Clip(in): 0.000
                   Flow: Both                   Weir Disc Coef: 3.200
              Geometry: Rectangular          Orifice Disc Coef: 0.600

              Span(in): 48.00                       Invert(ft): 3.250
              Rise(in): 10.00                Control Elev(ft): 3.250


-------------------------------------------------------------------------------------------------------
         Name: CS 10              From Node: POND 06           Length(ft): 35.00
        Group: BASE                 To Node: POND 04                Count: 1
```

	UPSTREAM	DOWNSTREAM		
			Friction Equation:	Average Conveyance
Geometry:	Rectangular	Rectangular	Solution Algorithm:	Automatic
Span(in):	48.00	48.00	Flow:	Both
Rise(in):	36.00	36.00	Entrance Loss Coef:	0.200
Invert(ft):	3.250	3.250	Exit Loss Coef:	1.000
Manning's N:	0.020000	0.020000	Outlet Ctrl Spec:	Use dc or tw
Top Clip(in):	0.000	0.000	Inlet Ctrl Spec:	Use dn
Bot Clip(in):	0.000	0.000	Solution Incs:	10

Upstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Downstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Spillway Box

*** Weir 1 of 1 for Drop Structure CS 10 ***

TABLE

Count:	1	Bottom Clip(in):	0.000
Type:	Vertical: Mavis	Top Clip(in):	0.000
Flow:	Both	Weir Disc Coef:	3.200
Geometry:	Rectangular	Orifice Disc Coef:	0.600
Span(in):	48.00	Invert(ft):	3.250
Rise(in):	10.00	Control Elev(ft):	3.250

Name:	DS 01	From Node:	POND 01	Length(ft):	50.00
Group:	BASE	To Node:	BOUNDARY	Count:	1

	UPSTREAM	DOWNSTREAM		
			Friction Equation:	Automatic
Geometry:	Circular	Circular	Solution Algorithm:	Most Restrictive
Span(in):	60.00	60.00	Flow:	Both
Rise(in):	60.00	60.00	Entrance Loss Coef:	0.000
Invert(ft):	3.000	3.000	Exit Loss Coef:	0.000
Manning's N:	0.024000	0.024000	Outlet Ctrl Spec:	Use dc or tw
Top Clip(in):	0.000	0.000	Inlet Ctrl Spec:	Use dc
Bot Clip(in):	0.000	0.000	Solution Incs:	10

Upstream FHWA Inlet Edge Description:
Circular CMP: Projecting

Downstream FHWA Inlet Edge Description:
Circular CMP: Projecting

*** Weir 1 of 2 for Drop Structure DS 01 ***

TABLE

Count:	1	Bottom Clip(in):	0.000
Type:	Vertical: Mavis	Top Clip(in):	0.000
Flow:	Both	Weir Disc Coef:	3.200
Geometry:	Rectangular	Orifice Disc Coef:	0.600
Span(in):	96.00	Invert(ft):	3.850
Rise(in):	24.00	Control Elev(ft):	3.850

*** Weir 2 of 2 for Drop Structure DS 01 ***

TABLE

Count:	1	Bottom Clip(in):	0.000
Type:	Horizontal	Top Clip(in):	0.000
Flow:	Both	Weir Disc Coef:	3.200
Geometry:	Circular	Orifice Disc Coef:	0.600
Span(in):	96.00	Invert(ft):	5.850
Rise(in):	96.00	Control Elev(ft):	5.850

Name:	DS 02	From Node:	POND 05	Length(ft):	25.00
Group:	BASE	To Node:	BOUNDARY	Count:	1

	UPSTREAM	DOWNSTREAM		
			Friction Equation:	Average Conveyance
Geometry:	Rectangular	Rectangular	Solution Algorithm:	Automatic
Span(in):	48.00	48.00	Flow:	Both
Rise(in):	48.00	48.00	Entrance Loss Coef:	0.200
Invert(ft):	3.250	3.000	Exit Loss Coef:	1.000
Manning's N:	0.020000	0.020000	Outlet Ctrl Spec:	Use dc or tw
Top Clip(in):	0.000	0.000	Inlet Ctrl Spec:	Use dn
Bot Clip(in):	0.000	0.000	Solution Incs:	10

Upstream FHWA Inlet Edge Description:
Rectangular Box: 30° to 75° wingwall flares

Downstream FHWA Inlet Edge Description:
Rectangular Box: 30° to 75° wingwall flares

Rice Trunk

*** Weir 1 of 2 for Drop Structure DS 02 ***

TABLE

Count:	1	Bottom Clip(in):	0.000
Type:	Vertical: Mavis	Top Clip(in):	0.000
Flow:	Both	Weir Disc Coef:	3.200
Geometry:	Rectangular	Orifice Disc Coef:	0.600
Span(in):	48.00	Invert(ft):	3.250
Rise(in):	12.00	Control Elev(ft):	3.250

*** Weir 2 of 2 for Drop Structure DS 02 ***

TABLE

Count:	1	Bottom Clip(in):	0.000
Type:	Horizontal	Top Clip(in):	0.000
Flow:	Positive	Weir Disc Coef:	3.200
Geometry:	Rectangular	Orifice Disc Coef:	0.600
Span(in):	48.00	Invert(ft):	3.500
Rise(in):	48.00	Control Elev(ft):	3.500

==========
==== Weirs ==========
==========

Name:	Road 05	From Node:	NODE 05
Group:	BASE	To Node:	NODE 05A
Flow:	Both	Count:	1
Type:	Vertical: Paved	Geometry:	Trapezoidal
Bottom Width(ft):	100.00		
Left Side Slope(h/v):	20.00		
Right Side Slope(h/v):	20.00		
Invert(ft):	11.000		
Control Elevation(ft):	11.000		
Struct Opening Dim(ft):	9999.00		

TABLE

Bottom Clip(ft):	0.000
Top Clip(ft):	0.000
Weir Discharge Coef:	2.500
Orifice Discharge Coef:	0.600

==========
==== Hydrology Simulations ==========
==========

Name: 002
Filename: N:\17091\DSGN\PRE DEVELOPMENT\ICPR\002.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00
Rainfall File: Scsiii
Rainfall Amount(in): 4.60

Time(hrs)	Print Inc(min)
12.000	30.00
15.000	15.00
24.000	30.00
360.000	30.00

Name: 010
Filename: N:\17091\DSGN\PRE DEVELOPMENT\ICPR\010.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00
Rainfall File: Scsiii
Rainfall Amount(in): 6.80

Time(hrs)	Print Inc(min)
12.000	30.00
15.000	15.00
24.000	30.00
360.000	30.00

Name: 025
Filename: N:\17091\DSGN\PRE DEVELOPMENT\ICPR\025.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00
Rainfall File: Scsiii
Rainfall Amount(in): 7.60

Time(hrs)	Print Inc(min)
12.000	30.00

15.000 15.00
24.000 30.00
360.000 30.00

Name: 050
Filename: N:\17091\DSGN\PRE DEVELOPMENT\ICPR\050.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00
Rainfall File: Scsiii
Rainfall Amount(in): 8.80

Time(hrs)	Print Inc(min)
12.000	30.00
15.000	15.00
24.000	30.00
360.000	30.00

Name: 100
Filename: N:\17091\DSGN\PRE DEVELOPMENT\ICPR\100.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00
Rainfall File: Scsiii
Rainfall Amount(in): 10.00

Time(hrs)	Print Inc(min)
12.000	30.00
15.000	15.00
24.000	30.00
360.000	30.00

==========

Routing Simulations

==========

Name: 002 Hydrology Sim: 002
Filename: N:\17091\DSGN\PRE DEVELOPMENT\ICPR\002.I32

Execute: Yes Restart: No Patch: No
Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
Time Step Optimizer: 10.000
Start Time(hrs): 0.000 End Time(hrs): 360.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
12.000	30.000
15.000	15.000
24.000	30.000
360.000	30.000

Group	Run
BASE	Yes

Name: 010 Hydrology Sim: 010
Filename: N:\17091\DSGN\PRE DEVELOPMENT\ICPR\010.I32

Execute: Yes Restart: No Patch: No
Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
Time Step Optimizer: 10.000
Start Time(hrs): 0.000 End Time(hrs): 360.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
12.000	30.000
15.000	15.000
24.000	30.000
360.000	30.000

Group	Run
BASE	Yes

```
-------------------------------------------------------------------------------------------------
         Name: 025                 Hydrology Sim: 025
     Filename: N:\17091\DSGN\PRE DEVELOPMENT\ICPR\025.I32

      Execute: Yes         Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                    End Time(hrs): 360.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                         Boundary Flows:



Time(hrs)       Print Inc(min)
--------------- ---------------
12.000          30.000
15.000          15.000
24.000          30.000
360.000         30.000

Group           Run
--------------- -----
BASE            Yes


-------------------------------------------------------------------------------------------------
         Name: 050                 Hydrology Sim: 050
     Filename: N:\17091\DSGN\PRE DEVELOPMENT\ICPR\050.I32

      Execute: Yes         Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                    End Time(hrs): 360.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                         Boundary Flows:



Time(hrs)       Print Inc(min)
--------------- ---------------
12.000          30.000
15.000          15.000
24.000          30.000
360.000         30.000

Group           Run
--------------- -----
BASE            Yes


-------------------------------------------------------------------------------------------------
         Name: 100                 Hydrology Sim: 100
     Filename: N:\17091\DSGN\PRE DEVELOPMENT\ICPR\100.I32

      Execute: Yes         Restart: No            Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                    End Time(hrs): 360.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                         Boundary Flows:



Time(hrs)       Print Inc(min)
--------------- ---------------
12.000          30.000
15.000          15.000
24.000          30.000
360.000         30.000

Group           Run
--------------- -----
BASE            Yes
```

KIAWAH RIVER PLANTATION
DRAINAGE BASIN STUDY

Appendix B

PRE-DEVELOPMENT CONDITIONS
ICPR MODEL OUTPUT – NODE MIN/MAX REPORT

PREPARED BY

THOMAS & HUTTON ENGINEERING CO.

KIAWAH RIVER PLANTATION J-17091
Pre Development
June 03, 2009
Node Min/Max Report

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
BOUNDARY	BASE	002	0.00	3.00	4.00	-0.0083	1633	13.25	292.83	0.00	0.00
BOUNDARY	BASE	010	0.00	3.00	4.00	-0.0083	1633	13.25	563.43	0.00	0.00
BOUNDARY	BASE	025	0.00	3.00	4.00	-0.0083	1633	13.25	668.51	0.00	0.00
BOUNDARY	BASE	050	0.00	3.00	4.00	-0.0083	1633	13.25	829.11	0.00	0.00
BOUNDARY	BASE	100	0.00	3.00	4.00	-0.0083	1633	13.25	992.09	0.00	0.00
NODE 01	BASE	002	23.30	12.19	15.00	0.0025	734614	13.75	46.13	23.30	7.30
NODE 01	BASE	010	22.37	12.83	15.00	0.0029	1162674	13.75	90.08	22.37	14.88
NODE 01	BASE	025	22.27	13.03	15.00	0.0035	1328674	13.75	106.96	22.27	17.44
NODE 01	BASE	050	22.22	13.28	15.00	0.0031	1553801	13.75	132.77	22.22	21.10
NODE 01	BASE	100	22.25	13.52	15.00	0.0031	1758437	13.75	159.01	22.25	24.50
NODE 01A	BASE	002	23.19	11.27	15.00	0.0017	9358	23.30	7.30	23.47	7.30
NODE 01A	BASE	010	22.16	11.69	15.00	0.0024	10596	22.37	14.88	22.51	14.89
NODE 01A	BASE	025	22.09	11.80	15.00	0.0026	10963	22.27	17.44	22.40	17.45
NODE 01A	BASE	050	22.15	11.96	15.00	0.0025	11472	22.22	21.10	22.35	21.11
NODE 01A	BASE	100	22.36	12.09	15.00	0.0023	11935	22.25	24.50	22.36	24.50
NODE 02	BASE	002	30.15	13.19	15.00	0.0037	4226511	16.50	128.37	30.15	23.70
NODE 02	BASE	010	31.22	13.83	15.00	0.0030	6685846	16.00	244.68	31.22	34.64
NODE 02	BASE	025	31.47	14.02	15.00	0.0034	7431767	16.00	289.60	31.47	38.53
NODE 02	BASE	050	31.80	14.29	15.00	0.0030	8458518	16.00	358.36	31.80	44.12
NODE 02	BASE	100	32.08	14.53	15.00	0.0031	9399850	16.00	428.23	32.08	49.39
NODE 02A	BASE	002	28.39	12.02	15.00	0.0022	12233	30.15	23.70	30.32	23.72
NODE 02A	BASE	010	30.52	12.18	15.00	0.0018	13457	31.22	34.64	31.32	34.65
NODE 02A	BASE	025	31.14	12.25	15.00	0.0018	13941	31.47	38.53	31.59	38.54
NODE 02A	BASE	050	31.77	12.36	15.00	0.0016	14645	31.80	44.12	31.97	44.12
NODE 02A	BASE	100	31.76	12.47	15.00	0.0016	15316	32.08	49.39	32.16	49.39
NODE 03	BASE	002	28.37	12.92	15.00	0.0031	2321451	16.50	68.54	28.37	19.55
NODE 03	BASE	010	29.84	13.43	15.00	0.0031	4608029	16.50	130.74	29.84	27.44
NODE 03	BASE	025	30.25	13.58	15.00	0.0028	5284156	16.50	154.60	30.25	29.85
NODE 03	BASE	050	30.73	13.77	15.00	0.0029	6191499	16.50	191.08	30.73	33.54
NODE 03	BASE	100	31.11	13.95	15.00	0.0030	7008844	16.50	228.16	31.11	37.04
NODE 03A	BASE	002	26.35	11.84	15.00	0.0024	12665	28.37	19.55	28.52	19.58
NODE 03A	BASE	010	29.26	11.99	15.00	0.0020	13963	29.84	27.44	29.96	27.45
NODE 03A	BASE	025	29.70	12.04	15.00	0.0016	14419	30.25	29.85	30.37	29.85
NODE 03A	BASE	050	30.62	12.13	15.00	0.0017	15131	30.73	33.54	30.83	33.54
NODE 03A	BASE	100	31.36	12.22	15.00	0.0017	15821	31.11	37.04	31.23	37.04
NODE 04	BASE	002	27.47	5.97	8.00	0.0011	3060454	14.50	115.36	27.45	9.27
NODE 04	BASE	010	26.31	6.68	8.00	0.0023	3525304	14.25	242.20	26.06	27.04
NODE 04	BASE	025	26.04	6.93	8.00	0.0025	3685926	14.25	292.65	25.75	34.96
NODE 04	BASE	050	25.72	7.28	8.00	0.0027	3918130	14.25	370.80	25.33	47.80
NODE 04	BASE	100	25.43	7.62	8.00	0.0030	4141134	14.25	451.07	24.93	61.54
NODE 04A	BASE	002	31.02	5.76	8.00	0.0011	15977	27.45	9.27	27.62	9.24
NODE 04A	BASE	010	28.02	6.40	8.00	0.0019	18879	26.06	27.04	26.16	26.99
NODE 04A	BASE	025	27.62	6.61	8.00	-0.0050	19853	25.75	34.96	25.85	34.89
NODE 04A	BASE	050	27.28	6.92	8.00	0.0050	21263	25.33	47.80	25.43	47.71
NODE 04A	BASE	100	27.11	7.21	8.00	-0.0050	22615	24.93	61.54	25.01	61.42
NODE 05	BASE	002	19.19	10.43	11.00	0.0050	689629	13.50	67.51	19.19	15.96
NODE 05	BASE	010	18.46	11.15	11.00	0.0050	1111338	13.25	125.50	18.46	32.91
NODE 05	BASE	025	17.51	11.25	11.00	0.0050	1167932	13.25	147.74	17.51	49.34
NODE 05	BASE	050	16.61	11.37	11.00	0.0050	1236778	13.25	181.54	16.61	74.04
NODE 05	BASE	100	16.06	11.47	11.00	0.0050	1297082	13.25	215.68	16.06	100.22
NODE 05A	BASE	002	15.56	8.13	11.00	0.0023	15977	19.19	15.96	18.45	16.08
NODE 05A	BASE	010	18.52	8.55	11.00	0.0031	18761	18.46	32.91	18.64	32.95
NODE 05A	BASE	025	17.54	9.06	11.00	-0.0037	20897	17.51	49.34	17.68	49.43
NODE 05A	BASE	050	16.65	9.61	11.00	0.0050	23226	16.61	74.04	16.75	74.09

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
NODE 05A	BASE	100	16.11	10.06	11.00	0.0050	25160	16.06	100.22	16.18	100.23
NODE 06	BASE	002	16.35	6.08	7.00	0.0018	124078	15.09	20.56	16.35	19.36
NODE 06	BASE	010	15.48	6.57	7.00	0.0029	183041	14.11	46.59	15.48	43.19
NODE 06	BASE	025	15.32	6.72	7.00	0.0041	201122	13.88	57.39	15.32	52.89
NODE 06	BASE	050	15.13	6.92	7.00	0.0046	225804	13.70	74.35	15.13	68.14
NODE 06	BASE	100	14.99	7.11	7.00	0.0039	239820	13.64	92.06	14.99	84.25
NODE 07	BASE	002	16.38	6.10	7.00	0.0021	197410	13.00	20.13	17.22	6.95
NODE 07	BASE	010	15.50	6.59	7.00	0.0032	240174	13.00	38.07	15.89	15.36
NODE 07	BASE	025	15.34	6.74	7.00	0.0044	253269	13.00	44.86	15.59	18.80
NODE 07	BASE	050	15.15	6.94	7.00	0.0047	271137	13.00	55.16	15.36	24.22
NODE 07	BASE	100	15.00	7.13	7.00	0.0039	287495	13.00	65.57	15.20	29.90
NODE 08	BASE	002	16.25	6.19	7.00	0.0021	500518	13.00	65.39	16.25	17.72
NODE 08	BASE	010	15.51	6.68	7.00	0.0032	683064	13.00	118.54	15.51	37.97
NODE 08	BASE	025	15.36	6.83	7.00	0.0044	739002	13.00	138.19	15.36	46.14
NODE 08	BASE	050	15.19	7.04	7.00	0.0046	807197	13.00	168.05	15.19	58.94
NODE 08	BASE	100	15.04	7.23	7.00	0.0037	838437	13.00	198.21	15.04	72.54
POND 01	BASE	002	52.22	5.60	6.00	0.0018	18067499	12.25	841.27	52.22	35.13
POND 01	BASE	010	52.59	6.26	6.00	0.0034	24776099	12.25	1528.88	52.59	60.90
POND 01	BASE	025	50.94	6.46	6.00	0.0039	25766597	12.25	1798.05	50.94	71.09
POND 01	BASE	050	48.93	6.77	6.00	0.0049	27226670	12.25	2213.14	48.93	85.21
POND 01	BASE	100	47.22	7.07	6.00	0.0050	28641366	12.25	2638.11	47.22	99.19
POND 02	BASE	002	29.60	3.72	6.00	0.0013	290621	12.25	20.04	29.60	0.88
POND 02	BASE	010	24.96	3.99	6.00	0.0020	295083	12.25	30.08	24.96	2.46
POND 02	BASE	025	24.64	4.09	6.00	0.0022	296733	12.25	33.97	24.64	3.27
POND 02	BASE	050	24.53	4.23	6.00	0.0026	298987	12.25	40.08	24.53	4.58
POND 02	BASE	100	24.10	4.37	6.00	0.0029	301246	12.25	46.60	24.10	6.12
POND 03	BASE	002	26.57	3.75	6.00	0.0013	344601	12.25	23.83	37.49	0.50
POND 03	BASE	010	24.46	4.05	6.00	0.0020	349352	12.25	35.83	33.07	1.10
POND 03	BASE	025	24.39	4.16	6.00	0.0022	351162	12.25	40.39	31.79	1.86
POND 03	BASE	050	23.57	4.32	6.00	0.0027	353698	12.25	47.38	29.82	1.92
POND 03	BASE	100	24.10	4.46	6.00	0.0030	355964	12.25	54.59	35.98	2.20
POND 04	BASE	002	24.14	3.79	6.00	0.0014	2579266	12.25	200.37	24.14	4.41
POND 04	BASE	010	23.86	4.09	6.00	0.0022	2588914	12.25	307.73	23.86	9.09
POND 04	BASE	025	23.67	4.20	6.00	0.0024	2592347	12.25	347.44	23.67	11.00
POND 04	BASE	050	23.62	4.37	6.00	0.0029	2597586	12.25	406.72	23.62	13.50
POND 04	BASE	100	23.51	4.53	6.00	0.0032	2602853	12.25	466.69	23.51	15.91
POND 05	BASE	002	14.71	4.11	6.00	0.0020	179985	12.75	26.85	14.71	8.46
POND 05	BASE	010	14.44	4.67	6.00	0.0035	188930	12.75	47.87	14.44	16.56
POND 05	BASE	025	14.40	4.88	6.00	0.0039	192291	12.75	55.74	14.40	19.81
POND 05	BASE	050	14.35	5.20	6.00	0.0050	197309	12.75	68.45	14.35	24.91
POND 05	BASE	100	14.31	5.52	6.00	0.0050	202281	12.75	81.44	14.31	30.22
POND 06	BASE	002	16.27	4.10	6.00	0.0017	377161	12.25	37.55	17.85	6.68
POND 06	BASE	010	15.94	4.65	6.00	0.0029	394722	12.25	62.28	17.57	12.67
POND 06	BASE	025	15.91	4.86	6.00	0.0033	401220	12.25	71.56	17.60	14.67
POND 06	BASE	050	15.91	5.17	6.00	0.0041	410962	12.25	85.65	17.64	17.52
POND 06	BASE	100	15.93	5.47	6.00	0.0043	420663	12.25	99.82	17.71	20.18
POND 07	BASE	002	14.86	4.46	6.00	0.0020	197696	12.75	28.37	14.86	5.65
POND 07	BASE	010	14.47	5.05	6.00	0.0035	205337	12.75	49.99	14.47	10.63
POND 07	BASE	025	14.41	5.26	6.00	0.0040	208115	12.75	57.80	14.41	12.21
POND 07	BASE	050	14.32	5.57	6.00	0.0049	212224	12.75	69.43	14.32	14.46
POND 07	BASE	100	14.26	5.88	6.00	0.0049	216249	12.75	80.85	14.26	16.55
POND 08	BASE	002	17.51	3.90	6.00	0.0014	811111	12.25	61.13	17.51	2.69
POND 08	BASE	010	16.82	4.11	6.00	0.0021	814746	12.25	92.90	16.82	5.41

KIAWAH RIVER PLANTATION J-17091
Pre Development
June 03, 2009
Node Min/Max Report

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
POND 08	BASE	025	16.71	4.18	6.00	0.0023	816049	12.25	104.58	16.71	6.53
POND 08	BASE	050	16.58	4.30	6.00	0.0028	817978	12.25	122.00	16.58	8.33
POND 08	BASE	100	16.52	4.41	6.00	0.0031	819934	12.25	139.56	16.52	9.90

KIAWAH RIVER PLANTATION
DRAINAGE BASIN STUDY

Appendix C

PRE-DEVELOPMENT CONDITIONS
STORMWATER DESIGN CONSIDERATIONS

PREPARED BY

THOMAS & HUTTON ENGINEERING CO.

STORMWATER DESIGN CONSIDERATIONS

PROJECT: 17091 KIAWAH RIVER PLANTATION **Job:** J-17091

PREPARED BY: Thomas and Hutton Engineering Company
PREPARED FOR:

Date: 5/18/09
Revised:
By: CGB

DRAINAGE BASIN 1

Calculate Pre-Development "Tc" and Composite "CN" **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Light Underbrush = 0.400
l = 100 ft
P2 = 4.60 in
S = 0.0010 ft/ft
t_1 = 59.4 min

Shallow Concentrated Flow:

t=1/60v
where
l = 3900 ft
Paved ? No
Slope, S = 0.0020 ft/ft
v = 0.72 ft/s
t_2 = 90.1 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Not maintained, dense brush, high stage = 0.1200
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 1: Tc = 149.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Woods: Good (no grazing or burning)	A	30	8.92	268
	Resi: 1 acre (20% avg. imp.)	B	68	1.50	102
	Commercial or Industrial (85% avg. imp.)	B	92	4.87	448
B/D	Woods: Good (no grazing or burning)	D	77	117.50	9,048
				132.79	9,865

Basin 1: Composite CN = 74

DRAINAGE BASIN 2

Calculate Pre-Development "Tc" and Composite "CN" **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0020 ft/ft
t_1 = 78.3 min

Shallow Concentrated Flow:

t=1/60v
where
l = 11000 ft
Paved ? No
Slope, S = 0.0020 ft/ft
v = 0.72 ft/s
t_2 = 254.1 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 2: Tc = 332.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Resi: 1 acre (20% avg. imp.)	B	68	7.80	530
	Woods: Good (no grazing or burning)	A	30	31.16	935
B/D	Woods: Good (no grazing or burning)	D	77	601.06	46,282
				640.02	47,747

Basin 2: Composite CN = 75

DRAINAGE BASIN 3 — DRAINAGE BASIN 3

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0020 ft/ft
t_1 = 78.3 min

Shallow Concentrated Flow:

t=1/60v

where l = 12000 ft
Paved ? No
Slope, S = 0.0020 ft/ft
v = 0.72 ft/s
t_2 = 277.2 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 3: Tc = 356.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Resi: 1 acre (20% avg. imp.)	B	68	0.78	53
	Crops (SR) Straight Row: Good	A	63	46.95	2,958
	Woods: Good (no grazing or burning)	D	77	14.29	1,100
B/D	Woods: Good (no grazing or burning)	D	77	297.65	22,919
				359.67	27,030

Basin 3: Composite CN = 75

DRAINAGE BASIN 4 — DRAINAGE BASIN 4

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0020 ft/ft
t_1 = 78.3 min

Shallow Concentrated Flow:

t=1/60v

where l = 2800 ft
Paved ? No
Slope, S = 0.0030 ft/ft
v = 0.88 ft/s
t_2 = 52.8 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 1800 ft
S = 0.0030 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 42.00 sf
P = 23.97 ft => Hydraulic Radius, R = 1.75 ft
v = 4.22 ft/s
t_3 = 7.1 min

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 4: Tc = 138.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Resi: 1 acre (20% avg. imp.)	B	68	20.31	1,381
	Crops (SR) Straight Row: Good	B	75	52.01	3,901
B/D	Woods: Good (no grazing or burning)	D	77	156.41	12,044
				228.73	17,325

Basin 4: Composite CN = 76

DRAINAGE BASIN 5 — DRAINAGE BASIN 5

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0020 ft/ft
t_1 = 78.3 min

Shallow Concentrated Flow:

t=1/60v

where
l = 800 ft
Paved ? No
Slope, S = 0.0030 ft/ft
v = 0.88 ft/s
t_2 = 15.1 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 1300 ft
S = 0.0040 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 42.00 sf
P = 23.97 ft => Hydraulic Radius, R = 1.75 ft
v = 4.88 ft/s
t_3 = 4.4 min

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 5: Tc = 98.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Resi: 1 acre (20% avg. imp.)	B	68	2.64	180
	Crops (SR) Straight Row: Good	B	75	14.00	1,050
B/D	Woods: Good (no grazing or burning)	D	77	32.41	2,496
				49.05	3,725

Basin 5: Composite CN = 76

DRAINAGE BASIN 6 — DRAINAGE BASIN 6

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Light Underbrush = 0.400
l = 100 ft
P2 = 4.60 in
S = 0.0020 ft/ft
t_1 = 45.0 min

Shallow Concentrated Flow:

t=1/60v

where
l = 2300 ft
Paved ? No
Slope, S = 0.0020 ft/ft
v = 0.72 ft/s
t_2 = 53.1 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 6: Tc = 98.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Resi: 1 acre (20% avg. imp.)	B	68	9.16	623
	Crops (SR) Straight Row: Good	C	83	5.96	495
B/D	Woods: Good (no grazing or burning)	D	77	68.88	5,304
				84.00	6,421

Basin 6: Composite CN = 76

DRAINAGE BASIN 7 — DRAINAGE BASIN 7

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0020 ft/ft
t_1 = 78.3 min

Shallow Concentrated Flow:

t=1/60v

where
l = 1000 ft
Paved ? No
Slope, S = 0.0020 ft/ft
v = 0.72 ft/s
t_2 = 23.1 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 7: Tc = 101.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Woods: Good (no grazing or burning)	A	30	2.85	86
	Crops (SR) Straight Row: Good	B	75	36.14	2,711
B/D	Woods: Good (no grazing or burning)	D	77	65.94	5,077
				104.93	7,873

Basin 7: Composite CN = 75

DRAINAGE BASIN 8 — DRAINAGE BASIN 8

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0020 ft/ft
t_1 = 78.3 min

Shallow Concentrated Flow:

t=1/60v

where
l = 1425 ft
Paved ? No
Slope, S = 0.0020 ft/ft
v = 0.72 ft/s
t_2 = 32.9 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 3700 ft
S = 0.0020 ft/ft
n = Not maintained, dense brush, high stage = 0.1200
A = 42.00 sf
P = 23.97 ft => Hydraulic Radius, R = 1.75 ft
v = 0.80 ft/s
t_3 = 76.6 min

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 8: Tc = 188.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Woods: Good (no grazing or burning)	B	55	58.28	3,205
	Crops (SR) Straight Row: Good	B	75	153.10	11,483
	Woods: Good (no grazing or burning)	A	30	54.23	1,627
B/D	Woods: Good (no grazing or burning)	D	77	232.74	17,921
				498.35	34,236

Basin 8: Composite CN = 69

DRAINAGE BASIN 9 — DRAINAGE BASIN 9

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0030 ft/ft
t_1 = 66.6 min

Shallow Concentrated Flow:

t=1/60v

where l = 6000 ft
Paved ? No
Slope, S = 0.0030 ft/ft
v = 0.88 ft/s
t_2 = 113.2 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 9: Tc = 180.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Woods: Good (no grazing or burning)	A	30	58.85	1,766
	Resi: 1 acre (20% avg. imp.)	B	68	16.83	1,144
	Crops (SR) Straight Row: Good	B	75	27.90	2,093
	Woods: Good (no grazing or burning)	C	70	9.59	671
B/D	Woods: Good (no grazing or burning)	D	77	386.68	29,774
	Woods: Good (no grazing or burning)	D	77	162.74	12,531
				662.59	47,979

Basin 9: Composite CN = 72

DRAINAGE BASIN 9A — DRAINAGE BASIN 9A

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0030 ft/ft
t_1 = 66.6 min

Shallow Concentrated Flow:

t=1/60v

where l = 600 ft
Paved ? No
Slope, S = 0.0030 ft/ft
v = 0.88 ft/s
t_2 = 11.3 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 9A: Tc = 78.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
B/D	Woods: Good (no grazing or burning)	D	77	18.54	1,428
	-	-	-	0.00	-
				18.54	1,428

Basin 9A: Composite CN = 77

DRAINAGE BASIN 10 — DRAINAGE BASIN 10

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Light Underbrush = 0.400
l = 100 ft
P2 = 4.60 in
S = 0.0030 ft/ft
t_1 = 38.3 min

Shallow Concentrated Flow:

t=1/60v

where l = 2500 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 40.8 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin : Tc = 79.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Woods: Good (no grazing or burning)	D	77	24.76	1,907
	Resi: 1 acre (20% avg. imp.)	B	68	7.31	497
	Crops (SR) Straight Row: Good	B	75	63.96	4,797
B/D	Woods: Good (no grazing or burning)	D	77	60.77	4,679
				156.80	11,880

Basin : Composite CN = 76

DRAINAGE BASIN 11 — DRAINAGE BASIN 11

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Light Underbrush = 0.400
l = 100 ft
P2 = 4.60 in
S = 0.0030 ft/ft
t_1 = 38.3 min

Shallow Concentrated Flow:

t=1/60v

where l = 4300 ft
Paved ? No
Slope, S = 0.0030 ft/ft
v = 0.88 ft/s
t_2 = 81.1 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 11: Tc = 119.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
B/D	Woods: Good (no grazing or burning)	D	77	121.85	9,382
	Crops (SR) Straight Row: Good	B	75	18.82	1,412
	Woods/grass combination: Good	D	79	4.46	352
				145.13	11,146

Basin 11: Composite CN = 77

DRAINAGE BASIN 12 — DRAINAGE BASIN 12

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Light Underbrush = 0.400
l = 100 ft
P2 = 4.60 in
S = 0.0020 ft/ft
t_1 = 45.0 min

Shallow Concentrated Flow:

t=1/60v

where
l = 2450 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 40.0 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 12: Tc = 85.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Resi: 2 acre (12% avg. imp.)	B	65	2.39	155
	Crops (SR) Straight Row: Good	B	75	17.53	1,315
B/D	Woods/grass combination: Good	D	79	59.62	4,710
				79.54	6,180

Basin 12: Composite CN = 78

DRAINAGE BASIN 13 — DRAINAGE BASIN 13

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Light Underbrush = 0.400
l = 100 ft
P2 = 4.60 in
S = 0.0030 ft/ft
t_1 = 38.3 min

Shallow Concentrated Flow:

t=1/60v

where
l = 3500 ft
Paved ? No
Slope, S = 0.0030 ft/ft
v = 0.88 ft/s
t_2 = 66.0 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 3600 ft
S = 0.0030 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 42.00 sf
P = 23.97 ft => Hydraulic Radius, R = 1.75 ft
v = 4.22 ft/s
t_3 = 14.2 min

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 13: Tc = 118.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Crops (SR) Straight Row: Good	B	75	17.53	1,315
	Woods: Good (no grazing or burning)	C	70	6.59	461
	Woods: Good (no grazing or burning)	D	77	25.03	1,927
B/D	Woods/grass combination: Good	D	79	197.92	15,636
				247.07	19,339

Basin 13: Composite CN = 78

DRAINAGE BASIN 14 — DRAINAGE BASIN 14

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Light Underbrush = 0.400
l = 100 ft
P2 = 4.60 in
S = 0.0030 ft/ft
t_1 = 38.3 min

Shallow Concentrated Flow:

t=1/60v

where l = 2400 ft
Paved ? No
Slope, S = 0.0030 ft/ft
v = 0.88 ft/s
t_2 = 45.3 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 1100 ft
S = 0.0030 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 42.00 sf
P = 23.97 ft => Hydraulic Radius, R = 1.75 ft
v = 4.22 ft/s
t_3 = 4.3 min

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 14: Tc = 88.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Resi: 1 acre (20% avg. imp.)	B	68	2.46	167
	Crops (SR) Straight Row: Good	B	75	38.82	2,912
	Woods: Good (no grazing or burning)	A	30	2.33	70
B/D	Woods/grass combination: Good	D	79	97.91	7,735
				141.52	10,884

Basin 14: Composite CN = 77

DRAINAGE BASIN 15 — DRAINAGE BASIN 15

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0030 ft/ft
t_1 = 66.6 min

Shallow Concentrated Flow:

t=1/60v

where l = 800 ft
Paved ? No
Slope, S = 0.0030 ft/ft
v = 0.88 ft/s
t_2 = 15.1 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 1800 ft
S = 0.0030 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 42.00 sf
P = 23.97 ft => Hydraulic Radius, R = 1.75 ft
v = 4.22 ft/s
t_3 = 7.1 min

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 15: Tc = 89.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Crops (SR) Straight Row: Good	B	75	15.49	1,162
B/D	Woods: Good (no grazing or burning)	D	77	23.01	1,772
				38.50	2,934

Basin 15: Composite CN = 76

DRAINAGE BASIN 16 — DRAINAGE BASIN 16

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0030 ft/ft
t_1 = 66.6 min

Shallow Concentrated Flow:

t=1/60v

where
l = 750 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 12.2 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 1700 ft
S = 0.0030 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 42.00 sf
P = 23.97 ft => Hydraulic Radius, R = 1.75 ft
v = 4.22 ft/s
t_3 = 6.7 min

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 16: Tc = 86.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Crops (SR) Straight Row: Good	B	75	9.90	743
B/D	Woods: Good (no grazing or burning)	D	77	25.79	1,986
				35.69	2,728

Basin 16: Composite CN = 76

DRAINAGE BASIN 17 — DRAINAGE BASIN 17

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0020 ft/ft
t_1 = 78.3 min

Shallow Concentrated Flow:

t=1/60v

where
l = 100 ft
Paved ? No
Slope, S = 0.0030 ft/ft
v = 0.88 ft/s
t_2 = 1.9 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 2400 ft
S = 0.0020 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 42.00 sf
P = 23.97 ft => Hydraulic Radius, R = 1.75 ft
v = 3.45 ft/s
t_3 = 11.6 min

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 17: Tc = 92.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
B/D	Woods: Good (no grazing or burning)	D	77	13.49	1,039
	Woods: Good (no grazing or burning)	D	77	18.47	1,422
				31.96	2,461

Basin 17: Composite CN = 77

DRAINAGE BASIN 18 — DRAINAGE BASIN 18

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0030 ft/ft
t_1 = 66.6 min

Shallow Concentrated Flow:

t=1/60v

where l = 100 ft
Paved ? No
Slope, S = 0.0030 ft/ft
v = 0.88 ft/s
t_2 = 1.9 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 18: Tc = 68.0 min

Determine Composite Curve Number

Description	HSG	CN	A (acres)	CN x A
Woods: Good (no grazing or burning)	A	30	15.08	452
Woods: Good (no grazing or burning)	D	77	3.40	262
			18.48	714

Basin 18: Composite CN = 39

DRAINAGE BASIN 19 — DRAINAGE BASIN 19

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0030 ft/ft
t_1 = 66.6 min

Shallow Concentrated Flow:

t=1/60v

where l = 100 ft
Paved ? No
Slope, S = 0.0030 ft/ft
v = 0.88 ft/s
t_2 = 1.9 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 19: Tc = 68.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Woods: Good (no grazing or burning)	A	30	5.96	179
B/D	Woods: Good (no grazing or burning)	D	77	1.28	99
	Woods: Good (no grazing or burning)	D	77	1.88	145
				9.12	422

Basin 19: Composite CN = 46

DRAINAGE BASIN 20 — DRAINAGE BASIN 20

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0030 ft/ft
t_1 = 66.6 min

Shallow Concentrated Flow:

t=1/60v

where l = 100 ft
Paved ? No
Slope, S = 0.0030 ft/ft
v = 0.88 ft/s
t_2 = 1.9 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 20: Tc = 68.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
B/D	Woods: Good (no grazing or burning)	D	77	24.82	1,911
	-	-	-	0.00	-
				24.82	1,911

Basin 20: Composite CN = 77

DRAINAGE BASIN 21 — DRAINAGE BASIN 21

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Grass: Bermuda = 0.410
l = 50 ft
P2 = 4.60 in
S = 0.0050 ft/ft
t_1 = 18.3 min

Shallow Concentrated Flow:

t=1/60v

where l = 200 ft
Paved ? Yes
Slope, S = 0.0050 ft/ft
v = 1.44 ft/s
t_2 = 2.3 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 400 ft
v= 2.00 ft/s
t= 3.3 min

Basin 21: Tc = 24.0 min

Determine Composite Curve Number

Description	HSG	CN	A (acres)	CN x A
Resi: 1/3 acre (30% avg. imp.)	B	72	121.07	8,717
Open Space, Good (grass > 75%)	B	61	155.23	9,469
Open Space, Good (grass > 75%)	A	39	26.29	1,025
Open Space, Good (grass > 75%)	D	80	12.93	1,034
			315.52	20,246

Basin 21: Composite CN = 64

DRAINAGE BASIN 22 — DRAINAGE BASIN 22

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0020 ft/ft
t_1 = 78.3 min

Shallow Concentrated Flow:

t=1/60v

where
l = 100 ft
Paved ? No
Slope, S = 0.0030 ft/ft
v = 0.88 ft/s
t_2 = 1.9 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 22: Tc = 80.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Woods: Good (no grazing or burning)	D	77	11.37	875
	Crops (SR) Straight Row: Good	B	75	23.41	1,756
B/D	Woods: Good (no grazing or burning)	D	77	38.48	2,963
				73.26	5,594

Basin 22: Composite CN = 76

DRAINAGE BASIN 23 — DRAINAGE BASIN 23

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0030 ft/ft
t_1 = 66.6 min

Shallow Concentrated Flow:

t=1/60v

where
l = 100 ft
Paved ? No
Slope, S = 0.0030 ft/ft
v = 0.88 ft/s
t_2 = 1.9 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 23: Tc = 68.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
B/D	Woods: Good (no grazing or burning)	D	77	37.61	2,896
	Woods: Good (no grazing or burning)	D	77	4.52	348
				42.13	3,244

Basin 23: Composite CN = 77

DRAINAGE BASIN 24 — DRAINAGE BASIN 24

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0030 ft/ft
t_1 = 66.6 min

Shallow Concentrated Flow:

t=1/60v

where l = 100 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 1.6 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 24: Tc = 68.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
B/D	Woods: Good (no grazing or burning)	D	77	11.49	885
	Woods: Good (no grazing or burning)	D	77	0.00	0
				11.49	885

Basin 24: Composite CN = 77

DRAINAGE BASIN 25 — DRAINAGE BASIN 25

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 59.4 min

Shallow Concentrated Flow:

t=1/60v

where l = 100 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 1.6 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 25: Tc = 61.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
B/D	Woods: Good (no grazing or burning)	D	77	21.66	1,668
	Woods: Good (no grazing or burning)	D	77	14.74	1,135
				36.40	2,803

Basin 25: Composite CN = 77

DRAINAGE BASIN 26 — DRAINAGE BASIN 26

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 59.4 min

Shallow Concentrated Flow:

t=1/60v

where l = 300 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 4.9 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 26: Tc = 64.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
B/D	Woods: Good (no grazing or burning)	D	77	20.80	1,602
	Woods: Good (no grazing or burning)	D	77	9.54	735
				30.34	2,336

Basin 26: Composite CN = 77

DRAINAGE BASIN 27 — DRAINAGE BASIN 27

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 59.4 min

Shallow Concentrated Flow:

t=1/60v

where l = 350 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 5.7 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 27: Tc = 65.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
B/D	Woods: Good (no grazing or burning)	D	77	12.27	945
	-	-	-	0.00	-
				12.27	945

Basin 27: Composite CN = 77

DRAINAGE BASIN 28 — DRAINAGE BASIN 28

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 59.4 min

Shallow Concentrated Flow:

t=1/60v

where l = 100 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 1.6 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 28: Tc = 61.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
B/D	Woods: Good (no grazing or burning)	D	77	18.65	1,436
	-	-	-	0.00	-
				18.65	1,436

Basin 28: Composite CN = 77

DRAINAGE BASIN 29 — DRAINAGE BASIN 29

Calculate Pre-Development "Tc" and Composite "CN" — **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 59.4 min

Shallow Concentrated Flow:

t=1/60v

where l = 100 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 1.6 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 29: Tc = 61.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
B/D	Woods: Good (no grazing or burning)	D	77	20.68	1,592
	Woods: Good (no grazing or burning)	D	77	12.42	956
				33.10	2,549

Basin 29: Composite CN = 77

DRAINAGE BASIN **Pond 1** **DRAINAGE BASIN Pond 1**

Calculate Pre-Development "Tc" and Composite "CN" **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 0 ft
P2 = 4.60 in
S = 0.0010 ft/ft
t_1 = 0.0 min

Shallow Concentrated Flow:

t=1/60v

where l = 0 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 0.0 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin Pond 1: Tc = 0.0 min

Determine Composite Curve Number

Description	HSG	CN	A (acres)	CN x A
Wet Ponds or Saturated Wetlands	D	98	172.13	16,869
-	-	-	0.00	-
			172.13	16,869

Basin Pond 1: Composite CN = 98

DRAINAGE BASIN **Pond 2** **DRAINAGE BASIN Pond 2**

Calculate Pre-Development "Tc" and Composite "CN" **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 0 ft
P2 = 4.60 in
S = 0.0010 ft/ft
t_1 = 0.0 min

Shallow Concentrated Flow:

t=1/60v

where l = 0 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 0.0 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin Pond 2: Tc = 0.0 min

Determine Composite Curve Number

Description	HSG	CN	A (acres)	CN x A
Wet Ponds or Saturated Wetlands	D	98	6.49	636
-	-	-	0.00	-
			6.49	636

Basin Pond 2: Composite CN = 98

DRAINAGE BASIN **Pond 3** **DRAINAGE BASIN Pond 3**

Calculate Pre-Development "Tc" and Composite "CN" **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 0 ft
P2 = 4.60 in
S = 0.0010 ft/ft
t_1 = 0.0 min

Shallow Concentrated Flow:

t=1/60v

where l = 0 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 0.0 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin Pond 3: Tc = 0.0 min

Determine Composite Curve Number

Description	HSG	CN	A (acres)	CN x A
Wet Ponds or Saturated Wetlands	D	98	7.73	758
-	-	-	0.00	-
			7.73	758

Basin Pond 3: Composite CN = 98

DRAINAGE BASIN **Pond 4** **DRAINAGE BASIN Pond 4**

Calculate Pre-Development "Tc" and Composite "CN" **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 0 ft
P2 = 4.60 in
S = 0.0010 ft/ft
t_1 = 0.0 min

Shallow Concentrated Flow:

t=1/60v

where l = 0 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 0.0 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin Pond 4: Tc = 0.0 min

Determine Composite Curve Number

Description	HSG	CN	A (acres)	CN x A
Wet Ponds or Saturated Wetlands	D	98	58.82	5,764
-	-	-	0.00	-
			58.82	5,764

Basin Pond 4: Composite CN = 98

DRAINAGE BASIN **Pond 5** **DRAINAGE BASIN Pond 5**

Calculate Pre-Development "Tc" and Composite "CN" **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 0 ft
P2 = 4.60 in
S = 0.0010 ft/ft
t_1 = 0.0 min

Shallow Concentrated Flow:

t=1/60v

where l = 0 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 0.0 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin Pond 5: Tc = 0.0 min

Determine Composite Curve Number

Description	HSG	CN	A (acres)	CN x A
Wet Ponds or Saturated Wetlands	D	98	3.82	374
-	-	-	0.00	-
			3.82	374

Basin Pond 5: Composite CN = 98

DRAINAGE BASIN **Pond 6** **DRAINAGE BASIN Pond 6**

Calculate Pre-Development "Tc" and Composite "CN" **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 0 ft
P2 = 4.60 in
S = 0.0010 ft/ft
t_1 = 0.0 min

Shallow Concentrated Flow:

t=1/60v

where l = 0 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 0.0 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin Pond 6: Tc = 0.0 min

Determine Composite Curve Number

Description	HSG	CN	A (acres)	CN x A
Wet Ponds or Saturated Wetlands	D	98	8.04	788
-	-	-	0.00	-
			8.04	788

Basin Pond 6: Composite CN = 98

DRAINAGE BASIN **Pond 7** **DRAINAGE BASIN Pond 7**

Calculate Pre-Development "Tc" and Composite "CN" **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 0 ft
P2 = 4.60 in
S = 0.0010 ft/ft
t_1 = 0.0 min

Shallow Concentrated Flow:

t=1/60v

where l = 0 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 0.0 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin Pond 7: Tc = 0.0 min

Determine Composite Curve Number

Description	HSG	CN	A (acres)	CN x A
Wet Ponds or Saturated Wetlands	D	98	4.25	417
-	-	-	0.00	-
			4.25	417

Basin Pond 7: Composite CN = 98

DRAINAGE BASIN **Pond 8** **DRAINAGE BASIN Pond 8**

Calculate Pre-Development "Tc" and Composite "CN" **"PRE"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 0 ft
P2 = 4.60 in
S = 0.0010 ft/ft
t_1 = 0.0 min

Shallow Concentrated Flow:

t=1/60v

where l = 0 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 0.0 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin Pond 8: Tc = 0.0 min

Determine Composite Curve Number

Description	HSG	CN	A (acres)	CN x A
Wet Ponds or Saturated Wetlands	D	98	18.46	1,809
-	-	-	0.00	-
			18.46	1,809

Basin Pond 8: Composite CN = 98

KIAWAH RIVER PLANTATION
DRAINAGE BASIN STUDY

Appendix D

POST-DEVELOPMENT (BUILD OUT)
ICPR MODEL INPUT

PREPARED BY

THOMAS & HUTTON ENGINEERING CO.

==========
==== Basins ==========
==========

Name: BASIN 01 Node: NODE 01 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 149.00
Area(ac): 132.790 Time Shift(hrs): 0.00
Curve Number: 74.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 02 Node: NODE 02 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 332.00
Area(ac): 640.020 Time Shift(hrs): 0.00
Curve Number: 75.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 03 Node: NODE 03 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 356.00
Area(ac): 359.670 Time Shift(hrs): 0.00
Curve Number: 75.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 04 Node: POND 01 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 138.00
Area(ac): 207.130 Time Shift(hrs): 0.00
Curve Number: 76.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 04A Node: FUTURE POND 04A Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 16.00
Area(ac): 35.330 Time Shift(hrs): 0.00
Curve Number: 66.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 05 Node: POND 01 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 98.00
Area(ac): 49.050 Time Shift(hrs): 0.00
Curve Number: 76.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 06 Node: POND 01 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 98.00
Area(ac): 84.000 Time Shift(hrs): 0.00

Curve Number: 76.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 07 Node: POND 01 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 101.00
Area(ac): 44.950 Time Shift(hrs): 0.00
Curve Number: 76.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 07A Node: FUTURE POND 07A Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 42.00
Area(ac): 97.400 Time Shift(hrs): 0.00
Curve Number: 65.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 07B Node: POND 01 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 13.00
Area(ac): 55.700 Time Shift(hrs): 0.00
Curve Number: 72.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 08 Node: NODE 04 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 129.00
Area(ac): 498.350 Time Shift(hrs): 0.00
Curve Number: 69.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 09 Node: POND 01 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 180.00
Area(ac): 491.770 Time Shift(hrs): 0.00
Curve Number: 71.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 09A Node: FUTURE POND 09A Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 12.00
Area(ac): 26.840 Time Shift(hrs): 0.00
Curve Number: 85.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 09B Node: POND 01 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 12.00

Area(ac): 18.540 Time Shift(hrs): 0.00
Curve Number: 72.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 09C Node: POND 01 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 17.00
Area(ac): 73.240 Time Shift(hrs): 0.00
Curve Number: 85.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 10 Node: POND 01 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 57.00
Area(ac): 30.670 Time Shift(hrs): 0.00
Curve Number: 75.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 10A Node: FUTURE POND 10A Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 41.00
Area(ac): 57.670 Time Shift(hrs): 0.00
Curve Number: 62.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 11 Node: POND 01 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 114.00
Area(ac): 133.990 Time Shift(hrs): 0.00
Curve Number: 77.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 12 Node: FUTURE POND 12 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 15.00
Area(ac): 41.900 Time Shift(hrs): 0.00
Curve Number: 77.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 13 Node: BOUNDARY Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 113.00
Area(ac): 160.710 Time Shift(hrs): 0.00
Curve Number: 78.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 14 Node: FUTURE POND 14 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00

Rainfall Amount(in): 4.600 Time of Conc(min): 16.00
Area(ac): 41.150 Time Shift(hrs): 0.00
Curve Number: 60.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 15 Node: FUTURE POND 15 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 42.00
Area(ac): 140.290 Time Shift(hrs): 0.00
Curve Number: 68.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 15A Node: FUTURE POND 15A Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 44.00
Area(ac): 34.000 Time Shift(hrs): 0.00
Curve Number: 64.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 16 Node: FUTURE POND 16 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 16.00
Area(ac): 53.570 Time Shift(hrs): 0.00
Curve Number: 75.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 17 Node: BOUNDARY Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 78.00
Area(ac): 41.570 Time Shift(hrs): 0.00
Curve Number: 77.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 18 Node: POND 02 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 16.00
Area(ac): 26.170 Time Shift(hrs): 0.00
Curve Number: 72.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 19 Node: POND 03 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 10.00
Area(ac): 20.450 Time Shift(hrs): 0.00
Curve Number: 72.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 20 Node: FUTURE POND 20 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0

Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 12.00
Area(ac): 14.590 Time Shift(hrs): 0.00
Curve Number: 76.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 20A Node: FUTURE POND 20A Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 13.00
Area(ac): 29.540 Time Shift(hrs): 0.00
Curve Number: 74.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 21 Node: POND 01 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 24.00
Area(ac): 315.520 Time Shift(hrs): 0.00
Curve Number: 64.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 22 Node: FUTURE POND 22 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 18.00
Area(ac): 67.310 Time Shift(hrs): 0.00
Curve Number: 84.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 23 Node: FUTURE POND 23 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 21.00
Area(ac): 58.570 Time Shift(hrs): 0.00
Curve Number: 86.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 23A Node: POND 07 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 13.00
Area(ac): 11.940 Time Shift(hrs): 0.00
Curve Number: 85.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 24 Node: POND 05 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 10.00
Area(ac): 23.350 Time Shift(hrs): 0.00
Curve Number: 68.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: BASIN 25 Node: POND 06 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

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        Unit Hydrograph: Uh323                  Peaking Factor: 323.0
          Rainfall File: Scsiii              Storm Duration(hrs): 24.00
    Rainfall Amount(in): 4.600                 Time of Conc(min): 12.00
                Area(ac): 16.050                 Time Shift(hrs): 0.00
           Curve Number: 72.00               Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00


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         Name: BASIN 26                Node: POND 08                Status: Onsite
        Group: BASE                    Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh323                  Peaking Factor: 323.0
          Rainfall File: Scsiii              Storm Duration(hrs): 24.00
    Rainfall Amount(in): 4.600                 Time of Conc(min): 10.00
                Area(ac): 24.010                 Time Shift(hrs): 0.00
           Curve Number: 70.00               Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00


-------------------------------------------------------------------------------------------------------
         Name: BASIN 27                Node: POND 06                Status: Onsite
        Group: BASE                    Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh323                  Peaking Factor: 323.0
          Rainfall File: Scsiii              Storm Duration(hrs): 24.00
    Rainfall Amount(in): 4.600                 Time of Conc(min): 18.00
                Area(ac): 31.590                 Time Shift(hrs): 0.00
           Curve Number: 72.00               Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00


-------------------------------------------------------------------------------------------------------
         Name: BASIN 28                Node: POND 04                Status: Onsite
        Group: BASE                    Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh323                  Peaking Factor: 323.0
          Rainfall File: Scsiii              Storm Duration(hrs): 24.00
    Rainfall Amount(in): 4.600                 Time of Conc(min): 17.00
                Area(ac): 35.750                 Time Shift(hrs): 0.00
           Curve Number: 72.00               Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00


-------------------------------------------------------------------------------------------------------
         Name: POND 01                 Node: POND 01                Status: Onsite
        Group: BASE                    Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh323                  Peaking Factor: 323.0
          Rainfall File: Scsiii              Storm Duration(hrs): 24.00
    Rainfall Amount(in): 4.600                 Time of Conc(min): 5.00
                Area(ac): 223.050                Time Shift(hrs): 0.00
           Curve Number: 93.00               Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00


-------------------------------------------------------------------------------------------------------
         Name: POND 02                 Node: POND 02                Status: Onsite
        Group: BASE                    Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh323                  Peaking Factor: 323.0
          Rainfall File: Scsiii              Storm Duration(hrs): 24.00
    Rainfall Amount(in): 4.600                 Time of Conc(min): 5.00
                Area(ac): 6.490                  Time Shift(hrs): 0.00
           Curve Number: 98.00               Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00


-------------------------------------------------------------------------------------------------------
         Name: POND 03                 Node: POND 03                Status: Onsite
        Group: BASE                    Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh323                  Peaking Factor: 323.0
          Rainfall File: Scsiii              Storm Duration(hrs): 24.00
    Rainfall Amount(in): 4.600                 Time of Conc(min): 5.00
                Area(ac): 7.730                  Time Shift(hrs): 0.00
           Curve Number: 98.00               Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00


-------------------------------------------------------------------------------------------------------
         Name: POND 04                 Node: POND 04                Status: Onsite
        Group: BASE                    Type: SCS Unit Hydrograph CN
```

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 5.00
Area(ac): 58.820 Time Shift(hrs): 0.00
Curve Number: 98.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: POND 05 Node: POND 05 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 5.00
Area(ac): 3.820 Time Shift(hrs): 0.00
Curve Number: 98.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: POND 06 Node: POND 06 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 5.00
Area(ac): 8.040 Time Shift(hrs): 0.00
Curve Number: 98.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: POND 07 Node: POND 07 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 5.00
Area(ac): 4.250 Time Shift(hrs): 0.00
Curve Number: 98.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: POND 08 Node: POND 08 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh323 Peaking Factor: 323.0
Rainfall File: Scsiii Storm Duration(hrs): 24.00
Rainfall Amount(in): 4.600 Time of Conc(min): 5.00
Area(ac): 18.460 Time Shift(hrs): 0.00
Curve Number: 98.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

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==== Nodes ==========
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Name: BOUNDARY Base Flow(cfs): 0.000 Init Stage(ft): 3.000
Group: BASE Warn Stage(ft): 4.000
Type: Time/Stage

Boundary stages determined by NOAA elevation information; the NAVD 88 elevations related to MLLW were computed from Bench Mark, Station I

Time(hrs)	Stage(ft)
0.00	3.000
1.00	2.500
2.00	2.000
3.00	1.500
4.00	1.000
5.00	0.500
6.00	0.000
7.00	0.500
8.00	1.000
9.00	1.500
10.00	2.000
11.00	2.500
12.00	3.000
13.00	2.500
14.00	2.000
15.00	1.500

16.00	1.000
17.00	0.500
18.00	0.000
19.00	0.500
20.00	1.000
21.00	1.500
22.00	2.000
23.00	2.500
24.00	3.000
25.00	2.500
26.00	2.000
27.00	1.500
28.00	1.000
29.00	0.500
30.00	0.000
31.00	0.500
32.00	1.000
33.00	1.500
34.00	2.000
35.00	2.500
36.00	3.000
37.00	2.500
38.00	2.000
39.00	1.500
40.00	1.000
41.00	0.500
42.00	0.000
43.00	0.500
44.00	1.000
45.00	1.500
46.00	2.000
47.00	2.500
48.00	3.000
49.00	2.500
50.00	2.000
51.00	1.500
52.00	1.000
53.00	0.500
54.00	0.000
55.00	0.500
56.00	1.000
57.00	1.500
58.00	2.000
59.00	2.500
60.00	3.000
61.00	2.500
62.00	2.000
63.00	1.500
64.00	1.000
65.00	0.500
66.00	0.000
67.00	0.500
68.00	1.000
69.00	1.500
70.00	2.000
71.00	2.500
72.00	3.000
73.00	2.500
74.00	2.000
75.00	1.500
76.00	1.000
77.00	0.500
78.00	0.000
79.00	0.500
80.00	1.000
81.00	1.500
82.00	2.000
83.00	2.500
84.00	3.000
85.00	2.500
86.00	2.000
87.00	1.500
88.00	1.000
89.00	0.500
90.00	0.000
91.00	0.500
92.00	1.000
93.00	1.500
94.00	2.000
95.00	2.500
96.00	3.000
97.00	2.500
98.00	2.000
99.00	1.500
100.00	1.000
101.00	0.500
102.00	0.000
103.00	0.500
104.00	1.000
105.00	1.500

106.00	2.000
107.00	2.500
108.00	3.000
109.00	2.500
110.00	2.000
111.00	1.500
112.00	1.000
113.00	0.500
114.00	0.000
115.00	0.500
116.00	1.000
117.00	1.500
118.00	2.000
119.00	2.500
120.00	3.000
121.00	2.500
122.00	2.000
123.00	1.500
124.00	1.000
125.00	0.500
126.00	0.000
127.00	0.500
128.00	1.000
129.00	1.500
130.00	2.000
131.00	2.500
132.00	3.000
133.00	2.500
134.00	2.000
135.00	1.500
136.00	1.000
137.00	0.500
138.00	0.000
139.00	0.500
140.00	1.000
141.00	1.500
142.00	2.000
143.00	2.500
144.00	3.000
145.00	2.500
146.00	2.000
147.00	1.500
148.00	1.000
149.00	0.500
150.00	0.000
151.00	0.500
152.00	1.000
153.00	1.500
154.00	2.000
155.00	2.500
156.00	3.000
157.00	2.500
158.00	2.000
159.00	1.500
160.00	1.000
161.00	0.500
162.00	0.000
163.00	0.500
164.00	1.000
165.00	1.500
166.00	2.000
167.00	2.500
168.00	3.000
169.00	2.500
170.00	2.000
171.00	1.500
172.00	1.000
173.00	0.500
174.00	0.000
175.00	0.500
176.00	1.000
177.00	1.500
178.00	2.000
179.00	2.500
180.00	3.000
181.00	2.500
182.00	2.000
183.00	1.500
184.00	1.000
185.00	0.500
186.00	0.000
187.00	0.500
188.00	1.000
189.00	1.500
190.00	2.000
191.00	2.500
192.00	3.000
193.00	2.500
194.00	2.000
195.00	1.500

196.00	1.000
197.00	0.500
198.00	0.000
199.00	0.500
200.00	1.000
201.00	1.500
202.00	2.000
203.00	2.500
204.00	3.000
205.00	2.500
206.00	2.000
207.00	1.500
208.00	1.000
209.00	0.500
210.00	0.000
211.00	0.500
212.00	1.000
213.00	1.500
214.00	2.000
215.00	2.500
216.00	3.000
217.00	2.500
218.00	2.000
219.00	1.500
220.00	1.000
221.00	0.500
222.00	0.000
223.00	0.500
224.00	1.000
225.00	1.500
226.00	2.000
227.00	2.500
228.00	3.000
229.00	2.500
230.00	2.000
231.00	1.500
232.00	1.000
233.00	0.500
234.00	0.000
235.00	0.500
236.00	1.000
237.00	1.500
238.00	2.000
239.00	2.500
240.00	3.000
241.00	2.500
242.00	2.000
243.00	1.500
244.00	1.000
245.00	0.500
246.00	0.000
247.00	0.500
248.00	1.000
249.00	1.500
250.00	2.000
251.00	2.500
252.00	3.000
253.00	2.500
254.00	2.000
255.00	1.500
256.00	1.000
257.00	0.500
258.00	0.000
259.00	0.500
260.00	1.000
261.00	1.500
262.00	2.000
263.00	2.500
264.00	3.000
265.00	2.500
266.00	2.000
267.00	1.500
268.00	1.000
269.00	0.500
270.00	0.000
271.00	0.500
272.00	1.000
273.00	1.500
274.00	2.000
275.00	2.500
276.00	3.000
277.00	2.500
278.00	2.000
279.00	1.500
280.00	1.000
281.00	0.500
282.00	0.000
283.00	0.500
284.00	1.000
285.00	1.500

286.00	2.000
287.00	2.500
288.00	3.000
289.00	2.500
290.00	2.000
291.00	1.500
292.00	1.000
293.00	0.500
294.00	0.000
295.00	0.500
296.00	1.000
297.00	1.500
298.00	2.000
299.00	2.500
300.00	3.000

Name: FUTURE POND 04A Base Flow(cfs): 0.000 Init Stage(ft): 5.000
Group: BASE Warn Stage(ft): 7.000
Type: Stage/Area

Stage(ft)	Area(ac)
5.000	1.7800
6.000	1.8800
7.000	1.9800

Name: FUTURE POND 07A Base Flow(cfs): 0.000 Init Stage(ft): 5.000
Group: BASE Warn Stage(ft): 7.000
Type: Stage/Area

Pond Acreage needed/added 6ac

Stage(ft)	Area(ac)
5.000	13.1900
6.000	13.5200
7.000	13.8500
8.000	14.1800

Name: FUTURE POND 09A Base Flow(cfs): 0.000 Init Stage(ft): 4.500
Group: BASE Warn Stage(ft): 7.000
Type: Stage/Area

Pond Acreage needed/added 2ac

Stage(ft)	Area(ac)
4.500	3.5100
5.000	3.5900
6.000	3.6800
7.000	3.7700

Name: FUTURE POND 10A Base Flow(cfs): 0.000 Init Stage(ft): 5.000
Group: BASE Warn Stage(ft): 8.000
Type: Stage/Area

Pond needed

Stage(ft)	Area(ac)
5.000	3.0000
6.000	3.0300
7.000	3.1900
8.000	3.3400
9.000	3.5000

Name: FUTURE POND 12 Base Flow(cfs): 0.000 Init Stage(ft): 7.000
Group: BASE Warn Stage(ft): 10.000
Type: Stage/Area

Stage(ft)	Area(ac)
7.000	6.5200
8.000	6.8100
9.000	7.1000
10.000	7.4000

Name: FUTURE POND 14 Base Flow(cfs): 0.000 Init Stage(ft): 8.000
Group: BASE Warn Stage(ft): 11.000
Type: Stage/Area

Stage(ft)	Area(ac)
8.000	1.6600
9.000	1.7500
10.000	1.8400
11.000	1.9300

Name: FUTURE POND 15 Base Flow(cfs): 0.000 Init Stage(ft): 7.000
Group: BASE Warn Stage(ft): 10.000
Type: Stage/Area

Stage(ft)	Area(ac)
7.000	14.0200
8.000	14.7000
9.000	15.3800
10.000	16.0600

Name: FUTURE POND 15A Base Flow(cfs): 0.000 Init Stage(ft): 4.500
Group: BASE Warn Stage(ft): 8.000
Type: Stage/Area

Pond needed

Stage(ft)	Area(ac)
4.500	2.6100
5.000	2.8400
6.000	3.0700
7.000	3.3000
8.000	3.5400

Name: FUTURE POND 16 Base Flow(cfs): 0.000 Init Stage(ft): 7.000
Group: BASE Warn Stage(ft): 10.000
Type: Stage/Area

Stage(ft)	Area(ac)
7.000	6.0300
8.000	6.3700
9.000	6.7200
10.000	7.0600

Name: FUTURE POND 20 Base Flow(cfs): 0.000 Init Stage(ft): 4.500
Group: BASE Warn Stage(ft): 8.000
Type: Stage/Area

Stage(ft)	Area(ac)
4.500	0.4900
5.000	0.5400
6.000	0.5900
7.000	0.6500
8.000	0.7000

Name: FUTURE POND 20A Base Flow(cfs): 0.000 Init Stage(ft): 4.500
Group: BASE Warn Stage(ft): 8.000
Type: Stage/Area

Stage(ft)	Area(ac)
4.500	2.7900
5.000	2.9500
6.000	3.1100
7.000	3.2800
8.000	3.4500

Name: FUTURE POND 22 Base Flow(cfs): 0.000 Init Stage(ft): 4.500
Group: BASE Warn Stage(ft): 8.000
Type: Stage/Area

Pond Acreage needed/added 2ac

Stage(ft)	Area(ac)
4.500	3.0700
5.000	3.1900
6.000	3.7400
7.000	3.9400
8.000	4.1400

Name: FUTURE POND 23 Base Flow(cfs): 0.000 Init Stage(ft): 4.500
Group: BASE Warn Stage(ft): 7.000
Type: Stage/Area

Pond needed

Stage(ft)	Area(ac)
4.500	5.8800
5.000	6.0200
6.000	6.1600
7.000	6.3000
8.000	6.4500

Name: NODE 01 Base Flow(cfs): 0.000 Init Stage(ft): 10.500
Group: BASE Warn Stage(ft): 15.000
Type: Stage/Area

Stage(ft)	Area(ac)
10.500	5.0000
11.500	10.0000
12.500	20.0000
13.500	40.0000
14.500	60.0000

Name: NODE 01A Base Flow(cfs): 0.000 Init Stage(ft): 10.500
Group: BASE Warn Stage(ft): 15.000
Type: Stage/Area

Stage(ft)	Area(ac)

Name: NODE 02 Base Flow(cfs): 0.000 Init Stage(ft): 10.500
Group: BASE Warn Stage(ft): 15.000
Type: Stage/Area

Stage(ft)	Area(ac)
10.500	5.0000
11.500	10.0000
12.500	40.0000
13.000	80.0000
14.000	168.7100

Name: NODE 02A Base Flow(cfs): 0.000 Init Stage(ft): 10.500
Group: BASE Warn Stage(ft): 15.000
Type: Stage/Area

Stage(ft)	Area(ac)

Name: NODE 03 Base Flow(cfs): 0.000 Init Stage(ft): 10.500
Group: BASE Warn Stage(ft): 15.000
Type: Stage/Area

Stage(ft)	Area(ac)
10.500	5.0000
11.500	10.0000
12.500	20.0000
13.000	60.0000
14.000	166.3900

Name: NODE 03A Base Flow(cfs): 0.000 Init Stage(ft): 10.500

Group: BASE Warn Stage(ft): 15.000
Type: Stage/Area

Stage(ft)	Area(ac)

Name: NODE 04 Base Flow(cfs): 0.000 Init Stage(ft): 5.000
Group: BASE Warn Stage(ft): 8.000
Type: Stage/Area

Stage(ft)	Area(ac)
5.000	55.7400
8.000	100.7200

Name: NODE 04A Base Flow(cfs): 0.000 Init Stage(ft): 5.000
Group: BASE Warn Stage(ft): 8.000
Type: Stage/Area

Stage(ft)	Area(ac)

Name: POND 01 Base Flow(cfs): 0.000 Init Stage(ft): 3.850
Group: BASE Warn Stage(ft): 6.000
Type: Stage/Area

Stage(ft)	Area(ac)
3.850	156.8000
4.500	172.1300
5.000	223.0200
6.000	539.0900
7.000	647.7100

Name: POND 02 Base Flow(cfs): 0.000 Init Stage(ft): 3.250
Group: BASE Warn Stage(ft): 6.000
Type: Stage/Area

Stage(ft)	Area(ac)
3.250	6.4900
6.000	7.4900

Name: POND 03 Base Flow(cfs): 0.000 Init Stage(ft): 3.250
Group: BASE Warn Stage(ft): 6.000
Type: Stage/Area

Stage(ft)	Area(ac)
3.250	7.7300
6.000	8.7300

Name: POND 04 Base Flow(cfs): 0.000 Init Stage(ft): 3.250
Group: BASE Warn Stage(ft): 6.000
Type: Stage/Area

Stage(ft)	Area(ac)
3.250	58.8200
6.000	60.8200

Name: POND 05 Base Flow(cfs): 0.000 Init Stage(ft): 3.250
Group: BASE Warn Stage(ft): 6.000
Type: Stage/Area

Stage(ft)	Area(ac)

3.250	3.8200
6.000	4.8200

Name: POND 06 Base Flow(cfs): 0.000 Init Stage(ft): 3.250
Group: BASE Warn Stage(ft): 6.000
Type: Stage/Area

Stage(ft)	Area(ac)
3.250	8.0400
6.000	10.0400

Name: POND 07 Base Flow(cfs): 0.000 Init Stage(ft): 3.500
Group: BASE Warn Stage(ft): 6.000
Type: Stage/Area

Stage(ft)	Area(ac)
3.500	4.2500
6.000	5.0000

Name: POND 08 Base Flow(cfs): 0.000 Init Stage(ft): 3.500
Group: BASE Warn Stage(ft): 6.000
Type: Stage/Area

Stage(ft)	Area(ac)
3.500	18.4600
6.000	19.4600

Pipes

Name: PIPE 01 From Node: NODE 01 Length(ft): 40.00
Group: BASE To Node: NODE 01A Count: 1
Friction Equation: Automatic

	UPSTREAM	DOWNSTREAM		
Geometry:	Circular	Circular	Solution Algorithm:	Most Restrictive
Span(in):	36.00	36.00	Flow:	Both
Rise(in):	36.00	36.00	Entrance Loss Coef:	0.00
Invert(ft):	10.500	10.500	Exit Loss Coef:	1.00
Manning's N:	0.013000	0.013000	Bend Loss Coef:	0.00
Top Clip(in):	0.000	0.000	Outlet Ctrl Spec:	Use dc or tw
Bot Clip(in):	6.000	6.000	Inlet Ctrl Spec:	Use dc
			Stabilizer Option:	None

Upstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Downstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Name: PIPE 02 From Node: NODE 02 Length(ft): 40.00
Group: BASE To Node: NODE 02A Count: 1
Friction Equation: Automatic

	UPSTREAM	DOWNSTREAM		
Geometry:	Circular	Circular	Solution Algorithm:	Most Restrictive
Span(in):	36.00	36.00	Flow:	Both
Rise(in):	36.00	36.00	Entrance Loss Coef:	0.00
Invert(ft):	10.500	10.500	Exit Loss Coef:	1.00
Manning's N:	0.013000	0.013000	Bend Loss Coef:	0.00
Top Clip(in):	0.000	0.000	Outlet Ctrl Spec:	Use dc or tw
Bot Clip(in):	0.000	0.000	Inlet Ctrl Spec:	Use dc
			Stabilizer Option:	None

Upstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Downstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Name: PIPE 03 From Node: NODE 03 Length(ft): 40.00

```
       Group: BASE                To Node: NODE 03A               Count: 1
                                                          Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                 Solution Algorithm: Most Restrictive
    Geometry: Circular       Circular                         Flow: Both
    Span(in): 36.00          36.00                      Entrance Loss Coef: 0.00
    Rise(in): 36.00          36.00                          Exit Loss Coef: 1.00
   Invert(ft): 10.500        10.500                         Bend Loss Coef: 0.00
  Manning's N: 0.013000      0.013000                    Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000         0.000                         Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000         0.000                      Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Downstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting



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        Name: PIPE 04            From Node: NODE 04           Length(ft): 30.00
       Group: BASE                To Node: NODE 04A              Count: 2
                                                          Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                 Solution Algorithm: Most Restrictive
    Geometry: Circular       Circular                         Flow: Both
    Span(in): 48.00          48.00                      Entrance Loss Coef: 0.00
    Rise(in): 48.00          48.00                          Exit Loss Coef: 1.00
   Invert(ft): 5.000         5.000                          Bend Loss Coef: 0.00
  Manning's N: 0.013000      0.013000                    Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000         0.000                         Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000         0.000                      Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Downstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting



--------------------------------------------------------------------------------------------------
        Name: PIPE 07A           From Node: FUTURE POND 07A   Length(ft): 400.00
       Group: BASE                To Node: FUTURE POND 10A        Count: 2
                                                          Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                 Solution Algorithm: Most Restrictive
    Geometry: Circular       Circular                         Flow: Both
    Span(in): 36.00          36.00                      Entrance Loss Coef: 0.00
    Rise(in): 36.00          36.00                          Exit Loss Coef: 1.00
   Invert(ft): 3.500         3.500                          Bend Loss Coef: 0.00
  Manning's N: 0.013000      0.013000                    Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000         0.000                         Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000         0.000                      Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Downstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting



--------------------------------------------------------------------------------------------------
        Name: PIPE 12            From Node: FUTURE POND 12    Length(ft): 400.00
       Group: BASE                To Node: FUTURE POND 15         Count: 1
                                                          Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                 Solution Algorithm: Most Restrictive
    Geometry: Circular       Circular                         Flow: Both
    Span(in): 48.00          48.00                      Entrance Loss Coef: 0.00
    Rise(in): 48.00          48.00                          Exit Loss Coef: 1.00
   Invert(ft): 3.000         3.000                          Bend Loss Coef: 0.00
  Manning's N: 0.013000      0.013000                    Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000         0.000                         Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000         0.000                      Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Downstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting
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Name:	PIPE 16	From Node:	FUTURE POND 16	Length(ft):	40.00
Group:	BASE	To Node:	FUTURE POND 15	Count:	1
				Friction Equation:	Automatic
	UPSTREAM	DOWNSTREAM		Solution Algorithm:	Most Restrictive
Geometry:	Circular	Circular		Flow:	Both
Span(in):	48.00	48.00		Entrance Loss Coef:	0.00
Rise(in):	48.00	48.00		Exit Loss Coef:	1.00
Invert(ft):	3.000	3.000		Bend Loss Coef:	0.00
Manning's N:	0.013000	0.013000		Outlet Ctrl Spec:	Use dc or tw
Top Clip(in):	0.000	0.000		Inlet Ctrl Spec:	Use dc
Bot Clip(in):	0.000	0.000		Stabilizer Option:	None

Upstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Downstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Name:	PIPE 20A	From Node:	FUTURE POND 20A	Length(ft):	800.00
Group:	BASE	To Node:	FUTURE POND 20	Count:	1
				Friction Equation:	Automatic
	UPSTREAM	DOWNSTREAM		Solution Algorithm:	Most Restrictive
Geometry:	Circular	Circular		Flow:	Both
Span(in):	36.00	36.00		Entrance Loss Coef:	0.00
Rise(in):	36.00	36.00		Exit Loss Coef:	1.00
Invert(ft):	3.500	3.500		Bend Loss Coef:	0.00
Manning's N:	0.013000	0.013000		Outlet Ctrl Spec:	Use dc or tw
Top Clip(in):	0.000	0.000		Inlet Ctrl Spec:	Use dc
Bot Clip(in):	0.000	0.000		Stabilizer Option:	None

Upstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Downstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Name:	PIPE 22	From Node:	FUTURE POND 22	Length(ft):	1100.00
Group:	BASE	To Node:	POND 01	Count:	2
				Friction Equation:	Automatic
	UPSTREAM	DOWNSTREAM		Solution Algorithm:	Most Restrictive
Geometry:	Circular	Circular		Flow:	Both
Span(in):	48.00	48.00		Entrance Loss Coef:	0.00
Rise(in):	48.00	48.00		Exit Loss Coef:	1.00
Invert(ft):	3.000	3.000		Bend Loss Coef:	0.00
Manning's N:	0.013000	0.013000		Outlet Ctrl Spec:	Use dc or tw
Top Clip(in):	0.000	0.000		Inlet Ctrl Spec:	Use dc
Bot Clip(in):	0.000	0.000		Stabilizer Option:	None

Upstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Downstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Name:	PIPE 23	From Node:	FUTURE POND 23	Length(ft):	225.00
Group:	BASE	To Node:	FUTURE POND 22	Count:	1
				Friction Equation:	Automatic
	UPSTREAM	DOWNSTREAM		Solution Algorithm:	Most Restrictive
Geometry:	Circular	Circular		Flow:	Both
Span(in):	48.00	48.00		Entrance Loss Coef:	0.00
Rise(in):	48.00	48.00		Exit Loss Coef:	1.00
Invert(ft):	3.000	3.000		Bend Loss Coef:	0.00
Manning's N:	0.013000	0.013000		Outlet Ctrl Spec:	Use dc or tw
Top Clip(in):	0.000	0.000		Inlet Ctrl Spec:	Use dc
Bot Clip(in):	0.000	0.000		Stabilizer Option:	None

Upstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Downstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

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         Name: PIPE 6              From Node: POND 02           Length(ft): 450.00
        Group: BASE                  To Node: BOUNDARY             Count: 1
                                                          Friction Equation: Automatic
               UPSTREAM       DOWNSTREAM                Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                        Flow: Both
     Span(in): 48.00          48.00                     Entrance Loss Coef: 0.00
     Rise(in): 48.00          48.00                         Exit Loss Coef: 0.00
   Invert(ft): 3.250          3.000                         Bend Loss Coef: 0.00
  Manning's N: 0.013000       0.013000                   Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                        Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                     Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting

Downstream FHWA Inlet Edge Description:
Circular Concrete: Groove end projecting


================================================================================================
==== Channels ==================================================================================
================================================================================================

          Name: CHANNEL 01          From Node: NODE 01A          Length(ft): 2703.00
         Group: BASE                  To Node: POND 01               Count: 1

               UPSTREAM       DOWNSTREAM                Friction Equation: Automatic
     Geometry: Trapezoidal    Trapezoidal              Solution Algorithm: Automatic
    Invert(ft): 10.500        4.100                           Flow: Both
 TClpInitZ(ft): 9999.000      9999.000                  Contraction Coef: 0.100
   Manning's N: 0.030000      0.030000                    Expansion Coef: 0.300
  Top Clip(ft): 0.000         0.000                    Entrance Loss Coef: 0.000
  Bot Clip(ft): 0.000         0.000                        Exit Loss Coef: 0.000
     Main XSec:                                         Outlet Ctrl Spec: Use dc or tw
  AuxElev1(ft):                                          Inlet Ctrl Spec: Use dc
     Aux XSec1:                                       Stabilizer Option: None
  AuxElev2(ft):
     Aux XSec2:
 Top Width(ft):
     Depth(ft):
 Bot Width(ft): 5.000         5.000
  LtSdSlp(h/v): 1.00          1.00
  RtSdSlp(h/v): 1.00          1.00


---------------------------------------------------------------------------------------------------
          Name: CHANNEL 02          From Node: NODE 02A          Length(ft): 2178.00
         Group: BASE                  To Node: POND 01               Count: 1

               UPSTREAM       DOWNSTREAM                Friction Equation: Automatic
     Geometry: Trapezoidal    Trapezoidal              Solution Algorithm: Automatic
    Invert(ft): 10.500        4.100                           Flow: Both
 TClpInitZ(ft): 9999.000      9999.000                  Contraction Coef: 0.100
   Manning's N: 0.030000      0.030000                    Expansion Coef: 0.300
  Top Clip(ft): 0.000         0.000                    Entrance Loss Coef: 0.000
  Bot Clip(ft): 0.000         0.000                        Exit Loss Coef: 0.000
     Main XSec:                                         Outlet Ctrl Spec: Use dc or tw
  AuxElev1(ft):                                          Inlet Ctrl Spec: Use dc
     Aux XSec1:                                       Stabilizer Option: None
  AuxElev2(ft):
     Aux XSec2:
 Top Width(ft):
     Depth(ft):
 Bot Width(ft): 5.000         5.000
  LtSdSlp(h/v): 2.00          2.00
  RtSdSlp(h/v): 2.00          2.00


---------------------------------------------------------------------------------------------------
          Name: CHANNEL 03          From Node: NODE 03A          Length(ft): 2400.00
         Group: BASE                  To Node: POND 01               Count: 1

               UPSTREAM       DOWNSTREAM                Friction Equation: Automatic
     Geometry: Trapezoidal    Trapezoidal              Solution Algorithm: Automatic
    Invert(ft): 10.500        4.100                           Flow: Both
 TClpInitZ(ft): 9999.000      9999.000                  Contraction Coef: 0.100
   Manning's N: 0.030000      0.030000                    Expansion Coef: 0.300
  Top Clip(ft): 0.000         0.000                    Entrance Loss Coef: 0.000
  Bot Clip(ft): 0.000         0.000                        Exit Loss Coef: 0.000
     Main XSec:                                         Outlet Ctrl Spec: Use dc or tw
  AuxElev1(ft):                                          Inlet Ctrl Spec: Use dc
     Aux XSec1:                                       Stabilizer Option: None
```

```
  AuxElev2(ft):
     Aux XSec2:
 Top Width(ft):
     Depth(ft):
 Bot Width(ft): 5.000          5.000
  LtSdSlp(h/v): 2.00           2.00
  RtSdSlp(h/v): 2.00           2.00



-------------------------------------------------------------------------------------------------
          Name: CHANNEL 04          From Node: NODE 04A           Length(ft): 2320.00
         Group: BASE                  To Node: POND 01                Count: 1

                UPSTREAM       DOWNSTREAM                  Friction Equation: Automatic
      Geometry: Trapezoidal    Trapezoidal                Solution Algorithm: Automatic
    Invert(ft): 5.000          4.100                              Flow: Both
 TClpInitZ(ft): 9999.000       9999.000                 Contraction Coef: 0.100
   Manning's N: 0.030000       0.030000                   Expansion Coef: 0.300
  Top Clip(ft): 0.000          0.000                    Entrance Loss Coef: 0.000
  Bot Clip(ft): 0.000          0.000                        Exit Loss Coef: 0.000
     Main XSec:                                          Outlet Ctrl Spec: Use dc or tw
  AuxElev1(ft):                                           Inlet Ctrl Spec: Use dc
     Aux XSec1:                                         Stabilizer Option: None
  AuxElev2(ft):
     Aux XSec2:
 Top Width(ft):
     Depth(ft):
 Bot Width(ft): 10.000         10.000
  LtSdSlp(h/v): 2.00           2.00
  RtSdSlp(h/v): 2.00           2.00



===============================================================================================
==== Drop Structures ==========================================================================
===============================================================================================

          Name: CS 01              From Node: POND 02           Length(ft): 35.00
         Group: BASE                  To Node: POND 03                Count: 1

                UPSTREAM       DOWNSTREAM                  Friction Equation: Average Conveyance
      Geometry: Rectangular    Rectangular                Solution Algorithm: Automatic
      Span(in): 48.00          48.00                              Flow: Both
      Rise(in): 36.00          36.00                    Entrance Loss Coef: 0.200
    Invert(ft): 3.250          3.250                        Exit Loss Coef: 1.000
   Manning's N: 0.020000       0.020000                   Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                       Inlet Ctrl Spec: Use dn
 Bot Clip(in): 0.000          0.000                          Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Downstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares



*** Weir 1 of 1 for Drop Structure CS 01 ***
                                                                                    TABLE
                   Count: 1                        Bottom Clip(in): 0.000
                    Type: Vertical: Mavis             Top Clip(in): 0.000
                    Flow: Both                     Weir Disc Coef: 3.200
                Geometry: Rectangular           Orifice Disc Coef: 0.600

                Span(in): 48.00                        Invert(ft): 3.250
                Rise(in): 12.00                  Control Elev(ft): 3.250


-------------------------------------------------------------------------------------------------
          Name: CS 02              From Node: POND 04           Length(ft): 35.00
         Group: BASE                  To Node: BOUNDARY               Count: 1

                UPSTREAM       DOWNSTREAM                  Friction Equation: Average Conveyance
      Geometry: Rectangular    Rectangular                Solution Algorithm: Automatic
      Span(in): 48.00          48.00                              Flow: Both
      Rise(in): 36.00          36.00                    Entrance Loss Coef: 0.200
    Invert(ft): 3.250          3.250                        Exit Loss Coef: 1.000
   Manning's N: 0.020000       0.020000                   Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                       Inlet Ctrl Spec: Use dn
 Bot Clip(in): 0.000          0.000                          Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Downstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares
```

*** Weir 1 of 1 for Drop Structure CS 02 ***

TABLE

Count:	1	Bottom Clip(in):	0.000
Type:	Vertical: Mavis	Top Clip(in):	0.000
Flow:	Both	Weir Disc Coef:	3.200
Geometry:	Rectangular	Orifice Disc Coef:	0.600
Span(in):	48.00	Invert(ft):	3.250
Rise(in):	10.00	Control Elev(ft):	3.250

Name:	CS 03	From Node:	POND 04
Group:	BASE	To Node:	BOUNDARY
Length(ft):	35.00		
Count:	1		

	UPSTREAM	DOWNSTREAM		
Geometry:	Rectangular	Rectangular	Friction Equation:	Average Conveyance
Span(in):	48.00	48.00	Solution Algorithm:	Automatic
Rise(in):	36.00	36.00	Flow:	Both
Invert(ft):	3.250	3.250	Entrance Loss Coef:	0.200
Manning's N:	0.020000	0.020000	Exit Loss Coef:	1.000
Top Clip(in):	0.000	0.000	Outlet Ctrl Spec:	Use dc or tw
Bot Clip(in):	0.000	0.000	Inlet Ctrl Spec:	Use dn
			Solution Incs:	10

Upstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Downstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

*** Weir 1 of 1 for Drop Structure CS 03 ***

TABLE

Count:	1	Bottom Clip(in):	0.000
Type:	Vertical: Mavis	Top Clip(in):	0.000
Flow:	Both	Weir Disc Coef:	3.200
Geometry:	Rectangular	Orifice Disc Coef:	0.600
Span(in):	48.00	Invert(ft):	3.250
Rise(in):	10.00	Control Elev(ft):	3.250

Name:	CS 04	From Node:	POND 08
Group:	BASE	To Node:	BOUNDARY
Length(ft):	35.00		
Count:	1		

	UPSTREAM	DOWNSTREAM		
Geometry:	Rectangular	Rectangular	Friction Equation:	Average Conveyance
Span(in):	48.00	48.00	Solution Algorithm:	Automatic
Rise(in):	36.00	36.00	Flow:	Both
Invert(ft):	3.500	3.500	Entrance Loss Coef:	0.200
Manning's N:	0.020000	0.020000	Exit Loss Coef:	1.000
Top Clip(in):	0.000	0.000	Outlet Ctrl Spec:	Use dc or tw
Bot Clip(in):	0.000	0.000	Inlet Ctrl Spec:	Use dn
			Solution Incs:	10

Upstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Downstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

*** Weir 1 of 1 for Drop Structure CS 04 ***

TABLE

Count:	1	Bottom Clip(in):	0.000
Type:	Vertical: Mavis	Top Clip(in):	0.000
Flow:	Both	Weir Disc Coef:	3.200
Geometry:	Rectangular	Orifice Disc Coef:	0.600
Span(in):	48.00	Invert(ft):	3.500
Rise(in):	10.00	Control Elev(ft):	3.500

Name:	CS 05	From Node:	POND 08
Group:	BASE	To Node:	BOUNDARY
Length(ft):	35.00		
Count:	1		

	UPSTREAM	DOWNSTREAM		
Geometry:	Rectangular	Rectangular	Friction Equation:	Average Conveyance
Span(in):	48.00	48.00	Solution Algorithm:	Automatic
Rise(in):	36.00	36.00	Flow:	Positive
Invert(ft):	3.500	3.500	Entrance Loss Coef:	0.200
Manning's N:	0.020000	0.020000	Exit Loss Coef:	1.000
Top Clip(in):	0.000	0.000	Outlet Ctrl Spec:	Use dc or tw
Bot Clip(in):	0.000	0.000	Inlet Ctrl Spec:	Use dn
			Solution Incs:	10

Upstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Downstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

*** Weir 1 of 1 for Drop Structure CS 05 ***

TABLE

Count:	1	Bottom Clip(in):	0.000
Type:	Vertical: Mavis	Top Clip(in):	0.000
Flow:	Both	Weir Disc Coef:	3.200
Geometry:	Rectangular	Orifice Disc Coef:	0.600
Span(in):	48.00	Invert(ft):	3.500
Rise(in):	10.00	Control Elev(ft):	3.500

Name:	CS 06	From Node:	POND 07
Group:	BASE	To Node:	BOUNDARY
Length(ft):	35.00		
Count:	1		

	UPSTREAM	DOWNSTREAM		
Geometry:	Rectangular	Rectangular	Friction Equation:	Average Conveyance
Span(in):	48.00	48.00	Solution Algorithm:	Automatic
Rise(in):	36.00	36.00	Flow:	Positive
Invert(ft):	3.500	3.500	Entrance Loss Coef:	0.200
Manning's N:	0.020000	0.020000	Exit Loss Coef:	1.000
Top Clip(in):	0.000	0.000	Outlet Ctrl Spec:	Use dc or tw
Bot Clip(in):	0.000	0.000	Inlet Ctrl Spec:	Use dn
			Solution Incs:	10

Upstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Downstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

*** Weir 1 of 1 for Drop Structure CS 06 ***

TABLE

Count:	1	Bottom Clip(in):	0.000
Type:	Vertical: Mavis	Top Clip(in):	0.000
Flow:	Both	Weir Disc Coef:	3.200
Geometry:	Rectangular	Orifice Disc Coef:	0.600
Span(in):	48.00	Invert(ft):	3.500
Rise(in):	12.00	Control Elev(ft):	3.500

Name:	CS 07	From Node:	BOUNDARY
Group:	BASE	To Node:	POND 07
Length(ft):	35.00		
Count:	1		

	UPSTREAM	DOWNSTREAM		
Geometry:	Rectangular	Rectangular	Friction Equation:	Average Conveyance
Span(in):	48.00	48.00	Solution Algorithm:	Automatic
Rise(in):	36.00	36.00	Flow:	Positive
Invert(ft):	3.500	3.500	Entrance Loss Coef:	0.200
Manning's N:	0.020000	0.020000	Exit Loss Coef:	1.000
Top Clip(in):	0.000	0.000	Outlet Ctrl Spec:	Use dc or tw
Bot Clip(in):	0.000	0.000	Inlet Ctrl Spec:	Use dn
			Solution Incs:	10

Upstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Downstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

*** Weir 1 of 1 for Drop Structure CS 07 ***

TABLE

Count:	1	Bottom Clip(in):	0.000
Type:	Horizontal	Top Clip(in):	0.000
Flow:	Both	Weir Disc Coef:	3.200
Geometry:	Rectangular	Orifice Disc Coef:	0.600
Span(in):	48.00	Invert(ft):	3.500
Rise(in):	48.00	Control Elev(ft):	3.500

Name:	CS 08	From Node:	POND 06
Group:	BASE	To Node:	POND 05
Length(ft):	35.00		
Count:	1		

	UPSTREAM	DOWNSTREAM		
Geometry:	Rectangular	Rectangular	Friction Equation:	Average Conveyance
Span(in):	48.00	48.00	Solution Algorithm:	Automatic
Rise(in):	36.00	36.00	Flow:	Both
Invert(ft):	3.250	3.250	Entrance Loss Coef:	0.200
			Exit Loss Coef:	1.000

```
  Manning's N: 0.020000       0.020000                  Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                      Inlet Ctrl Spec: Use dn
 Bot Clip(in): 0.000          0.000                        Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Downstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares



*** Weir 1 of 1 for Drop Structure CS 08 ***
                                                                                    TABLE
                  Count: 1                      Bottom Clip(in): 0.000
                   Type: Vertical: Mavis           Top Clip(in): 0.000
                   Flow: Both                   Weir Disc Coef: 3.200
              Geometry: Rectangular          Orifice Disc Coef: 0.600

              Span(in): 48.00                       Invert(ft): 3.250
              Rise(in): 10.00                Control Elev(ft): 3.250


-------------------------------------------------------------------------------------------------
        Name: CS 09               From Node: POND 03           Length(ft): 35.00
       Group: BASE                  To Node: POND 04                Count: 1

              UPSTREAM       DOWNSTREAM                Friction Equation: Average Conveyance
    Geometry: Rectangular    Rectangular              Solution Algorithm: Automatic
    Span(in): 48.00          48.00                                 Flow: Both
    Rise(in): 36.00          36.00                    Entrance Loss Coef: 0.200
  Invert(ft): 3.250          3.250                        Exit Loss Coef: 1.000
 Manning's N: 0.020000       0.020000                   Outlet Ctrl Spec: Use dc or tw
Top Clip(in): 0.000          0.000                      Inlet Ctrl Spec: Use dn
Bot Clip(in): 0.000          0.000                        Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Downstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares



*** Weir 1 of 1 for Drop Structure CS 09  ***
                                                                                    TABLE
                  Count: 1                      Bottom Clip(in): 0.000
                   Type: Vertical: Mavis           Top Clip(in): 0.000
                   Flow: Both                   Weir Disc Coef: 3.200
              Geometry: Rectangular          Orifice Disc Coef: 0.600

              Span(in): 48.00                       Invert(ft): 3.250
              Rise(in): 10.00                Control Elev(ft): 3.250


-------------------------------------------------------------------------------------------------
        Name: CS 10               From Node: POND 06           Length(ft): 35.00
       Group: BASE                  To Node: POND 04                Count: 1

              UPSTREAM       DOWNSTREAM                Friction Equation: Average Conveyance
    Geometry: Rectangular    Rectangular              Solution Algorithm: Automatic
    Span(in): 48.00          48.00                                 Flow: Both
    Rise(in): 36.00          36.00                    Entrance Loss Coef: 0.200
  Invert(ft): 3.250          3.250                        Exit Loss Coef: 1.000
 Manning's N: 0.020000       0.020000                   Outlet Ctrl Spec: Use dc or tw
Top Clip(in): 0.000          0.000                      Inlet Ctrl Spec: Use dn
Bot Clip(in): 0.000          0.000                        Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares

Downstream FHWA Inlet Edge Description:
Rectangular Box: 0° wingwall flares



*** Weir 1 of 1 for Drop Structure CS 10  ***
                                                                                    TABLE
                  Count: 1                      Bottom Clip(in): 0.000
                   Type: Vertical: Mavis           Top Clip(in): 0.000
                   Flow: Both                   Weir Disc Coef: 3.200
              Geometry: Rectangular          Orifice Disc Coef: 0.600

              Span(in): 48.00                       Invert(ft): 3.250
              Rise(in): 10.00                Control Elev(ft): 3.250


-------------------------------------------------------------------------------------------------
        Name: DS 01               From Node: POND 01           Length(ft): 30.00
       Group: BASE                  To Node: BOUNDARY               Count: 1
```

```
              UPSTREAM       DOWNSTREAM                 Friction Equation: Automatic
     Geometry: Circular       Circular                 Solution Algorithm: Most Restrictive
     Span(in): 60.00          60.00                                 Flow: Both
     Rise(in): 60.00          60.00                    Entrance Loss Coef: 0.000
   Invert(ft): 3.000          3.000                        Exit Loss Coef: 0.000
  Manning's N: 0.024000       0.024000                   Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                       Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                         Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Circular CMP: Projecting

Downstream FHWA Inlet Edge Description:
Circular CMP: Projecting



*** Weir 1 of 2 for Drop Structure DS 01 ***
                                                                                      TABLE
                  Count: 1                      Bottom Clip(in): 0.000
                   Type: Vertical: Mavis           Top Clip(in): 0.000
                   Flow: Both                   Weir Disc Coef: 3.200
               Geometry: Rectangular          Orifice Disc Coef: 0.600

               Span(in): 96.00                       Invert(ft): 3.850
               Rise(in): 24.00                Control Elev(ft): 3.850

*** Weir 2 of 2 for Drop Structure DS 01 ***
                                                                                      TABLE
                  Count: 1                      Bottom Clip(in): 0.000
                   Type: Horizontal                Top Clip(in): 0.000
                   Flow: Both                   Weir Disc Coef: 3.200
               Geometry: Circular             Orifice Disc Coef: 0.600

               Span(in): 96.00                       Invert(ft): 5.850
               Rise(in): 96.00                Control Elev(ft): 5.850


-------------------------------------------------------------------------------------------------------
        Name: DS 01A             From Node: POND 01           Length(ft): 30.00
       Group: BASE                 To Node: BOUNDARY              Count: 1

              UPSTREAM       DOWNSTREAM                 Friction Equation: Automatic
     Geometry: Circular       Circular                 Solution Algorithm: Most Restrictive
     Span(in): 60.00          60.00                                 Flow: None
     Rise(in): 60.00          60.00                    Entrance Loss Coef: 0.000
   Invert(ft): 3.000          3.000                        Exit Loss Coef: 0.000
  Manning's N: 0.024000       0.024000                   Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                       Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                         Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Circular CMP: Projecting

Downstream FHWA Inlet Edge Description:
Circular CMP: Projecting



*** Weir 1 of 2 for Drop Structure DS 01A ***
                                                                                      TABLE
                  Count: 1                      Bottom Clip(in): 0.000
                   Type: Vertical: Mavis           Top Clip(in): 0.000
                   Flow: Both                   Weir Disc Coef: 3.200
               Geometry: Rectangular          Orifice Disc Coef: 0.600

               Span(in): 96.00                       Invert(ft): 4.100
               Rise(in): 24.00                Control Elev(ft): 4.100

*** Weir 2 of 2 for Drop Structure DS 01A ***
                                                                                      TABLE
                  Count: 1                      Bottom Clip(in): 0.000
                   Type: Horizontal                Top Clip(in): 0.000
                   Flow: Both                   Weir Disc Coef: 3.200
               Geometry: Circular             Orifice Disc Coef: 0.600

               Span(in): 96.00                       Invert(ft): 6.100
               Rise(in): 96.00                Control Elev(ft): 6.100


-------------------------------------------------------------------------------------------------------
        Name: DS 02              From Node: POND 05           Length(ft): 25.00
       Group: BASE                 To Node: BOUNDARY              Count: 1

              UPSTREAM       DOWNSTREAM                 Friction Equation: Average Conveyance
     Geometry: Rectangular    Rectangular              Solution Algorithm: Automatic
     Span(in): 48.00          48.00                                 Flow: Both
     Rise(in): 48.00          48.00                    Entrance Loss Coef: 0.200
   Invert(ft): 3.250          3.000                        Exit Loss Coef: 1.000
```

```
  Manning's N: 0.020000       0.020000                  Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                      Inlet Ctrl Spec: Use dn
 Bot Clip(in): 0.000          0.000                        Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Rectangular Box: 30° to 75° wingwall flares

Downstream FHWA Inlet Edge Description:
Rectangular Box: 30° to 75° wingwall flares



*** Weir 1 of 2 for Drop Structure DS 02 ***
                                                                                    TABLE
                  Count: 1                      Bottom Clip(in): 0.000
                   Type: Vertical: Mavis           Top Clip(in): 0.000
                   Flow: Both                   Weir Disc Coef: 3.200
               Geometry: Rectangular          Orifice Disc Coef: 0.600

               Span(in): 48.00                       Invert(ft): 3.250
               Rise(in): 12.00                Control Elev(ft): 3.250

*** Weir 2 of 2 for Drop Structure DS 02 ***
                                                                                    TABLE
                  Count: 1                      Bottom Clip(in): 0.000
                   Type: Horizontal                Top Clip(in): 0.000
                   Flow: Positive               Weir Disc Coef: 3.200
               Geometry: Rectangular          Orifice Disc Coef: 0.600

               Span(in): 48.00                       Invert(ft): 3.500
               Rise(in): 48.00                Control Elev(ft): 3.500


-------------------------------------------------------------------------------------------------------
         Name: DS 04A              From Node: FUTURE POND 04A    Length(ft): 50.00
        Group: BASE                  To Node: POND 01                Count: 2

               UPSTREAM       DOWNSTREAM                Friction Equation: Automatic
     Geometry: Circular       Circular                 Solution Algorithm: Most Restrictive
     Span(in): 30.00          30.00                                Flow: Both
     Rise(in): 30.00          30.00                    Entrance Loss Coef: 0.000
   Invert(ft): 4.000          3.500                        Exit Loss Coef: 1.000
  Manning's N: 0.013000       0.013000                   Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                        Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                          Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall



*** Weir 1 of 1 for Drop Structure DS 04A ***
                                                                                    TABLE
                  Count: 1                      Bottom Clip(in): 0.000
                   Type: Horizontal                Top Clip(in): 0.000
                   Flow: Both                   Weir Disc Coef: 3.200
               Geometry: Rectangular          Orifice Disc Coef: 0.600

               Span(in): 72.00                       Invert(ft): 5.000
               Rise(in): 36.00                Control Elev(ft): 5.000


-------------------------------------------------------------------------------------------------------
         Name: DS 07A              From Node: FUTURE POND 07A    Length(ft): 475.00
        Group: BASE                  To Node: POND 01                Count: 1

               UPSTREAM       DOWNSTREAM                Friction Equation: Automatic
     Geometry: Circular       Circular                 Solution Algorithm: Most Restrictive
     Span(in): 36.00          36.00                                Flow: None
     Rise(in): 36.00          36.00                    Entrance Loss Coef: 0.000
   Invert(ft): 4.000          3.500                        Exit Loss Coef: 1.000
  Manning's N: 0.013000       0.013000                   Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                        Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                          Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall



*** Weir 1 of 1 for Drop Structure DS 07A ***
                                                                                    TABLE
                  Count: 1                      Bottom Clip(in): 0.000
                   Type: Horizontal                Top Clip(in): 0.000
```

```
                Flow: Both                    Weir Disc Coef: 3.200
            Geometry: Rectangular           Orifice Disc Coef: 0.600

            Span(in): 60.00                       Invert(ft): 5.000
            Rise(in): 36.00                  Control Elev(ft): 5.000


-------------------------------------------------------------------------------------------------
         Name: DS 09A             From Node: FUTURE POND 09A    Length(ft): 300.00
        Group: BASE                 To Node: POND 01                Count: 2

              UPSTREAM       DOWNSTREAM                 Friction Equation: Automatic
     Geometry: Circular       Circular                  Solution Algorithm: Most Restrictive
     Span(in): 30.00          30.00                                Flow: Both
     Rise(in): 30.00          30.00                     Entrance Loss Coef: 0.000
   Invert(ft): 3.500          3.500                         Exit Loss Coef: 1.000
  Manning's N: 0.013000       0.013000                    Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                        Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                          Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall



*** Weir 1 of 1 for Drop Structure DS 09A ***
                                                                                    TABLE
                Count: 1                    Bottom Clip(in): 0.000
                 Type: Horizontal              Top Clip(in): 0.000
                 Flow: Both                  Weir Disc Coef: 3.200
            Geometry: Rectangular           Orifice Disc Coef: 0.600

            Span(in): 72.00                       Invert(ft): 4.500
            Rise(in): 36.00                  Control Elev(ft): 4.500


-------------------------------------------------------------------------------------------------
         Name: DS 10A             From Node: FUTURE POND 10A    Length(ft): 275.00
        Group: BASE                 To Node: BOUNDARY               Count: 2

              UPSTREAM       DOWNSTREAM                 Friction Equation: Automatic
     Geometry: Circular       Circular                  Solution Algorithm: Most Restrictive
     Span(in): 36.00          36.00                                Flow: Both
     Rise(in): 36.00          36.00                     Entrance Loss Coef: 0.000
   Invert(ft): 3.500          3.500                         Exit Loss Coef: 1.000
  Manning's N: 0.013000       0.013000                    Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                        Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                          Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall



*** Weir 1 of 1 for Drop Structure DS 10A ***
                                                                                    TABLE
                Count: 1                    Bottom Clip(in): 0.000
                 Type: Horizontal              Top Clip(in): 0.000
                 Flow: Both                  Weir Disc Coef: 3.200
            Geometry: Rectangular           Orifice Disc Coef: 0.600

            Span(in): 60.00                       Invert(ft): 5.000
            Rise(in): 36.00                  Control Elev(ft): 5.000


-------------------------------------------------------------------------------------------------
         Name: DS 14              From Node: FUTURE POND 14     Length(ft): 900.00
        Group: BASE                 To Node: FUTURE POND 15          Count: 1

              UPSTREAM       DOWNSTREAM                 Friction Equation: Automatic
     Geometry: Circular       Circular                  Solution Algorithm: Most Restrictive
     Span(in): 42.00          42.00                                Flow: Both
     Rise(in): 42.00          42.00                     Entrance Loss Coef: 0.000
   Invert(ft): 3.500          3.500                         Exit Loss Coef: 1.000
  Manning's N: 0.013000       0.013000                    Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                        Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                          Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall
```

*** Weir 1 of 1 for Drop Structure DS 14 ***

TABLE

Count:	1	Bottom Clip(in):	0.000
Type:	Horizontal	Top Clip(in):	0.000
Flow:	Both	Weir Disc Coef:	3.200
Geometry:	Rectangular	Orifice Disc Coef:	0.600
Span(in):	60.00	Invert(ft):	8.000
Rise(in):	36.00	Control Elev(ft):	8.000

Name:	DS 15	From Node:	FUTURE POND 15
Group:	BASE	To Node:	FUTURE POND 15A
Length(ft):	325.00		
Count:	1		

	UPSTREAM	DOWNSTREAM		
Geometry:	Circular	Circular	Friction Equation:	Automatic
Span(in):	48.00	48.00	Solution Algorithm:	Most Restrictive
Rise(in):	48.00	48.00	Flow:	Both
Invert(ft):	3.500	3.500	Entrance Loss Coef:	0.000
Manning's N:	0.013000	0.013000	Exit Loss Coef:	1.000
Top Clip(in):	0.000	0.000	Outlet Ctrl Spec:	Use dc or tw
Bot Clip(in):	0.000	0.000	Inlet Ctrl Spec:	Use dc
			Solution Incs:	10

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

*** Weir 1 of 1 for Drop Structure DS 15 ***

TABLE

Count:	1	Bottom Clip(in):	0.000
Type:	Horizontal	Top Clip(in):	0.000
Flow:	Both	Weir Disc Coef:	3.200
Geometry:	Rectangular	Orifice Disc Coef:	0.600
Span(in):	72.00	Invert(ft):	7.000
Rise(in):	48.00	Control Elev(ft):	7.000

Name:	DS 15A	From Node:	FUTURE POND 15A
Group:	BASE	To Node:	BOUNDARY
Length(ft):	400.00		
Count:	1		

	UPSTREAM	DOWNSTREAM		
Geometry:	Circular	Circular	Friction Equation:	Automatic
Span(in):	48.00	48.00	Solution Algorithm:	Most Restrictive
Rise(in):	48.00	48.00	Flow:	Both
Invert(ft):	3.500	3.500	Entrance Loss Coef:	0.000
Manning's N:	0.013000	0.013000	Exit Loss Coef:	1.000
Top Clip(in):	0.000	0.000	Outlet Ctrl Spec:	Use dc or tw
Bot Clip(in):	0.000	0.000	Inlet Ctrl Spec:	Use dc
			Solution Incs:	10

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

*** Weir 1 of 1 for Drop Structure DS 15A ***

TABLE

Count:	1	Bottom Clip(in):	0.000
Type:	Horizontal	Top Clip(in):	0.000
Flow:	Both	Weir Disc Coef:	3.200
Geometry:	Rectangular	Orifice Disc Coef:	0.600
Span(in):	72.00	Invert(ft):	4.500
Rise(in):	36.00	Control Elev(ft):	4.500

Name:	DS 20	From Node:	FUTURE POND 20
Group:	BASE	To Node:	POND 04
Length(ft):	600.00		
Count:	1		

	UPSTREAM	DOWNSTREAM		
Geometry:	Circular	Circular	Friction Equation:	Automatic
Span(in):	36.00	36.00	Solution Algorithm:	Most Restrictive
Rise(in):	36.00	36.00	Flow:	Both
Invert(ft):	3.500	3.500	Entrance Loss Coef:	0.000
Manning's N:	0.013000	0.013000	Exit Loss Coef:	1.000
Top Clip(in):	0.000	0.000	Outlet Ctrl Spec:	Use dc or tw
Bot Clip(in):	0.000	0.000	Inlet Ctrl Spec:	Use dc
			Solution Incs:	10

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

*** Weir 1 of 1 for Drop Structure DS 20 ***

TABLE

Count:	1	Bottom Clip(in):	0.000
Type:	Horizontal	Top Clip(in):	0.000
Flow:	Both	Weir Disc Coef:	3.200
Geometry:	Rectangular	Orifice Disc Coef:	0.600
Span(in):	60.00	Invert(ft):	4.500
Rise(in):	36.00	Control Elev(ft):	4.500

Weirs

Name:	WEIR 23	From Node:	FUTURE POND 23
Group:	BASE	To Node:	POND 07
Flow:	Both	Count:	1
Type:	Vertical: Fread	Geometry:	Trapezoidal
Bottom Width(ft):	20.00		
Left Side Slope(h/v):	6.00		
Right Side Slope(h/v):	6.00		
Invert(ft):	5.000		
Control Elevation(ft):	5.000		
Struct Opening Dim(ft):	9999.00		

TABLE

Bottom Clip(ft):	0.000
Top Clip(ft):	0.000
Weir Discharge Coef:	2.800
Orifice Discharge Coef:	0.600

Hydrology Simulations

Name: 002
Filename: N:\17091\Dsgn\Post Development\002.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00
Rainfall File: Scsiii
Rainfall Amount(in): 4.60

Time(hrs)	Print Inc(min)
12.000	30.00
15.000	15.00
24.000	30.00
360.000	30.00

Name: 010
Filename: N:\17091\Dsgn\Post Development\010.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00
Rainfall File: Scsiii
Rainfall Amount(in): 6.80

Time(hrs)	Print Inc(min)
12.000	30.00
15.000	15.00
24.000	30.00
360.000	30.00

Name: 025
Filename: N:\17091\Dsgn\Post Development\025.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00
Rainfall File: Scsiii
Rainfall Amount(in): 7.80

Time(hrs)	Print Inc(min)
12.000	30.00
15.000	15.00

24.000 30.00
360.000 30.00

Name: 050
Filename: N:\17091\Dsgn\Post Development\050.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00
Rainfall File: Scsiii
Rainfall Amount(in): 8.80

Time(hrs)	Print Inc(min)
12.000	30.00
15.000	15.00
24.000	30.00
360.000	30.00

Name: 100
Filename: N:\17091\Dsgn\Post Development\100.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00
Rainfall File: Scsiii
Rainfall Amount(in): 10.00

Time(hrs)	Print Inc(min)
12.000	30.00
15.000	15.00
24.000	30.00
360.000	30.00

==========
==== Routing Simulations ==========
==========

Name: 002 Hydrology Sim: 002
Filename: N:\17091\Dsgn\Post Development\002.I32

Execute: Yes Restart: No Patch: No
Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
Time Step Optimizer: 10.000
Start Time(hrs): 0.000 End Time(hrs): 360.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
12.000	30.000
15.000	15.000
24.000	30.000
360.000	30.000

Group	Run
BASE	Yes

Name: 010 Hydrology Sim: 010
Filename: N:\17091\Dsgn\Post Development\010.I32

Execute: Yes Restart: No Patch: No
Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
Time Step Optimizer: 10.000
Start Time(hrs): 0.000 End Time(hrs): 360.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
12.000	30.000
15.000	15.000
24.000	30.000
360.000	30.000

Group	Run
BASE	Yes

```
-------------------------------------------------------------------------------------------------------
         Name: 025                 Hydrology Sim: 025
     Filename: N:\17091\Dsgn\Post Development\025.I32

      Execute: Yes         Restart: No           Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                    End Time(hrs): 360.00
     Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
        Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
12.000          30.000
15.000          15.000
24.000          30.000
360.000         30.000

Group           Run
--------------- -----
BASE            Yes


-------------------------------------------------------------------------------------------------------
         Name: 050                 Hydrology Sim: 050
     Filename: N:\17091\Dsgn\Post Development\050.I32

      Execute: Yes         Restart: No           Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                    End Time(hrs): 360.00
     Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
        Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
12.000          30.000
15.000          15.000
24.000          30.000
360.000         30.000

Group           Run
--------------- -----
BASE            Yes


-------------------------------------------------------------------------------------------------------
         Name: 100                 Hydrology Sim: 100
     Filename: N:\17091\Dsgn\Post Development\100.I32

      Execute: Yes         Restart: No           Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                    End Time(hrs): 360.00
     Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
        Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
12.000          30.000
15.000          15.000
24.000          30.000
360.000         30.000

Group           Run
--------------- -----
BASE            Yes
```

KIAWAH RIVER PLANTATION
DRAINAGE BASIN STUDY

Appendix E

POST-DEVELOPMENT (BUILD OUT)
ICPR MODEL OUTPUT – NODE MIN/MAX REPORT

PREPARED BY

THOMAS & HUTTON ENGINEERING CO.

KIAWAH RIVER PLANTATION J-17091
Post Development
June 3, 2009
Node Min/Max Report

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
BOUNDARY	BASE	002	0.00	3.00	4.00	-0.0083	45	13.50	164.54	0.00	0.00
BOUNDARY	BASE	010	0.00	3.00	4.00	-0.0083	45	13.50	324.25	0.00	0.00
BOUNDARY	BASE	025	0.00	3.00	4.00	-0.0083	45	13.34	395.17	0.00	0.00
BOUNDARY	BASE	050	0.00	3.00	4.00	-0.0083	45	13.25	466.18	0.00	0.00
BOUNDARY	BASE	100	0.00	3.00	4.00	-0.0083	45	13.25	551.26	0.00	0.00
FUTURE POND 04A	BASE	002	12.72	5.55	7.00	0.0024	79933	12.25	32.13	12.72	17.28
FUTURE POND 04A	BASE	010	12.72	6.27	7.00	0.0035	83087	12.25	70.89	12.72	34.99
FUTURE POND 04A	BASE	025	12.73	6.66	7.00	0.0037	84770	12.25	90.08	12.73	42.60
FUTURE POND 04A	BASE	050	12.74	7.06	7.00	0.0037	86532	12.25	109.84	12.74	50.32
FUTURE POND 04A	BASE	100	12.75	7.57	7.00	0.0038	88726	12.25	134.03	12.75	58.99
FUTURE POND 07A	BASE	002	15.83	5.52	7.00	0.0011	583216	12.50	50.85	17.56	10.22
FUTURE POND 07A	BASE	010	15.60	6.20	7.00	-0.0013	592493	12.50	117.31	17.63	20.84
FUTURE POND 07A	BASE	025	15.71	6.57	7.00	-0.0017	597247	12.50	150.69	18.01	25.28
FUTURE POND 07A	BASE	050	15.83	6.97	7.00	-0.0021	602939	12.50	185.29	18.41	28.95
FUTURE POND 07A	BASE	100	15.96	7.48	7.00	-0.0026	610227	12.50	227.95	18.61	32.98
FUTURE POND 09A	BASE	002	41.54	5.49	7.00	0.0033	158317	12.25	59.59	13.06	15.85
FUTURE POND 09A	BASE	010	43.94	6.13	7.00	0.0032	160805	12.25	98.10	12.92	26.12
FUTURE POND 09A	BASE	025	42.59	6.38	7.00	0.0032	161789	12.25	115.59	12.88	29.60
FUTURE POND 09A	BASE	050	41.80	6.63	7.00	0.0031	162758	12.25	133.00	12.86	33.61
FUTURE POND 09A	BASE	100	41.17	6.92	7.00	0.0031	163893	12.25	153.78	12.85	38.43
FUTURE POND 10A	BASE	002	15.35	5.47	8.00	0.0012	132435	12.50	19.04	15.35	15.44
FUTURE POND 10A	BASE	010	15.09	6.09	8.00	0.0014	133403	12.50	49.71	15.09	31.39
FUTURE POND 10A	BASE	025	15.05	6.43	8.00	0.0018	135254	12.50	65.46	15.05	37.34
FUTURE POND 10A	BASE	050	15.01	6.79	8.00	-0.0021	137520	12.50	81.76	15.01	42.97
FUTURE POND 10A	BASE	100	14.99	7.24	8.00	-0.0023	140612	12.50	101.85	14.99	49.42
FUTURE POND 12	BASE	002	15.02	7.76	10.00	0.0016	293664	12.25	65.77	12.30	14.08
FUTURE POND 12	BASE	010	16.68	8.68	10.00	0.0021	305238	12.25	120.01	12.30	19.14
FUTURE POND 12	BASE	025	16.97	9.17	10.00	0.0022	311533	12.25	145.36	12.31	21.60
FUTURE POND 12	BASE	050	17.20	9.67	10.00	0.0024	318137	12.25	170.82	12.31	24.10
FUTURE POND 12	BASE	100	17.40	10.29	10.00	0.0025	326167	12.25	201.41	12.30	26.93
FUTURE POND 14	BASE	002	12.71	8.44	11.00	0.0023	74034	12.25	24.90	12.71	14.93
FUTURE POND 14	BASE	010	12.82	9.15	11.00	0.0030	76825	12.25	64.84	12.47	31.45
FUTURE POND 14	BASE	025	12.93	9.70	11.00	0.0036	78957	12.25	85.39	12.45	33.95
FUTURE POND 14	BASE	050	12.99	10.30	11.00	0.0039	81339	12.25	106.90	12.50	36.73
FUTURE POND 14	BASE	100	13.07	11.08	11.00	0.0041	84400	12.25	133.63	12.56	40.36
FUTURE POND 15	BASE	002	14.88	7.75	10.00	0.0019	633014	12.50	130.56	14.36	41.17
FUTURE POND 15	BASE	010	16.65	8.66	10.00	0.0019	660059	12.50	266.27	13.33	63.56
FUTURE POND 15	BASE	025	16.95	9.16	10.00	0.0022	674628	12.50	326.54	13.10	67.87
FUTURE POND 15	BASE	050	17.12	9.66	10.00	0.0023	689567	12.50	388.20	12.93	71.15
FUTURE POND 15	BASE	100	17.26	10.27	10.00	0.0024	707725	12.50	462.91	12.77	73.30
FUTURE POND 15A	BASE	002	17.47	7.02	8.00	0.0031	143920	14.18	47.43	17.47	34.44
FUTURE POND 15A	BASE	010	16.96	8.04	8.00	-0.0037	154626	12.92	89.19	16.96	48.25
FUTURE POND 15A	BASE	025	16.97	8.41	8.00	-0.0037	158460	12.75	107.71	16.97	53.48
FUTURE POND 15A	BASE	050	17.00	8.78	8.00	-0.0037	162335	12.75	124.38	17.00	58.56
FUTURE POND 15A	BASE	100	16.96	9.22	8.00	0.0039	166984	12.64	142.55	16.96	64.53
FUTURE POND 16	BASE	002	14.92	7.76	10.00	0.0018	273895	12.25	75.27	12.33	23.86
FUTURE POND 16	BASE	010	16.62	8.67	10.00	0.0024	287742	12.25	141.66	12.34	36.46
FUTURE POND 16	BASE	025	16.92	9.17	10.00	0.0025	295179	12.25	172.99	12.35	42.28
FUTURE POND 16	BASE	050	17.13	9.67	10.00	0.0025	302663	12.25	204.60	12.35	47.80
FUTURE POND 16	BASE	100	17.31	10.29	10.00	0.0026	311765	12.25	242.67	12.35	53.95
FUTURE POND 20	BASE	002	13.14	5.52	8.00	0.0050	25776	12.25	18.87	13.14	9.35
FUTURE POND 20	BASE	010	12.96	6.47	8.00	0.0050	27123	12.25	33.87	12.94	17.19
FUTURE POND 20	BASE	025	12.95	6.94	8.00	0.0050	28208	12.25	41.51	12.95	19.90

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
FUTURE POND 20	BASE	050	12.93	7.40	8.00	0.0050	29239	12.25	49.90	12.93	23.03
FUTURE POND 20	BASE	100	12.90	7.95	8.00	0.0050	30443	12.25	60.34	12.90	26.78
FUTURE POND 20A	BASE	002	13.73	5.62	8.00	0.0035	133955	12.25	44.05	14.44	6.19
FUTURE POND 20A	BASE	010	13.59	6.66	8.00	0.0043	140481	12.25	83.29	14.79	11.62
FUTURE POND 20A	BASE	025	13.70	7.18	8.00	0.0043	144255	12.25	101.83	15.40	13.39
FUTURE POND 20A	BASE	050	13.74	7.69	8.00	0.0044	148062	12.25	120.54	15.11	15.21
FUTURE POND 20A	BASE	100	13.79	8.31	8.00	0.0044	152628	12.25	143.10	15.26	17.42
FUTURE POND 22	BASE	002	12.88	5.75	8.00	0.0050	161367	12.25	108.98	13.06	41.43
FUTURE POND 22	BASE	010	12.73	6.60	8.00	0.0050	171530	12.25	179.89	12.81	65.73
FUTURE POND 22	BASE	025	12.73	7.01	8.00	0.0050	173070	12.25	211.65	12.90	74.25
FUTURE POND 22	BASE	050	12.72	7.42	8.00	0.0050	176608	12.25	242.92	12.78	82.81
FUTURE POND 22	BASE	100	12.73	7.90	8.00	0.0050	180744	12.25	280.48	12.82	94.28
FUTURE POND 23	BASE	002	13.01	5.74	7.00	0.0040	267151	12.25	104.13	13.18	42.90
FUTURE POND 23	BASE	010	12.87	6.32	7.00	0.0043	270612	12.25	171.97	12.99	80.49
FUTURE POND 23	BASE	025	13.60	6.70	7.00	0.0046	272829	12.25	202.79	12.83	101.71
FUTURE POND 23	BASE	050	13.64	7.12	7.00	0.0050	275224	12.25	233.48	12.69	123.69
FUTURE POND 23	BASE	100	13.66	7.61	7.00	0.0049	278437	12.25	270.07	12.56	145.52
NODE 01	BASE	002	23.30	12.19	15.00	0.0018	734607	13.75	46.13	23.30	7.29
NODE 01	BASE	010	22.36	12.83	15.00	0.0023	1162644	13.75	90.08	22.36	14.88
NODE 01	BASE	025	22.25	13.07	15.00	0.0026	1367902	13.75	111.22	22.25	18.07
NODE 01	BASE	050	22.23	13.28	15.00	0.0024	1553757	13.75	132.78	22.23	21.10
NODE 01	BASE	100	22.24	13.52	15.00	0.0025	1758410	13.75	159.00	22.24	24.50
NODE 01A	BASE	002	23.40	11.14	15.00	0.0013	9114	23.30	7.29	23.44	7.29
NODE 01A	BASE	010	22.49	11.49	15.00	0.0016	10223	22.36	14.88	22.48	14.88
NODE 01A	BASE	025	22.44	11.61	15.00	0.0017	10636	22.25	18.07	22.37	18.07
NODE 01A	BASE	050	22.48	11.72	15.00	0.0016	11018	22.23	21.10	22.33	21.10
NODE 01A	BASE	100	22.34	11.84	15.00	0.0014	11434	22.24	24.50	22.34	24.49
NODE 02	BASE	002	30.15	13.19	15.00	0.0030	4226478	16.50	128.37	30.15	23.70
NODE 02	BASE	010	31.21	13.83	15.00	0.0030	6685863	16.00	244.68	31.21	34.64
NODE 02	BASE	025	31.54	14.07	15.00	0.0030	7609898	16.00	300.95	31.54	39.45
NODE 02	BASE	050	31.80	14.29	15.00	0.0030	8458478	16.00	358.35	31.80	44.12
NODE 02	BASE	100	32.08	14.53	15.00	0.0034	9399862	16.00	428.23	32.08	49.39
NODE 02A	BASE	002	29.67	11.70	15.00	0.0016	11021	30.15	23.70	30.25	23.70
NODE 02A	BASE	010	30.96	11.90	15.00	0.0013	12349	31.21	34.64	31.29	34.64
NODE 02A	BASE	025	31.40	11.99	15.00	0.0013	12927	31.54	39.45	31.60	39.45
NODE 02A	BASE	050	31.87	12.08	15.00	0.0013	13484	31.80	44.12	31.92	44.12
NODE 02A	BASE	100	32.18	12.17	15.00	0.0013	14117	32.08	49.39	32.15	49.39
NODE 03	BASE	002	28.37	12.92	15.00	0.0031	2321446	16.50	68.54	28.37	19.55
NODE 03	BASE	010	29.83	13.43	15.00	0.0031	4608118	16.50	130.74	29.83	27.45
NODE 03	BASE	025	30.34	13.61	15.00	0.0030	5443195	16.50	160.62	30.34	30.49
NODE 03	BASE	050	30.73	13.77	15.00	0.0030	6191529	16.50	191.08	30.73	33.54
NODE 03	BASE	100	31.12	13.95	15.00	0.0031	7008896	16.50	228.15	31.12	37.04
NODE 03A	BASE	002	28.09	11.58	15.00	0.0016	11687	28.37	19.55	28.49	19.56
NODE 03A	BASE	010	29.81	11.75	15.00	0.0015	13072	29.83	27.45	29.93	27.45
NODE 03A	BASE	025	30.39	11.82	15.00	0.0015	13629	30.34	30.49	30.44	30.49
NODE 03A	BASE	050	30.88	11.89	15.00	0.0015	14185	30.73	33.54	30.82	33.54
NODE 03A	BASE	100	31.37	11.98	15.00	0.0015	14829	31.12	37.04	31.20	37.04
NODE 04	BASE	002	26.32	5.99	8.00	0.0010	3072113	13.50	150.48	25.77	7.87
NODE 04	BASE	010	25.36	6.73	8.00	0.0019	3560953	13.50	319.61	24.86	22.19
NODE 04	BASE	025	25.05	7.06	8.00	0.0021	3770539	13.50	403.24	24.35	30.60
NODE 04	BASE	050	24.72	7.36	8.00	0.0023	3971774	13.50	489.41	23.37	39.95
NODE 04	BASE	100	24.23	7.72	8.00	0.0025	4203291	13.50	595.27	22.68	52.24

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
NODE 04A	BASE	002	26.64	5.91	8.00	0.0014	16556	25.77	7.87	26.04	7.86
NODE 04A	BASE	010	25.56	6.63	8.00	0.0027	19779	24.86	22.19	25.06	22.16
NODE 04A	BASE	025	25.27	6.92	8.00	0.0023	21107	24.35	30.60	24.60	30.55
NODE 04A	BASE	050	25.00	7.21	8.00	0.0021	22371	23.37	39.95	23.50	39.88
NODE 04A	BASE	100	24.70	7.53	8.00	0.0023	23807	22.68	52.24	22.82	52.16
POND 01	BASE	002	41.44	5.49	6.00	0.0020	16570678	12.25	1229.89	41.44	34.28
POND 01	BASE	010	43.88	6.13	6.00	0.0024	24154689	12.25	2189.22	43.88	57.99
POND 01	BASE	025	42.52	6.38	6.00	0.0025	25345056	12.25	2649.83	42.52	71.90
POND 01	BASE	050	41.73	6.63	6.00	0.0027	26518258	12.25	3117.32	41.73	85.30
POND 01	BASE	100	41.10	6.92	6.00	0.0028	27890404	12.25	3682.67	41.10	101.05
POND 02	BASE	002	16.57	3.93	6.00	0.0019	294092	12.25	52.27	13.87	3.86
POND 02	BASE	010	14.05	4.35	6.00	0.0019	300902	12.25	93.29	13.33	10.80
POND 02	BASE	025	13.84	4.55	6.00	0.0020	304115	12.25	112.72	13.24	13.96
POND 02	BASE	050	13.59	4.75	6.00	0.0021	307383	12.25	132.36	13.20	17.65
POND 02	BASE	100	13.45	5.00	6.00	0.0022	311296	12.25	156.08	13.16	22.47
POND 03	BASE	002	17.29	3.91	6.00	0.0019	347111	12.25	55.22	15.85	2.90
POND 03	BASE	010	16.08	4.33	6.00	0.0018	353750	12.25	96.48	14.72	6.46
POND 03	BASE	025	15.43	4.52	6.00	0.0018	356846	12.25	115.96	14.51	7.80
POND 03	BASE	050	15.14	4.72	6.00	0.0019	359976	12.25	135.67	14.19	9.04
POND 03	BASE	100	14.77	4.96	6.00	0.0019	363729	12.25	159.84	13.96	10.43
POND 04	BASE	002	24.35	3.87	6.00	0.0012	2581715	12.25	233.68	24.35	5.50
POND 04	BASE	010	23.73	4.24	6.00	0.0011	2593578	12.25	374.46	23.73	11.62
POND 04	BASE	025	23.65	4.41	6.00	0.0011	2598944	12.25	439.82	23.65	14.13
POND 04	BASE	050	23.85	4.58	6.00	0.0011	2604372	12.25	504.56	23.85	16.60
POND 04	BASE	100	24.00	4.79	6.00	0.0011	2610891	12.25	583.44	24.00	19.36
POND 05	BASE	002	14.76	3.96	6.00	0.0025	177571	12.25	41.69	14.76	6.53
POND 05	BASE	010	13.95	4.49	6.00	0.0025	185993	12.25	78.07	13.95	13.77
POND 05	BASE	025	13.74	4.73	6.00	0.0026	189817	12.25	94.93	13.74	17.40
POND 05	BASE	050	13.46	4.97	6.00	0.0026	193690	12.25	112.56	13.46	21.19
POND 05	BASE	100	13.33	5.27	6.00	0.0026	198335	12.25	133.99	13.33	25.98
POND 06	BASE	002	14.76	4.06	6.00	0.0024	375833	12.25	84.00	14.80	7.83
POND 06	BASE	010	14.24	4.67	6.00	0.0025	395314	12.25	153.32	14.67	15.61
POND 06	BASE	025	14.21	4.97	6.00	0.0025	404814	12.25	186.24	14.74	18.90
POND 06	BASE	050	14.20	5.28	6.00	0.0026	414443	12.25	219.53	14.78	21.98
POND 06	BASE	100	14.21	5.64	6.00	0.0027	426062	12.25	259.79	14.87	25.45
POND 07	BASE	002	47.22	5.29	6.00	0.0025	208457	12.91	49.50	47.22	12.40
POND 07	BASE	010	13.70	6.27	6.00	0.0031	221331	12.72	127.46	13.70	19.01
POND 07	BASE	025	13.66	6.68	6.00	0.0037	226742	12.69	167.51	13.66	21.48
POND 07	BASE	050	13.68	7.11	6.00	0.0036	232262	12.66	208.61	13.68	23.84
POND 07	BASE	100	13.70	7.60	6.00	0.0035	238709	12.55	253.41	13.70	26.43
POND 08	BASE	002	16.90	3.95	6.00	0.0014	811974	12.25	90.19	16.90	3.28
POND 08	BASE	010	16.45	4.22	6.00	0.0013	816619	12.25	150.46	16.45	7.05
POND 08	BASE	025	16.09	4.34	6.00	0.0012	818740	12.25	178.60	16.09	9.05
POND 08	BASE	050	15.43	4.46	6.00	0.0013	820909	12.25	207.05	15.43	11.18
POND 08	BASE	100	15.31	4.62	6.00	0.0013	823570	12.25	241.40	15.31	13.49

KIAWAH RIVER PLANTATION
DRAINAGE BASIN STUDY

Appendix F

POST-DEVELOPMENT (BUILD OUT)
STORMWATER DESIGN CONSIDERATIONS

PREPARED BY

THOMAS & HUTTON ENGINEERING CO.

STORMWATER DESIGN CONSIDERATIONS

PROJECT: 17091 KIAWAH RIVER PLANTATION **Job:** J-17091

PREPARED BY: Thomas and Hutton Engineering Company
PREPARED FOR:

Date: 5/21/09
Revised:
By: CGB

DRAINAGE BASIN 1

Calculate Post-Development "Tc" and Composite "CN" **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Light Underbrush = 0.400
l = 100 ft
P2 = 4.60 in
S = 0.0010 ft/ft
t_1 = 59.4 min

Shallow Concentrated Flow:

t=1/60v
where
l = 3900 ft
Paved ? No
Slope, S = 0.0020 ft/ft
v = 0.72 ft/s
t_2 = 90.1 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Not maintained, dense brush, high stage = 0.1200
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 1: Tc = 149.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Woods: Good (no grazing or burning)	A	30	8.92	268
	Resi: 1 acre (20% avg. imp.)	B	68	1.50	102
	Commercial or Industrial (85% avg. imp.)	B	92	4.87	448
B/D	Woods: Good (no grazing or burning)	D	77	117.50	9,048
				132.79	9,865

Basin 1: Composite CN = 74

DRAINAGE BASIN 2

Calculate Post-Development "Tc" and Composite "CN" **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0020 ft/ft
t_1 = 78.3 min

Shallow Concentrated Flow:

t=1/60v
where
l = 11000 ft
Paved ? No
Slope, S = 0.0020 ft/ft
v = 0.72 ft/s
t_2 = 254.1 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 2: Tc = 332.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Resi: 1 acre (20% avg. imp.)	B	68	7.80	530
	Woods: Good (no grazing or burning)	A	30	31.16	935
B/D	Woods: Good (no grazing or burning)	D	77	601.06	46,282
				640.02	47,747

Basin 2: Composite CN = 75

DRAINAGE BASIN 3

DRAINAGE BASIN 3

Calculate Post-Development "Tc" and Composite "CN"

"POST"

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0020 ft/ft
t_1 = 78.3 min

Shallow Concentrated Flow:

t=1/60v

where
l = 12000 ft
Paved ? No
Slope, S = 0.0020 ft/ft
v = 0.72 ft/s
t_2 = 277.2 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 3: Tc = 356.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Resi: 1 acre (20% avg. imp.)	B	68	0.78	53
	Crops (SR) Straight Row: Good	A	63	46.95	2,958
	Woods: Good (no grazing or burning)	D	77	14.29	1,100
B/D	Woods: Good (no grazing or burning)	D	77	297.65	22,919
				359.67	27,030

Basin 3: Composite CN = 75

DRAINAGE BASIN 4

DRAINAGE BASIN 4

Calculate Post-Development "Tc" and Composite "CN"

"POST"

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0020 ft/ft
t_1 = 78.3 min

Shallow Concentrated Flow:

t=1/60v

where
l = 2800 ft
Paved ? No
Slope, S = 0.0030 ft/ft
v = 0.88 ft/s
t_2 = 52.8 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 1800 ft
S = 0.0030 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 42.00 sf
P = 23.97 ft => Hydraulic Radius, R = 1.75 ft
v = 4.22 ft/s
t_3 = 7.1 min

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 4: Tc = 138.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Resi: 1 acre (20% avg. imp.)	B	68	20.31	1,381
	Crops (SR) Straight Row: Good	B	75	52.01	3,901
B/D	Woods: Good (no grazing or burning)	D	77	134.81	10,380
				207.13	15,662

Basin 4: Composite CN = 76

DRAINAGE BASIN 4A — DRAINAGE BASIN 4A

Calculate Post-Development "Tc" and Composite "CN" — **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Pvmt. & Grass Combo (50/50) = 0.100
l = 50 ft
P2 = 4.60 in
S = 0.0050 ft/ft
t_1 = 5.9 min

Shallow Concentrated Flow:

t=1/60v

where l = 150 ft
Paved ? Yes
Slope, S = 0.0040 ft/ft
v = 1.29 ft/s
t_2 = 1.9 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 1000 ft
v= 2.00 ft/s
t= 8.3 min

Basin 4A: Tc = 16.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Resi: 1 acre (20% avg. imp.)	B	68	24.36	1,656
B/D	Open Space, Good (grass > 75%)	B	61	10.97	669
				35.33	2,326

Basin 4A: Composite CN = 66

DRAINAGE BASIN 5 — DRAINAGE BASIN 5

Calculate Post-Development "Tc" and Composite "CN" — **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0020 ft/ft
t_1 = 78.3 min

Shallow Concentrated Flow:

t=1/60v

where l = 800 ft
Paved ? No
Slope, S = 0.0030 ft/ft
v = 0.88 ft/s
t_2 = 15.1 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 1300 ft
S = 0.0040 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 42.00 sf
P = 23.97 ft => Hydraulic Radius, R = 1.75 ft
v = 4.88 ft/s
t_3 = 4.4 min

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 5: Tc = 98.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Resi: 1 acre (20% avg. imp.)	B	68	2.64	180
	Crops (SR) Straight Row: Good	B	75	14.00	1,050
B/D	Woods: Good (no grazing or burning)	D	77	32.41	2,496
				49.05	3,725

Basin 5: Composite CN = 76

DRAINAGE BASIN 6 — DRAINAGE BASIN 6

Calculate Post-Development "Tc" and Composite "CN" — **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Light Underbrush = 0.400
l = 100 ft
P2 = 4.60 in
S = 0.0020 ft/ft
t_1 = 45.0 min

Shallow Concentrated Flow:

t=1/60v

where l = 2300 ft
Paved ? No
Slope, S = 0.0020 ft/ft
v = 0.72 ft/s
t_2 = 53.1 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 6: Tc = 98.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Resi: 1 acre (20% avg. imp.)	B	68	9.16	623
	Crops (SR) Straight Row: Good	C	83	5.96	495
B/D	Woods: Good (no grazing or burning)	D	77	68.88	5,304
				84.00	6,421

Basin 6: Composite CN = 76

DRAINAGE BASIN 7 — DRAINAGE BASIN 7

Calculate Post-Development "Tc" and Composite "CN" — **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0020 ft/ft
t_1 = 78.3 min

Shallow Concentrated Flow:

t=1/60v

where l = 1000 ft
Paved ? No
Slope, S = 0.0020 ft/ft
v = 0.72 ft/s
t_2 = 23.1 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 7: Tc = 101.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Crops (SR) Straight Row: Good	B	75	11.31	848
B/D	Woods: Good (no grazing or burning)	D	77	33.64	2,590
				44.95	3,439

Basin 7: Composite CN = 76

DRAINAGE BASIN 7A **DRAINAGE BASIN 7A**

Calculate Post-Development "Tc" and Composite "CN" **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Grass: Bermuda = 0.410
l = 100 ft
P2 = 4.60 in
S = 0.0050 ft/ft
t_1 = 31.8 min

Shallow Concentrated Flow:

t=1/60v

where l = 500 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 8.2 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 300 ft
v= 2.00 ft/s
t= 2.5 min

Basin 7A: Tc = 42.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Open Space, Good (grass > 75%)	A	39	1.85	72
	Wet Ponds or Saturated Wetlands	B	98	8.18	802
	Open Space, Good (grass > 75%)	D	80	8.41	673
B/D	Open Space, Good (grass > 75%)	B	61	78.96	4,817
				97.40	6,363

Basin 7A: Composite CN = 65

DRAINAGE BASIN 7B **DRAINAGE BASIN 7B**

Calculate Post-Development "Tc" and Composite "CN" **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Pvmt. & Grass Combo (50/50) = 0.100
l = 50 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 6.5 min

Shallow Concentrated Flow:

t=1/60v

where l = 150 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 2.4 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 500 ft
v= 2.00 ft/s
t= 4.2 min

Basin 7B: Tc = 13.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
B/D	Resi: 1/3 acre (30% avg. imp.)	B	72	55.70	4,010
				55.70	4,010

Basin 7B: Composite CN = 72

DRAINAGE BASIN 8 — DRAINAGE BASIN 8

Calculate Post-Development "Tc" and Composite "CN" — **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0020 ft/ft
t_1 = 78.3 min

Shallow Concentrated Flow:

t=1/60v

where l = 1425 ft
Paved ? No
Slope, S = 0.0020 ft/ft
v = 0.72 ft/s
t_2 = 32.9 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 3700 ft
S = 0.0020 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 42.00 sf
P = 23.97 ft => Hydraulic Radius, R = 1.75 ft
v = 3.45 ft/s
t_3 = 17.9 min

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 8: Tc = 129.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Woods: Good (no grazing or burning)	B	55	58.28	3,205
	Crops (SR) Straight Row: Good	B	75	153.10	11,483
	Woods: Good (no grazing or burning)	A	30	54.23	1,627
B/D	Woods: Good (no grazing or burning)	D	77	232.74	17,921
				498.35	34,236

Basin 8: Composite CN = 69

DRAINAGE BASIN 9 — DRAINAGE BASIN 9

Calculate Post-Development "Tc" and Composite "CN" — **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 100 ft
P2 = 4.60 in
S = 0.0030 ft/ft
t_1 = 66.6 min

Shallow Concentrated Flow:

t=1/60v

where l = 6000 ft
Paved ? No
Slope, S = 0.0030 ft/ft
v = 0.88 ft/s
t_2 = 113.2 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 9: Tc = 180.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Woods: Good (no grazing or burning)	A	30	58.85	1,766
	Resi: 1 acre (20% avg. imp.)	B	68	16.83	1,144
	Crops (SR) Straight Row: Good	B	75	27.90	2,093
	Woods: Good (no grazing or burning)	C	70	9.59	671
B/D	Woods: Good (no grazing or burning)	D	77	215.86	16,621
	Woods: Good (no grazing or burning)	D	77	162.74	12,531
				491.77	34,826

Basin 9: Composite CN = 71

DRAINAGE BASIN 9A

DRAINAGE BASIN 9A

Calculate Post-Development "Tc" and Composite "CN" **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Pvmt. & Grass Combo (50/50) = 0.100
l = 50 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 6.5 min

Shallow Concentrated Flow:

t=1/60v

where l = 150 ft
Paved ? Yes
Slope, S = 0.0040 ft/ft
v = 1.29 ft/s
t_2 = 1.9 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 450 ft
v= 2.00 ft/s
t= 3.8 min

Basin 9A: Tc = 12.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Resi: 1/3 acre (30% avg. imp.)	C	81	9.16	742
	Wet Ponds or Saturated Wetlands	C	98	1.78	174
B/D	Resi: 1/3 acre (30% avg. imp.)	B	72	15.90	1,145
				26.84	2,061

Basin 9A: Composite CN = 77

DRAINAGE BASIN 9B

DRAINAGE BASIN 9B

Calculate Post-Development "Tc" and Composite "CN" **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Pvmt. & Grass Combo (50/50) = 0.100
l = 50 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 6.5 min

Shallow Concentrated Flow:

t=1/60v

where l = 150 ft
Paved ? Yes
Slope, S = 0.0040 ft/ft
v = 1.29 ft/s
t_2 = 1.9 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 450 ft
v= 2.00 ft/s
t= 3.8 min

Basin 9B: Tc = 12.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
B/D	Resi: 1/3 acre (30% avg. imp.)	B	72	18.54	1,335
				18.54	1,335

Basin 9B: Composite CN = 72

DRAINAGE BASIN 9C — DRAINAGE BASIN 9C

Calculate Post-Development "Tc" and Composite "CN" — **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Pvmt. & Grass Combo (50/50) = 0.100
l = 50 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 6.5 min

Shallow Concentrated Flow:

t=1/60v

where l = 150 ft
Paved ? Yes
Slope, S = 0.0040 ft/ft
v = 1.29 ft/s
t_2 = 1.9 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 1000 ft
v= 2.00 ft/s
t= 8.3 min

Basin 9C: Tc = 17.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Resi: 1/8 acre or less; townhouse (65% imp.)	A	77	2.31	178
B/D	Resi: 1/8 acre or less; townhouse (65% imp.)	B	85	70.93	6,029
				73.24	6,207

Basin 9C: Composite CN = 85

DRAINAGE BASIN 10 — DRAINAGE BASIN 10

Calculate Post-Development "Tc" and Composite "CN" — **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Light Underbrush = 0.400
l = 100 ft
P2 = 4.60 in
S = 0.0030 ft/ft
t_1 = 38.3 min

Shallow Concentrated Flow:

t=1/60v

where l = 1150 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 18.8 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 10: Tc = 57.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Resi: 1 acre (20% avg. imp.)	B	68	2.49	169
	Crops (SR) Straight Row: Good	B	75	27.04	2,028
B/D	Woods: Good (no grazing or burning)	D	77	1.14	88
				30.67	2,285

Basin 10: Composite CN = 75

DRAINAGE BASIN 10A — DRAINAGE BASIN 10A

Calculate Post-Development "Tc" and Composite "CN" — **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Grass: Bermuda = 0.410
l = 100 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 34.8 min

Shallow Concentrated Flow:

t=1/60v

where
l = 150 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 2.4 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 500 ft
v= 2.00 ft/s
t= 4.2 min

Basin 10A: Tc = 41.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Wet Ponds or Saturated Wetlands	B	98	3.03	297
B/D	Open Space, Good (grass > 75%)	B	61	54.64	3,333
				57.67	3,630

Basin 10A: Composite CN = 63

DRAINAGE BASIN 11 — DRAINAGE BASIN 11

Calculate Post-Development "Tc" and Composite "CN" — **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Light Underbrush = 0.400
l = 100 ft
P2 = 4.60 in
S = 0.0030 ft/ft
t_1 = 38.3 min

Shallow Concentrated Flow:

t=1/60v

where
l = 4000 ft
Paved ? No
Slope, S = 0.0030 ft/ft
v = 0.88 ft/s
t_2 = 75.4 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 11: Tc = 114.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
B/D	Woods: Good (no grazing or burning)	D	77	110.71	8,525
	Crops (SR) Straight Row: Good	B	75	18.82	1,412
	Woods/grass combination: Good	D	79	4.46	352
				133.99	10,289

Basin 11: Composite CN = 77

DRAINAGE BASIN 12 — DRAINAGE BASIN 12

Calculate Post-Development "Tc" and Composite "CN" — **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Pvmt. & Grass Combo (50/50) = 0.100
l = 50 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 6.5 min

Shallow Concentrated Flow:

t=1/60v

where
l = 150 ft
Paved ? Yes
Slope, S = 0.0040 ft/ft
v = 1.29 ft/s
t_2 = 1.9 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 750 ft
v= 2.00 ft/s
t= 6.3 min

Basin 12: Tc = 15.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Wet Ponds or Saturated Wetlands	B	98	7.40	725
B/D	Resi: 1/3 acre (30% avg. imp.)	B	72	34.50	2,484
				41.90	3,209

Basin 12: Composite CN = 77

DRAINAGE BASIN 13 — DRAINAGE BASIN 13

Calculate Post-Development "Tc" and Composite "CN" — **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Light Underbrush = 0.400
l = 100 ft
P2 = 4.60 in
S = 0.0030 ft/ft
t_1 = 38.3 min

Shallow Concentrated Flow:

t=1/60v

where
l = 3200 ft
Paved ? No
Slope, S = 0.0030 ft/ft
v = 0.88 ft/s
t_2 = 60.4 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 3600 ft
S = 0.0030 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 42.00 sf
P = 23.97 ft => Hydraulic Radius, R = 1.75 ft
v = 4.22 ft/s
t_3 = 14.2 min

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 13: Tc = 113.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Crops (SR) Straight Row: Good	B	75	17.53	1,315
	Woods: Good (no grazing or burning)	C	70	6.59	461
	Woods: Good (no grazing or burning)	D	77	25.03	1,927
B/D	Woods/grass combination: Good	D	79	111.56	8,813
				160.71	12,517

Basin 13: Composite CN = 78

DRAINAGE BASIN 14 — DRAINAGE BASIN 14

Calculate Post-Development "Tc" and Composite "CN" — **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Pvmt. & Grass Combo (50/50) = 0.100
l = 50 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 6.5 min

Shallow Concentrated Flow:

t=1/60v

where l = 150 ft
Paved ? No
Slope, S = 0.0030 ft/ft
v = 0.88 ft/s
t_2 = 2.8 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 775 ft
v= 2.00 ft/s
t= 6.5 min

Basin 14: Tc = 16.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Wet Ponds or Saturated Wetlands	B	98	1.93	189
	Open Space, Good (grass > 75%)	B	61	4.11	251
B/D	Woods/grass combination: Good	B	58	35.11	2,036
				41.15	2,476

Basin 14: Composite CN = 60

DRAINAGE BASIN 15 — DRAINAGE BASIN 15

Calculate Post-Development "Tc" and Composite "CN" — **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Grass: Bermuda = 0.410
l = 100 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 34.8 min

Shallow Concentrated Flow:

t=1/60v

where l = 200 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 3.3 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 500 ft
v= 2.00 ft/s
t= 4.2 min

Basin 15: Tc = 42.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Wet Ponds or Saturated Wetlands	B	98	16.06	1,574
	Resi: 1/3 acre (30% avg. imp.)	B	72	31.55	2,272
B/D	Open Space, Good (grass > 75%)	B	61	92.68	5,653
				140.29	9,499

Basin 15: Composite CN = 68

DRAINAGE BASIN 15A **DRAINAGE BASIN 15A**

Calculate Post-Development "Tc" and Composite "CN" **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Grass: Bermuda = 0.410
l = 100 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 34.8 min

Shallow Concentrated Flow:

t=1/60v

where l = 250 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 4.1 min

Basin 15A: Tc = 44.0 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 600 ft
v= 2.00 ft/s
t= 5.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Wet Ponds or Saturated Wetlands	B	98	2.61	256
	Resi: 1/3 acre (30% avg. imp.)	B	72	1.98	143
B/D	Open Space, Good (grass > 75%)	B	61	29.41	1,794
				34.00	2,192

Basin 15A: Composite CN = 64

DRAINAGE BASIN 16 **DRAINAGE BASIN 16**

Calculate Post-Development "Tc" and Composite "CN" **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Pvmt. & Grass Combo (50/50) = 0.100
l = 50 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 6.5 min

Shallow Concentrated Flow:

t=1/60v

where l = 150 ft
Paved ? Yes
Slope, S = 0.0040 ft/ft
v = 1.29 ft/s
t_2 = 1.9 min

Basin 16: Tc = 16.0 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 950 ft
v= 2.00 ft/s
t= 7.9 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Wet Ponds or Saturated Wetlands	B	98	7.06	692
B/D	Resi: 1/3 acre (30% avg. imp.)	B	72	46.51	3,349
				53.57	4,041

Basin 16: Composite CN = 75

DRAINAGE BASIN 17 — DRAINAGE BASIN 17

Calculate Post-Development "Tc" and Composite "CN" — **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 50 ft
P2 = 4.60 in
S = 0.0020 ft/ft
t_1 = 45.0 min

Shallow Concentrated Flow:

t=1/60v

where
l = 100 ft
Paved ? No
Slope, S = 0.0030 ft/ft
v = 0.88 ft/s
t_2 = 1.9 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 6500 ft
S = 0.0020 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 42.00 sf
P = 23.97 ft => Hydraulic Radius, R = 1.75 ft
v = 3.45 ft/s
t_3 = 31.4 min

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin 17: Tc = 78.0 min

Determine Composite Curve Number

Description	HSG	CN	A (acres)	CN x A
Woods: Good (no grazing or burning)	D	77	41.57	3,201
			41.57	3,201

Basin 17: Composite CN = 77

DRAINAGE BASIN 18 — DRAINAGE BASIN 18

Calculate Post-Development "Tc" and Composite "CN" — **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Pvmt. & Grass Combo (50/50) = 0.100
l = 50 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 6.5 min

Shallow Concentrated Flow:

t=1/60v

where
l = 150 ft
Paved ? Yes
Slope, S = 0.0040 ft/ft
v = 1.29 ft/s
t_2 = 1.9 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 900 ft
v= 2.00 ft/s
t= 7.5 min

Basin 18: Tc = 16.0 min

Determine Composite Curve Number

Description	HSG	CN	A (acres)	CN x A
Resi: 1/3 acre (30% avg. imp.)	B	72	26.17	1,884
-	-	-	0.00	-
			26.17	1,884

Basin 18: Composite CN = 72

DRAINAGE BASIN 19 — DRAINAGE BASIN 19

Calculate Post-Development "Tc" and Composite "CN" — **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Smooth/Paved Surfaces = 0.011
l = 50 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 1.1 min

Shallow Concentrated Flow:

t=1/60v

where l = 150 ft
Paved ? Yes
Slope, S = 0.0040 ft/ft
v = 1.29 ft/s
t_2 = 1.9 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 850 ft
v= 2.00 ft/s
t= 7.1 min

Basin 19: Tc = 10.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Resi: 1/3 acre (30% avg. imp.)	B	72	20.45	1,472
				20.45	1,472

Basin 19: Composite CN = 72

DRAINAGE BASIN 20 — DRAINAGE BASIN 20

Calculate Post-Development "Tc" and Composite "CN" — **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Pvmt. & Grass Combo (50/50) = 0.100
l = 50 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 6.5 min

Shallow Concentrated Flow:

t=1/60v

where l = 150 ft
Paved ? Yes
Slope, S = 0.0040 ft/ft
v = 1.29 ft/s
t_2 = 1.9 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 400 ft
v= 2.00 ft/s
t= 3.3 min

Basin 20: Tc = 12.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
B/D	Resi: 1/3 acre (30% avg. imp.)	B	72	12.59	906
	Wet Ponds or Saturated Wetlands	B	98	2.00	196
				14.59	1,102

Basin 20: Composite CN = 76

DRAINAGE BASIN 20A — DRAINAGE BASIN 20A

Calculate Post-Development "Tc" and Composite "CN" — **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Pvmt. & Grass Combo (50/50) = 0.100
l = 50 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 6.5 min

Shallow Concentrated Flow:

t=1/60v

where
l = 150 ft
Paved ? Yes
Slope, S = 0.0040 ft/ft
v = 1.29 ft/s
t_2 = 1.9 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 550 ft
v= 2.00 ft/s
t= 4.6 min

Basin 20A: Tc = 13.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
B/D	Resi: 1/3 acre (30% avg. imp.)	B	72	27.39	1,972
	Wet Ponds or Saturated Wetlands	B	98	2.15	211
				29.54	2,183

Basin 20A: Composite CN = 74

DRAINAGE BASIN 21 — DRAINAGE BASIN 21

Calculate Post-Development "Tc" and Composite "CN" — **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Grass: Bermuda = 0.410
l = 50 ft
P2 = 4.60 in
S = 0.0050 ft/ft
t_1 = 18.3 min

Shallow Concentrated Flow:

t=1/60v

where
l = 200 ft
Paved ? Yes
Slope, S = 0.0050 ft/ft
v = 1.44 ft/s
t_2 = 2.3 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 400 ft
v= 2.00 ft/s
t= 3.3 min

Basin 21: Tc = 24.0 min

Determine Composite Curve Number

Description	HSG	CN	A (acres)	CN x A
Resi: 1/3 acre (30% avg. imp.)	B	72	121.07	8,717
Open Space, Good (grass > 75%)	B	61	155.23	9,469
Open Space, Good (grass > 75%)	A	39	26.29	1,025
Open Space, Good (grass > 75%)	D	80	12.93	1,034
			315.52	20,246

Basin 21: Composite CN = 64

DRAINAGE BASIN 22 **DRAINAGE BASIN 22**

Calculate Post-Development "Tc" and Composite "CN" **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Pvmt. & Grass Combo (50/50) = 0.100
l = 50 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 6.5 min

Shallow Concentrated Flow:

t=1/60v

where l = 150 ft
Paved ? Yes
Slope, S = 0.0040 ft/ft
v = 1.29 ft/s
t_2 = 1.9 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 1200 ft
v= 2.00 ft/s
t= 10.0 min

Basin 22: Tc = 18.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
	Wet Ponds or Saturated Wetlands	B	98	2.14	210
	Open Space, Good (grass > 75%)	B	61	3.49	213
B/D	Resi: 1/8 acre or less; townhouse (65% imp.)	B	85	61.68	5,243
				67.31	5,665

Basin 22: Composite CN = 84

DRAINAGE BASIN 23 **DRAINAGE BASIN 23**

Calculate Post-Development "Tc" and Composite "CN" **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Pvmt. & Grass Combo (50/50) = 0.100
l = 50 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 6.5 min

Shallow Concentrated Flow:

t=1/60v

where l = 150 ft
Paved ? Yes
Slope, S = 0.0040 ft/ft
v = 1.29 ft/s
t_2 = 1.9 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 1500 ft
v= 2.00 ft/s
t= 12.5 min

Basin 23: Tc = 21.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
B/D	Resi: 1/8 acre or less; townhouse (65% imp.)	B	85	52.69	4,479
	Wet Ponds or Saturated Wetlands	B	98	5.88	576
				58.57	5,055

Basin 23: Composite CN = 86

DRAINAGE BASIN 23A — DRAINAGE BASIN 23A

Calculate Post-Development "Tc" and Composite "CN" — **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Pvmt. & Grass Combo (50/50) = 0.100
l = 50 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 6.5 min

Shallow Concentrated Flow:

t=1/60v

where l = 150 ft
Paved ? Yes
Slope, S = 0.0040 ft/ft
v = 1.29 ft/s
t_2 = 1.9 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 500 ft
v= 2.00 ft/s
t= 4.2 min

Basin 23A: Tc = 13.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
B/D	Resi: 1/8 acre or less; townhouse (65% imp.)	B	85	11.94	1,015
				11.94	1,015

Basin 23A: Composite CN = 85

DRAINAGE BASIN 24 — DRAINAGE BASIN 24

Calculate Post-Development "Tc" and Composite "CN" — **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Pvmt. & Grass Combo (50/50) = 0.100
l = 50 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 6.5 min

Shallow Concentrated Flow:

t=1/60v

where l = 150 ft
Paved ? Yes
Slope, S = 0.0040 ft/ft
v = 1.29 ft/s
t_2 = 1.9 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 150 ft
v= 2.00 ft/s
t= 1.3 min

Basin 24: Tc = 10.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
B/D	Resi: 1/3 acre (30% avg. imp.)	B	72	14.62	1,053
	Open Space, Good (grass > 75%)	B	61	8.73	533
				23.35	1,585

Basin 24: Composite CN = 68

DRAINAGE BASIN 25 — DRAINAGE BASIN 25

Calculate Post-Development "Tc" and Composite "CN" — **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Pvmt. & Grass Combo (50/50) = 0.100
l = 50 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 6.5 min

Shallow Concentrated Flow:

t=1/60v

where l = 125 ft
Paved ? Yes
Slope, S = 0.0040 ft/ft
v = 1.29 ft/s
t_2 = 1.6 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 500 ft
v= 2.00 ft/s
t= 4.2 min

Basin 25: Tc = 12.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
B/D	Resi: 1/3 acre (30% avg. imp.)	B	72	16.05	1,156
				16.05	1,156

Basin 25: Composite CN = 72

DRAINAGE BASIN 26 — DRAINAGE BASIN 26

Calculate Post-Development "Tc" and Composite "CN" — **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Pvmt. & Grass Combo (50/50) = 0.100
l = 50 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 6.5 min

Shallow Concentrated Flow:

t=1/60v

where l = 150 ft
Paved ? Yes
Slope, S = 0.0040 ft/ft
v = 1.29 ft/s
t_2 = 1.9 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 150 ft
v= 2.00 ft/s
t= 1.3 min

Basin 26: Tc = 10.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
B/D	Resi: 1/3 acre (30% avg. imp.)	B	72	20.31	1,462
	Open Space, Good (grass > 75%)	B	61	3.70	226
				24.01	1,688

Basin 26: Composite CN = 70

DRAINAGE BASIN 27 — DRAINAGE BASIN 27

Calculate Post-Development "Tc" and Composite "CN" — **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Pvmt. & Grass Combo (50/50) = 0.100
l = 50 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 6.5 min

Shallow Concentrated Flow:

t=1/60v

where l = 150 ft
Paved ? Yes
Slope, S = 0.0040 ft/ft
v = 1.29 ft/s
t_2 = 1.9 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 1100 ft
v= 2.00 ft/s
t= 9.2 min

Basin 27: Tc = 18.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
B/D	Resi: 1/3 acre (30% avg. imp.)	B	72	31.59	2,274
	-	-	-	0.00	-
				31.59	2,274

Basin 27: Composite CN = 72

DRAINAGE BASIN 28 — DRAINAGE BASIN 28

Calculate Post-Development "Tc" and Composite "CN" — **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Pvmt. & Grass Combo (50/50) = 0.100
l = 50 ft
P2 = 4.60 in
S = 0.0040 ft/ft
t_1 = 6.5 min

Shallow Concentrated Flow:

t=1/60v

where l = 150 ft
Paved ? Yes
Slope, S = 0.0040 ft/ft
v = 1.29 ft/s
t_2 = 1.9 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 1000 ft
v= 2.00 ft/s
t= 8.3 min

Basin 28: Tc = 17.0 min

Determine Composite Curve Number

	Description	HSG	CN	A (acres)	CN x A
B/D	Resi: 1/3 acre (30% avg. imp.)	B	72	35.75	2,574
	-	-	-	0.00	-
				35.75	2,574

Basin 28: Composite CN = 72

DRAINAGE BASIN **Pond 1** **DRAINAGE BASIN Pond 1**

Calculate Post-Development "Tc" and Composite "CN" **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 0 ft
P2 = 4.60 in
S = 0.0010 ft/ft
t_1 = 0.0 min

Shallow Concentrated Flow:

t=1/60v

where l = 0 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 0.0 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin Pond 1: Tc = 0.0 min

Determine Composite Curve Number

Description	HSG	CN	A (acres)	CN x A
Wet Ponds or Saturated Wetlands	D	98	172.13	16,869
Woods: Good (no grazing or burning)	D	77	50.92	3,921
			223.05	20,790

Basin Pond 1: Composite CN = 93

DRAINAGE BASIN **Pond 2** **DRAINAGE BASIN Pond 2**

Calculate Post-Development "Tc" and Composite "CN" **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 0 ft
P2 = 4.60 in
S = 0.0010 ft/ft
t_1 = 0.0 min

Shallow Concentrated Flow:

t=1/60v

where l = 0 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 0.0 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin Pond 2: Tc = 0.0 min

Determine Composite Curve Number

Description	HSG	CN	A (acres)	CN x A
Wet Ponds or Saturated Wetlands	D	98	6.49	636
-	-	-	0.00	-
			6.49	636

Basin Pond 2: Composite CN = 98

DRAINAGE BASIN **Pond 3** **DRAINAGE BASIN Pond 3**

Calculate Post-Development "Tc" and Composite "CN" **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 0 ft
P2 = 4.60 in
S = 0.0010 ft/ft
t_1 = 0.0 min

Shallow Concentrated Flow:

t=1/60v

where l = 0 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 0.0 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin Pond 3: Tc = 0.0 min

Determine Composite Curve Number

Description	HSG	CN	A (acres)	CN x A
Wet Ponds or Saturated Wetlands	D	98	7.73	758
-	-	-	0.00	-
			7.73	758

Basin Pond 3: Composite CN = 98

DRAINAGE BASIN **Pond 4** **DRAINAGE BASIN Pond 4**

Calculate Post-Development "Tc" and Composite "CN" **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 0 ft
P2 = 4.60 in
S = 0.0010 ft/ft
t_1 = 0.0 min

Shallow Concentrated Flow:

t=1/60v

where l = 0 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 0.0 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin Pond 4: Tc = 0.0 min

Determine Composite Curve Number

Description	HSG	CN	A (acres)	CN x A
Wet Ponds or Saturated Wetlands	D	98	58.82	5,764
-	-	-	0.00	-
			58.82	5,764

Basin Pond 4: Composite CN = 98

DRAINAGE BASIN **Pond 5** **DRAINAGE BASIN Pond 5**

Calculate Post-Development "Tc" and Composite "CN" **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 0 ft
P2 = 4.60 in
S = 0.0010 ft/ft
t_1 = 0.0 min

Shallow Concentrated Flow:

t=1/60v

where l = 0 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 0.0 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin Pond 5: Tc = 0.0 min

Determine Composite Curve Number

Description	HSG	CN	A (acres)	CN x A
Wet Ponds or Saturated Wetlands	D	98	3.82	374
-	-	-	0.00	-
			3.82	374

Basin Pond 5: Composite CN = 98

DRAINAGE BASIN **Pond 6** **DRAINAGE BASIN Pond 6**

Calculate Post-Development "Tc" and Composite "CN" **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 0 ft
P2 = 4.60 in
S = 0.0010 ft/ft
t_1 = 0.0 min

Shallow Concentrated Flow:

t=1/60v

where l = 0 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 0.0 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin Pond 6: Tc = 0.0 min

Determine Composite Curve Number

Description	HSG	CN	A (acres)	CN x A
Wet Ponds or Saturated Wetlands	D	98	8.04	788
-	-	-	0.00	-
			8.04	788

Basin Pond 6: Composite CN = 98

DRAINAGE BASIN **Pond 7** **DRAINAGE BASIN Pond 7**

Calculate Post-Development "Tc" and Composite "CN" **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 0 ft
P2 = 4.60 in
S = 0.0010 ft/ft
t_1 = 0.0 min

Shallow Concentrated Flow:

t=1/60v

where l = 0 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 0.0 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin Pond 7: Tc = 0.0 min

Determine Composite Curve Number

Description	HSG	CN	A (acres)	CN x A
Wet Ponds or Saturated Wetlands	D	98	4.25	417
-	-	-	0.00	-
			4.25	417

Basin Pond 7: Composite CN = 98

DRAINAGE BASIN **Pond 8** **DRAINAGE BASIN Pond 8**

Calculate Post-Development "Tc" and Composite "CN" **"POST"**

Calculate Time of Concentration:

Use Travel Time Concept:

Overland Sheet Flow:

t = (0.007(nl)^0.8)/((P2^0.5)*(S^0.4))

where: t = Travel time for Overland Flow (min)
n = Manning's coefficient - from TR-55
l = Length of flow (ft)
P2 = 2-yr rainfall depth (in)
S = Hydraulic slope (ft/ft)

n = Woods: Dense Underbrush = 0.800
l = 0 ft
P2 = 4.60 in
S = 0.0010 ft/ft
t_1 = 0.0 min

Shallow Concentrated Flow:

t=1/60v

where l = 0 ft
Paved ? No
Slope, S = 0.0040 ft/ft
v = 1.02 ft/s
t_2 = 0.0 min

Channel Flow: t=l/60v

where: t=Travel time for Pipe Flow (min)
l=Length of flow (ft)
S=Average watercourse slope (ft/ft)
n = Manning's Coefficient for Channel Flow
A=Cross-Sectional Area (ft^2)
P=Wetted Perimeter (ft)
R=Hydraulic Radius (ft)
v=Velocity (ft/s)- From TR-55

l = 0 ft
S = 0.0000 ft/ft
n = Earth, fairly uniform, some weeds = 0.0280
A = 0.00 sf
P = 0.00 ft => Hydraulic Radius, R = n/a
v = n/a
t_3 = n/a

Pipe Flow: t=1/60v

l= 0 ft
v= 0.00 ft/s
t= 0.0 min

Basin Pond 8: Tc = 0.0 min

Determine Composite Curve Number

Description	HSG	CN	A (acres)	CN x A
Wet Ponds or Saturated Wetlands	D	98	18.46	1,809
-	-	-	0.00	-
			18.46	1,809

Basin Pond 8: Composite CN = 98

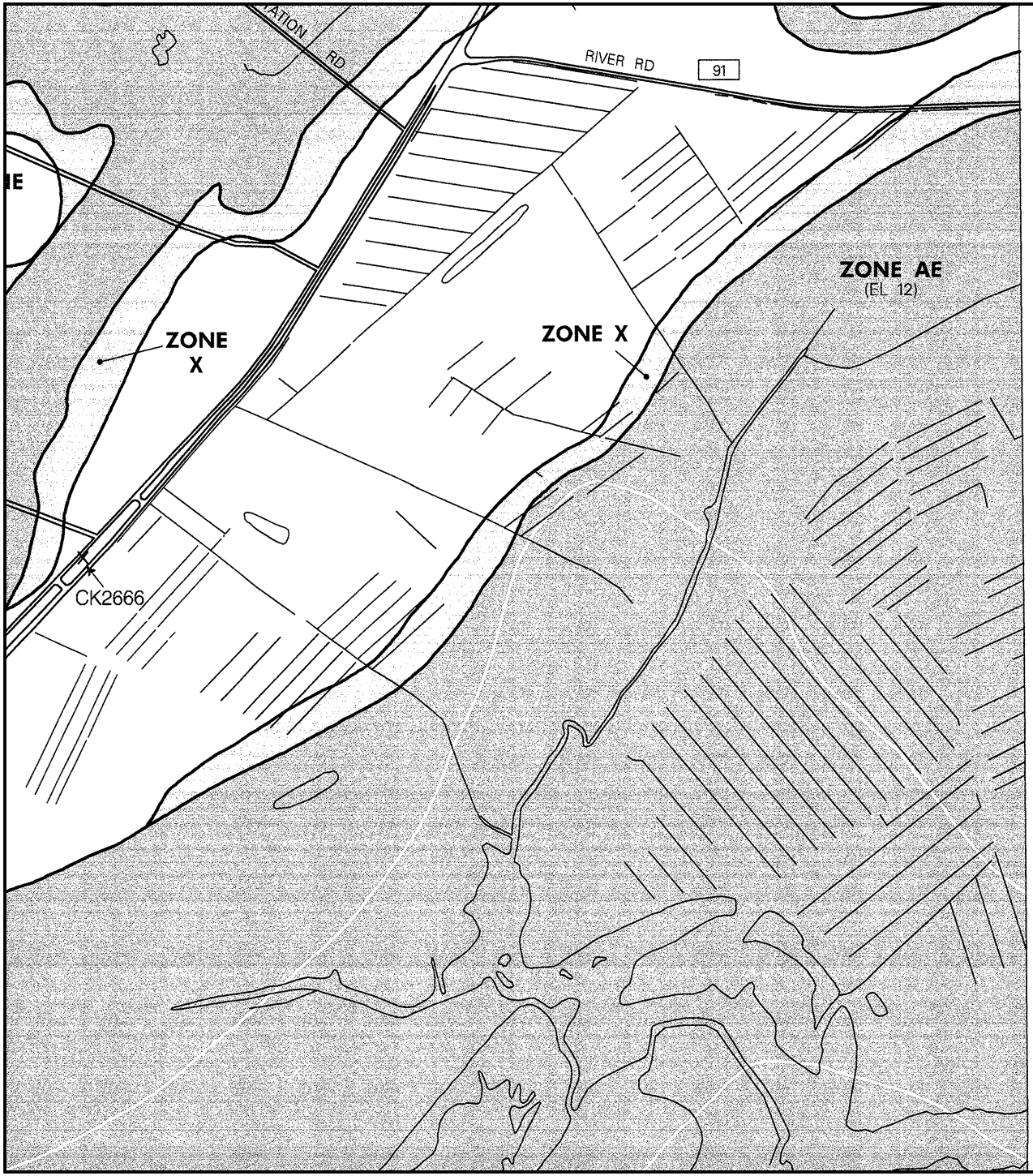
KIAWAH RIVER PLANTATION
DRAINAGE BASIN STUDY

Appendix G

FEMA FLOOD MAP (FIRM)

PREPARED BY

THOMAS & HUTTON ENGINEERING CO.



APPROXIMATE SCALE

MAP SCALE 1" = 1000'

500 0 1000 2000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

CHARLESTON COUNTY, SOUTH CAROLINA AND INCORPORATED AREAS

PANEL 645 OF 855

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

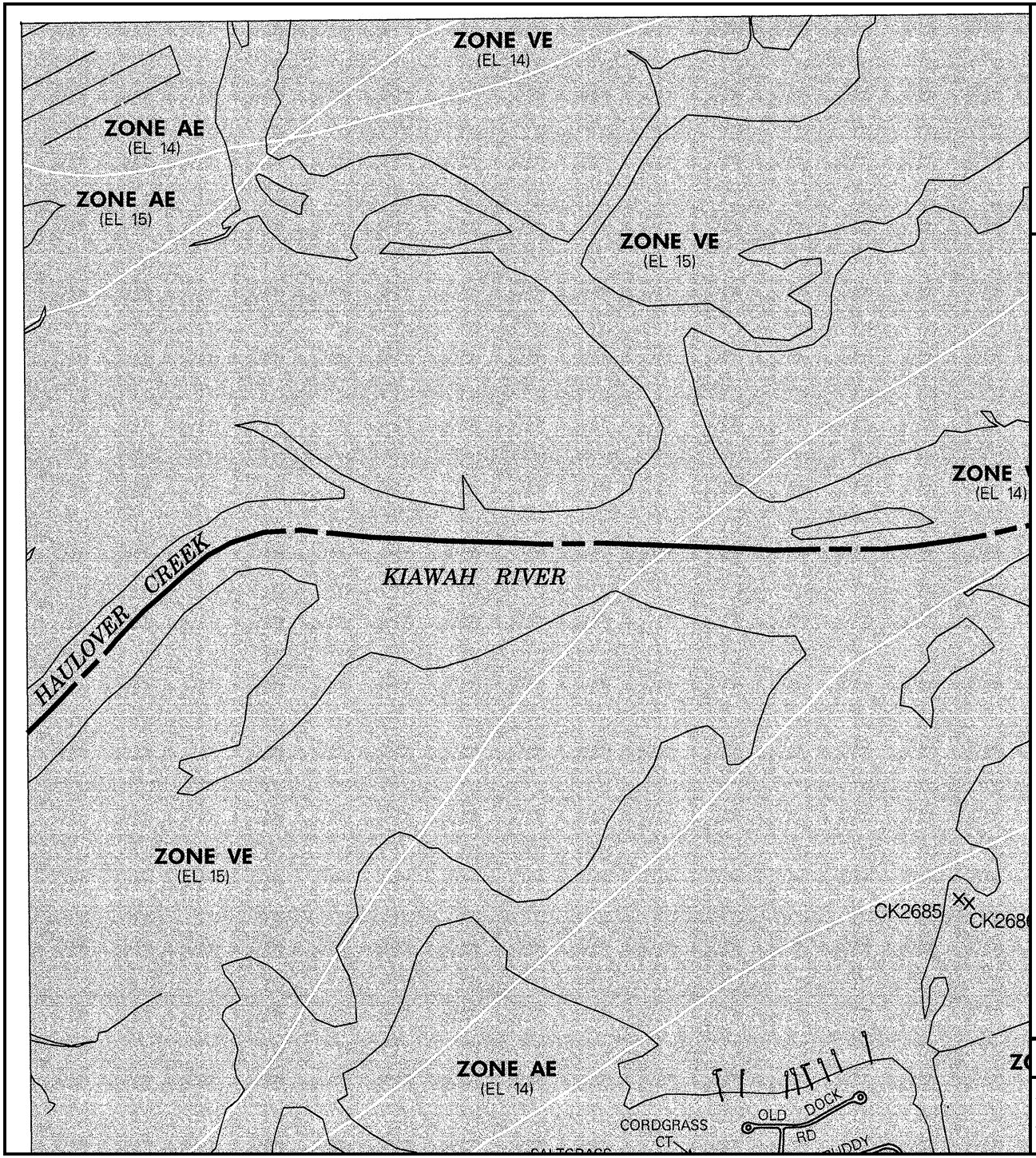
COMMUNITY	NUMBER	PANEL	SUFFIX
CHARLESTON COUNTY	455413	0645	J

Notice to User: The MAP NUMBER shown below should be used when placing map orders; the COMMUNITY NUMBER shown above should be used on insurance applications for the subject community.

MAP NUMBER
45019C0645J

EFFECTIVE DATE:
NOVEMBER 17, 2004

Federal Emergency Management Agency



APPROXIMATE SCALE

MAP SCALE 1" = 1000'

500 0 1000 2000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

CHARLESTON COUNTY,
SOUTH CAROLINA
AND INCORPORATED AREAS

PANEL 805 OF 855

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CHARLESTON COUNTY	455413	0805	J
KIAWAH ISLAND, TOWN OF	450257	0805	J

–NOTE–

THIS MAP INCORPORATES APPROXIMATE BOUNDARIES OF COASTAL BARRIER RESOURCES SYSTEM UNITS AND/OR OTHERWISE PROTECTED AREAS ESTABLISHED UNDER THE COASTAL BARRIER IMPROVEMENT ACT OF 1990 (PL 101-591).

Notice to User: The MAP NUMBER shown below should be used when placing map orders; the COMMUNITY NUMBER shown above should be used on insurance applications for the subject community.

MAP NUMBER
45019C0805J

EFFECTIVE DATE:
NOVEMBER 17, 2004

Federal Emergency Management Agency

KIAWAH RIVER PLANTATION
DRAINAGE BASIN STUDY

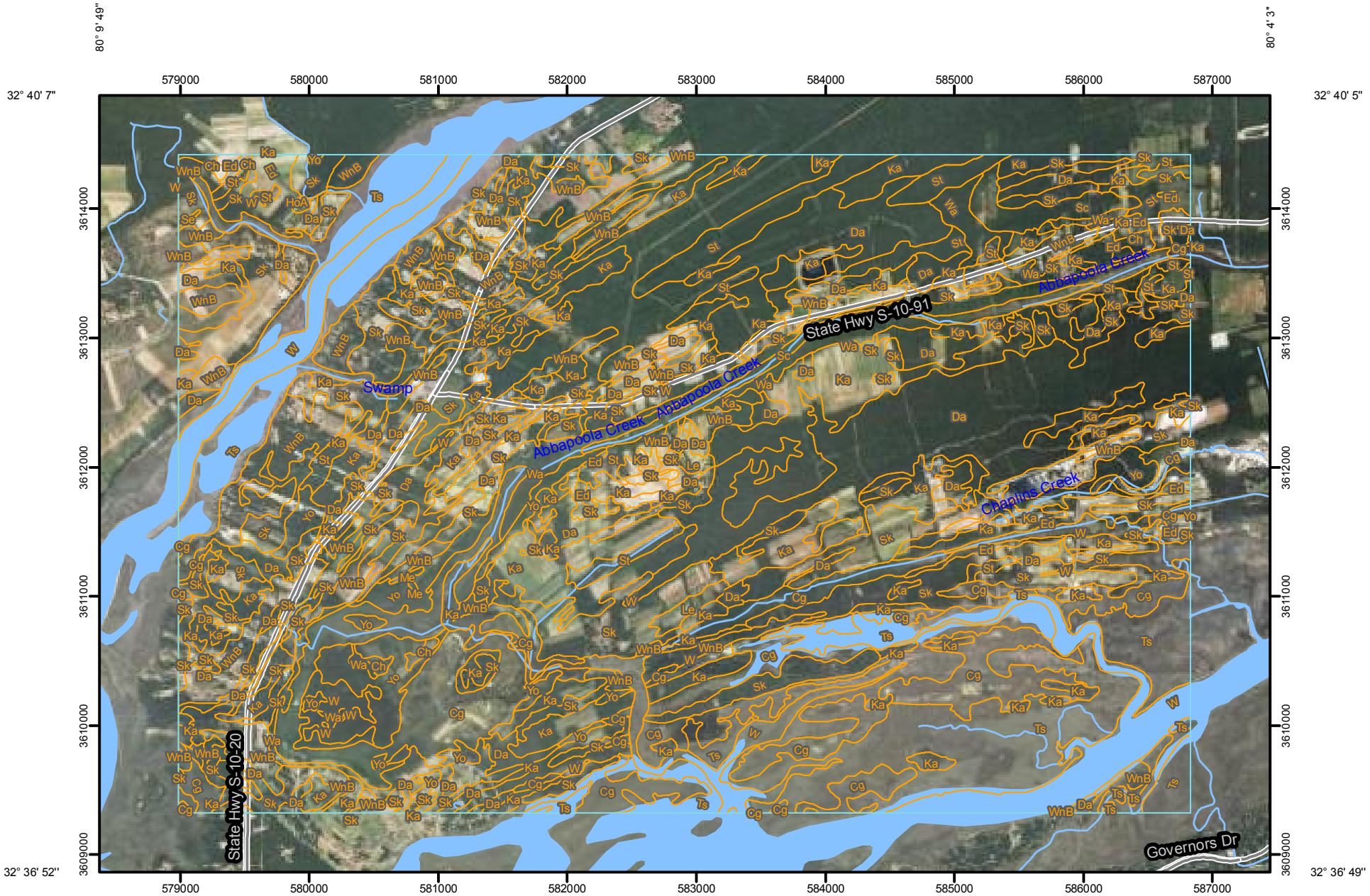
Appendix H

WEB SOIL SURVEY (NRCS)

PREPARED BY

THOMAS & HUTTON ENGINEERING CO.

Soil Map—Charleston County Area, South Carolina
(Kiawah River Plantation)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads

MAP INFORMATION

Map Scale: 1:43,000 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Charleston County Area, South Carolina
Survey Area Data: Version 7, Jan 8, 2009

Date(s) aerial images were photographed: 6/7/2006; 6/10/2006; 6/9/2006; 7/21/2005; 6/17/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Charleston County Area, South Carolina (SC690)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
Cg	Capers silty clay loam	989.2	10.0%
Ch	Charleston loamy fine sand	26.7	0.3%
Da	Dawhoo and rutlege loamy fine sand	1,877.4	19.0%
Ed	Edisto loamy fine sand	159.6	1.6%
HoA	Hockley loamy fine sand, 0 to 2 percent slopes	3.3	0.0%
Ka	Kiawah loamy fine sand	1,567.7	15.9%
Le	Leon fine sand	31.6	0.3%
Me	Meggett clay loam	3.6	0.0%
Sc	Santee clay loam	140.0	1.4%
Se	Santee loam	1.5	0.0%
Sk	Seabrook loamy fine sand	1,572.2	15.9%
St	Stono fine sandy loam	348.0	3.5%
Ts	Tidal marsh, soft	1,164.0	11.8%
W	Water	527.7	5.3%
Wa	Wadmalaw fine sandy loam	317.0	3.2%
WnB	Wando loamy fine sand, 0 to 6 percent slopes	851.4	8.6%
Yo	Yonges loamy fine sand	294.6	3.0%
Totals for Area of Interest		**9,875.2**	**100.0%**

KIAWAH RIVER PLANTATION
DRAINAGE BASIN STUDY

Appendix I

2008 SOUTH CAROLINA
LIST OF IMPAIRED WATERS/SCDHEC

PREPARED BY

THOMAS & HUTTON ENGINEERING CO.

TMDL TARGET DATE(S) ++	NOTE	BASIN	HUC	LOCATION	STATION	COUNTY	USE	CAUSE
2013		SALUDA	030501100401	TOM'S CREEK AT RED BLUFF RD.	S-950	RICHLAND	REC	FC
2015		SALUDA	030501100402	BUCKHEAD CREEK AT S-09-151 2.1 MI NE OF FORT MOTTE	RS-04521	CALHOUN	AL	BIO
2011	#	SALUDA	030501100403	CONGAREE RVR AT US 601 (SC-001)	C-007	CALHOUN	AL	CU
2011		SALUDA	030501100403	CONGAREE RVR AT US 601 (SC-001)	C-007	CALHOUN	REC	FC
2017		SALUDA	030501100403	CONGAREE RVR AT US 601 (SC-001)	C-007	CALHOUN	FISH	HG
2013		SANTEE	030501110101	WARLEY CREEK AT CO RD S-09-287 3.4 MI NW OF LONE STAR	RS-04389	CALHOUN	AL	BIO
2010		SANTEE	030501110102	DUCKFORD BRANCH AT S-43-52 3.2 MI SW OF PINEWOOD	RS-05585	SUMTER	REC	FC
2009	*	SANTEE	030501110102	SPRING CROVE CREEK @ SECONDARY ROAD 26 BRIDGE	SC-009	CLARENDON	REC	FC
2013, 2013, 2013		SANTEE	030501110103	LK INSPIRATION - ST MATTHEWS (FRONT OF HEALTH DEPT)	C-058	CALHOUN	AL	TN, TP, TURBIDITY
2015		SANTEE	030501110103	FURTICK BRANCH@ COUNTY RD. 11	CW-517	CALHOUN	REC	FC
2018		SANTEE	030501110103	LYONS CREEK@ COUNTY RD. 20	CW-546	CALHOUN	REC	FC
2013		SANTEE	030501110103	LYONS CREEK AT SC 6	ST-533	CALHOUN	AL	BIO
2014	#	SANTEE	030501110104	UPPER LAKE MARION @ THE MOUTH OF HALFWAY SWAMP CREEK	SC-038	CALHOUN	AL	TP
2013		SANTEE	030501110104	HALFWAY SWAMP CREEK AT SR 157	ST-534	CALHOUN	AL	BIO
2021		SANTEE	030501110105	BIG POPLAR CREEK @ SECONDARY ROAD 105 BRIDGE	SC-011	CALHOUN	AL	DO
2009	*	SANTEE	030501110106	BIG BRANCH AT S-14-41 (SC-047)	CW-243	CLARENDON	REC	FC
2009	*	SANTEE	030501110107	UNNAMED TRIBUTARY TO TAWCAW CREEK AT S-14-559 (WILLIAM BRUNSON ROAD) 4.6 MI SE OF SUMMERTON	RS-03505	CLARENDON	REC	FC
2016		SANTEE	030501110107	MID LAKE MARION @ TAW CAW CREEK EMBAYMENT	SC-017	CLARENDON	AL	TP
2014		SANTEE	030501110107	TAWCAW CK AT S-14-127 3.2 MI S OF SUMMERTON (SC-018)	ST-018	CLARENDON	AL	DO
2008	*	SANTEE	030501110107	TAWCAW CK AT S-14-127 3.2 MI S OF SUMMERTON (SC-018)	ST-018	CLARENDON	REC	FC
2008	*	SANTEE	030501110108	WHITE OAK CREEK AT COUNTY RD 345, 4.5 M ESE OF SUMMERTON	RS-01051	CLARENDON	REC	FC
2009	*	SANTEE	030501110108	POTATO CREEK AT S-14-715 (ROGERS ROAD) 5.5 MI SE OF SUMMERTON	RS-03501	CLARENDON	REC	FC
2017		SANTEE	030501110108	LAKE MARION @ WYBOO CREEK	ST-024	CLARENDON	FISH	HG
2014		SANTEE	030501110108	POTATO CK AT S-14-127 3.2 MI S OF SUMMERTON (SC-020)	ST-035	CLARENDON	AL	DO
2008	*	SANTEE	030501110108	POTATO CK AT S-14-127 3.2 MI S OF SUMMERTON (SC-020)	ST-035	CLARENDON	REC	FC
2017		SANTEE	030501110109	LAKE MARION @ TREZVANT'S LANDING	C-007K	CALHOUN	FISH	HG
2017		SANTEE	030501110109	LAKE MARION @ DANIELS 4H CAMP	C-057	CALHOUN	FISH	HG
2014		SANTEE	030501110109	LAKE MARION FOREBAY, SPILLWAY MARKER 44 (SC-022)	CL-042	ORANGEBURG	AL	CU
2016		SANTEE	030501110109	LK MARION @ CHANNEL MARKER 69; USE SANTEE COOPER SC-016	RL-02308	CLARENDON	AL	TP
2016	#	SANTEE	030501110109	LAKE MARION 0.5 MI NE OF CALHOUN LANDING (USE SC-044)	RL-04388	CALHOUN	AL	TP
2014, 2014		SANTEE	030501110109	UPPER LAKE MARION NEAR PACK'S LANDING	SC-005	SUMTER	AL	DO, TP
2016		SANTEE	030501110109	LAKE MARION AT RR TRESTLE AT LONE STAR (SC-008)	SC-008	CALHOUN	AL	TP
2014	#	SANTEE	030501110109	UPPER LAKE MARION AT CHANNEL MARKER 150	SC-010	CALHOUN	AL	TP
2014, 2014		SANTEE	030501110109	UPPER LAKE MARION @ HEADWATERS OF CHAPEL BRANCH CREEK	SC-014	ORANGEBURG	AL	PH, TP
2014		SANTEE	030501110109	UPPER LAKE MARION 2.0 KM BELOW RIMINI RAILROAD TRESTLE	SC-039	CLARENDON	AL	TP
2016		SANTEE	030501110109	MID LAKE MARION @ CHANNEL MARKER 79	SC-040	ORANGEBURG	AL	TP
2008	*	SANTEE	030501110109	STREAM FLOWING THRU SANTEE NATIONAL GOLF COURSE POND @ HWY 6	SC-045	ORANGEBURG	REC	FC
2015		SANTEE	030501110109	SURFACE DRAINAGE FROM SAFETY KLEEN HAZARDOUS LANDFILL	SC-057	SUMTER	AL	NI
2016		SANTEE	030501110109	LK MARION AT OLD US 301/15 BRDG AT SANTEE (SC-015)	ST-025	ORANGEBURG	AL	TP
2017		SANTEE	030501110109	LAKE MARION @ DAM	ST-027	CLARENDON	FISH	HG

TMDL TARGET DATE(S) ++	NOTE	BASIN	HUC	LOCATION	STATION	COUNTY	USE	CAUSE
2017		SANTEE	030501110109	LAKE MARION @ RIMINI	ST-519	SUMTER	FISH	HG
2017		SANTEE	030501110109	LAKE MARION @ LOW FALLS LANDING	ST-529	CALHOUN	FISH	HG
2017		SANTEE	030501120101	SANTEE RIVER BELOW LAKE MARION (WILSONS)	ST-532	BERKELEY	FISH	HG
2013		SANTEE	030501120102	BENNETTS BRANCH AT S-14-351 11.5 MI SSE OF MANNING	RS-05399	CLARENDON	REC	FC
2015		SANTEE	030501120102	BENNETTS BRANCH AT SR 351	ST-536	CLAREDON	AL	BIO
2013		SANTEE	030501120102	DOCTOR BRANCH AT SR 48	ST-537	CLAREDON	AL	BIO
2017		SANTEE	030501120105	REDIVERSION CANAL AT US 52 (SC-037A)	ST-031	BERKELEY	FISH	HG
2017		SANTEE	030501120106	SANTEE RIVER @ US 52 (HWY 52 LANDING)	ST-528	WILLIAMSBURG	FISH	HG
2009	*	SANTEE	030501120205	ECHAW CK AT PITCH LANDING FRANCIS MARION NATL FOREST	RS-02467	BERKELEY	REC	FC
2017		SANTEE	030501120206	SANTEE RIVER @ SC 41/US 17A	ST-001	BERKELEY	FISH	HG
2017		SANTEE	030501120302	WAMBAW CREEK (STILL'S LANDING)	CSTL-112	CHARLESTON	FISH	HG
2012		SANTEE	030501120303	SOUTH SANTEE RIVER AT ALLIGATOR CREEK	06A-01	GEORGETOWN	SHELLFISH	FC
2012		SANTEE	030501120303	SOUTH SANTEE RIVER NEAR THE MIDPOINT OF GRACE ISL. (C-3/01)	06A-01A	CHARLESTON	SHELLFISH	FC
2012		SANTEE	030501120303	SOUTH SANTEE INLET	06A-02	GEORGETOWN	SHELLFISH	FC
2013		SANTEE	030501120303	ALLIGATOR CREEK NEAREST S. SANTEE RVR BTWN MRKRS 24&25	06B-13	CHARLESTON	SHELLFISH	FC
2009	*	SANTEE	030501120303	CEDAR CREEK AT CNTY RD 857 HAMPTON PLANTATION STATE PARK	RS-01056	CHARLESTON	REC	FC
2017		SANTEE	030501120303	S SANTEE RVR AT US 17	ST-006	CHARLESTON	FISH	HG
2017		SANTEE	030501120402	WADMACON CREEK @ SANDHOLE	CSTL-586	GEORGETOWN	FISH	HG
2017		SANTEE	030501120402	WADMACON CREEK @ THE BLUFF	CSTL-587	GEORGETOWN	FISH	HG
2012		SANTEE	030501120403	NORTH SANTEE RIVER AT BEACH CREEK	06A-03	GEORGETOWN	SHELLFISH	FC
2012		SANTEE	030501120403	NORTH SANTEE INLET	06A-04	GEORGETOWN	SHELLFISH	FC
2012		SANTEE	030501120403	NORTH SANTEE BAY - E OF CANE ISLAND (C6-97)	06A-04A	GEORGETOWN	SHELLFISH	FC
2012		SANTEE	030501120403	NORTH SANTEE RIVER - SW OF CANE ISLAND (C6-97)	06A-04B	GEORGETOWN	SHELLFISH	FC
2012		SANTEE	030501120403	NORTH SANTEE RVR NEAR THE NORTHWESTERN TIP OF CONE ISL (C-3/-01)	06A-04C	GEORGETOWN	SHELLFISH	FC
2012		SANTEE	030501120403	NORTH SANTEE RIVER AND MOSQUITO CREEK	06A-05	GEORGETOWN	SHELLFISH	FC
2012		SANTEE	030501120403	AIWW AT MINUM CREEK	06A-11	GEORGETOWN	SHELLFISH	FC
2017		SANTEE	030501120403	NORTH SANTEE RIVER @ HARRIS LANDING	CSTL-593	GEORGETOWN	FISH	HG
2010		SANTEE	030501120403	MINIM CREEK, 9 M S OF GEORGETOWN	RT-01654	GEORGETOWN	AL	TURBIDITY
2017		SANTEE	030501120403	NORTH SANTEE RIVER @ POLE YARD	ST-005	GEORGETOWN	FISH	HG
2017		SANTEE	030502010101	DIVERSION CANAL	CSTL-079	BERKELEY	FISH	HG
2017		SANTEE	030502010101	LAKE MOULTRIE @ DAM	CSTL-080	BERKELEY	FISH	HG
2011		SANTEE	030502010101	TRIBUTARY 0.6 KM UPSTR OF SC HWY. 6 NEAR CROSS HS	SC-026	BERKELEY	REC	FC
2009	*	SANTEE	030502010101	TRIBUTARY FLOWING TO LAKE MOULTRIE FROM CROSS GENER. STATION	SC-043	BERKELEY	REC	FC
2017		SANTEE	030502010101	LAKE MOULTRIE @ FRED L. DAY LANDING	ST-530	BERKELEY	FISH	HG
2017		SANTEE	030502010101	LAKE MOULTRIE @ HATCHERY LANDING	ST-531	BERKELEY	FISH	HG
2008	*	SANTEE	030502010201	WADBOO SWAMP AT S-08-447 THIRD BRIDGE FROM WEST	RS-02461	BERKELEY	REC	FC
2008	*	SANTEE	030502010201	WALKER SW AT US 52 2.5 MI S ST STEPHENS	ST-007	BERKELEY	REC	FC
2017		SANTEE	030502010203	WADBOO CREEK @ REMBERT C. DENNIS RAMP	CSTL-113	BERKELEY	FISH	HG
2009	*	SANTEE	030502010203	CANE GULLEY BRANCH AT S-08-97 6.1 MI NE OF MONCKS CORNER	RS-03333	BERKELEY	REC	FC
2011		SANTEE	030502010301	TURKEY CK AT FOREST SERVICE RD 251 IRISHTOWN FM SC 402	RS-02483	BERKELEY	REC	FC

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2017		SANTEE	030502010304	EAST FORK OF COOPER RIVER NEAR QUINBYCR	CSTL-564	BERKELEY	FISH	HG
2017		SANTEE	030502010401	WANDO RIVER AT DEEP CREEK	09B-04	CHARLESTON	SHELLFISH	FC
2017		SANTEE	030502010401	WANDO RIVER OPPOSITE BIG PARADISE ISLAND	09B-05	CHARLESTON	SHELLFISH	FC
2017		SANTEE	030502010401	WANDO RIVER AT PARADISE BOAT LANDING	09B-06	CHARLESTON	SHELLFISH	FC
2017		SANTEE	030502010401	DEEP CREEK - 1 MILE FROM CONFLUENCE WITH WANDO RIVER	09B-09	CHARLESTON	SHELLFISH	FC
2017		SANTEE	030502010401	WANDO RIVER AT ALSTON CREEK CONFLUENCE	09B-10	CHARLESTON	SHELLFISH	FC
2017		SANTEE	030502010401	WANDO RIVER AT GUERIN CREEK	09B-11	CHARLESTON	SHELLFISH	FC
2017		SANTEE	030502010401	GUERIN CREEK AT OLD HOUSE CREEK	09B-12	BERKELEY	SHELLFISH	FC
2020		SANTEE	030502010401	TOOMER CREEK 2.5 MI E SC 41 BRIDGE OVER WANDO RIVER	RT-06012	CHARLESTON	AL	DO
2017		SANTEE	030502010402	BOONE HALL CREEK OPPOSITE COUNTY RECREATION AREA	09B-07	CHARLESTON	SHELLFISH	FC
2017		SANTEE	030502010402	RAT HALL CRK AT CONFLUENCE WITH WANDO RVR. (C6-97/U4/01)	09B-18	CHARLESTON	SHELLFISH	FC
2017		SANTEE	030502010402	WANDO RIVER AT I-526 MARK CLARK EXPRESSWAY (09B-15)	MD-264	CHARLESTON	AL	NH3N
2021		SANTEE	030502010402	BERESFORD CREEK 5.3 MI NNE OF WANDO AND COOPER RIVER CONFLUENCE	RO-056092	BERKELEY	AL	DO
2017		SANTEE	030502010402	BOONE HALL CREEK 1.5 MI WNW OF INTERSECTION OF US 17 AND SC 41	RT-052100	CHARLESTON	REC	FC
2017		SANTEE	030502010505	CYPRESS SWP AT US 78	CSTL-078	DORCHESTER	REC	FC
2014, 2014		SANTEE	030502010601	DORCHESTER CK AT SC 165	CSTL-013	DORCHESTER	AL	DO, NH3N
2014		SANTEE	030502010601	SAWMILL BR AT SC 78 E OF SUMMERVILLE	CSTL-043	DORCHESTER	AL	DO
2010		SANTEE	030502010602	ASHLEY RVR AT SC 165 4.8 MI SSW OF SUMMERVILLE	CSTL-102	DORCHESTER	REC	FC
2009	*	SANTEE	030502010603	EAGLE CK AT SC 642 5 MI SSE OF SUMMERVILLE	CSTL-099	DORCHESTER	REC	FC
2010		SANTEE	030502010603	EAGLE CK AT SC 642 5 MI SSE OF SUMMERVILLE	CSTL-099	DORCHESTER	AL	TURBIDITY
2017		SANTEE	030502010604	ASHLEY RIVER @ DORCHESTER STATE PARK	CSTL-560	DORCHESTER	FISH	HG
2010		SANTEE	030502010604	ASHLEY RVR AT MAGNOLIA GARDENS	MD-049	CHARLESTON	REC	FC
2010		SANTEE	030502010604	ASHLEY RVR AT MAGNOLIA GARDENS	MD-049	CHARLESTON	AL	TURBIDITY
2009	*	SANTEE	030502010604	ASHLEY RV 1.8 MI NW RUNNYMEDE PLANTATION	RT-032046	CHARLESTON	REC	FC
2009	*	SANTEE	030502010605	CHURCH CK MOUTH	MD-246	CHARLESTON	REC	FC
2016		SANTEE	030502010605	JAMES ISLAND CREEK N OF WHITE HALL PLANTATION	RT-052098	CHARLESTON	AL	DO
2016		SANTEE	030502010605	JAMES ISLAND CREEK N OF WHITE HALL PLANTATION	RT-052098	CHARLESTON	REC	FC
2017		SANTEE	030502010701	COOPER RIVER @ US 17A	CSTL-062	BERKELEY	FISH	HG
2014		SANTEE	030502010703	FOSTER CREEK AT CHARLESTON CPW WATER INTAKE	MD-240	BERKELEY	AL	DO
2014		SANTEE	030502010704	BACK RIVER RES IN FOREBAY EQUIDISTANT FROM DAM AND SHORELINES	CSTL-124	BERKELEY	AL	DO
2017		SANTEE	030502010704	COOPER RIVER @ BUSHY PARK	MD-042	BERKELEY	FISH	HG
2017		SANTEE	030502010704	BACK RIVER RESERVOIR	MD-152	BERKELEY	FISH	HG
2017		SANTEE	030502010704	DURHAM CREEK	MD-217	BERKELEY	FISH	HG
2009	*	SANTEE	030502010706	GOOSE CK AT S-08-136 BRIDGE	MD-039	BERKELEY	REC	FC
2015		SANTEE	030502010706	GOOSE CK AT US 52 N CHTN	MD-114	CHARLESTON	AL	DO
2015		SANTEE	030502010706	GOOSE CK RES 2.3 M S OF GOOSE CREEK TOWN CENTER	RL-01008	BERKELEY	AL	DO
2015, 2015, 2015		SANTEE	030502010706	GOOSE CREEK RESERVOIR 1.0 MI NW OF SPILLWAY NEAR W SHORELINE	RL-03340	BERKELEY	AL	CHLA, DO, TP
2015, 2015		SANTEE	030502010706	GOOSE CREEK RESERVOIR 2.8 MI NW OF SPILLWAY NEAR OTRANTO	RL-04390	BERKELEY	AL	DO, TP
2015		SANTEE	030502010706	GOOSE CREEK RESERVOIR 0.55 MI W OF DAM	RL-05412	BERKELEY	AL	TP
2015, 2015		SANTEE	030502010706	GOOSE CREEK RESERVOIR 2 MI N OF SPILLWAY	RL-06434	BERKELEY	AL	DO, TP

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2015, 2015		SANTEE	030502010706	GOOSE CREEK RESERVOIR 100 M US OF DAM	ST-032	BERKELEY	AL	CHLA, TP
2017		SANTEE	030502010706	GOOSE CREEK RESERVOIR 100 M US OF DAM	ST-032	BERKELEY	FISH	HG
2015, 2015, 2015		SANTEE	030502010706	GOOSE CK RESERVOIR AT 2ND POWERLINES US OF BOAT RAMP	ST-033	BERKELEY	AL	CHLA, PH, TP
2018		SANTEE	030502010707	BLOCK ISL. CREEK - 100 YDS S. OF SPLIT FROM SPOIL AREA	10A-32	CHARLESTON	SHELLFISH	FC
2018		SANTEE	030502010707	BLOCK ISLAND CREEK - 100 YDS S. OF SPLIT FROM SPOIL AREA	10A-32	CHARLESTON	SHELLFISH	FC
2017	#	SANTEE	030502010707	INTRACOASTAL WATERWAY AT SC 703 E MT PLEASANT	MD-069	CHARLESTON	AL	CU
2017	#	SANTEE	030502010707	SHEM CK AT BRDG ON US 17	MD-071	CHARLESTON	AL	CU
2010		SANTEE	030502010707	SHEM CK AT BRDG ON US 17	MD-071	CHARLESTON	REC	FC
2017	#	SANTEE	030502010707	CHAS HBR AT FT JOHNSON PIER AT MARINE SCI LAB	MD-165	CHARLESTON	AL	CU
2009	*	SANTEE	030502010707	FILBIN CREEK AT VIRGINIA AVE, NORTH CHARLESTON	MD-249	CHARLESTON	REC	FC
2017	#	SANTEE	030502010707	CHARLESTON HARBOR 0.5 MI SE OF MOUTH OF SHEM CK	RO-036044	CHARLESTON	AL	CU
2014	#	SANTEE	030502010707	UNNAMED TRIBUTARY TO PARROT POINT CREEK 0.8 MI S OF FT JOHNSON	RT-042072	CHARLESTON	AL	TURBIDITY
2018		SANTEE	030502020105	RANTOWLES CREEK AT CONFLUENCE OF STONO RIVER	11-18	CHARLESTON	SHELLFISH	FC
2008	*	SANTEE	030502020201	LOG BRIDGE CK AT SC 162	MD-121	CHARLESTON	REC	FC
2018		SANTEE	030502020202	STONO RIVER (AIWW) AT MARKER #27	11-12	CHARLESTON	SHELLFISH	FC
2018		SANTEE	030502020202	STONO RIVER (AIWW) AT MARKER #51	11-16	CHARLESTON	SHELLFISH	FC
2018		SANTEE	030502020202	STONO RIVER (LOG BRIDGE CREEK) AT MARKER #54	11-17	CHARLESTON	SHELLFISH	FC
2018		SANTEE	030502020202	STONO RIVER AT MOUTH OF PENNY CREEK NEAR MARKER #25	11-27	CHARLESTON	SHELLFISH	FC
2014		SANTEE	030502020202	STONO RVR AT SC 700	MD-026	CHARLESTON	AL	DO
2017		SANTEE	030502020202	STONO RVR AT S-10-20 2 MI UPSTRM OF CLEMSON EXP STA	MD-202	CHARLESTON	AL	CU
2017		SANTEE	030502020204	FOLLY RIVER AT SC 171	MD-130	CHARLESTON	AL	CU
2018		SANTEE	030502020205	ABBAPOOLA CREEK AT FIRST LARGE BEND	11-06	CHARLESTON	SHELLFISH	FC
2018		SANTEE	030502020205	ABBAPOOLA CREEK AT CONFLUENCE WITH SMALL CREEK ON WEST BANK AT SEVENTH BEND (C-4/99)	11-06A	CHARLESTON	SHELLFISH	FC
2018		SANTEE	030502020205	BASS CREEK AT CONFLUENCE WITH CINDER CREEK	11-32	CHARLESTON	SHELLFISH	FC
2018		SANTEE	030502020205	CINDER CREEK AT PUBLIC DOCK (3RD BEND FROM CONFLUENCE WITH BASSK CREEK) (C5-01)	11-34	CHARLESTON	SHELLFISH	FC
2018		SANTEE	030502020205	BASS CREEK AT PUBLIC DOCK (5TH BEND FROM CONFLUENCE WITH CINDER CREEK (C5-01)	11-35	CHARLESTON	SHELLFISH	FC
2018		SANTEE	030502020205	ABBAPOOLA CREEK@ BLIND ROAD	MD-802	CHARLESTON	REC	FC
2010		SANTEE	030502020205	TRIBUTARY TO STONO INLET, 11 M SW OF CHARLESTON	RT-01642	CHARLESTON	AL	TURBIDITY
2013		SANTEE	030502090101	ALLIGATOR CREEK AND OCEAN INLET	06B-06	CHARLESTON	SHELLFISH	FC
2013		SANTEE	030502090101	ALLIGATOR CREEK AT MARKER #26	06B-07	CHARLESTON	SHELLFISH	FC
2013		SANTEE	030502090101	CASINO CREEK AT MARKER #29	06B-08	CHARLESTON	SHELLFISH	FC
2013		SANTEE	030502090101	DUPREE CREEK - 500 FEET N. OF NEW DOCK (S.OF MRKR #30)	06B-09	CHARLESTON	SHELLFISH	FC
2013		SANTEE	030502090101	AIWW AT MARKER #32	06B-10	CHARLESTON	SHELLFISH	FC
2013		SANTEE	030502090101	ALLIGATOR CREEK STATE SHELLFISH GROUND	06B-12	CHARLESTON	SHELLFISH	FC
2013		SANTEE	030502090101	CASINO CREEK MIDWAY BETWEEN STATIONS 19 AND 24 (AT SMALL UNNAMED CREEK ON RIGHT, SOUTHBOUND)	06B-16	CHARLESTON	SHELLFISH	FC
2013		SANTEE	030502090101	CASINO CREEK AND SKRINE CREEK,CONFLUENCE	06B-19	CHARLESTON	SHELLFISH	FC
2013		SANTEE	030502090101	DUPREE CREEK 1,000 YARDS UP FROM CLUBHOUSE CREEK	06B-20	CHARLESTON	SHELLFISH	FC
2013		SANTEE	030502090101	ALLIGATOR CREEK AND RAMHORN CREEK CONFLUENCE	06B-21	CHARLESTON	SHELLFISH	FC
2013		SANTEE	030502090101	RAMHORN CREEK AND MILL CREEK CONFLUENCE	06B-22	CHARLESTON	SHELLFISH	FC
2013		SANTEE	030502090101	SKRINE CREEK AND CONGAREE BOAT CREEK CONFLUENCE	06B-23	CHARLESTON	SHELLFISH	FC
2019, 2012		SANTEE	030502090101	ALLIGATOR CREEK AT STATE SHELLFISH GROUND (06B-12)	MD-265	CHARLESTON	AL	CU, TURBIDITY
2019		SANTEE	030502090101	CASINO CREEK AT CLOSURE LINE (06B-16)	MD-266	CHARLESTON	AL	CU

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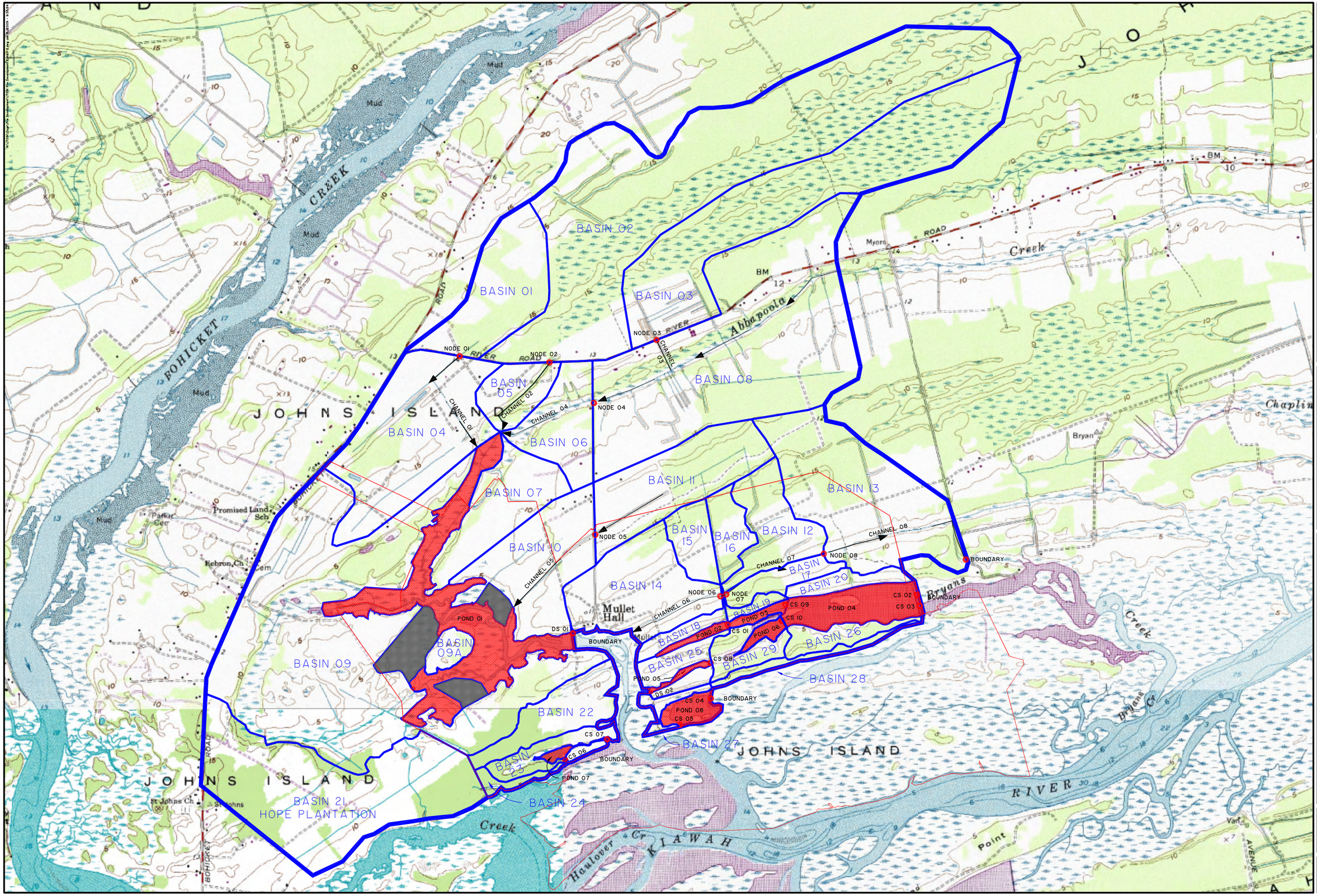
2008	*	SANTEE	030502090101	E FORK OF DEVILS DEN CK HEADWATERS	RT-02016	CHARLESTON	AL	CU
2009	*	SANTEE	030502090201	AWENDAW CREEK AT US 17	MD-250	CHARLESTON	REC	FC
2014		SANTEE	030502090202	GRAHAM CREEK AT MARKER #64	07-02	CHARLESTON	SHELLFISH	FC
2014		SANTEE	030502090202	AWENDAW CREEK AT MARKER #57	07-03	CHARLESTON	SHELLFISH	FC
2014		SANTEE	030502090202	HARBOR RIVER AT MARKER #48	07-04	CHARLESTON	SHELLFISH	FC
2014		SANTEE	030502090202	TIBWIN CREEK AT MARKER #42	07-05	CHARLESTON	SHELLFISH	FC
2014		SANTEE	030502090202	DOEHALL CREEK AT CONFLUENCE OF AIWW - NORTH OF MARKER #46	07-09	CHARLESTON	SHELLFISH	FC
2014		SANTEE	030502090202	DOEHALL CREEK-THIRD BEND	07-14	CHARLESTON	SHELLFISH	FC
2014		SANTEE	030502090202	SANDY POINT CREEK - 4TH BEND	07-15	CHARLESTON	SHELLFISH	FC
2014, 2010		SANTEE	030502090202	JEREMY CK NEAR BOAT LANDING AT MCCLELLANVILLE TOWN HALL	MD-203	CHARLESTON	AL	DO, TURBIDITY
2010		SANTEE	030502090202	JEREMY CK NEAR BOAT LANDING AT MCCLELLANVILLE TOWN HALL	MD-203	CHARLESTON	REC	FC
2015		SANTEE	030502090202	FIVE FATHOM CREEK AT BULL RIVER (07-06A)	MD-267	CHARLESTON	AL	TURBIDITY
2019, 2012		SANTEE	030502090202	AWENDAW CREEK AT MARKER #57 (07-03)	MD-268	CHARLESTON	AL	CU, TURBIDITY
2012		SANTEE	030502090202	AIWW MIDWAY BETWEEN AWENDAW AND GRAHAM CREEK	MD-793	CHARLESTON	REC	FC
2010		SANTEE	030502090202	TRIBUTARY TO MATHEWS CREEK, 1 M S OF MCLELLANVILLE	RT-01623	CHARLESTON	AL	TURBIDITY
2016		SANTEE	030502090203	AIWW ADJACENT TO WILD DUNES GOLF COURSE STORM DRAINAGE OUTFALL	09A-18	CHARLESTON	SHELLFISH	FC
2016		SANTEE	030502090203	HAMLIN SOUND (08-02)	MD-271	CHARLESTON	AL	NH3N
2016		SANTEE	030502090204	AIWW AT 25TH STREET - ISLE OF PALMS	09A-19	CHARLESTON	SHELLFISH	FC
2016		SANTEE	030502090204	UPPER REACHES OF INLET CREEK	09A-24	CHARLESTON	SHELLFISH	FC
2016		SANTEE	030502090204	UPPER INLET CREEK AT JENNIE CREEK	09A-30	CHARLESTON	SHELLFISH	FC
2016		SANTEE	030502090204	BAY AT END OF UPPER INLET CREEK	09A-31	CHARLESTON	SHELLFISH	FC
2013		SANTEE	030502090204	LOWER HAMLIN CREEK AT SITE OF NEW BRIDGE (09A-29)	MD-272	CHARLESTON	AL	CU
2014		SANTEE	030502090205	GRAHAM CREEK AND BULLS BAY	07-02A	CHARLESTON	SHELLFISH	FC
2017		SAVANNAH	030502060308	LITTLE RIVER @ SC 81	SV-699	MCCORMICK	FISH	HG
2017		SAVANNAH	030601010102	LAKE JOCASSEE TOXAWAY RIVER ARM	CL-018	OCONEE	FISH	HG
2017		SAVANNAH	030601010104	LAKE JOCASSEE @ END OF SEC RD 25	SV-313	OCONEE	FISH	HG
2011		SAVANNAH	030601010202	LITTLE EASTATOE CREEK@ MOCCASIN ROAD (ACROSS BOGGS PROPERTY)	SV-806	PICKENS	REC	FC
2008	*	SAVANNAH	030601010302	BURGESS CK AT S-37-171	RS-02466	OCONEE	REC	FC
2015		SAVANNAH	030601010304	LITTLE RVR AT S-37-24 7.1 MI NE OF WALHALLA	SV-203	OCONEE	REC	FC
2010		SAVANNAH	030601010305	UNNAMED TRIB TO LITTLE CANE CREEK	SV-811	OCONEE	REC	FC
2010		SAVANNAH	030601010305	UNNAMED TRIB TO LITTLE CANE CREEK @ TAYLOR ROAD	SV-812	OCONEE	REC	FC
2013		SAVANNAH	030601010402	NORTH FORK AT US 178 2.9 MI N OF PICKENS	SV-206	PICKENS	AL	BIO
2014		SAVANNAH	030601010405	RICES CREEK AT SR 158	SV-740	PICKENS	AL	BIO
2014		SAVANNAH	030601010406	GOLDEN CREEK AT GOLDEN CRK. RD.	SV-738	PICKENS	AL	BIO

KIAWAH RIVER PLANTATION
STORMWATER MASTER PLAN

Exhibits

PREPARED BY

THOMAS & HUTTON ENGINEERING CO.



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NO.	REVISIONS	BY	DATE

KIAWAH RIVER PLANTATION, LP
CHARLESTON COUNTY, SOUTH CAROLINA

KIAWAH RIVER PLANTATION PROPERTY UPDATE

PRE DEVELOPMENT EXHIBIT

JOB NO:	J-17091.0000
DATE:	5/18/09
DRAWN:	CGB
DESIGNED:	CGB
REVIEWED:	ERG
APPROVED:	JHD
SCALE:	1" = 1000'

PRE

BASIN 01
BASIN 02
BASIN 03
BASIN 04
BASIN 04A
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HOPE PLANTATION
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BASIN 26
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BASIN 28
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CS 06
CS 07
CS 08
CS 09
CS 10
DS 01
DS 02
BOUNDARY
OPT
ADDITIONAL LAKES NEEDED
JOHNS ISLAND
ROAD
RIVER
Creek
Mud
Myers
Bryan
Chaplin
Bryans
Haulover Cr
KIAWAH
Point
Parker Cem
Promised Land Sch
Hebron Ch
St Johns Ch
St Johns
BM 10
BM 12

NO.	REVISIONS	BY	DATE

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SOUTH CAROLINA • WILLIAMSTON

KIAWAH RIVER PLANTATION, LP
CHARLESTON COUNTY, SOUTH CAROLINA

KIAWAH RIVER PLANTATION PROPERTY UPDATE

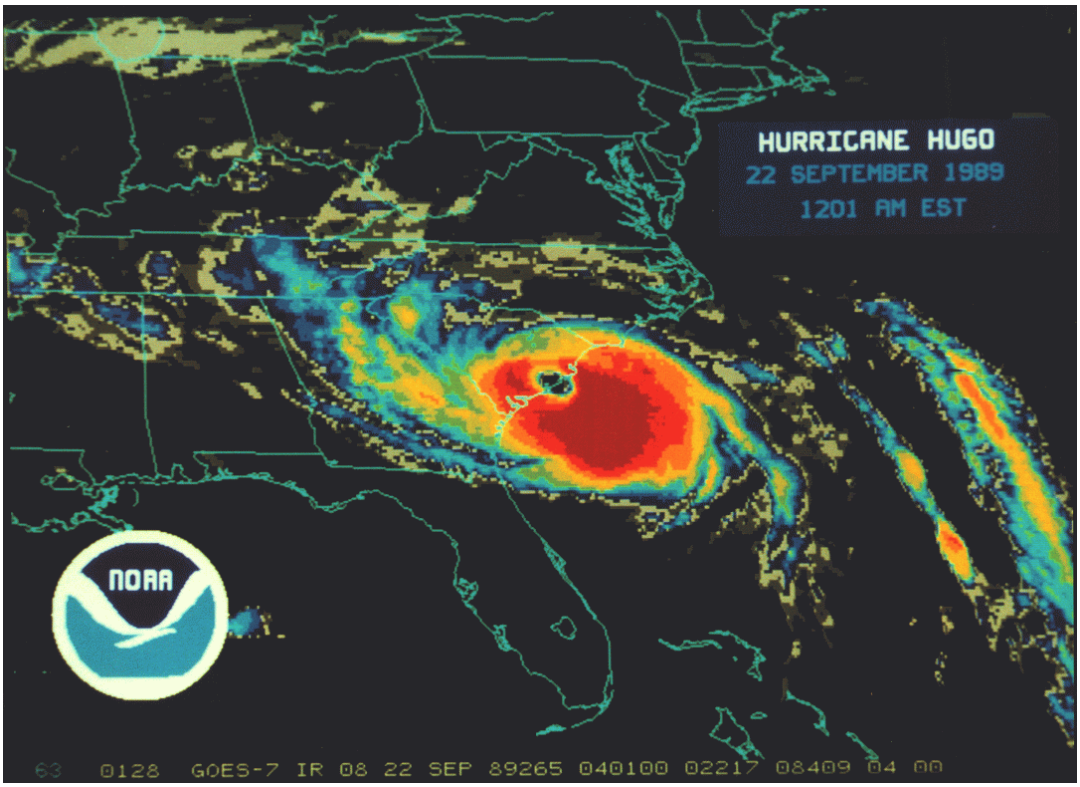
POST DEVELOPMENT EXHIBIT

JOB NO:	J-17091.0000
DATE:	5/18/09
DRAWN:	CGB
DESIGNED:	CGB
REVIEWED:	ERG
APPROVED:	ERG
SCALE:	1" = 1000'

POST

SCDHEC MONITORING STATION EXHIBIT 1

Kiawah River Plantation
Hurricane Preparedness Plan



be... HURRICANE PREPARED

Prepared by:
Thomas & Hutton Engineering Co.

What is a Hurricane?

A hurricane is a type of tropical cyclone, the general term for all circulating weather systems over tropical waters (counterclockwise in the Northern Hemisphere). Tropical cyclones are classified as follows:

Tropical Depression:

An organized system of clouds and thunderstorms with a defined circulation and maximum sustained winds of 38 mph (33 knots) or less.

Tropical Storm:

An organized system of strong thunderstorms with a defined circulation and maximum sustained winds of 39 to 73 mph (34-63 knots).

Hurricane:

An intense tropical weather system with a well-defined circulation and maximum sustained winds of 74 mph (64 knots) or higher. In the western Pacific, hurricanes are called "typhoons," and similar storms in the Indian Ocean are called "cyclones."

Hurricanes are products of a tropical ocean and atmosphere. Powered by heat from the sea, they are steered by the easterly trade winds and the temperate westerlies as well as by their own ferocious energy. Around their core, winds grow with great velocity, generating violent seas. Moving ashore, they sweep the ocean inward while spawning tornadoes and producing torrential rains and floods. Each year, on average, 10 tropical storms, of which six become hurricanes, develop over the Atlantic Ocean, Caribbean Sea, or Gulf of Mexico. Many of these remain over the ocean; however, about five hurricanes strike the United States coastline every three years. Of these five, two will be major hurricanes, category 3 or greater on the Saffir-Simpson Hurricane Scale.

Hurricane Watches and Warnings

Tropical Storm Watch:

Tropical Storm conditions are possible in the specified area of the Watch, usually within 36 hours.

Tropical Storm Warning:

Tropical Storm conditions are expected in the specified area of the Warning, usually within 24 hours.

Hurricane Watch:

Hurricane conditions are possible in the specified area of the Watch, usually within 36 hours. During a Hurricane Watch, prepare to take immediate action to protect your family and property in case a Hurricane Warning is issued.

Hurricane Warning:

Hurricane conditions are expected in the specified area of the Warning, usually within 24 hours. Complete all storm preparations and evacuate if directed by local officials.

Important Contact Information

In the event of a hurricane, go to www.scemd.org for up-to-date information.

Local Government:

- **Charleston County:**
  - **www.charlestoncounty.org**
- **Berkeley County Emergency Management:**
  - **http://GIS.BerkeleyCountySC.gov/hurricane**
- **Colleton County:**
  - **www.colletoncounty.org**
- **Dorchester County:**
  - **www.dorchestercounty.net**

Getting Help and Information:

- **American Red Cross:**
  - **www.redcross.org**
  - **www.lowcountryredcross.org**
- **Centers for Disease Control:**
  - **www.bt.cdc.gov**
- **Federal Emergency Management Agency:**
  - **www.fema.gov**
- **National Weather Service Hurricane Center:**
  - **www.nhc.noaa.gov**
- **National Hurricane Center:**
  - **www.hurricanesafety.org**
- **S.C. Emergency Management Division:**
  - **www.scemd.org**

Phone Numbers:

- **Charleston County Emergency Preparedness Division:**
  - **843-202-7400**
- **Charleston County Emergency Public Information Line:**
  - **843-202-7100 (English)**
  - **843-202-7191 (Spanish – working during emergencies)**
- **Disabilities Resource Center:**
  - **843-225-5080**
- **S.C. Department of Transportation (Evacuation Traffic Information):**
  - **1-888-877-9151**
- **Public Information Phone System (PIPS):**
  - **1-866-246-0133 (Only activated when needed. Spanish interpreters available)**
- **Hispanic Outreach of South Carolina:**
  - **1-803-419-5112**
- **S. C. Insurance News Service**
  - **1-803-252-3455**

Storm Surge

The Saffir-Simpson Hurricane Scale

The greatest potential for loss of life in coastal areas related to a hurricane is from the storm surge, which historically has claimed nine of ten victims.

Storm surge is simply water that is pushed toward the shore by the force of the winds swirling around the storm. This advancing surge combines with the normal tides to create the hurricane storm tide, which can increase the mean water level 15 feet or more. In addition, wind-driven waves are superimposed on the storm tide. This rise in water level can cause severe flooding in coastal areas, particularly when the storm tide coincides with the normal high tides. Because much of the United States' densely populated Atlantic and Gulf Coast coastlines lie less than 10 feet above mean sea level, the danger from storm tides is tremendous.

The level of surge in a particular area is also determined by the slope of the continental shelf. A shallow slope off the coast will allow a greater surge to inundate coastal communities. Communities with a steeper continental shelf will not see as much surge inundation, although large breaking waves can still present major problems. Storm tides, waves, and currents in confined harbors severely damage ships, marinas, and pleasure boats

These surge values are averages for these storm categories. Actual surge depths may be much greater.

Category 1: Minimal Damage

Winds: 74-95 mph
Along the South Carolina coast, surges of up to 4 to 5 feet can be expected.
No real damage to building structure. Damage primarily to unanchored mobile homes, shrubbery, and trees. Also, some coastal road flooding and minor pier damage.

Category 2: Moderate Damage

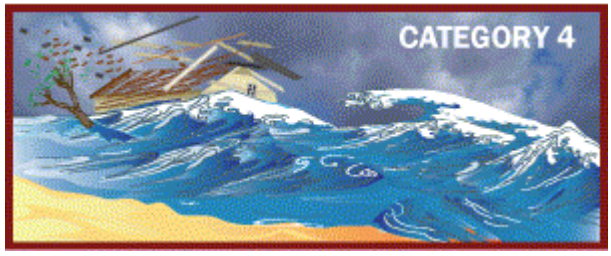
Winds: 96-110 mph
Along the South Carolina coast, surges of up to 6 to 8 feet can be expected.
Some roofing material, door, and window damage to buildings. Considerable damage to shrubbery and trees with some trees blown down. Considerable damage to mobile homes, poorly constructed signs, and piers. Small craft in unprotected anchorages break moorings.

Category 3: Extensive Damage

Winds: 111-130 mph
Along the South Carolina coast, surges of up to 9 to 12 feet can be expected.
Some structural damage to small residences and utility buildings with a minor amount of curtainwall failure. Damage to shrubbery and trees with foilage blown off trees and large trees blown down. Mobile homes and poorly constructed signs are destroyed. Flooding near the coast destroys smaller structures with larger structures damaged by battering of floating debris.

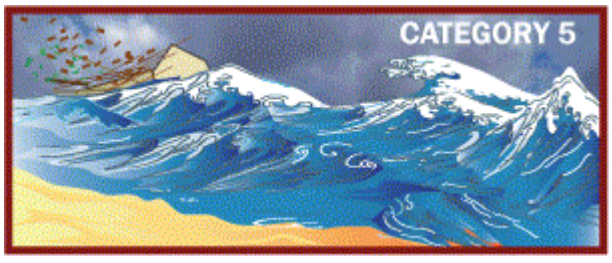
Category 4: Extreme Damage

Winds: 131-155 mph
Along the South Carolina coast, surges of up to 13 to 18 feet can be expected.
More extensive curtainwall failures with some complete roof structure failures on small residences. Shrubs, trees and most signs are blown down. Complete destruction of mobile homes. Extensive damage to doors and windows. Major damage to lower floors of structures near the shore.



Category 5: Catastrophic Damage

Winds: More than 155 mph
Along the South Carolina coast, a surge higher than 18 feet can be expected.
Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Most shrubs, trees, and signs blown down. Complete destruction of mobile homes. Severe and extensive window and door damage. Massive evacuation of residential areas on low ground may be required.



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"911" Reverse Notification System

The POA/HOA, as development of the community occurs, may establish the "911" Reverse Notification System to contact residents of the community during emergency situations. The Reverse Notification System can target precise geographic areas with immediate notification of helpful information for the residents and to help aid in rapid response by emergency personnel.

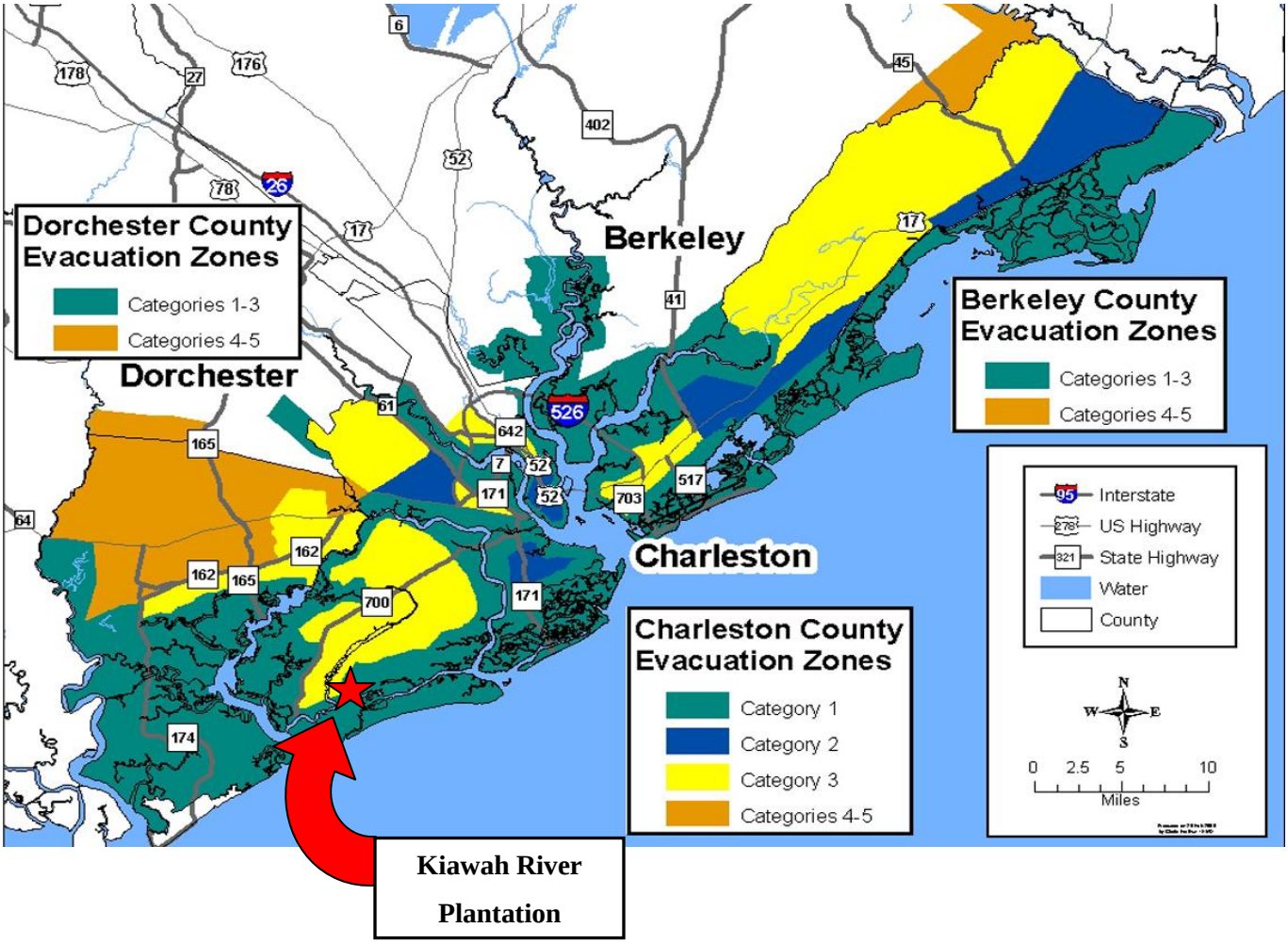
The POA/HOA can contact the REVERSE 911 Interactive Community Notification System by calling 1-800-247-2363 ext. 2 or by email at **help@reverse911.com** to setup the notification system for the community.

Emergency / Evacuation Staging Areas

The POA/HOA may work with the emergency personnel and Law Enforcement to develop staging areas for emergency equipment and personnel in common areas throughout the community. These areas may include Clubhouses, Community Centers, Play Fields, open spaces, etc. All staging areas shall be coordinated with the Charleston County Emergency Preparedness Division, Law Enforcement, Charleston County Fire & EMS and other emergency personnel.

Coastal Evacuation Zones

The map below show areas that are subject to possible evacuation based on the category of the hurricane. Actual storm conditions may require changes to the planned evacuation zones. Local officials encourage citizens to stay tuned to state and local media for specific emergency management evacuation instructions



Note that Kiawah River Plantation is located in an area that is subject to evacuation during a Category 1 storm.

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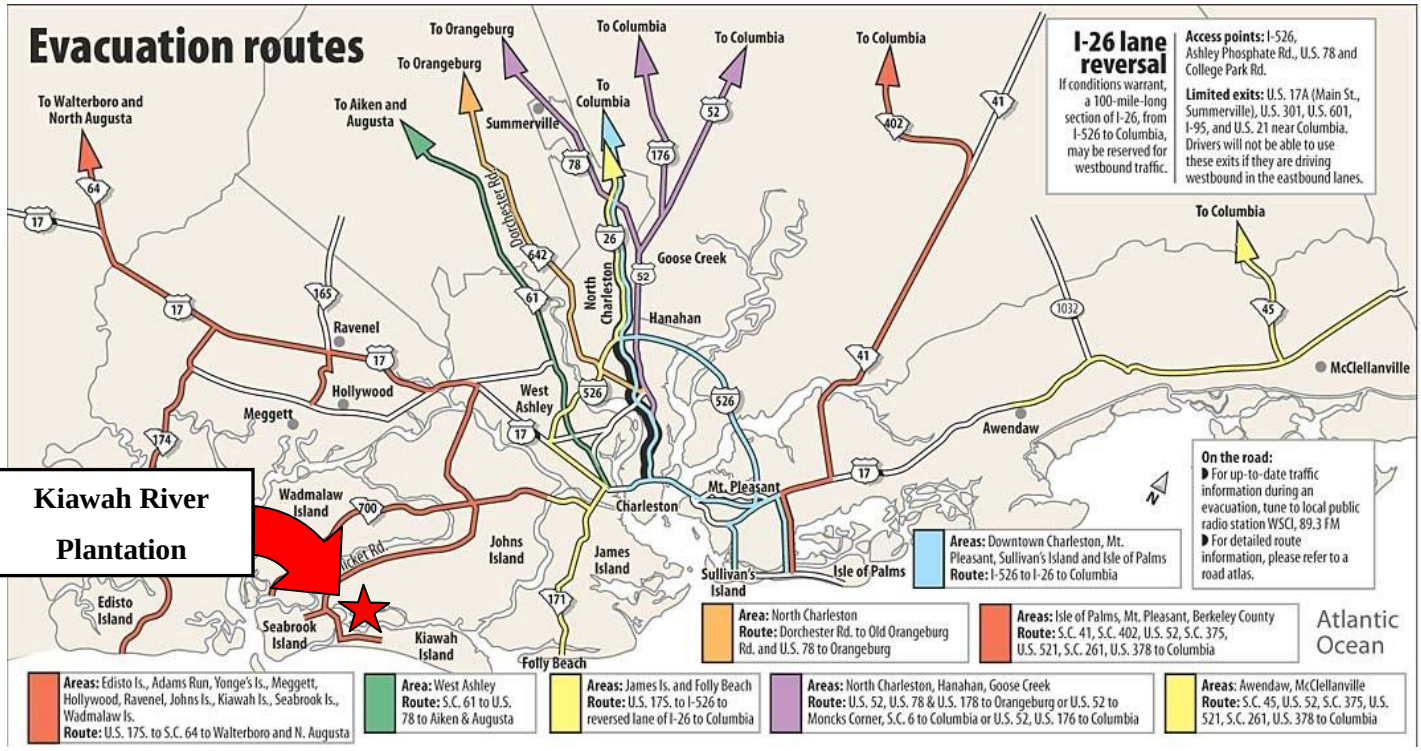
Low Country Evacuation Routes



From Kiawah River Plantation, take Bohicket Road (S-20) to US 17. On US 17, travel south to SC 64 to Walterboro, and on to North Augusta.

Prepared by:

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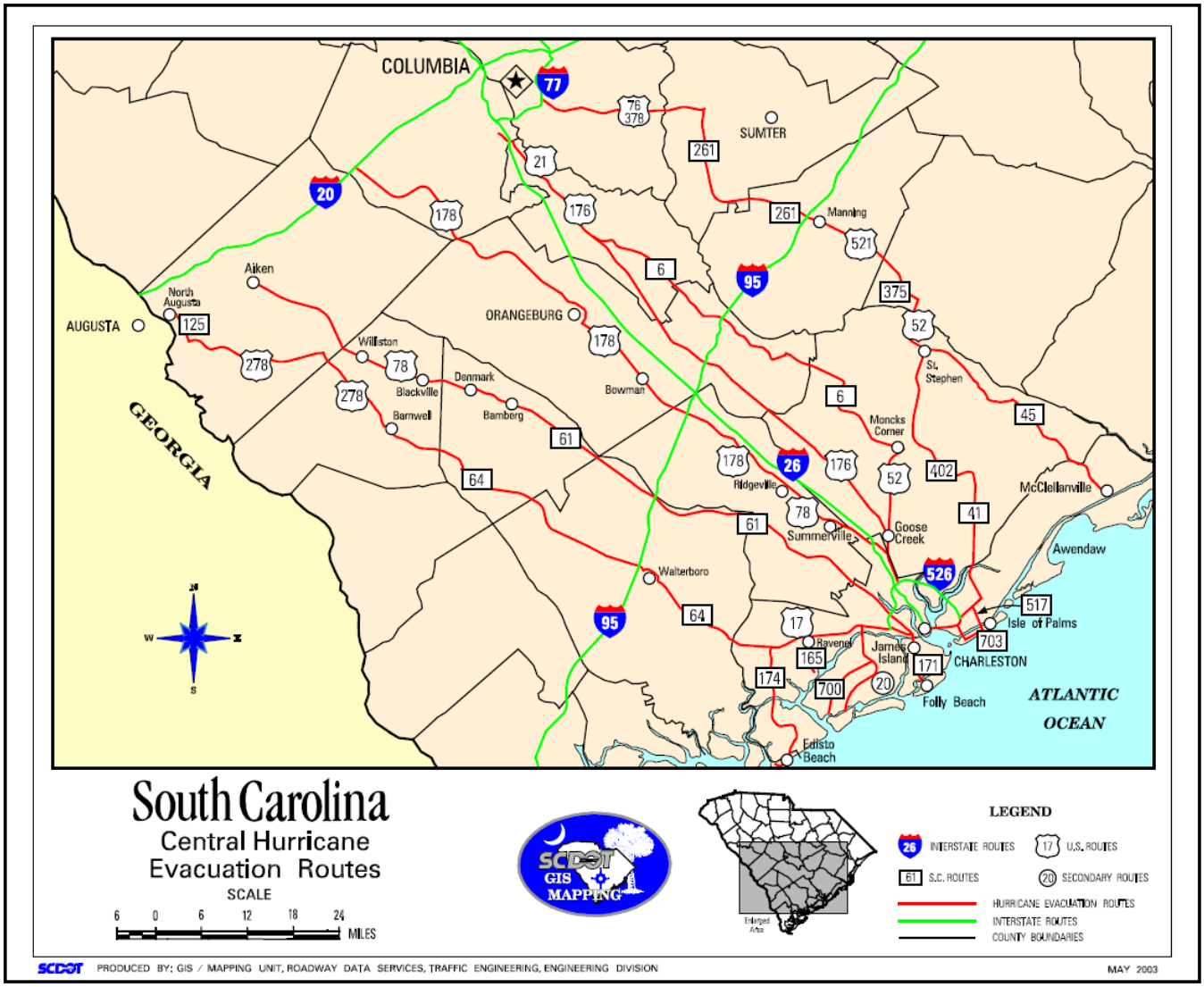

Voluntary Evacuations: If you live in a low-lying area (i.e. a barrier island or areas subject to flooding) or a mobile home, you should strongly consider evacuating if emergency officials issue a voluntary evacuations order. The earlier you leave, the less congestion you will face. Those of you not living in such areas should still have evacuation plans in place in case a mandatory evacuation order is issued.

Mandatory Evacuations: Evacuation orders are very serious and only issued when there is sufficient evidence that the area in danger. It is important to note that under mandatory evacuations, your route is determined for you.

Evacuation: When evacuating, it is important to know the evacuation route from your home, along with several emergency-meeting locations along the route. This is especially helpful for families traveling in more than one vehicle. In an emergency situation it is also important that the vehicle you will be traveling in is in working condition and has a sufficient amount of fuel. If you wait until a mandatory evacuation is called, you must take the evacuation route assigned by the South Carolina Department of Transportation in order to quickly and effectively evacuate your specific area.

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Thomas & Hutton Engineering Co.

What to do Before, During, and After a Hurricane

BEFORE

Be prepared

Plan an evacuation route. Consider staying in a motel or with family and friends outside the vulnerable area. Learn safe routes inland and the locations of official shelters. Be ready to drive at least 20 to 50 miles inland to locate a safe place.

Basic Disaster Supplies Kit

Gather disaster supplies and create a basic supplies kit, which you can use at home or take if you evacuate. Include:

- "2009 South Carolina Hurricane Guide"
- Non-perishable food (including canned goods)
- Drinking water (two quarts per person per day)
- Flashlights, extra batteries, and bulbs
- Battery-powered AM/FM or hand crank radio and NOAA weather radio with extra batteries
- First-aid kit and manual
- Non-electric can opener
- Essential medicines, including prescriptions
- Sturdy shoes
- Baby supplies (including baby food and diapers)
- Games and books
- Fire extinguisher
- Important documents (insurance policies, family records, photo identification, important telephone numbers, tax records, bank information)
- Toiletries and other personal hygiene items
- Cash and credit cards

Before You Leave Home

- Make arrangements for pets. Pets are not allowed in official shelters.
- Fuel up family vehicles and service them.
- Turn off gas, electricity, and water.
- Stay tuned to your local television and radio stations for emergency information.

Pickup Assistance Support

- Residents that do not have or require transportation support should notify the community CERT members of a specific need in the event of evacuation. Residents requiring transportation for evacuation shelters should meet at the identified pickup point located at: **Newton Farm, 149 Village Green Lane on Kiawah Island**
- Residents requiring special medical needs and transportation should register with **SCHDEC (843) 953-2450** and the **Disabilities Resource Center (843) 225-5080**.

On The Road (See Evacuation Route Maps)

The South Carolina Emergency Management Division has been working in partnership with the petroleum industry in an attempt to make extra fuel available at certain filling stations along major evacuation routes; once you're on the road, tune to your radio to find out which filling stations are participating. Rest areas along I-26 will be enhanced with additional facilities to accommodate motorists efficiently. Department of Public Safety weigh stations will also be available as comfort stations. In addition to the items listed above in your Basic Disaster Supplies Kit, ALSO CARRY:

- Road maps
- Jumper cables
- Tire repair kit

At The Public Shelter (See Shelter Locations)

Before heading to a public shelter, first consider staying with family and friends or in a motel out of the area. If those are not available, the American Red Cross will provide a safe place to stay when you have no other place to go. Cots and blankets will not be provided in the public shelter, and although food will be provided, specialty items for infants and individuals on restricted diets may not be available.

If you plan to evacuate to a shelter, you will want to carry the supplies listed above in your Basic Disaster Supplies Kit, PLUS:

- Blankets, sleeping bags, pillows and cots
- Special foods, if you are on a restricted diet

DURING

Protect Yourself

- Stay tuned to your local television and radio stations for emergency information.
- Stay inside a well-constructed building away from windows and doors, even if they are covered. Go to an interior first-floor room, basement, closet, or under the stairs.
- Be alert. Tornadoes are often spawned during hurricanes.
- If the "eye" of the storm passes over your area, be aware that severe conditions will return with winds from the other direction in a very short time.

AFTER

Returning Home

- Check with local law enforcement, news service broadcasts and your community CERT personnel prior to returning to see if your community has been declared safe before entering. Roads may be closed for your protection. Do not drive in flooded areas.
- Check gas, water, electrical lines and appliances for damage.
- Avoid using candles and other open flames indoors. Use a flashlight to inspect damage.
- Report life-threatening emergencies only.
- Contact your Insurance Company Claims Department.

Re-Entry Plan

Charleston County Emergency Preparedness Division Re-Entry Plan

- Residents should familiarize the approved re-entry plan by going to the website **http://www.charlestoncounty.org/departments/EPD/Re-Entry-Plan.pdf.** The community Lowcountry CERT members may be asked to help with local law enforcement and emergency response personnel with re-entry into your community.

Debris Cleanup Preparations

Major debris cleanup will be coordinated by local Municipal Public Works Departments and will occur following the event to open major roadways and emergency facilities to ensure access for rapid response by emergency personnel once areas have been determined safe. Cleanup will be prioritized by emergency personnel to vital facilities such as hospitals, fire stations, police stations and EMS stations in order to provide emergency services to the surrounding communities.

Community residents should remain patient. Cleanup operations will take time and may be extensive. Residents are encouraged to localize debris from their homes and neighborhood, but should be careful not to block roadways and access in the event of the need for emergency personnel.

Community Based Organizations

Lowcountry CERT (Community Emergency Response Team)

As development occurs and residents begin to inhabit homes in the development, the members of the community are encouraged to initiate and join the Lowcountry CERT program as a valuable asset for your community during times of emergencies. As trained personnel, you will learn how to respond and help others in need of help during emergency situations prior to, during and after the response of emergency assistance. Members of the Lowcountry CERT program will be asked to participate in planned training activities for not only their development but also for the surrounding community. Interested parties can contact the Emergency Preparedness Division at **(843) 202-7405** to enroll in the program or you can download an application from **www.LCERT.org**. CERT training is provided free of charge in Charleston County to anyone 18 years old or over.

Insurance Claims Contact Information

Allstate Insurance:
Claims #: 1-800-54-STORM (1-800-547-8676)

Builders Mutual Insurance Company:
Claims #- 1-800-809-4861

Companion Property & Casualty Insurance:
Claims #: (800) 845-2724, option 2 or fax at (803) 419-8063

GEICO:
Claims # 1-800-841-3000

General Casualty Insurance Company:
Claims: 1-800-334-0241

GMAC Insurance:
Claims # - 1-800-468-3466

Grange Insurance:
Claims #: 1-800-445-3030

Harleysville Insurance:
Claims #: 1-800-892-8877

Johnson & Johnson Inc Managing general Agent:
Claims #: 1-800-487-7565 Ext. 3029

Nationwide Insurance:
Claims # - 1-800-421-3535

Progressive Insurance:
Claims # - 1-800-274-4499

PURE High Value Homeowners Insurance
Claims Hotline: 888-813-PURE (7873) or e-mail claims@purehnw.com or fax claims to 914-328-3883.

South Carolina Farm Bureau Mutual Insurance Company:
Claims Hotline: 1-800-799-7500

South Carolina Wind & Hail Underwriting Association:
Claims #: Call your insurance broker/agent

The Seibels Bruce Group, Inc.:
Catawba Insurance Company
Claims: 1-800-525-8835

Southern Mutual Insurance Company:
Claims #: 1-800-226-1919

Insurance Claims Contact Information Contd.

Southern Mutual Church Insurance:
Claims #: 1-800-922-5332

State Farm:
Claims #: Contact your agent or 1-800-SF-CLAIM

State Auto Insurance:
Claims #: 1-800-766-1853 or e-mail claims@stateauto.com

USAA:
Claims #: 1-800-531-8222

Universal North America Insurance Company:
Claims #: 866-999-0898

Utica National Insurance Group:
Claims #: (Fax) 315-266-4121 or 1-800-274-1914 ext. 2772

Charleston County Shelter Locations

Stall High School
7749 Pinehurst Street
N. Charleston, SC 29420

Midland Park Elementary
2415 Midland Park Road
N. Charleston, SC 29418

Morningside Middle School
1999 Singley Lane
N. Charleston, SC 29405

Garrett Academy of Technology
2731 Gordon Street
N. Charleston, SC 29405

A.C. Corcoran Elementary
8585 Vistavia Road
N. Charleston, SC 29406

Pepperhill Elementary School
3300 Creola Road
N. Charleston, SC 29420

Brentwood Middle School
2685 Leeds Avenue
N. Charleston, SC 29405

Lambs Elementary School
6800 Dorchester Road
N. Charleston, SC 29418

***RESIDENTS SHOULD CONTINUE TO BE APPRISED OF IDENTIFIED SHELTER LOCATIONS AS THEY CONTINUE TO BE REVISED OVER TIME. GO TO www.charlestoncounty.org/pdfs/HurricaneGuide-PrintAtHomeColor.pdf FOR CURRENT SHELTER LOCATIONS.**

Sources:

- **South Carolina Department of Transportation**
- **Charleston County**
- **City of Charleston**
- **Charleston Post & Courier**
- **South Carolina Insurance News Service**
- **Reverse 911 Interactive Community Notification System**
- **Charleston County Lowcountry CERT**

As information continues to evolve, residents are encouraged to review and update the Hurricane Preparedness Plan for current contact information, addresses and telephone numbers for State and Local agencies, emergency personnel, municipalities, shelter locations and community programs on a yearly basis.

Early preparation and continued awareness by all the residents is vital and warranted during times of emergency events.

CULTURAL RESOURCES SURVEY OF MULLET HALL PLANTATION, JOHNS ISLAND, CHARLESTON COUNTY, SOUTH CAROLINA

CHICORA RESEARCH CONTRIBUTION 498

CULTURAL RESOURCES SURVEY OF MULLET HALL PLANTATION, JOHNS ISLAND CHARLESTON COUNTY, SOUTH CAROLINA

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CHICORA RESEARCH CONTRIBUTION 498

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www.chicora.org

July 28, 2008

ABSTRACT

This study reports on an intensive cultural resources survey of a nearly 1,427 acre tract, located on Johns Island in Charleston County, South Carolina. The work was conducted to assist Mr. Kevin O'Neill of Kiawah River Plantation, LP comply with Section 106 of the National Preservation Act and the regulations codified in 36CFR800.

The tract, which is located at the southern edge of Johns Island, bordering the Kiawah River, will be developed for single family occupancy. While still relatively rural, the surrounding area is being developed with neighborhoods and commercial structures.

The proposed undertaking will require the clearing of the tract, followed by construction of various infrastructure elements, such as roads, stormwater drainage, and utilities. Individual lot construction will involve grading, additional utility construction, and subsequent building of structures. These activities have the potential to affect archaeological and historical sites and this survey was conducted to identify and assess archaeological and historical sites that may be in the project tract. For this study, an area of potential effect (APE) 0.5 mile from the proposed tract was assumed.

An investigation of the archaeological site files at the South Carolina Institute of Archaeology and Anthropology identified four previously recorded sites (38CH629, 38CH1730, 38CH1731, 38CH1732) in the APE. An additional 13 sites (38CH487, 38CH487A, and 38CH1539-1549) were identified on the Mullet Hall Property during a 1994 reconnaissance by Chicora Foundation.

The four sites outside the Mullet Hall property (38CH629 and 38CH1730-1732) were identified during a 1999 survey for an adjacent residential development. Site 38CH629 is a Mississippian and nineteenth to twentieth century scatter; 38CH1730 is an unidentifiable prehistoric and eighteenth century site; 38CH1731 is a nineteenth to twentieth century scatter; and 38CH1732 is a Woodland and nineteenth to twentieth century site. All four of these sites were recommended not eligible for the National Register.

Of the sites previously identified on the Mullet Hall property, 38CH487 is described as a nineteenth century slave row; however, there is some confusion about the site described as 38CH487A. The site shown on the topographic maps at SCIAA was recorded in 1980 during a seventeenth century survey by Stanley South and Michael Hartley. While the site did not contain any seventeenth century materials, it was described a "house ruin," although no other description was given. The 1994 reconnaissance of the property revisited 38CH487A and reassigned the site number as 38CH1540, however the locations of 38CH487A and 38CH1540 are still shown in separate locations. It is believed that 38CH487A is shown incorrectly on the 1980 site form.

Other previously identified sites on the property include 38CH1539, an area of redeposited materials; 38CH1540, a plantation complex; 38CH1541, an eighteenth to nineteenth century main house; 38CH1542, two nineteenth century slave rows; 38CH1543, an eighteenth century main house; 38CH1544, a nineteenth century tenant site; 38CH1545, and late nineteenth century house; 38CH1546, a nineteenth to twentieth century scatter; 38CH1547, an eighteenth to nineteenth century slave row; 38CH1548, Bishop Cemetery, and 38CH1549, a cemetery. Although only examined at a reconnaissance level, five sites (38CH1540,

38CH1541, 38CH1542, 38CH1547, and 38CH1548) were thought to be eligible for the National Register. Four sites (38CH487, 38CH1543, 38CH1545, and 38CH1549) were potentially eligible and three sites (38CH1539, 38CH1544, and 38CH1546) were recommended not eligible for the National Register of Historic Places.

The S.C. Department of Archives and History GIS was also consulted for any National Register of Historic Places sites were in the vicinity of the project area. There is one NRHP property, the Bass Pond Site, located south of the Mullet Hall Property. In addition, twelve historic structures (365-0380, 1391, 1392, and 1464-1468 and 1470-1473) were identified in the vicinity; they were recorded either during a survey of James and Johns islands (Fick et al. 1989) or Charleston County (Fick 1992). Site 365-0380 are the c. 1808 Shoolbred graves; 1391, 1392, 1472, and 1473 are unidentified structures that have all been recommended not eligible for the National Register. Site 1464 is the St. John AME Church Cemetery; 1465 is the Hope Plantation Cemetery; 1466 is the Freeman House; 1467 is the James and Hattie Freeman House (Brickley House); 1468 is the Mt. Hebron Presbyterian Church (St. Francis Center); 1470 is the Promised Land Reformed Episcopal Church; and 1471 is the Lee Glover House. All resources are not eligible for the National Register except 1468, which was recommended eligible.

In preparation of the field investigation, a detailed historical context for Johns Island was prepared using a variety of primary sources. Areas of special interest include the military history of the island, as well as the development of a plantation economy. Careful attention was paid to comparing the agricultural schedules for Johns Island with surrounding areas in order to explore events specific to the island setting. An area of the island's history that has received far too little attention is the development of truck farming. The tract specific history took ownership back to the late eighteenth century, identifying that today's Mullet Hall consisted of three primary properties during the antebellum -- from west to east, the plantation of James Legare, Solomon Legare, and Benjamin Roper (The Oaks). This historical research addressed the economic activities of each of these owners, as well as the convergence of the properties under the modern ownership of Limehouse. Detailed plats and maps were found to be invaluable in the identification and assessment of the archaeological resources on the property.

The archaeological survey of the tract incorporated shovel testing at 100-foot intervals on transects that were placed at 100-foot intervals along the roads running throughout the tract. All shovel test fill was screened through ¼-inch mesh and the remains were recorded. A total of 4,199 shovel tests were excavated along 375 transect lines.

Sites Identified on the Mullet Hall tract

Site No.	Site Type	Eligibility
38CH487	slave settlement	E
38CH487A	not identified	-
38CH1539	redeposited	NE
38CH1540	plantation settlement	E
38CH1541	plantation settlement	E
38CH1542	slave settlements	E
38CH1543	plantation settlement	PE
38CH1544	tenant	PE
38CH1545	late 19th c house	PE
38CH1546	historic scatter	NE
38CH1547	slave settlements	E
38CH1548	Bishop Cemetery	PE
38CH1549	cemetery	PE
38CH2240	pottery scatter	NE
38CH2241	historic scatter	NE
38CH2242	prehistoric & historic scatter	PE
38CH2243	prehistoric & historic scatter	NE
38CH2244	prehistoric & historic scatter	PE
38CH2245	historic scatter	NE
38CH2246	prehistoric scatter	NE
38CH2247	prehistoric scatter	NE
38CH2248	historic settlement	E
38CH2249	prehistoric scatter	NE
38CH2250	prehistoric & historic scatter	PE
38CH2251	20th c trash dump	NE
38CH2252	historic scatter	PE
38CH2253	prehistoric & historic scatter	NE
38CH2254	historic scatter	NE

As a result of these investigations, 26 sites were identified. These include eleven originally identified sites (38CH487, 38CH1539-1543, and 38CH1545-38CH1549) and fifteen newly identified sites (38CH2240-2254). The area of 38CH487A was revisited, but no remains were found. In addition,

site 38CH1544 was found to be located off the Mullet Hall property, so no further work was performed.

For the newly identified sites, 38CH2240 is a prehistoric pottery scatter; 38CH2241 is a nineteenth to twentieth century scatter; 38CH2242 is a prehistoric and eighteenth century scatter; 38CH2243 is a prehistoric and eighteenth to nineteenth century scatter; 38CH2244 is a prehistoric and eighteenth to twentieth century scatter; 38CH2245 is a nineteenth to twentieth century scatter; 38CH2246 is a prehistoric pottery scatter; 38CH2247 is a Middle Woodland scatter; 38CH2248 is an early nineteenth century site; 38CH2249 is a prehistoric scatter; 38CH2250 is a prehistoric and eighteenth century scatter; 38CH2251 is a twentieth century trash dump; 38CH2252 is an eighteenth to twentieth century scatter; site 38CH2253 is a prehistoric and nineteenth century scatter; and 38CH2254 is a nineteenth to twentieth century scatter.

The National Register assessment for the sites recommends five sites eligible (38CH487, 38CH1540, 38CH1541, 38CH1542, and 38CH2248), 12 not eligible (38CH1539, 38CH1546, 38CH1549, 38CH2240-2241, 38CH2243, 38CH2245-2247, 38CH2249, and 38CH2253-2254**)**, and nine potentially eligible (38CH1543, 38CH1545, 38CH1547-1549, 38CH2242, 2244 , 38CH2250, and 38CH2252).

Finally, it is possible that archaeological remains may be encountered in the project area during clearing activities. Crews should be advised to report any discoveries of concentrations of artifacts (such as bottles, ceramics, or projectile points) or brick rubble to the project engineer, who should in turn report the material to the State Historic Preservation Office or to Chicora Foundation (the process of dealing with late discoveries is discussed in 36CFR800.13(b)(3)). No construction should take place in the vicinity of these late discoveries until they have been examined by an archaeologist and, if necessary, have been processed according to 36CFR800.13(b)(3).

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INTRODUCTION

This investigation was conducted by Dr. Michael Trinkley of Chicora Foundation, Inc. for Mr. Kevin O'Neill of Kiawah River Plantation, LP in Charleston, South Carolina. The work was conducted to assist the client with Section 106 of the National Historic Preservation Act and the regulations codified in 36CFR800.

The project site consists of a 1,427 acre tract proposed to be used for residential development on the southern tip of Johns Island, South Carolina (Figure 1). The tract, irregular in shape, is in an area of Charleston County already seeing significant growth. At least three large tracts have been surveyed for residential development in the vicinity within the last decade.

The tract consists of low, level topography with marsh and creeks encompassing the southern half. Currently used as a hunt club, much of the once cultivated fields have been allowed to grow up into a mixed pine and hardwood forest, although several fields are still being cultivated. Some fields have been turned into planted pines. Multiple ponds are also found on the property.

While still in the planning stages, the property will likely include several phases of residential housing, as well as several commercial areas and golf courses. This work will require the construction of utilities such as electrical lines, sewer, and water, as well as an expanded road system and possibly even connector routes. There will also be construction on the individual house lots. As with any development there is the possibility of increased short-term noise, traffic, and dust levels associated with construction activities. All have the potential to damage or otherwise affect cultural resources that may be present on the tract. This study, however, does not consider any future secondary impact of the project, including increased or expanded development of this section of Charleston County.

We were requested by Mr. Kevin O'Neill of Kiawah River Plantation, LP to provide a proposal for a cultural resource survey on January 9, 2008. A proposal was provided on January 30. An agreement was signed on March 18, 2008. The survey, which involved background investigations at the South Carolina Institute of Archaeology and Anthropology, the South Carolina Department of Archives and History, the South Carolina Historical Society, Charleston County Register of Mesne Conveyance, and the South Caroliniana Library, and subsequent fieldwork, was begun shortly thereafter.

An investigation of the archaeological site files at the South Carolina Institute of Archaeology and Anthropology identified four (38CH629, 38CH1730, 38CH1731, 38CH1732) previously recorded sites in the 0.5 mile APE. An additional 13 sites (38CH487, 38CH487A, and 38CH1539-1549) were identified on the Mullet Hall Property during a 1994 reconnaissance (Adams and Trinkley 1994).

The four sites off the Mullet Hall property (38CH629 and 38CH1730-1732) were identified during a 1999 survey for an adjacent residential development (Bridgman et al. 1999). Site 38CH629 is a Mississippian and nineteenth to twentieth century scatter; 38CH1730 is an unidentifiable prehistoric and eighteenth century site; 38CH1731 is a nineteenth to twentieth century scatter; and 38CH1732 is a Woodland and nineteenth to twentieth century site. All four of these sites were recommended not eligible for the National Register.

Of the sites found on the Mullet Hall

property, 38CH487 is described as a nineteenth century slave row; however, there is some confusion about the site described as 38CH487A. The site shown on the topographic maps at SCIAA was recorded in 1980 during a seventeenth century survey by Stanley South and Michael Hartley (South and Hartley 1980). While the site did not contain any seventeenth century materials, it was described a "house ruin," although no other description was given. The report that includes the site (South and Hartley 1980:59) describes it as early nineteenth century. The 1994 reconnaissance of the property revisited 38CH487A and reassigned the site number as 38CH1540, however the locations of 38CH487A and 38CH1540 are shown in separate locations. It is believed that 38CH487A is shown incorrectly on the 1980 site form and is in fact 38CH1540.

Other sites on the property include 38CH1539, an area of redeposited materials; 38CH1540, a plantation complex; 38CH1541, an eighteenth to nineteenth century main house; 38CH1542, two nineteenth century slave rows; 38CH1543, an eighteenth century main house; 38CH1544, a nineteenth century tenant site; 38CH1545, and late nineteenth century house;

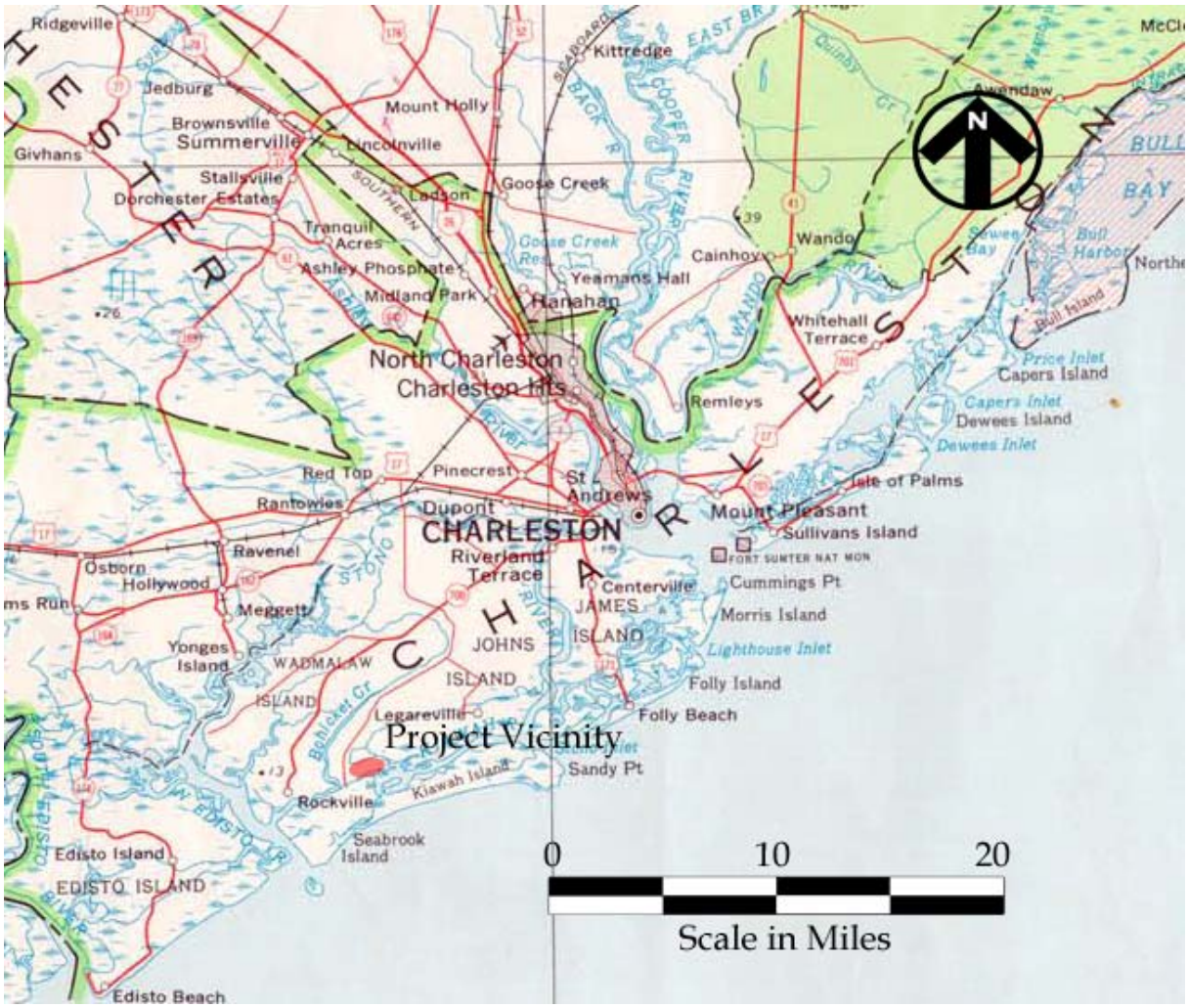


Figure 1. Project vicinity in Charleston County (basemap is USGS 1:500,000).

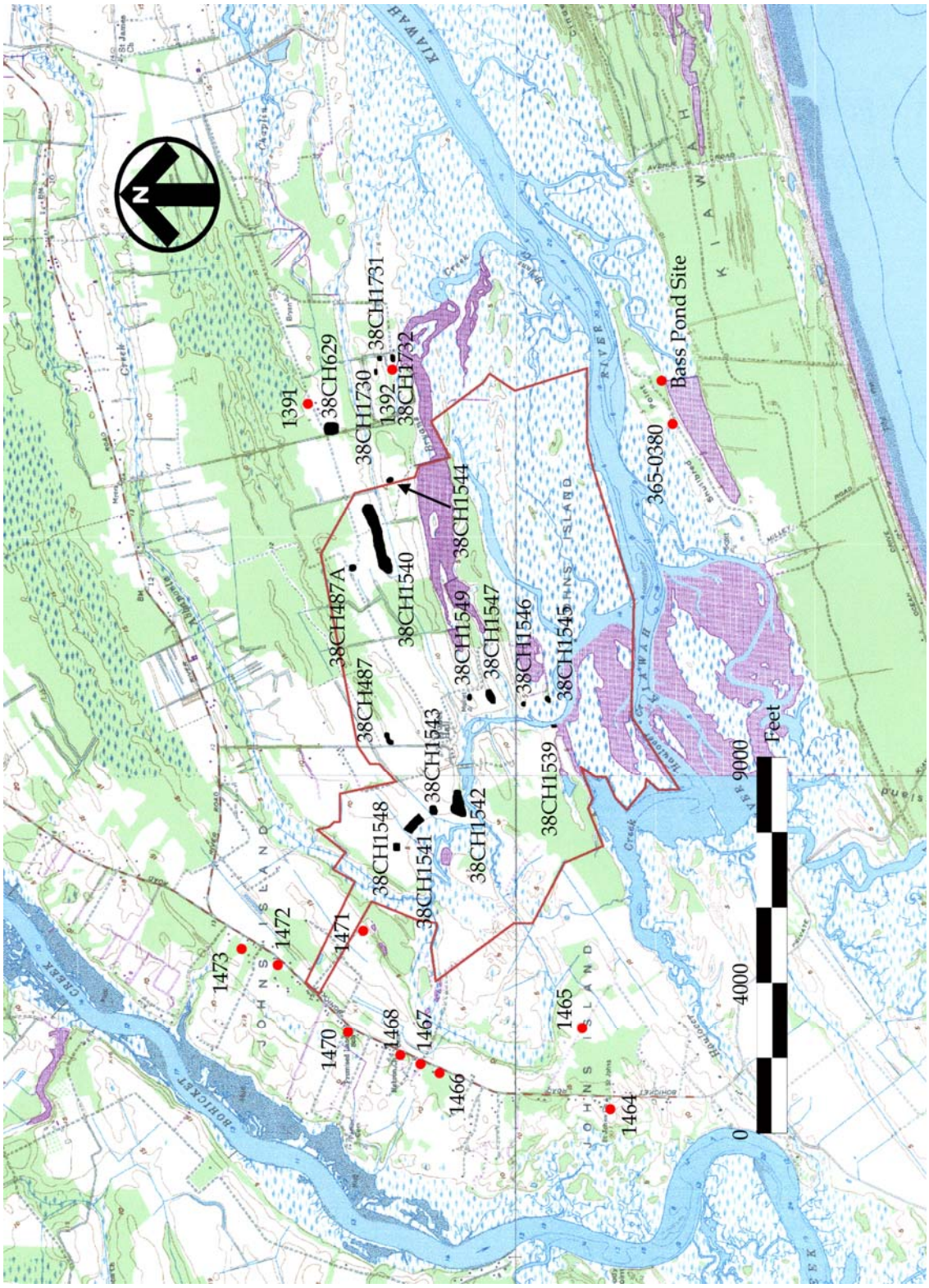


Figure 2. Project tract and previously identified sites (basemap is USGS Wadmalaw Island, Legareville, Rockville, and Kiawah Island 7.5').

38CH1546, a nineteenth to twentieth century scatter; 38CH1547, an eighteenth to nineteenth century slave row; 38CH1548, Bishop Cemetery, and 38CH1549, a cemetery.

Although only examined at a reconnaissance level, five sites (38CH1540, 38CH1541, 38CH1542, 38CH1547, and 38CH1548) were thought to be eligible for the National Register. Four sites (38CH487, 38CH1543, 38CH1545, and 38CH1549) were potentially eligible and three sites (38CH1539, 38CH1544, and 38CH1546) were recommended not eligible for the National Register of Historic Places.

Table 1.
Sites identified at Mullet Hall and eligibility recommendations

Site Number	Description	Size (in feet)	Central UTM[1] Easting	Central UTM[1] Northing	Soil	Eligibility
38CH487	18th-19th c. scatter	900 x 600	582408	3610894	Seabrook	E
38CH1539	19th c. scatter	50 x 10	582480	3609560	Kiawah	NE
38CH1540	18th-19th c. plantation complex	2,400 x 950	583972	3610963	Seabrook	E
38CH1541	18th-20th c. domestic	700 x 900	581720	3610682	Seabrook	E
38CH1542	19th-20th c. settlement	1,200 x 500	581841	3610310	Seabrook	E
38CH1543	18th-19th c. scatter	300 x 300	581842	3610534	Seabrook	PE
38CH1545	prehistoric/20th c. scatter	350 X 200	582743	3609623	Kiawah	PE
38CH1546	prehistoric/18th-19th c. scatter	200 x 250	582671	3609837	Seabrook	NE
38CH1547	prehistoric/18th-19th c. scatter	650 x 450	582686	3610045	Kiawah	PE
38CH1548	19th-20th c. cemetery	200 x 200[2]	581509	3610818	Kiawah	PE
38CH1549	cemetery	250 x 250[2]	582734	3610249	Wando	PE
38CH2240	prehistoric scatter	150 x 200	584231	3610883	Seabrook	NE
38CH2241	19th-20th c. scatter	150 x 200	582369	3609721	Kiawah	NE
38CH2242	prehistoric/18th c. settlement	400 x 300	582376	3610096	Wando	PE
38CH2243	prehistoric/18th-19th c. scatter	1,850 x 400	583003	3609935	Seabrook	NE
38CH2244	prehistoric/18th-20th c. scatter	500 x 250	582663	3610209	Wando	PE
38CH2245	19th-20th c. scatter	150 x 150	583345	3610070	Seabrook	NE
38CH2246	prehistoric scatter	150 x 50	583482	3610108	Seabrook	NE
38CH2247	Middle Woodland scatter	50 x 50	583702	3610141	Seabrook	NE
38CH2248	Early 19th c. scatter	150 x 100	584432	3610336	Seabrook	E
38CH2249	prehistoric scatter	500 x 200	582899	3610344	Wando	NE
38CH2250	prehistoric/18th c. scatter	1,000 x 550	583944	3610691	Seabrook	PE
38CH2251	20th c. trash dump	200 x 200	582704	3610444	Wando	NE
38CH2252	18th-20th c. possible overseer	450 x 250	580877	3610417	Yonges	PE
38CH2253	prehistoric/19th c. scatter	550 x 350	582682	3610696	Seabrook	NE
38CH2254	19th-20th c. scatter	100 x 200	580916	3611205	Wando	NE

[1] Zone 17, NAD27 datum

[2] Includes buffer as discussed

The S.C. Department of Archives and History GIS was also consulted to see if any National Register of Historic Places sites were in the vicinity of the project area. There is one NRHP property, the Bass Pond Site, located south of the Mullet Hall Property. In addition, twelve historic structures (365-0380, 1391, 1392, and 1464-1468 and 1470-1473) were identified in the vicinity, which were recorded either from a survey of James and Johns islands (Fick et al. 1989) or Charleston County (Fick 1992). Site 365-0380 are the c. 1808 Shoolbred graves; 1391, 1392, 1472, and 1473 are unidentified structures that have all been recommended not eligible for the National Register. Site 1464 is the St. John AME Church Cemetery; 1465 is the Hope Plantation Cemetery; 1466 is the Freeman House; 1467 is the James and Hattie Freeman House (Brickley House); 1468 is the Mt. Hebron Presbyterian Church (St. Francis Center); 1470 is the Promised Land Reformed Episcopal Church; and 1471 is the Lee Glover House. All resources are not eligible for the National Register except 1468, which was recommended eligible.

The fieldwork took place from May 7 through June 13 by Ms. Nicole Southerland and Ms. Ashley Guba under the direction of Dr. Michael Trinkley. Ms. Sarah Fick prepared the historical overview of the study tract. The results of the archaeological and historical investigations are included in this report.

NATURAL ENVIRONMENT

Physiography

Charleston County is located in the lower Atlantic Coastal Plain of South Carolina and is bounded to the east by the Atlantic Ocean and a series of marsh, barrier, and sea islands (Mathews et al. 1980:133). Elevations in the County range from sea level to about 70 feet above mean sea level (AMSL).

The mainland topography consists of subtle ridge and bay undulations, characteristic of beach ridge plains.

Seven major drainages are found in Charleston County. Four of these, the Wando, Ashley, Stono, and North Edisto, are dominated by tidal flows and are saline. Nearby portions of the Stono were historically used for the cultivation of rice by plantations such as Fenwick Hall. The three drainages with significant freshwater flow are the Santee, forming the northern boundary of the County, the South Edisto, forming the southern boundary, and the Cooper, which bisects the County.

Johns Island is a sea island consisting of about 84 square miles. It is located south of the City of Charleston, bordered to the north and east by the Stono River and James Island, to the northwest by Church Flats and the mainland, to the west by Church and Bohicket creeks and, beyond them, Wadmalaw Island. To the south of Johns Island is the Kiawah River and the barrier islands of Seabrook and Kiawah. Johns Island has a crescent shape (Figure 4), with its western neighbor, Wadmalaw, about half its size (42 square miles). Extensive tidal marshes occupy the low-lying area immediately between Kiawah and Johns Island.

At a general level, elevations on Johns Island range from sea level at Kiawah River to about 30 feet above mean sea level (AMSL) in the center of the island. However, when topography is more carefully examined, the island consists of well preserved Pleistocene barrier island ridges separated by troughs. These troughs are characterized by broad, low gradient interior drains. The larger ones, such as Hut and Abbapolla, are named and consist of well defined creeks. Many others, however, are unnamed and appear only a swampy sloughs. The ridges follow a southwest-northeast orientation and the largest runs from Bohicket Creek northeast to the Johns Island airport. A second area of high ground is found along Maybank Highway, while a less well

Figure 3. View of typical forest on the property.

defined third area is situated in the Hickory Hill area of the island.

The tidal range on the Stono varies from about 5.3 feet at it is mouth (Snake Island) to 6.4 feet at Church flats. The Wadmalaw has a tidal range of 6.9 feet at the Church Creek bridge.

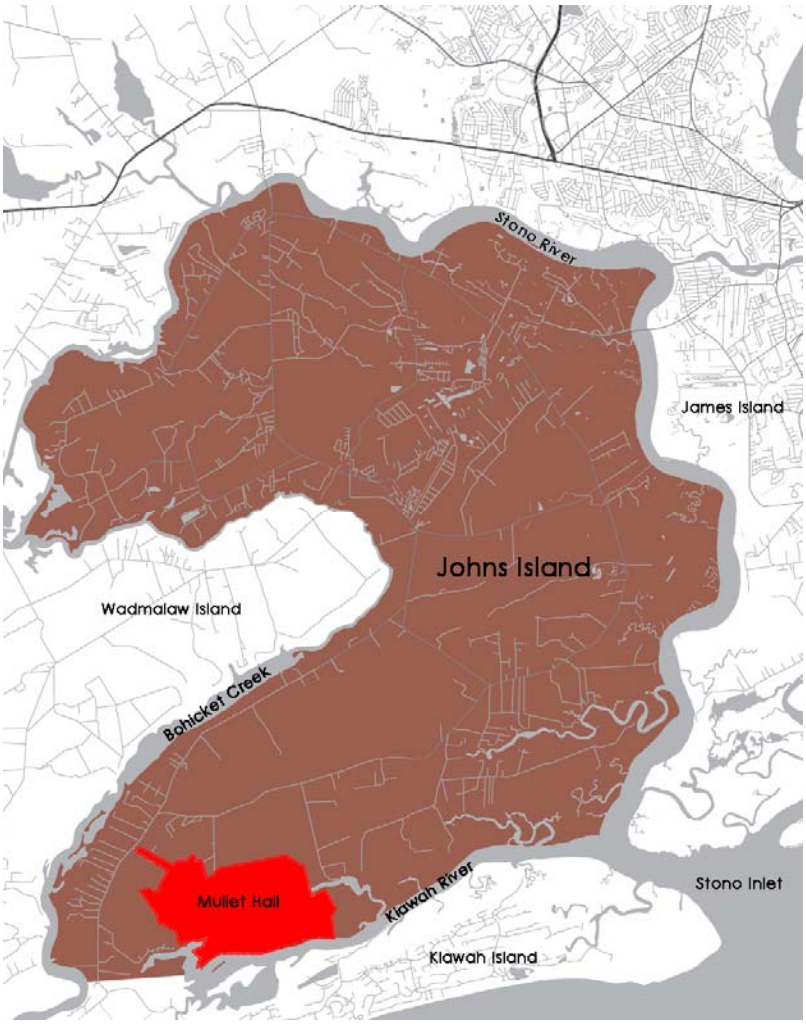


Figure 4. Map of Johns Island showing the project area.

Throughout this area the creeks vary from very high salinities to brackish water. For example, the salinity of the lower Stono is about 32‰, but drops to about 9‰ at its upper end.

Because of the low topography, many broad, low gradient interior drains are present as either extensions of the tidal rivers or as flooded bays and swales. Extensions include Bryans Creek, which flows into the Kiawah River.

Geology and Soils

Coastal Plain geological formations are unconsolidated sedimentary deposits of very recent age (Pleistocene and Holocene) lying unconformably on ancient crystalline rocks (Cooke 1936; Miller 1971:74). The Pleistocene sediments are organized into topographically distinct, but lithologically similar, geomorphic units, or terraces, parallel to the coast. The sites are located in an area identified by Cooke (1936) as part of the Pamlico terrace, which includes the land between the recent shore and an abandoned shore line about 25 feet AMSL. Cooke (1936:7) notes that evidence of ancient beaches and swales can still be seen in the Pamlico formation and this likely contributed to the ridge and trough topography present in some areas.

Within the coastal zone, the soils are Holocene and Pleistocene in age and were formed from materials that were deposited during the various stages of coastal submergence. The formation of soils is affected by this parent material (primarily sands and clays), the temperate climate, the various soil organisms, topography, and time.

The mainland soils are Pleistocene in age and tend to have more distinct horizon development and diversity than the younger soils of the sea and barrier islands. Sandy to loamy soils predominate in the level to gently sloping mainland areas. The island soils are less diverse

and less well developed, frequently lacking a well-defined B horizon. Organic matter is low and the soils tend to be acidic. The Holocene deposits typical of barrier islands and found as a fringe on some sea islands, consist almost entirely of quartz sand, which exhibits little organic matter. Tidal marsh soils are Holocene in age and consist of fine sands, clay, and organic matter deposited over older Pleistocene sands. The soils are frequently covered by up to 2 feet of saltwater during high tides. Historically, marsh soils have been used as compost or fertilizer for a variety of crops, including cotton (Hammond 1884:510) and Allston mentions that the sandy soil of the coastal region "bears well the admixture of salt and marsh mud with the compost" (Allston 1854:13).

Figure 5. View of field planted in corn.

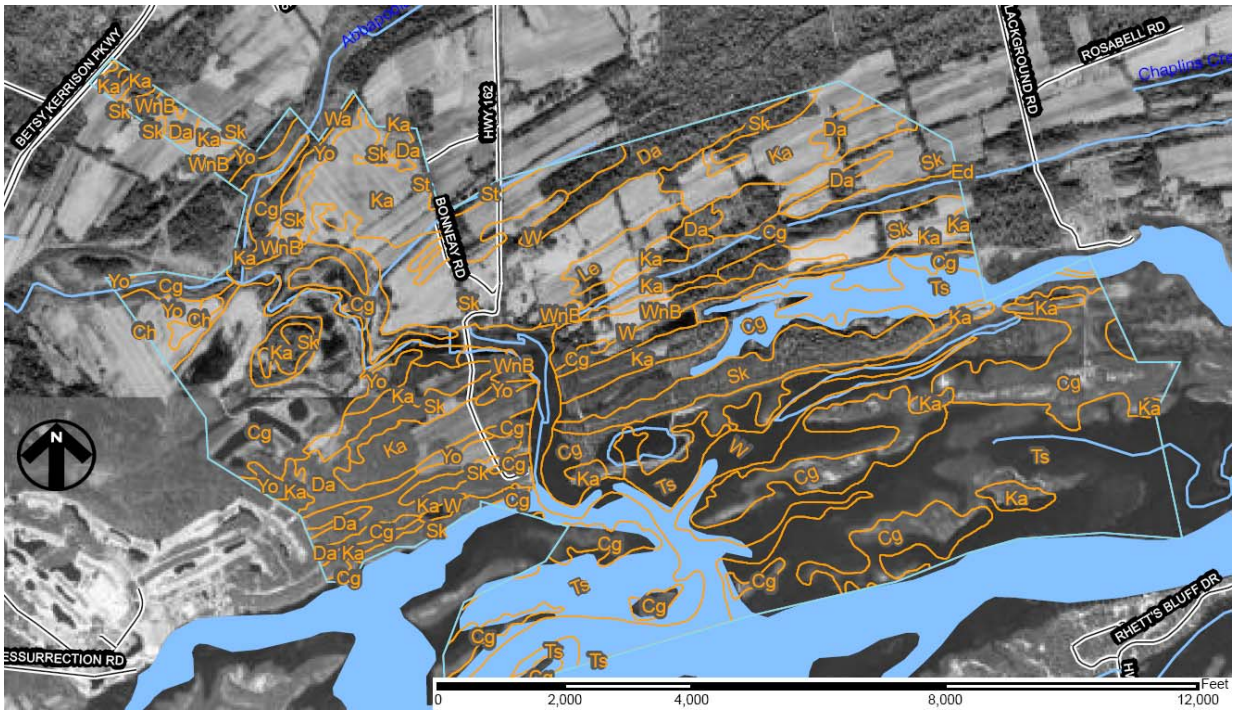
Eleven soil types are found in the survey area (Figure 6) including one excessively drained soil, Wando; two moderately well drained soils, Charleston and Seabrook; three somewhat poorly drained soils, Edisto, Kiawah, and Leon; three poorly drained soils, Dawhoo/Rutledge, Wadmalaw, and Yonges; and two very poorly drained soils, Capers and Stono.

Wando soils have an Ap horizon of dark brown (10YR4/3) loamy fine sand to 0.7 foot in depth over a brown (7.5YR5/4) loamy fine sand that extends to 2.7 feet. These soils account for 2.2% of the entire Mullet Hall property.

Charleston soils have an Ap horizon of dark brown (10YR3/3) loamy fine sand to 0.7 foot over a yellowish brown (10YR5/4) loamy fine sand to a depth of 1.3 feet. Seabrook soils have an Ap horizon of very dark grayish brown (10YR3/2) loamy fine sand to a depth of 0.8 foot over a dark brown (10YR4/3) or dark yellowish brown (10YR4/4) loamy fine sand to a depth of 1.7 feet. The moderately well drained soils cover approximately 16% of the entire property.

The somewhat poorly drained soils cover about 17.3% of the entire property. These include Edisto, which have an Ap horizon of very dark grayish brown (10YR3/2) loamy fine sand to 0.8 foot in depth over a pale brown (10YR6/3) loamy fine sand; Kiawah soils, which have an Ap horizon of very dark grayish brown (10YR3/2) loamy fine sand to 0.7 foot over a dark grayish brown (10YR4/2) loamy fine sand to 1.2 feet in depth; and Leon soils, which have an A horizon of very dark gray (10YR3/1) fine sand to 0.8 foot in depth over a gray (10YR6/1) coarse sand to 1.7 feet in depth.

The Dawhoo and Rutlege Series has an Ap horizon of black (10YR2/1) loamy fine sand to just under 1.0 foot over a very dark grayish brown (10YR3/2) loamy fine sand to a depth of 1.5 feet. Wadmalaw soils have an A horizon of black (10YR2/1) fine sandy loam to 0.4 foot in depth over a very dark gray (10YR3/1) fine sandy loam silty clay to a depth of 1.5 feet. Stono soils have an Ap horizon of black (10YR2/1) fine sandy loam to 0.8 foot in depth over a black (10YR2/1) fine sandy loam to 1.4 feet in depth. These soils will exhibit water at grade or within the upper foot during most periods.



Key:
Cg – Capers silty clay loam
Ch – Charleston loamy fine sand
Da – Dawhoo & Rutlege loamy fine sand
Ed – Edisto loamy fine sand
Ka – Kiawah loamy fine sand
Le – Leon fine sand
Sk – Seabrook loamy fine sand
St – Stono fine sandy loam
Ts – Tidal marsh, soft
Wa – Wadmalaw fine sandy loam
WnB – Wando loamy fine sand, 0-6%
Yo – Yonges loamy fine sand

Figure 6. Soils in the study tract.

to 0.8 foot in depth. The Yonges Series has an Ap horizon of dark grayish brown (10YR4/2) loamy fine sand to 0.8 foot over a light brownish gray (10YR6/2) loamy fine sand to 1.2 feet in depth. The poorly drained soils account for 6.6% of the Mullet Hall property.

The very poorly drained soils are the most common soils within the tract and account for 27.3% of the property. Capers soils have an A horizon of dark gray (5Y4/1) silty clay loam to 0.4 foot in depth over a dark grayish brown (2.5Y4/2)

In addition, tidal marsh accounts for 22.4% of the property while water covers 8.4% of the property.

Climate

John Lawson described South Carolina in 1700 as having, "a sweet Air, moderate Climate, and fertile Soil" (Lefler 1967:86). Of course, Lawson tended to romanticize Carolina. In December 1740, Robert Pringle remarked that Charleston was having "hard frosts & Snow"

characterized as "a great Detriment to the Negroes" (Edgar 1972:282), while in May 1744 Pringle states, "the weather having already Come is very hot" (Edgar 1972:685).

The major climatic controls of the area are latitude, elevation, distance from the ocean, and location with respect to the average tracks of migratory cyclones. Charleston's latitude of 32°37'N places it on the edge of the balmy subtopical climate typical of Florida, further south.

Figure 7. View of a pond in the project area.

As a result, there are relatively short, mild winters and long, warm, humid summers. The large amount of nearby warm ocean water surface produces a marine climate, which tends to moderate both the cold and hot weather. The Appalachian Mountains, about 220 miles to the northwest, block the shallow cold air masses from the northwest, moderating them before they reach the sea islands (Mathews et al. 1980:46).

The average high temperature in Charleston in July is 81°F, although temperatures are frequently in the 90s during much of the month (Kjerfve 1975:C-4). Mills noted:

> in the months of June, July, and August, 1752, the weather in Charleston was warmer than any of the inhabitants before had ever experienced. The mercury in the shade often rose above 90°, and for nearly twenty successive days varied between that and 101° (Mills 1972:444).

The area normally experiences a high relative humidity, adding greatly to the discomfort. Kjerfve (1975:C-5) found an annual mean value of 73.5% RH, with the highest levels occurring during the summer. Pringle remarked in 1742 that guns "suffer'd with the Rust by Lying so Long here, & which affects any Kind of Iron Ware, much more in this Climate than in Europe" (Edgar 1972:465).

The annual rainfall in this portion of Charleston is about 49 inches, fairly evenly spaced over the year. While adequate for most crops, there may be periods of both excessive rain and drought. The Charleston area has recorded up to 20 inches of rain in a single month and the rainfall over a three month period has exceeded 30 inches no less than nine times in the past 37 years. Likewise, periods of drought can occur and cause considerable damage to crops and livestock. Mills remarks that the "Summer of 1728 was uncommonly hot; the face of the earth was completely parched; the pools of standing water dried up, and the field reduced to the greatest distress" (Mills 1972:447-448). Another significant historical drought occurred in 1845, affecting both the coastal areas and the piedmont.

The annual growing season is 295 days, one of the longest in South Carolina. This mild climate, adequate rainfall, and long growing season, as Hilliard (1984:13) notes, is largely responsible for the presence of many southern crops, such as cotton and sugar cane.

Floristics

The survey area exhibits three major ecosystems: the maritime forest ecosystem, which consists of the upland forest areas, the palustrine ecosystem, which consists of essentially fresh water, non-tidal wetlands, and the riverine ecosystem, which is derived from salt water and is characterized by a tidal influence (Sandifer et al. 1980:7-9).

Figure 8. View of alligators on the property.

The maritime forest ecosystem has been found to consist of five principal forest types, including the Oak-Pine forests, the Mixed Oak Hardwood forests, the Palmetto forests, the Oak thickets, and other miscellaneous wooded areas (such as salt marsh thickets and wax myrtle thickets).

Of these, the Oak-Pine forests are most common, constituting large areas of Charleston's original forest community. In some areas palmetto becomes an important sub-dominant. Typically these forests are dominated by the laurel oak with pine (primarily loblolly with minor amounts of longleaf pine) as the major canopy co-dominant. Hickory is present, although uncommon. Other trees found are the sweet gum and magnolia, with sassafras, red bay, American holly, and wax myrtle and palmetto found in the understory.

Mills, in the early nineteenth century, remarked that:

> South Carolina is rich in native and exotic productions; the varieties of its soil, climate, and geological positions, afford plants of rare, valuable, and medicinal qualities; fruits of a luscious, refreshing, and nourishing nature; vines and shrubs of exquisite beauty, fragrance, and luxuriance, and forest trees of noble growth, in great variety (Mills 1972:66).

The loblolly pine was called the "pitch or Frankincense Pine" and was used to produce tar and turpentine; the longleaf pine was "much used in building and for all other domestic purposes"; trees such as the red bay and red cedar were often used in furniture making and cedar was a favorite for posts; and live oaks were recognized as yielding "the best of timber for ship building"; (Mills 1972:66-85). Mills also observed that:

> in former years cypress was much used in building, but the difficulty of obtaining it now, compared with the pine, occasions little of it to be cut for

> sale, except in the shape of shingles; the cypress is a most valuable wood for durability and lightness. Besides the two named we have cedar, poplar, beech, oak, and locust, which are or may be also used in building (Mills 1972:460).

The "Oak and hickory high lands" according to Mills were, "well suited for corn and provisions, also for indigo and cotton" (Mills 1972:443). The value of these lands in the mid-1820s was from $10 to $20 per acre, less expensive than the tidal swamp or inland swamp lands (where rice and, with drainage, cotton could be grown).

Today, virtually all of the project area's higher ground evidences some form of disturbance. Many of the trees on the tract are young pines and hardwoods that have recently grown into previously cultivated fields (Figure 3). There are still cultivated fields on the property, which were planted in corn (Figure 5), tomatoes, squash, zucchini, and cabbage. Some fields have been converted into planted pines. There are also several dug ponds on the property (Figure 7).

The palustrine ecosystem, which includes all wetland ecosystems, such as the swamps, bays, savannas, pocisins, and creeks where the salinities measure less than 0.5 ppt, is found throughout the project area. These palustrine ecosystems tend to be diverse, although not well studied (Sandifer et al. 1980:295). Many of these freshwater areas are likely associated with the various troughs scattered across the area. A number of forest types may be found in the palustrine areas which would attract a variety of terrestrial mammals. The typical vegetation might consist of red maple, swamp tupelo, sweet gum, red bay, cypress, and various hollies. Also expected in these areas would be wading birds and reptiles. It seems likely that these freshwater environs were of particular importance to the prehistoric occupants, but posed only a passing hindrance to the historic plantation owners.

Being managed as a hunt club, the property played host to numerous animals including deer, turkey, and alligators (Figure 8).

PREHISTORIC BACKGROUND

Previous Research

Charleston County has received a significant amount of archaeological attention. Nearly two decades ago, Derting and his colleagues listed over 430 reports for the county (Derting et al. 1991:127-182). A very large number of these studies represent cultural resource surveys conducted by agencies such as the U.S. Forest Service and the S.C. Department of Transportation. Many others have been conducted by various consultants, such as Carolina Archaeological Services and Brockington and Associates. Others focus on the urban archaeology of downtown Charleston, conducted primarily by The Charleston Museum. Recently, Chicora Foundation completed a major data recovery project on a small Thom's Creek site in Mount Pleasant (Trinkley and Hacker 2007).

There seems to be little research specific to Johns Island. Jordan and Stringfellow (1998:10-13) deal with the 10,000 plus years of prehistory in three pages. Most cultural resource studies – such as this – review prehistory in very generic terms (as we do below).

Nevertheless, both nearby Kiawah and Seabrook have produced prehistoric sites worthy of brief mention. Investigations on Kiawah resulted in data recovery excavations at the Bass Pond Site (38CH124) (Trinkley 1993). Those investigations compared the site to another Thom's Creek occupation on Kiawah, 38CH125/126, revealing striking differences in the Thom's Creek ceramics. At CH124 Thom's Creek Finger Pinched dominated and the radiocarbon date was 2090 B.C. At CH125/126 Thom's Creek Reed Punctate was the dominant pottery (and no finger pinched wares were recovered). Pottery, however, was not the only difference. At CH124 structural features, relatively dense shell middens, and a diverse artifact assemblage including projectile points, flakes, bone awls, atlatl weights, fired clay objects, hones, shell tools, and antler tools were recovered. Well preserved floral and faunal materials were also recovered. In contrast, CH125/126 produced a very Spartan assemblage, lacking structural remains and the variety of tools found at Bass Pond (for a detailed examination of non-shell ring Thom's Creek sites, see Trinkley and Hacker 2007:7-24).

Also examined on Kiawah was a Deptford midden, 38CH1219 (Trinkley et al. 1995). At this site excavation revealed that the "midden" actually consisted of multiple small piles, each with low artifact density. Almost immediately adjacent to the midden piles, however, were areas with appreciably higher artifact density. Both Deptford and St. Catherines pottery was found in the middens. The lithics were limited, with most specimens appearing to represent unsuccessful experimentation with local mudstone or siltstone. Floral remains, exclusively from non-midden areas, included both hickory nutshell and palmetto seeds.

Investigations on nearby Seabrook Island explored a poorly documented site (38CH1257) that produced not only Deptford remains, but also Mississippian materials (Trinkley 1999). The latter were of special interest, being associated with at least one structure and a feature filled with peach pits – dating the settlement to the protohistoric.

To the east, on James Island, Chicora archaeologists examined one feature – a 12 foot diameter shellfish steaming pit (Trinkley and Hacker 1997). This work, while limited to one feature, is nevertheless notable since the level of analysis is exceptional and the work demonstrates the level of detail that can be obtained from even limited archaeological data.

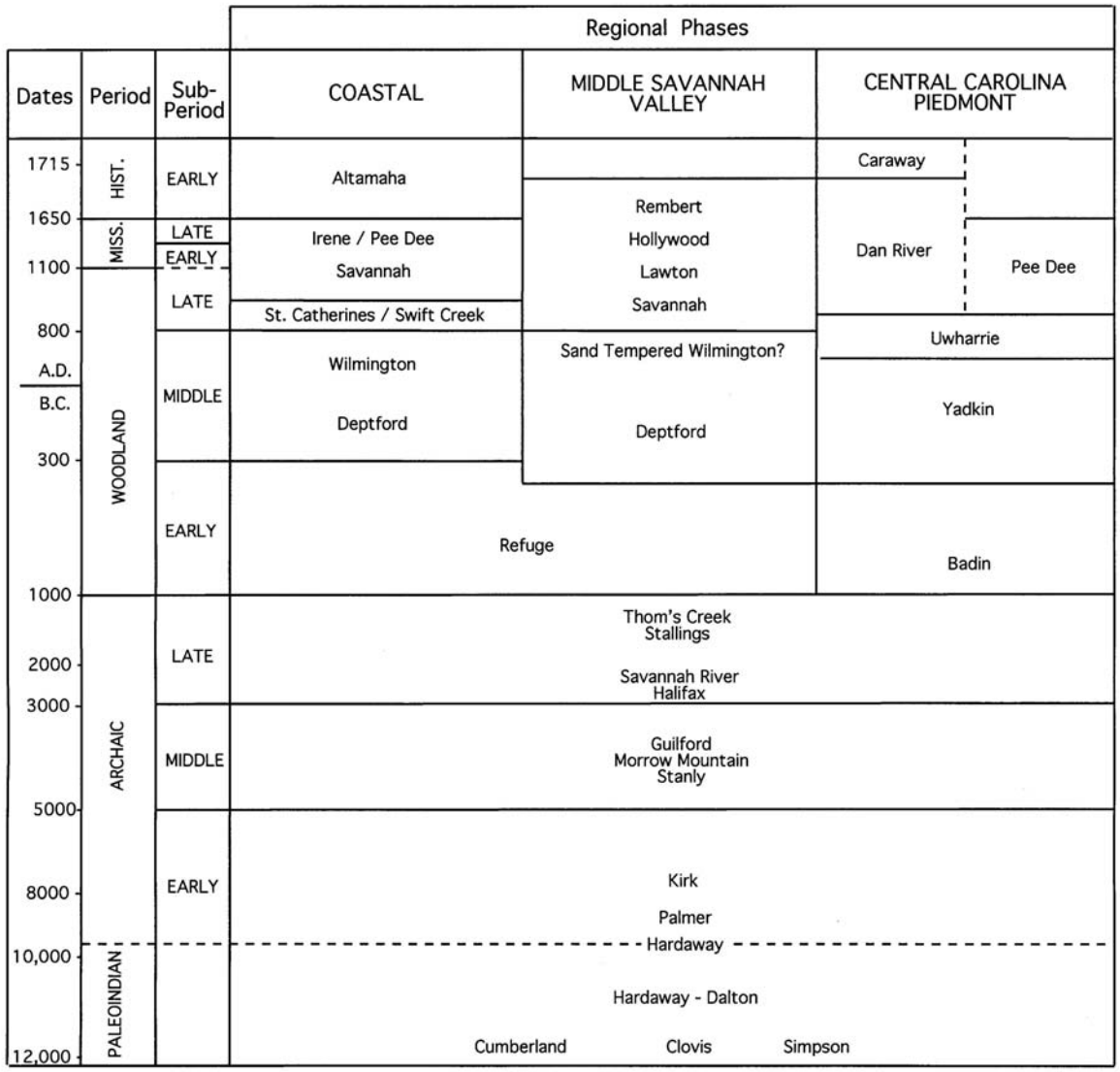


Figure 9. Generalized cultural sequence for South Carolina.

Taken together these studies help provide a good overview of the types of prehistoric sites likely to be identified on Johns Island.

Prehistoric Overview

Paleoindian Period

The Paleoindian Period, most commonly dated from about 12,000 to 10,000 B.P., is evidenced by basally thinned, side-notch projectile points; fluted, lanceolate projectile points; side scrapers; end scrapers; and drills (Coe 1964; Michie 1977; Williams 1965). Oliver (1981, 1985) has proposed to extend the Paleoindian dating in the North Carolina Piedmont to perhaps as early as 14,000 B.P., incorporating the Hardaway Side-Notched and Palmer Corner-Notched types, usually accepted as Early Archaic, as representatives of the terminal phase. This view, verbally suggested by Coe for a number of years,

has considerable technological appeal.[1] Oliver suggests a continuity from the Hardaway Blade through the Hardaway-Dalton to the Hardaway Side-Notched, eventually to the Palmer Side-Notched (Oliver 1985:199-200). While convincingly argued, this approach is not universally accepted.

The Paleoindian occupation, while widespread, does not appear to have been intensive. Artifacts are most frequently found along major river drainages, which Michie interprets to support the concept of an economy "oriented toward the exploitation of now extinct mega-fauna" (Michie 1977:124). Survey data for Paleoindian tools, most notably fluted points, is somewhat dated, but has been summarized by Charles and Michie (1992). They reveal a widespread distribution across the state (see also Anderson 1992b:Figure 5.1) with at least several concentrations relating to intensity of collector activity. What is clear is that points are found fairly far removed from the origin of the raw material. Charles and Michie suggest that this may "imply a geographically extensive settlement system" (Charles and Michie 1992:247).

Although data are sparse, one of the more attractive theories that explains the widespread distribution of Paleoindian sites is the model tracking the replacement of a high technology forager (or HTF) adaptation by a "progressively adaptation" accompanied by increasingly distinct more generalized band/microband foraging regional traditions (perhaps reflecting movement either along or perhaps even between river drainages) (Anderson 1992b:46).

Distinctive projectile points include lanceolates such as Clovis, Dalton, perhaps the Hardaway, and Big Sandy (Coe 1964; Phelps 1983; Oliver 1985). A temporal sequence of Paleoindian projectile points was proposed by Williams (1965:24-51), but according to Phelps (1983:18) there is little stratigraphic or chronometric evidence for it. While this is certainly true, a number of authors, such as Anderson (1992a) and Oliver (1985) have assembled impressive data sets. We are inclined to believe that while often not conclusively proven by stratigraphic excavations (and such proof may be an unreasonable expectation), there is a large body of circumstantial evidence. The weight of this evidence tends to provide considerable support.

Unfortunately, relatively little is known about Paleoindian subsistence strategies, settlement systems, or social organization (see, however, Anderson 1992b for an excellent overview and synthesis of what is known). Generally, archaeologists agree that the Paleoindian groups were at a band level of society, were nomadic, and were both hunters and foragers. While population density, based on isolated finds, is thought to have been low, Walthall suggests that toward the end of the period, "there was an increase in population density and in territoriality and that a number of new resource areas were beginning to be exploited" (Walthall 1980:30).

Archaic Period

The Archaic Period, which dates from 10,000 to 3,000 B.P.[2], does not form a sharp break

[1] While never discussed by Coe at length, he did observe that many of the Hardaway points, especially from the lowest contexts, had facial fluting or thinning which, "in cases where the side-notches or basal portions were missing, . . . could be mistaken for fluted points of the Paleo-Indian period" (Coe 1964:64). While not an especially strong statement, it does reveal the formation of the concept. Further insight is offered by Ward's (1983:63) all too brief comments on the more recent investigations at the Hardaway site (see also Daniel 1992).

[2] The terminal point for the Archaic is no clearer than that for the Paleoindian and many researchers suggest a terminal date of 4,000 B.P. rather than 3,000 B.P. There is also the question of whether ceramics, such as the fiber-tempered Stallings ware, will be included as Archaic, or will be included with the Woodland. Oliver, for example, argues that the inclusion of ceramics with Late Archaic attributes "complicates and confuses classification and

with the Paleoindian Period, but is a slow transition characterized by a modern climate and an increase in the diversity of material culture. Associated with this is a reliance on a broad spectrum of small mammals, although the white tailed deer was likely the most commonly exploited animal. Archaic period assemblages, exemplified by corner-notched and broad-stemmed projectile points, are fairly common, perhaps because the swamps and drainages offered especially attractive ecotones.

Many researchers have reported data suggestive of a noticeable population increase from the Paleoindian into the Early Archaic. This has tentatively been associated with a greater emphasis on foraging. Diagnostic Early Archaic artifacts include the Kirk Corner Notched point. As previously discussed, Palmer points may be included with either the Paleoindian or Archaic period, depending on theoretical perspective. As the climate became hotter and drier than the previous Paleoindian period, resulting in vegetational changes, it also affected settlement patterning as evidenced by a long-term Kirk phase midden deposit at the Hardaway site (Coe 1964:60). This is believed to have been the result of a change in subsistence strategies.

Settlements during the Early Archaic suggest the presence of a few very large, and apparently intensively occupied, sites which can best be considered base camps. Hardaway might be one such site. In addition, there were numerous small sites which produce only a few artifacts — these are the "network of tracks" mentioned by Ward (1983:65). The base camps produce a wide range of artifact types and raw materials which has suggested to many researchers long-term, perhaps seasonal or multi-seasonal, occupation. In contrast, the smaller sites are thought of as special purpose or foraging sites (see Ward 1983:67).

Middle Archaic (8,000 to 6,000 B.P.) diagnostic artifacts include Morrow Mountain, Guilford, Stanly and Halifax projectile points. Much of our best information on the Middle Archaic comes from sites investigated west of the Appalachian Mountains, such as the work by Jeff Chapman and his students in the Little Tennessee River Valley (for a general overview see Chapman 1977, 1985a, 1985b). There is good evidence that Middle Archaic lithic technologies changed dramatically. End scrapers, at times associated with Paleoindian traditions, are discontinued, raw materials tend to reflect the greater use of locally available materials, and mortars are initially introduced. Associated with these technological changes there seem to also be some significant cultural modifications. Prepared burials begin to more commonly occur and storage pits are identified. The work at Middle Archaic river valley sites, with their evidence of a diverse floral and faunal subsistence base, seems to stand in stark contrast to Caldwell's Middle Archaic "Old Quartz Industry" of Georgia and the Carolinas, where axes, choppers, and ground and polished stone tools are very rare.

Among the most common of all Middle Woodland artifacts is the Morrow Mountain Stemmed projectile point. This type was originally divided into two varieties by Coe (1964:37,43), based primarily on the size of the blade and the stem. Morrow Mountain I points had relatively small triangular blades with short, pointed stems. Morrow Mountain II points had longer, narrower blades with long, tapered stems. Coe suggested a temporal sequence from Morrow Mountain I to Morrow Mountain II. While this has been rejected by some archaeologists, who suggest that the differences are entirely related to the life-stage of the point, the debate is far from settled and Coe

interpretation needlessly" (Oliver 1981:20). He comments that according to the original definition of the Archaic, it "represents a preceramic horizon" and that "the presence of ceramics provides a convenient marker for separation of the Archaic and Woodland periods (Oliver 1981:21). Others would counter that such an approach ignores cultural continuity and forces an artificial, and perhaps unrealistic, separation. Sassaman and Anderson (1994:38-44), for example, include Stallings and Thom's Creek wares in their discussion of "Late Archaic Pottery."

has considerable support for his scenario.

The Morrow Mountain point is also important in our discussions since it represents a departure from the Carolina Stemmed Tradition. Coe has suggested that the groups responsible for the Middle Archaic Morrow Mountain (and the later Guilford points) were intrusive ("without any background" in Coe's words) into the North Carolina Piedmont, from the west, and were contemporaneous with the groups producing Stanly points (Coe 1964:122-123; see also Phelps 1983:23). Phelps, building on Coe, refers to the Morrow Mountain and Guilford as the "Western Intrusive horizon." Sassaman (1995) has proposed a scenario for the Morrow Mountain groups which would support this west-to-east time-transgressive process. Abbott and his colleagues, perhaps unaware of Sassaman's data, dismiss the concept, commenting that the shear distribution and number of these points "makes this position wholly untenable" (Abbott et al. 1995:9).

The controversy surrounding Morrow Mountain also includes its posited date range. Coe (1964:123) did not expect the Morrow Mountain to predate 6500 B.P., yet more recent research in Tennessee reveals a date range of about 7500 to 6500 B.P. Sassaman and Anderson (1994:24) observe that the South Carolina dates have never matched the antiquity of their more western counterparts and suggest continuation to perhaps as late as 5500 B.P. In fact they suggest that even later dates are possible since it can often be difficult to separate Morrow Mountain and Guilford points.

The MALA point was defined over 20 years ago. The term is an acronym standing for Middle Archaic and Late Archaic, the strata in which these points were first encountered at the Pen Point site (38BR383) in Barnwell County, South Carolina (Sassaman 1985). These stemmed and notched lanceolate points were originally found in a context suggesting a single-episode event with variation not based on temporal variation. The original discussion was explicitly worded to avoid application of a typology, although as Sassaman and Anderson (1994:27) note, the "type" has spread into more common usage. There are possible connections with both the Halifax points of North Carolina and the Benton points of the middle Tennessee River valley, while the "heartland" for the MALA appears confined to the lower middle Coastal Plain of South Carolina.

The available information has resulted in a variety of competing settlement models. Some argue for increased sedentism and a reduction of mobility (see Goodyear et al. 1979:111). Ward argues that the most appropriate model is one which includes relatively stable and sedentary hunters and gatherers "primarily adapted to the varied and rich resource base offered by the major alluvial valleys" (Ward 1983:69). While he recognizes the presence of "inter-riverine" sites, he discounts explanations which focus on seasonal rounds, suggesting "alternative explanations . . . [including] a wide range of adaptive responses." Most importantly, he notes that:

> the seasonal transhumance model and the sedentary model are opposite ends of a continuum, and in all likelihood variations on these two themes probably existed in different regions at different times throughout the Archaic period (Ward 1983:69).

Others suggest increased mobility during the Archaic (see Cable 1982). Sassaman (1983) has suggested that the Morrow Mountain phase people had a great deal of residential mobility, based on the variety of environmental zones they are found in and the lack of site diversity. The high level of mobility, coupled with the rapid replacement of these points, may help explain the seemingly large numbers of sites with Middle Archaic assemblages. Curiously, the later Guilford phase sites are not as widely distributed, perhaps suggesting that only certain micro-environments were used (cf. Ward [1983:68-69] who would likely reject the notion that

substantially different environmental zones are, in fact, represented).

Abbott et al. have argued for a combination of these models, noting that the almost certain increase in population levels probably resulted in a contraction of local territories. With small territories there would have been significantly greater pressure to successfully exploit the limited resources by more frequent movement of camps. They discount the idea that these territories could have been exploited from a single base camp without horticultural technology. Abbott and his colleagues conclude, "increased residential mobility under such conditions may in fact represent a common stage in the development of sedentism" (Abbott et al. 1995:9).

From excavations at a Sandhills site in Chesterfield County, South Carolina, Gunn and his colleague (Gunn and Wilson 1993) offer an alternative model for Middle Archaic settlement. He accepts that the uplands were desiccated from global warming, but rather than limiting occupation, this environmental change made the area more attractive for residential base camps. Gunn and Wilson suggest that the open, or fringe, habitat of the upland margins would have been attractive to a wide variety of plant and animal species.

The Late Archaic, usually dated from 6,000 to 3,000 or 4,000 B.P., is characterized by the appearance of large, square stemmed Savannah River projectile points (Coe 1964). These people continued to intensively exploit the uplands much like earlier Archaic groups with, the bulk of our data for this period coming from the Uwharrie region in North Carolina.

One of the more debated issues of the Late Archaic is the typology of the Savannah River Stemmed and its various diminutive forms. Oliver, refining Coe's (1964) original Savannah River Stemmed type and a small variant from Gaston (South 1959:153-157), developed a complete sequence of stemmed points that decrease uniformly in size through time (Oliver 1981, 1985). Specifically, he sees the progression from Savannah River Stemmed to Small Savannah River Stemmed to Gypsy Stemmed to Swannanoa from about 5000 B.P. to about 1,500 B.P. He also notes that the latter two forms are associated with Woodland pottery.

This reconstruction is still debated with a number of archaeologists expressing concern with what they see as typological overlap and ambiguity. They point to a dearth of radiocarbon dates and good excavation contexts at the same time they express concern with the application of this typology outside the North Carolina Piedmont (see, for a synopsis, Sassaman and Anderson 1990:158-162, 1994:35).

In addition to the presence of Savannah River points, the Late Archaic also witnessed the introduction of steatite vessels (see Coe 1964:112-113; Sassaman 1993), polished and pecked stone artifacts, and grinding stones. Some also include the introduction of fiber-tempered pottery about 4000 B.P. in the Late Archaic (for a discussion see Sassaman and Anderson 1994:38-44). This innovation is of special importance along the Georgia and South Carolina coasts, but seems to have had only minimal impact in the uplands of South or North Carolina.

There is evidence that during the Late Archaic the climate began to approximate modern climatic conditions. Rainfall increased resulting in a more lush vegetation pattern. The pollen record indicates an increase in pine which reduced the oak-hickory nut masts which previously were so widespread. This change probably affected settlement patterning since nut masts were now more isolated and concentrated. From research in the Savannah River valley near Aiken, South Carolina, Sassaman has found considerable diversity in Late Archaic site types with sites occurring in virtually every upland environmental zone. He suggests that this more complex settlement pattern evolved from an increasingly complex socio-economic system. While it is unlikely that this model can be simply transferred

to the Sandhills of South Carolina without an extensive review of site data and micro-environmental data, it does demonstrate one approach to understanding the transition from Archaic to Woodland.

Woodland Period

As previously discussed, there are those who see the Woodland beginning with the introduction of pottery. Under this scenario the Early Woodland may begin as early as 4,500 B.P. and continued to about 2,300 B.P. Diagnostics would include the small variety of the Late Archaic Savannah River Stemmed point (Oliver 1985) and pottery of the Stallings and Thoms Creek series. These sand tempered Thoms Creek wares are decorated using punctations, jab-and-drag, and incised designs (Trinkley 1976). Also potentially included are Refuge wares, also characterized by sandy paste, but often having only a plain or dentate-stamped surface (Waring 1968). Others would have the Woodland beginning about 3,000 B.P. and perhaps as late as 2,500 B.P. with the introduction of pottery which is cord-marked or fabric-impressed and suggestive of influences from northern cultures.

There remains considerable ambiguity regarding the pottery series found in the South Carolina Sandhills and their association with coastal plain and piedmont types. The earliest pottery found at many sites may be called either Deptford or Yadkin, depending on the research or their inclination at any given moment.

The Deptford phase, which dates from 3050 to 1350 B.P., is best characterized by fine to coarse sandy paste pottery with a check stamped surface treatment. The Deptford settlement pattern involves both coastal and inland sites.

Inland sites such as 38AK228-W, 38LX5, 38RD60, and 38BM40 indicate the presence of an extensive Deptford occupation on the Fall Line and the Inner Coastal Plain/Sand Hills, although sandy, acidic soils preclude statements on the subsistence base (Anderson 1979; Ryan 1972; Trinkley 1980). These interior or upland Deptford sites, however, are strongly associated with the swamp terrace edge, and this environment is productive not only in nut masts, but also in large mammals such as deer. Perhaps the best data concerning Deptford "base camps" comes from the Lewis-West site (38AK228-W), where evidence of abundant food remains, storage pit features, elaborate material culture, mortuary behavior, and craft specialization has been reported (Sassaman et al. 1990:96-98; see also Sassaman 1993 for similar data recovered from 38AK157).

Further to the north and west, in the Piedmont, the Early Woodland is marked by a pottery type defined by Coe (1964:27-29) as Badin.[3] This pottery is identified as having very fine sand in the paste with an occasional pebble. Coe identified cord-marked, fabric-marked, net-impressed, and plain surface finishes. Beyond this pottery little is known about the makers of the Badin wares and relatively few of these sherds are reported from South Carolina sites.

Somewhat more information is available for the Middle Woodland, typically given the range of about 2,300 B.P. to 1,200 B.P. In the Piedmont and even into the Sand Hills, the dominant Middle Woodland ceramic type is typically identified as the Yadkin series. Characterized by a crushed quartz temper the pottery includes surface treatments of cord-marked, fabric-marked, and a very few linear check-stamped sherds (Coe 1964:30-32). It is regrettable that several of the seemingly "best" Yadkin sites, such as the Trestle site (31An19) explored by Peter Cooper (Ward 1983:72-73), have never been published. The Yadkin series in South Carolina was first observed by Ward (1978, 1983) from the White's Creek drainage in Marlboro County, South Carolina. Since then, a large

[3] The ceramics suggest clear regional differences during the Woodland which seem to only be magnified during the later phases. Ward (1983:71), for example, notes that there "marked distinctions" between the pottery from the Buggs Island and Gaston Reservoirs and that from the south-central Piedmont.

Yadkin village has been identified by DePratter at the Dunlap site (38DA66) in Darlington County, South Carolina (Chester DePratter, personal communication 1985) and Blanton et al. (1986) and have excavated a small Yadkin site (389SU83) in Sumter County, South Carolina. Research at 38FL249 on the Roche Carolina tract in northern Florence County revealed an assemblage including Badin, Yadkin, and Wilmington wares (Trinkley et al. 1993:85-102). Anderson et al. (1982:299-302) offer additional typological assessments of the Yadkin wares in South Carolina.

Yadkin ceramics are associated with medium-sized triangular points, although Oliver (1981) suggests that a continuation of the Piedmont Stemmed Tradition to at least 1650 B.P. coexisted with this Triangular Tradition. The Yadkin in South Carolina has been best explored by research at 38SU83 in Sumter County (Blanton et al. 1986) and at 38FL249 in Florence County (Trinkley et al. 1993).

Over the years the suggestion that Cape Fear might be replace by such types as Deep Creek and Mount Pleasant has raised considerable controversy. Taylor, for example, rejects the use of the North Carolina types in favor of those developed by Anderson et al. (1982) from their work at Mattassee Lake in Berkeley County (Taylor 1984:80). Cable (1991) is even less generous in his denouncement of ceramic constructs developed nearly a decade ago, also favoring adoption of the Mattassee Lake typology and chronology. This construct, recognizing five phases (Deptford I-III, McClellanville, and Santee I), uses a type variety system.

Regardless of terminology, these Middle Woodland Coastal Plain and Coastal Zone phases continue the Early Woodland Deptford pattern of mobility. While sites are found all along the coast and inland to the Fall Line, shell midden sites evidence sparse shell and artifacts. Gone are the abundant shell tools, worked bone items, and clay balls. Recent investigations at Coastal Zone sites such as 38BU747 and 38BU1214, however, have provided some evidence of worked bone and shell items at Deptford phase middens (see Trinkley 1990).

In some respects the Late Woodland (1,200 B.P. to 400 B.P.) may be characterized as a continuation of previous Middle Woodland cultural assemblages. While outside the Carolinas there were major cultural changes, such as the continued development and elaboration of agriculture, the Carolina groups settled into a lifeway not appreciably different from that observed for the previous 500-700 years. From the vantage point of the Middle Savannah Valley Sassaman and his colleagues note that, "the Late Woodland is difficult to delineate typologically from its antecedent or from the subsequent Mississippian period" (Sassaman et al. 1990:14). This situation would remain unchanged until the development of the South Appalachian Mississippian complex (see Ferguson 1971).

South Appalachian Mississippian

As Schnell and Wright (1993:2) observe, "Mississippian" means different things to different people — even to its earliest researchers. To Willey (1966) it meant a particular group of traits. To Griffin (1985) it meant a complex social and technological interaction sphere. To Smith (1986) it was defined as an adaptive strategy. The meaning is further distorted, or at least affected, when the issue is viewed from a strict temporal or chronological orientation, such as this presentation (since to us, the period covers the time span from about A.D. 900 to A.D. 1500).

The Mississippian may be viewed rather basically by focusing on a simple coastal chronology based almost entirely on the results of excavations at Irene (Caldwell and McCann 1941) and the resulting synthesis by DePratter (1979:Table 30; 1991:183-193). In this scenario the Savannah Phase, consisting of three subphases, is followed by the Irene, broken into two subphases.

The Savannah I Phase, characterized by cord marking, is seen as developing from earlier

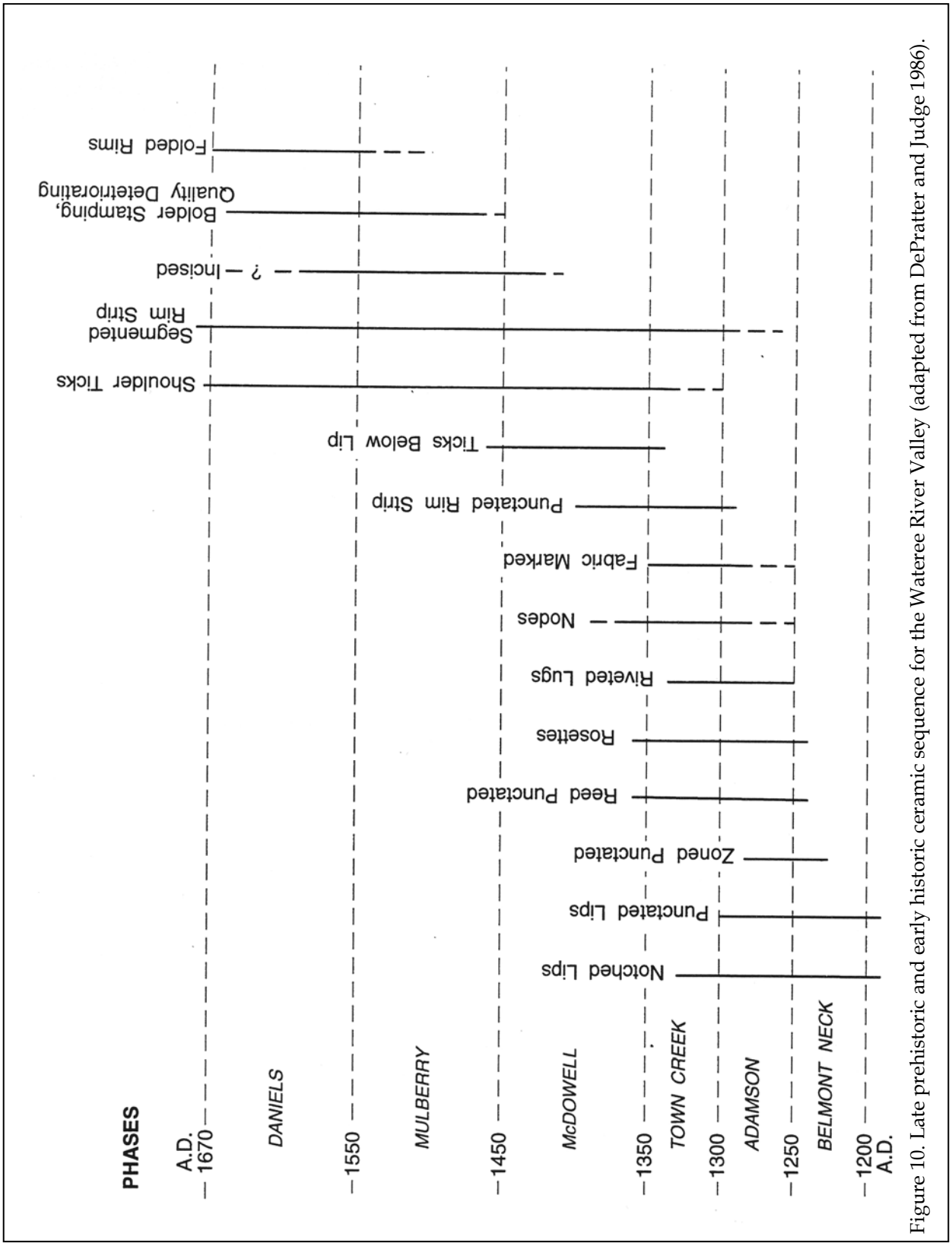


Figure 10. Late prehistoric and early historic ceramic sequence for the Wateree River Valley (adapted from DePratter and Judge 1986).

cultures. Present are flat-topped temple mounds, although these seem to decline dramatically from the mouth of the Savannah River northward. While the settlement system is very similar to that of the Late Woodland, there are also nucleated settlements found near estuaries and along freshwater rivers further inland. Although agriculture is seen by many as almost essential, there is no good evidence for corn or other domesticated crops.

Savannah II is distinguished by the introduction of check stamping and Savannah III is defined by the presence of complicated stamping. The Savannah III Complicated Stamped pottery is primarily curvilinear, often of concentric circles or oval motifs. Sassaman et al. (1990:207) suggest that the current temporal ranges are likely too restrictive for these subphases and suggest instead broader period of perhaps A.D. 1100 to 1200 for Savannah II and perhaps A.D. 1200 to 1300 for Savannah III.

The Savannah phase gives way to what is often called the Irene Phase, probably beginning about A.D. 1300. The Irene I Phase is identified by the appearance of Irene Complicated Stamped pottery using the filfot cross and line block motifs. Not only are these motifs different from the earlier Savannah Complicated Stamped designs, but the Irene ware is characterized by grit inclusions and a coarse texture, compared to the Savannah's sandy inclusions and fine to medium-grained paste.

Also present in Irene collections are a range of rim decorations, including nodes, rosettes, and fillet appliques. Although incising is found in very low quantities during this early period, the succeeding Irene II phase is characterized by bold incising. The mouth of the Savannah River, however, was likely abandoned by the end of the Irene I Phase since little incising is found in this area.

From the more northern region, the Pee Dee culture was defined through the excavations of Joffre Coe at Town Creek which is located about 150 miles due north of Charleston (Coe 1995; Reid 1967). The site, generally accepted to represent a northern intrusion of a Mississippian chiefdom, was originally dated from about A.D. 1550 to 1750, although more recent analyses suggests a date more likely between A.D. 900 and 1400 (Coe 1995:159).

In the Charleston area the only reasonably documented Mississippian excavations are those undertaken by Stanley South at the moundless ceremonial center at Charles Town Landing (South 1971). Anderson (1994:115) notes with regret that there has been "no broad-scale comparative analyses of Mississippian ceramics" for the South Carolina area, although there has been some effort to untangle the typology of the Middle Wateree valley. In particular DePratter and Judge (1986, 1990:56-58) have proposed a fairly detailed six phase division encompassing the period from A.D. 1200 through 1670. Although it is unclear how well their chronology and associated ceramic changes can be transposed from the Middle Wateree to the coast, it seems to be an excellent starting point (Figure 10 provides a generalized scheme).

The Belmont Neck Phase pottery (A.D. 1200-1250) is characterized by complicated stamped motifs with plain or notched rims. In the Wateree Valley these motifs are primarily concentric circles, with other various curvilinear designs and perhaps a cross bar diamond motif. Burnishing, while present, is a minority. Tempering ranges from fine to coarse sand.

The Adamson Phase pottery (A.D. 1250-1300) becomes dominated by the filfot motif, along with a minor amount of line block stamping. Burnished pottery is about twice as common as in the earlier Belmont Neck Phase. Lip notching and reed punctates below the lip are more common. There doesn't seem to be any significant change in tempering, although there may be a trend for the fine sands to drop out.

During the Town Creek Phase (A.D. 1300-1350) the pottery motifs are similar to those found earlier, with the addition of punctated and

segmented rim strips. Fabric marking, which is rare in earlier phases, becomes more noticeable during the Town Creek Phase and then drops out quickly. Burnishing is only slightly more common and the temper does not seem to change.

The McDowell Phase (A.D. 1350-1450) is characterized by pottery with larger, bolder stamped motifs. The filfot motifs are still most common, although DePratter and Judge seem to suggest that simple stamping increases during this phase. Burnishing now accounts for nearly a quarter of the typical collection.

The most noticeable change during the Mulberry Phase (A.D. 1450-1550) is the addition of incising. In addition, there may be a shift away from the filfot to other motifs, apparently at the expense of plain burnished pottery, which declines in frequency. Segmented applique strips are the most common rim decoration.

During the final Daniels Phase (A.D. 1550-1670) the pottery is recognizable by a deterioration in stamping quality and larger, more abstract motifs (or perhaps just less recognizable motifs?). Burnished pottery is again more common with incising remaining stable. Applique rim strips are larger and located farther down from the lip. Tempering remains a medium sand.

After A.D. 1670 we have virtually no information since no well documented coastal sites have been excavated and adequately reported.

HISTORICAL SYNTHESIS

Overview of Johns Island

Protohistoric

There are three Native American groups that may have been on the sea islands in the study area during the protohistoric and early historic periods, including the Kiawah, Stono, and Bohicket. Regrettably little is known about any of these groups.

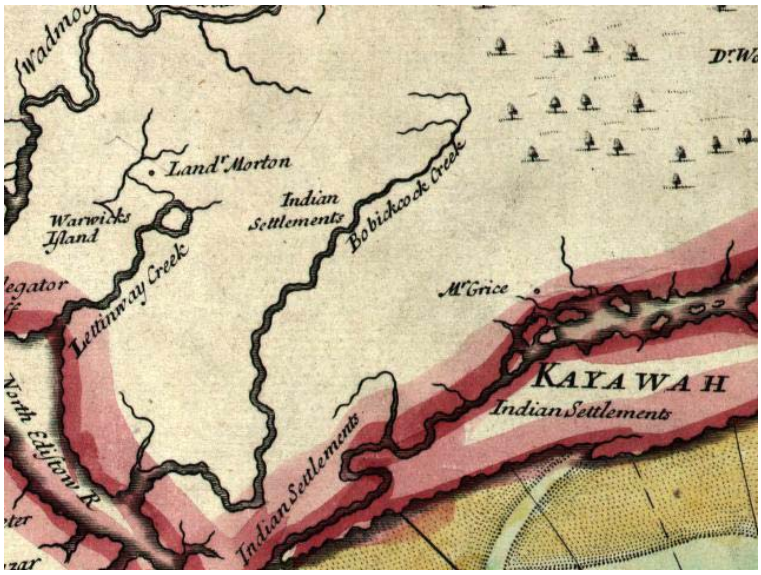


Figure 11. Portion of the 1711 Crisp map, *A Compleat Description of the Province of Carolina*, showing three "Indian Settlements." None, however, are identified.

It seems likely that Sandford first saw the Bohicket Indians and their agricultural fields along Bohicket Creek in 1666 (Waddell 1980:95-96) — a location they continued to hold for a number of years. In ca. 1685, for example, they are shown by Mathews east of the head of Bohicket Creek and by ca. 1695 they are shown on the Thornton-Morden map on the north side of the creek near the headwaters (Waddell 1980:96) — a location they held on the Crisp map of 1711 (Waddell 1980:97; Figure 11). In 1707 an act establishing Indian lookout posts reveals that the "Jones Island" outlook was to be manned by "Bohicott Indians." Waddell (1980:97) suggests that Jones Island was likely Seabrook.

The early location of the Kiawah is problematic, although it seems likely that by the early 1670s they were on the Ashley, in the immediate vicinity of the Albemarle settlement. Waddell (1980:236) comments on an early account by Cheves, which points out that there was an Indian village just beyond the palisade and that an Indian grave (with "trade beads") had been found near "Old Town" (Waddell 1980:234). The Kiawah were still on the banks of the Ashley in 1682 when Ferguson made his account of Indian tribes (Waddell 1980:237) and Gaycoyne shows them, in 1682, about two miles south of the Stono, on an island. Waddell points out that the map is far too crude to allow any accurate placement, and suggests that the most important feature of this map is that it indicates some movement of the Kiawah southward had taken place by this time. Mathews, in 1685, places the Kiawah directly on Kiawah Island and Waddell suggests a location near where the Kiawah flows into the Stono (Waddell 1980:238). Although there is uncertainty, it may be that their location remained unchanged a decade later, when they are still shown on Kiawah Island by the Thornton-Morden map.

Perhaps the best evidence pointing to a Kiawah settlement is provided by the Diamond

plat of Trescott's Plantation east of the Cooper River. Waddell comments that the plat may even show an Indian mound and the historic documents reveal that Trescott even dug through Indian burials in laying out his plantation house (Waddell 1980:241-242). This may be the only clear link to the Kiawah that remains.

In 1671 the Stono were reported to be living north of the Edisto and south of the Kiawah (at the English settlement) (Waddell 1980:303). The location seems to remain constant, in spite of their problems with the English, since in 1682 Ferguson remarks that the Stono were south of the Kiawah, "upon the River Stonoh, adjoining to Edisto" (Waddell 1980:305). By 1695, however, the Thornton-Morden map shows the Stono on Seabrook Island, at the mouth of the North Edisto River (Waddell 1980:307). In fact, the Stono continue to be closely associated with Seabrook through at least the first decade of the 1700s, when Seabrook Island was even called "Stonoe" Island (Waddell 1980:307).

In spite of the Seabrook Island connection, it seems that the most promising lead for a Stono settlement might be the Frances Hext plantation known as Indian Graves on Johns Island. It doesn't appear that too much has been made of the name of the plantation (see Jordan and Stringfellow 1998:246, 263, 280).

These brief discussions clearly point out the frequent movement of low country Indians. For example, the Kiawah moved away from the pressures of the Ashley River settlement, eventually to Kiawah Island. The Stono may have moved from along the Stono River to Seabrook. The Bohicket seem to have been the most stable, largely staying north of Bohicket Creek, although perhaps sharing some of Seabrook Island with the Stono. In spite of the maps and review of the historical documents, none of these settlements have been found and we have no real information on any of these early tribes.[1]

One of the earliest accounts, by Maurice Matthews in 1671, lumps them all together,

> The Indians all About us are our friends; all y^{t} we have knowledge of by theyre Appearance and traid with us) . . . . some of these have 4 or 5 Cassikaes . . . . I finde no tributaries among them, butt intermarriages & poverty causeth them to visitt one Another; never quarelling who is ye better man; they are generally poore & Spanish; Affraid of ye very foot step of a Westoe; A sort of people y^{t} live up to the westward [which these say eat people and are great warriors] (Cheves 2000:334)

In 1696 Governor Archdale signed a law requiring Indians, including the Stonoe, Kiaway, and others, to pay one deerskin yearly to the government. This resulted from the colonists noting that the Indians had been "furnished with clothes and all sorts of tools necessary for making their provisions and have from time to time as often they have had need thereof been protected and defended." Yet the bill complained that these same Indians, "have not hitherto been any ways useful or serviceable or contributing to the inhabitants of this province" (Hicks 1998:75).

Mills, in the early nineteenth century, expressed the situation concisely,

[1] It may be that South's "moundless ceremonial center" uncovered at Charles Towne Landing is a Kiawah settlement, but unfortunately these excavations have never been fully reported.

> [a] number of tribes of Indians inhabited this country originally; but little care has been taken to preserve either their names or locations (Mills 1972:749 [1826]).

Nevertheless, as late as 1847 there was at least one settlement Indian, William Beamer, living on Johns Island. He had served with American forces during the Revolution and afterwards had been an overseer for various planters, including William Sams (Hicks 1998:275).

Although contact period archaeological studies have not been conducted on Johns Island, Polhemus (1972) did report on the accidental discovery of four burials with trade goods. No archaeological study of the site, however, was conducted and when this site was recently developed, the site was quickly dismissed (Bridgman et al. 1999).

Parish and Administrative Divisions

The study area falls within the Proprietary county of Colleton, created in 1682. The 640 square mile Colleton County, however, was effectively eliminated with the creation of the seven original judicial districts in 1769. The Charleston District included 4,180 square miles and incorporated today's Charleston, Colleton, Dorchester, and Berkeley counties, as well as a small portion of Orangeburg County.

The boundaries of Charleston were constantly changing. For a few years, between 1785 and 1791 Charleston was reduced to the peninsula, James Island, and Sullivans Island, with Johns Island being subsumed by Colleton County. By 1791, however, the boundaries were restored and although Charleston changed in shape and size, Johns Island remained in Charleston District until 1882, when the southern portion of the area, including Johns Island, was lost to Berkeley County. The islands returned to Charleston in 1893 and there has been no substantive change since that time.

In addition to the judicial districts, South Carolina was also divided into a series of parishes as a result of the 1706 Church Act. Our study area of Johns Island falls within the original St. Paul Parish. The boundaries ran from the South Edisto River to the Stono River. In 1734, however, St. Paul lost to the creation of St. John-Colleton. This new parish included the sea islands of Edisto, Seabrook, Kiawah, Johns, and Wadmalaw, with the mainland north of the Stono being retained by St. Paul. James Island has remained part of St. Andrews Parish from the 1706 division through the present. These parishes were eliminated as governmental units by the 1865 state constitution, although some local government and public service districts are still parish based in unincorporated sections of St. Andrews and St. Pauls.

Given the instability of political boundaries throughout the nineteenth century, the more stable parish boundaries – used by nineteenth century census takers – provide more accurate statistics for researchers than county-level data (Fick 1992:1).

Eighteenth Century Life

The English established the first permanent settlement in what is today South Carolina in 1670 on a low rise on the west bank of the Ashley River. This original settlement encompassed about 9 acres; just beyond was a spring and a Kiawah Indian village (Cheves 2000:173). Like other European powers, the English were lured to the New World for a variety of reasons, including the acquisition of land and the promotion of agriculture. The Lord Proprietors, who owned the colony until 1719-1720, intended to discover a staple crop, the marketing of which would provide great wealth through the mercantile system.

By 1680 the settlers of Albemarle Point had moved the village across the bay to the tip of the peninsula formed by the Ashley and Cooper rivers. This new settlement at Oyster Point would become modern-day Charleston.

The original settlement became part of Old Town Plantation owned by Lynch Horry in the antebellum. Evidence of the earlier Kiawah settlement, however, was still obvious as late as the 1880s, when a burial containing trade beads was uncovered (Cheves 2000:353).

The move provided not only a more healthful climate and an area of better defense, but:

> the cituation of this Town is so convenient for public Commerce that it rather seems to be the design of some skillful Artist than the accidental position of nature (Mathews 1954:153).

Early settlers came from the English West Indies, directly from England, and from other colonies. But perhaps more than any others, it was the Barbadian elite who would set the Carolina culture apart from that of the more northern colonies, such as Virginia, and who would also establish the roots of cash monoculture and slavery (Sirmans 1966; Waterhouse 1975). Coclanis notes that almost as many Carolina settlers came from the small island of Barbados in the decade of the 1670s as from England herself, remarking that:

> Carolina - alone among the English colonies on the mainland of North America - felt the heat of the tropics from the start. Those that wish to understand the torridity of South Carolina's later history, its passion and its zeal, would do well to remember this point (Coclanis 1989:22).

Clowse (1971:60-61) suggests that cattle raising began as a response to the initial inability to find salable tropical or semitropical crops. Ranching, especially on the islands, was an easy way to exploit the region's land and resources, offering a relatively secure return for very little investment. Few slaves were necessary to manage the herd. The mild climate of the islands made winter forage more abundant and winter shelters unnecessary. The salt marshes, useless for other purposes, provided excellent grazing and eliminated the need to provide salt licks. Further, the islands were self-contained, eliminating the need for fences (Coon 1972; Dunbar 1961). Fick et al. (1989:9) comment that the estate inventory of Bernard Schenckingh, who died in 1692, included "134 head of cattle" and "one negro man."

Production of cattle, hogs, and sheep quickly outstripped local consumption and by the late seventeenth century beef and pork were principal exports of the Colony to the West Indies (Ver Steeg 1975:114-116).

The slaughtered meat, once salted, found a ready market in the West Indies where the focus on sugar prevented planters from feeding their slaves. The tanning of the resulting hides supplied additional income (as well as supplying local needs). Moreover, the herds represented a food reservoir, providing a buffer for the colonists themselves.

Weir also comments on the prevalence of cattle raising throughout colonial Carolina, with at least 60,000 head present as late as 1751. He notes, however, that as lucrative as it might be for a few, it was not a source of fortunes for many. In fact, those that prospered during the earliest years, "appear to have done so mainly by the aggressive and simultaneous pursuit of various opportunities" (Weir 1997:142).

Other early eighteenth century economic activity around Charleston focused on naval stores (such as lumber and tar) and Indian trade (prior to 1715) (Fick 1992:10). Weir notes that deerskins paled in comparison to the value of tar and pitch. By 1699 a royal official noted that Carolina was the only source for these commodities in America and in 1705 parliament granted a subsidy for their production (Weir

1997:143). Large amounts were easily produced and shipped from South Carolina.

Clowse provides details on Charleston exports. Deerskins fluctuate widely by year, beginning with 64,488 skins in 1699, dipping to 22,133 the following year and peaking at 121,355 in 1707. The Yemassee War dramatically reduced the trade in 1717 and it took five years for the levels to return to pre-war levels of around 50-60,000 skins.

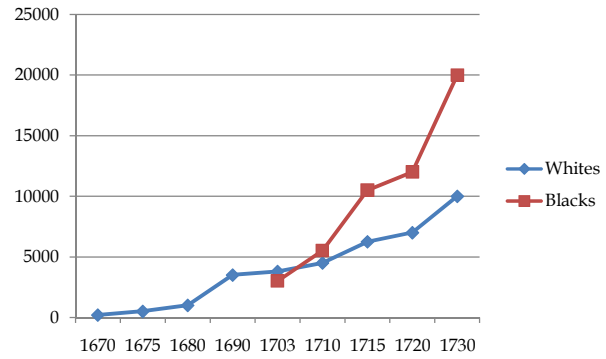


Figure 12. Growth of the African American slave population in Carolina during the early eighteenth century.

The Yemassee War left its mark on Johns Island when a band of Apalachee Indians, allies of the Yemassee, crossed the Edisto and raided as far north as the Stono River in July 1715. About 20 plantations were destroyed before the Indians retreated southward, burning the Pon Pon River bridge behind them (Milling 1969:145, 174).

Two forts were constructed as a result. One was LaRoche's Bridge Fort. It was constructed to guard the bridge (named for nearby planter James LaRoche) that connected Wadmalaw and Johns islands. Situated on Johns Island, just north of where Maybank Highway crosses from Johns to Wadmalaw, the fort was garrisoned from August 1715 to March 1716 (Fick et al 1989:9; Ivers 1970:55). A second fort, known as Stono Bridge Fort, was constructed on John Beamer's (or Beamor) plantation.[2] This fort was also garrisoned from August 1715 to March 1716 (Ivers 1970:74).

By 1720 the naval stores market was glutted. In addition, British ropemakers complained that Carolina tar "scorched" the rope and preferred tar from Sweden. The most significant difference was that Swedish tar was rendered from live or green trees, Carolina tar was taken from deadwood. The Carolina producers refused to change production because of the cost and by 1724 parliament allowed the bounty on naval stores to lapse. Lobbyists for Carolina producers and British merchants succeeded in getting a new, albeit lower, bounty passed by parliament in 1729. Significant quantities continued to be shipped throughout the colonial period (Clowse 1971:Table III).

Development of A Market Economy

Upland rice was the first valuable commodity that the Carolina planters identified. The development and evolution of this crop on interior swamps in the eighteenth century is discussed at length in Trinkley et al. (2003:13-42) and it relied on a complex network of drained and diked interior lowlands combined with interior reservoirs. Beginning about 1720, rice exports climb dramatically, with the price increasing from 5.17 shillings per hundredweight in 1722 to 8.98 shillings in 1750 (Trinkley et al. 2003:33). There were downturns, but overall interior swamp rice brought the first staple commodity to Carolina and created planters of great wealth.

There were, however, consequences. One of these was the dramatic increase in African American slaves during the early

[2] We have found no obvious connection between this individual and the Indian, William Beamer. John Beamer was likely the son of James Beamer, who Baldwin (1985:18) identifies as immigrating to South Carolina in 1682.

colonial period. Although the number of enslaved Africans can't be readily determined prior to about 1703, Figure 12 shows the dramatic rise of the black population beginning about 1710.

This rise in the black population brought increasing concern over the possibility of a slave rebellion. In 1739 this fear became reality with the Stono Rebellion. Lead by the Angolan slave Jemmy, a band of 20 slaves began their rebellion on Johns Island south of the vicinity of the Limehouse Bridge and Chisolm Road (Fick et al. 1989:14). They attacked the Hutchinson warehouse or store, killing the two guards and gaining access to weapons and ammunition (Stono Rebellion National Register of Historic Places Nomination, SCDAH). The band swelled to about 80 slaves marching southward to seek their freedom in Spanish St. Augustine. They were overtaken by the Provincial militia in the vicinity of Parkers Ferry close to the Edisto River crossing. About thirty slaves were killed outright; about the same number escaped, but were gradually captured over the next months and executed. One, however, remained a fugitive for three years.

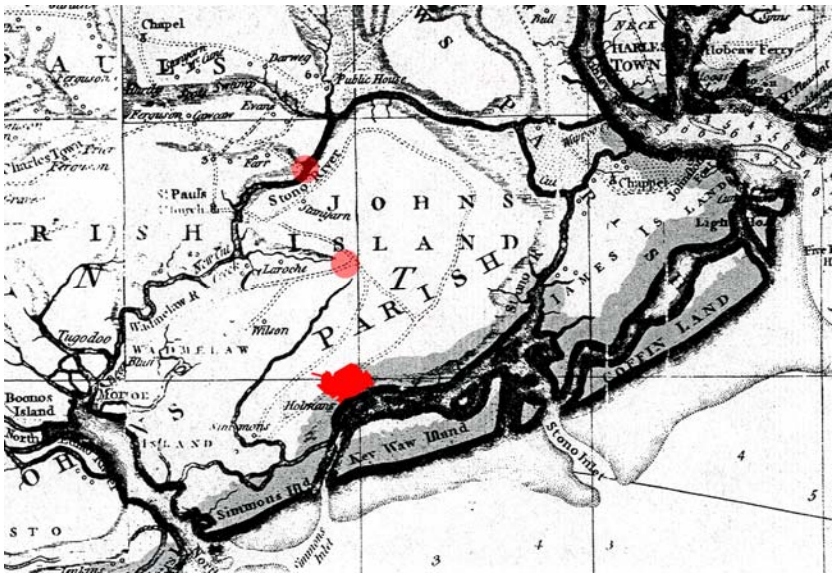


Figure 13. Portion of Stuart's 1780 map showing the vicinity of the two Yemassee War forts and the study tract.

The primary result of the rebellion was the development of a "negro act" that severely limited the privileges of the slaves. African American slaves were no longer allowed to grow their own food, assemble in groups, earn their own money, or learn to read. While some restrictions were in force prior to the Negro Act, the rebellion caused stricter enforcement.

Early experiments with indigo in Carolina were abandoned in the face of West Indian competition. Beginning in the first decades of the eighteenth century, however, Jamaica and the other islands turned to sugar, which was more profitable. Leaving the English dyers without a British supplier, they turned to the French islands. However, about 1740 tensions with France threatened to cut off "French Blue" and Carolina was presented with a second opportunity. This was further buttressed by English bounties that made the production – even given its rather mediocre quality (typically the cheapest "copper indigo" quality) – profitable. South Carolina enjoyed the luxury of this second staple for about three decades before the American Revolution interrupted shipments and the bounty that supported inferior Carolina indigo was lost.

Indigo cultivation was fairly simple. The crop was planted from seed in middle April, with a preference for dry, loose soil typical of "hickory lands and pine barrens." The plant was harvested in late June or early July, immediately after it blossomed, by cutting it off at ground level. This allowed the roots to produce a

second, and sometimes a third, crop before it was killed by frost.

If cultivation was simple, processing indigo was difficult. The plants were hauled to the indigo vats and placed in a steeper made from pine or cypress planks measuring 16 feet square and 3½ to 5 feet deep. The plants were weighted down, covered with water, and allowed to ferment for 10 to 14 hours to remove the dye. The "liquor" was drained off to the wooden beating vats, which were typically 15 feet long, 8 feet wide, and 5 feet deep. There the solution was oxidized by beating. After visible precipitation began, limewater was added from the adjacent lime vat to aid coagulation of the dye. Agitation was continued for about an hour. Afterwards the liquid was drained from the vat and strained through woolen cloth to catch the dye. As Carman notes, "indigo has a very disagreeable smell, while making and curing; and the foeces, when taken out of the steeper, if not immediately buried in the ground (for which it is excellent manure) breeds incredible swarms of flies" (Carman 1939:288 [1775]).

The wet dye was carried to the curing shed where it was pressed to remove as much water as possible and cut into cubes about 2 inches square. It was dried on trays in the shade, then placed in barrels with damp moss, where it was allowed to mold for several days. Afterwards it was brushed off and graded into four categories -- fine blue, ordinary blue, fine purple, and ordinary copper, the least desirable (Copenhaver 1930:895).

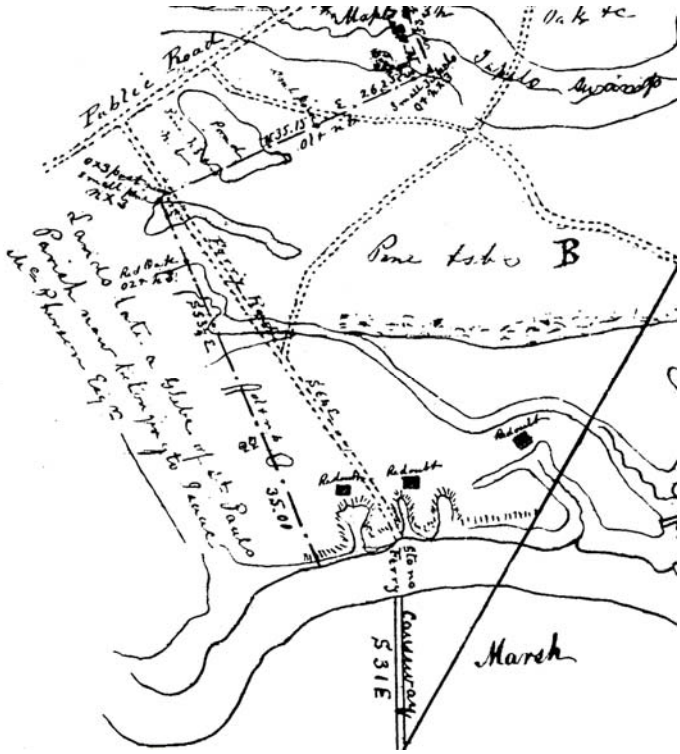


Figure 14. Portion of a 1786 plat showing the three redoubts at Stono Ferry from the 1779 battle (McCrady Plat 6528).

Early Settlement on Johns Island

The earliest warrant for land that specifically mentions Johns Island (called St. Johns Island) dates from 1707 (Salley and Olsberg 1973:640). Fick et al. (1989:8) mention early grants on Johns Island to Thomas Stanyarne (1698), Thomas Weatherly (1707), and Elizabeth Godfrey (1710). Clowse reports that the first land grants for Colleton County, created in 1682, did not occur until 1694. By 1700, the 63 grants known for Colleton totaled 33,635 acres – averaging 534 acres each. Between 1710 and 1719 an additional 151 grants were entered, totaling 71,506 acres. Nevertheless, Mathews comments that in 1680 the land between the Ashley and Stono Rivers to the west was populated fairly thickly (Mathews 1954).

The Holman shown on early maps of Johns Island (see Figure 13) is likely Thomas Holman, who is known to have at least 500 acres by 1718 (SCDAH, Colonial Plat Book (copy series), vol. 12, pg. 171).

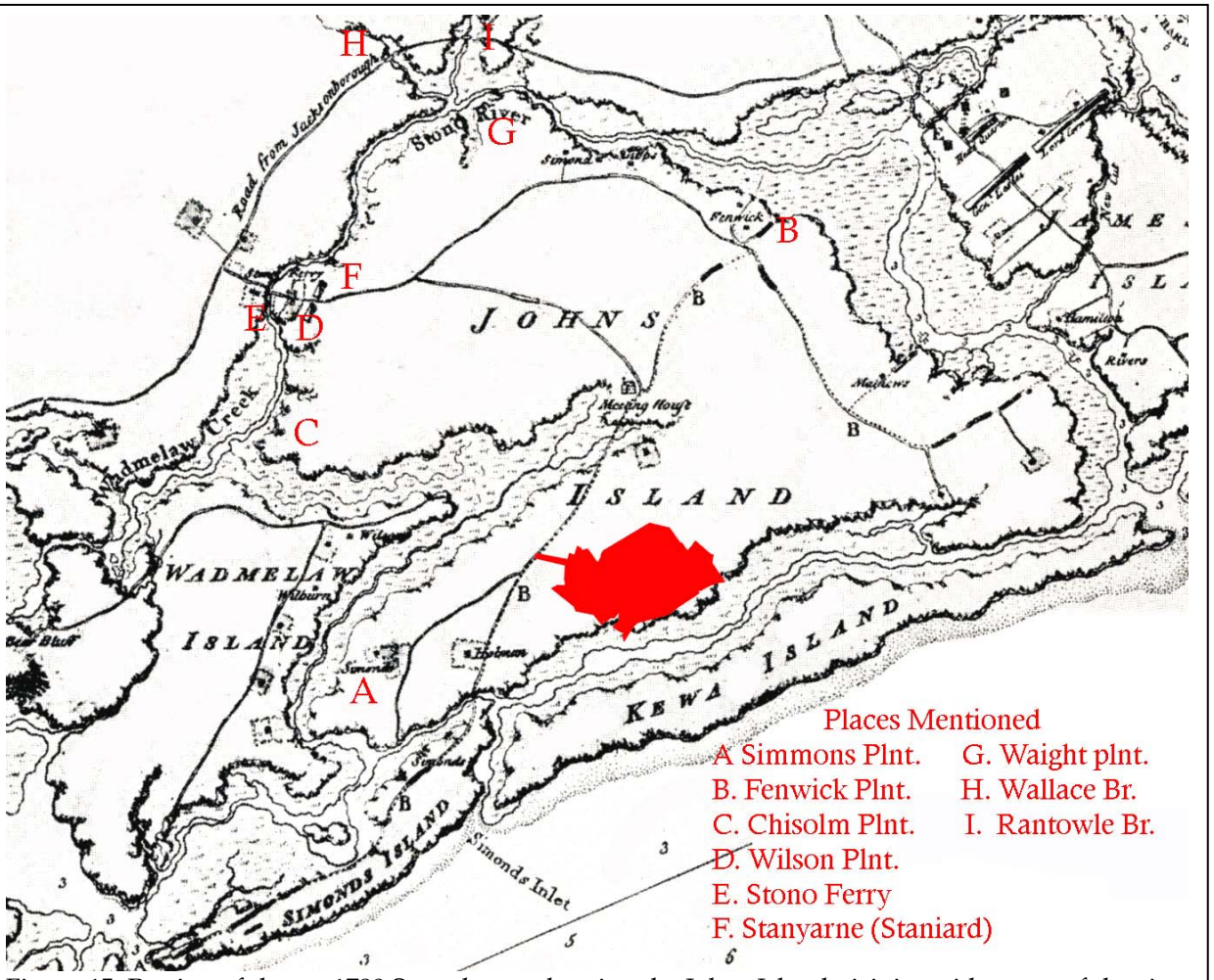


Figure 15. Portion of the ca. 1780 Sproul map showing the Johns Island vicinity with many of the sites mentioned in the British accounts.

The Revolution

After the abortive attempt by the British to take Charleston in June 1776, the American Revolution was largely fought in the North. However, in May 1779, a British Army marched from Savannah to besiege Charleston. On May 10, Augustine Prevost reached Ashley Ferry on the Ashley River about 7 miles north of the city, crossed the river and defeated a small cavalry detachment sent by Francis Marion to delay their advance. The British camped at the Ferry for about two weeks and then marched southward across James and Johns islands to Stono Ferry. During this crossing of Johns Island a number of plantations were burned, including those of Abraham Bosomworth and Robert Gibbes (Fick et al. 1989:17).

Fludd offers a brief mention of a lookout post established by the Johns Island planters on Chaplin's Point on the Kiawah River, near the Stono Inlet (Fludd 1886:81). There do not, however, appear to have been any fortifications at this point.

The bulk of the British forces crossed the Stono and continued along the coast to Beaufort. Prevost, however, left about 900 troops at a series of three redoubts that were enclosed in an

abatis on the eastern shore.[3] American general Benjamin Lincoln mounted an attack on June 20. He was able to obtain only 1,200 men, mostly militia units that were unable to match the resolve and discipline of professional soldiers in a defensive position. The battle lasted only an hour and half. During that time the two forces were within easy killing range of one another – less than 60 yards. The British lost 26 killed and 103 wounded. The American forces suffered 34 killed, 113 wounded, and 18 missing.

Lincoln realized that he would be unable to force the British out and retreated to Charleston. Their mission of shielding Prevost's retreat accomplished, the British forces broke camp and also marched to Beaufort, arriving there on July 8, 1779 (Morrill 1993:53-54). Lincoln put a positive spin on the campaign, writing to Governor Rutledge, "Our men now see that little is to be feared either from musquetry or field pieces; they are full of spirit, & are sure they can beat the enemy on equal grounds at any time" (Mattern 1995:74). Ramsay, however, observed that, "immediately after this attack, the American militia impatient of absence from their homes returned to their plantations" (Ramsay 1990:446 [1789]).

In the fall of 1779 the combined American and French armies failed to liberate Savannah (and Georgia) from Prevost. The heavily fortified British suffered relatively few losses. The American forces, however, lost nearly a fifth of the entire allied army (Morrill 1993:64). If this wasn't bad enough, it laid the groundwork for the second Royal invasion of South Carolina.

On December 26, 1779 Sir Henry Clinton debarked from New York with a British armada of 90 transports under Admiral Marriot Arbuthnot. After briefly anchoring off the Georgia coast to make repairs and final preparation, the fleet set sail for the North Edisto River on February 11, 1780. They arrived off Simmons (today's Seabrook) Island the evening of the 11th and began putting troops ashore, with the process not completed until the following day. Those disembarking included English grenadiers and light infantry under General Leslie, Hessian grenadiers, a Jäger detachment, and the 33rd Regiment.

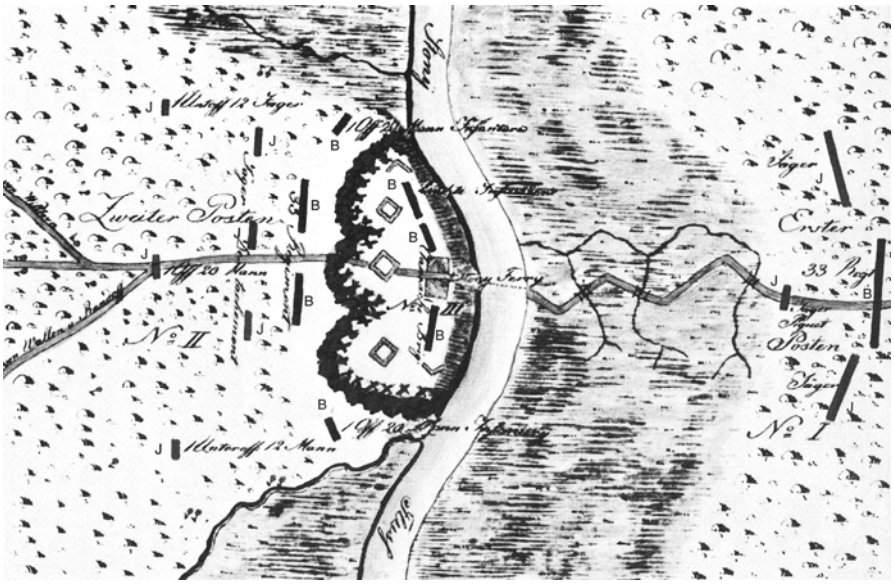


Figure 16. Plan of Stono Ferry in 1780 (Tustin 1979). J = Jäger Corps, B = British troops.

One account reports that,

> towards ten o'clock the troops set out through a pathless and marshy wood, which continued

[3] These redoubts and their associated archaeological remains were destroyed by development of Stono Ferry Plantation at the north side of the ferry, opposite Johns Island, in 1985. No archaeological study was conducted.

> with the greatest difficulty until five o'clock in the evening. A path often had to be cut through the bushes with axes and bayonets in water up to the waist.
>
> By this time we reached a prepared road and discovered a plantation, from whose owners this island had derived its name (Tustin 1979:196)

Another diarist, Captain Johann Hinrichs, reported that Simmons Island "is a part of Johns Island, desolate and salty, and full of cabbage trees" (Ulhendorf 1938:181). This account also remarks on the dense thickets, marshy conditions, and "impenetrable woods where human feet had never trod!" (Ulhendorf 1938:183). A third account by General Von Huyn reported, "All the white inhabitants were on their way to the city with their guns, arms, and ammunition, leaving behind their wives and children, as well as their Negroes" (Ulhendorf 1938:371).

Some of the troops continued, crossing over onto Johns Island, where they took camp,

> The jäger detachment and the 33rd Regiment . . . occupied a road leading to Stono Ferry . . . the remaining troops encamped on Simmons Island.
>
> At midnight we had to move forward over a mile to Wilson's plantation, where the landing place for the provisions and baggage ships was situated. We had nothing but stinking water in this area (Tustin 1979:196).

In addition to his diary, Ewald also wrote at least one letter that describes these events. He adds that on February 13 and 14 the armies advanced to Stono Ferry, as well as to the houses of Chisolm and Fenwick. On the 16th part of the army crossed the Stono at what he called White's house, probably the settlement of Abraham Waight, while the remainder crossed at Stono Ferry. They occupied the old redoubts constructed the year before. Additional troops cross over to James Island from Fenwick's plantation (Ulhendorf 1938:27). Other accounts suggests that the British crossed the Stono at a variety of other locations, including "Sucky Staniard's" and landing at "Ingles' plantation on pleasant, rising ground" (Ulhendorf 1938:187). Additional troops camped at William Ashley's plantation on Johns Island, where they were joined by the 71st Scottish Regiment (Tustin 1979:203). In February 1780, Captain John Peebles of the Scottish Grenadiers, was briefly headquartered at the Simmons estate, "a large Plantation and house" (Gruber 1998:339) at the south tip of Johns Island, the former home of James Simmons (d. 1775) and his wife Ann Holmes (d. 1773). Francis Simmons (ca. 1765-1814), the heir to the property, had been sent abroad by his trustees for his safety and education. Peebles mentioned two other Johns Island landmarks, describing Headquarters (Fenwick Hall) as "a large modern house with offices" and the nearby Gibbes House (Peaceful Retreat) as "a good house on the bank of Stono River" (Gruber 1998:339).

For their part, the few American forces present retreated toward Charleston using Wallace's and Rantowle's bridges, destroying them both after crossing (Ulhendorf 1938:187). The British appear to have been proceeding slowly, at least in part because of the "horses, cattle, and Negroes" that they had removed from plantations. In fact, a portion of the British forces remained on John's Island and Hinrichs' diary comments that daily foraging parties scoured the island, "thus great quantity of livestock has been driven in" (Ulhendorf 1938:197). In fact, the British spread out, raiding plantations on Wadmalaw (Ulhendorf 1938:199). Hough reported that "Major Hay and Captain Moncrieff are appointed Commissaries of all captured Goods, and the Troops are amply

supplied with fresh Provisions and Rice by them" (Hough 1867:37). At least some plantations – like the Vanderhorst house on Kiawah – were burned during the British advance on Charleston (Trinkley 1993:57). Even the Anglican church on Johns Island was not spared. The assessment was bleak, "not a door, window, shutter, or pew to be seen, a large part of the floor missing, aisle pavement in many places destroyed" (quoted in MacCallum 1970:12).

The accounts reveal that a number of British fortifications dotted the area surrounding Charleston. For example, two are noted at Peronneau's house at the Wappoo River (on James Island, just south of the better known McLeod plantation) which were "heavily fortified." At least two redoubts were constructed at Fenwick's Point on Wappoo where nine 32 pounders were put into position (Ulhendorf 1938:375, 379). [4]

By March 29, 1780, Clinton had moved from Johns to James Island, occupied Fort Johnson, crossed the Wappoo Cut, and arrived at Drayton Hall, about 7 miles northwest of Charleston. The British navy with its 216 guns had blocked Charleston harbor. On April 10 Clinton called on Lincoln to surrender Charleston; Lincoln refused. Rather than retreat, the patriots continuing sending troops into Charleston; in fact civil officials in Charleston threatened to help the British destroy Lincoln's army should he attempt to flee the city (Morrill 1993:70). The Charleston battle lasted one evening, May 9, and on May 12 Lincoln surrendered, allowing Clinton to capture 5,466 armed troops, 391 artillery pieces, 5,916 muskets, 33,000 rounds of small arms ammunition, over 8,000 rounds of shot, and 376 barrels of powder. Charleston – and the surrounding countryside – was held by British forces for the next 2½ years.

Clinton issued a proclamation allowing his troops to seize "all such Valuable Property as shall be found belonging to any person in Rebellion" for the armies' use. He declared all unoccupied property to be forfeited under the assumption that if the owner had fled, he must have been fighting against the Crown. Brannon notes that one British captain remarked that the local population "hated us from the bottom of their hearts because we carried off their belongings" (Brannon 2007:37).

On September 16, the British announced that the real and personal estates of 83 "wicked and dangerous traitors" would be sequestered. It was seen by the conquerors as "both just and expedient" that the property of those defying the King should be used to put down the revolution.

When these names(McCowen 1972:153-154) are compared to those offered by Jordan and Stringfellow (1998:237) as residing on Johns, Seabrook, Wadmalaw, and Kiawah islands, the only certain matches are those of Arnoldus Vanderhorst on Kiawah and William Gibbes on Johns Island.

This does not mean, however, that the British were the masters of South Carolina. The active war shifted to the upstate, but American raids in the low country continued. At first the British sought to bring Loyalist estates back to productivity. They found that most were so damaged by war that their productivity was low. As the frequency of raids increased, the British abandoned many of these plantations. The British also abandoned efforts to ship goods overland and used heavily armed boats instead. Eventually even this effort proved useless (Cruden 1890:13; McCowen 1972:94).

When Charleston was finally abandoned by the British in December 1782, McCowen estimates that of the 9,127 civilians, over 5,000 were African Americans. He observes, "this loss of manpower at a critical period of reconstruction greatly undermined the economy" (McCowen 1972:109).

[4] These fortifications have never been identified archaeologically.

The Jacksonboro Assembly, meeting in January 1782, approved the confiscation and amercement of various properties. The Confiscation Act was directed toward those who were British subjects or steadfast Loyalists. Based on the official lists, 239 Loyalist estates were confiscated. In contrast, amercement was directed toward those who had wavered in their allegiance, but had repented and taken a loyalty oath. Again based on the published lists 47 estates were amerced at 12% of their value (McCowen 1972:135-137). However, it has been shown that these lists are incomplete and there were at least 400 estates either confiscated or amerced (Brannon 2007:172).

Table 2
Population and Wealth in St. Johns Colleton in 1860

	Acres	White Population	Slaves	No. of Slave Owners	Average No. Slaves per owner	Value of Real Estate	No. Reporting	Average Value of Real Estate	Value of Personal Estate	No. Reporting	Average Value of Personal Estate
Johns Island	48,605	129	2,346	62	38	$594,500	34	$17,485	$1,796,203	36	$49,895
Edisto	38,447	301	4,506	123	37	$2,246,850	50	$44,937	$4,585,285	75	$61,137
Wadmalaw	27,433	190	2,800	80	35	$720,500	39	$18,474	$2,137,811	46	$46,474

At least five Johns Island planters were affected. Richard Russell Ash, Alexander Chisolm, John Freer, William Sams, and John Wells all petitioned the Assembly requesting relief from amercement. Chisolm and Freer were even able to provide petitions from other residents on Johns Island in support of their requests. In Freer's case the petitioners explained that they knew "of no Act that he has Committed whereby to deserve, Amercement, unless his having taken British protection" (SCDAH, Petitions to the General Assembly, 1783).

After the Revolution a number of citizens came forward with claims for supplies, service, loans, and other issues. At least 14 of those reported to be on Johns Island by Jordan and Stringfellow (1993:237) appear to have submitted claims (Ravill 1941).

Recovery and the Antebellum

The period from 1790 through the early 1800s was one of reorganization and expansion. Indigo was no longer a profitable crop, although rice continued to be the gold upon which much of the low country was built. Gradually, however, cotton came to replace indigo, although it too was based on specialization in the production of a staple crop using slave labor. As Coclanis notes, "such specialization, under prevailing market conditions, generally proved highly profitable to those individuals in both the low country and in Europe with capital directly involved in the production or distribution of such staples" (Coclanis 1989:130).

Cotton planting spread throughout the south after the Revolution, encouraged by improvements in ginning machinery (the best-known being Eli Whitney's wire-toothed saw gin, patented in 1794). Sea Island cotton, a distinct type characterized by its long staples and black seeds, became the pre-eminent crop on Johns Island. Unlike the more common upland green-seed cotton, distinguished by its short fibers, Sea Island cotton was not ginned with Whitney's machine. Its long fibers required planters to continue using the traditional roller gins usually in the form of slave-powered foot gins. Only in the 1850s, with the development of the improved Fones McCarthy gin, did mechanical equipment become popular (Porcher and Fick 2005:221).

Sea Island cotton was developed on the Georgia Sea Islands in about 1785, and in 1790 William Elliott grew South Carolina's first commercial crop on Hilton Head Island. By the

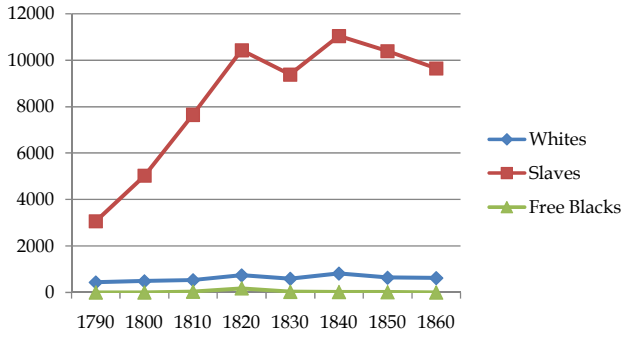


Figure 17. Comparison of white, slave, and free blacks on Wadmalaw, Edisto, and Johns islands (St. Johns Colleton) between 1790 and 1860.

early 1800s, several planters, notably Kinsey Burden of Johns Island, had developed improved strains that commanded the highest prices on the European market (Porcher and Fick 2005: 95-96).

The new emphasis on cotton dramatically changed the area's racial makeup. Figure 17 shows that African American slaves – other than a slight dip in 1830 (perhaps the result of the crash of cotton prices in 1819), steadily increased in numbers, from 3,065 in 1790 to their peak in 1840 at 11,044. There was a slight decline in slaves after 1840, with St. Johns Colleton containing 9,652 slaves at the eve of the Civil War.

In contrast, the white population increased from 433 to only 819 in 1840, declining in St. Johns Colleton to 620 in 1860. The free black population in the district was small – peaking at 179 in 1820, then declining to only four in the 1860 census. In spite of the fluctuation in raw numbers, the proportion of black slaves to whites steadily increased from 7:1 in 1790 to 16:1 in 1830. This ratio held fairly stable until the Civil War.

We are able to obtain an even better view of slave holding on the islands that compose St. Johns Colleton when we look at the 1860 census. Johns Island was the most heavily populated by African Americans – with 2,346 slaves and only 129 whites, the ratio was 18:1 compared to the 15:1 found on both Wadmalaw and Edisto. While the difference in average slave holds between Edisto and Johns Island is not significant, owners on both islands held more slaves than did those on Wadmalaw.

The wealth of the Edisto planters is clearly revealed by their reported real estate holdings and personal estates. Johns and Wadmalaw islands come in distant second and third whether total value or average value is considered. Farm values on Wadmalaw were slightly greater than those on Johns Island, but the personal estate value was higher on Johns Island.

There are other changes in the district over time. For example, the 1840 census indicates the importance of agricultural pursuits – there are only 12 individuals enumerated that did not list their occupation as planter. All 12 were classified as "learned professionals,"

Table 3.
Occupations in St. Johns Colleton District from the 1850 and 1860 Federal Census

	1850		1860		1860 Johns Island		1860 Edisto Island		1860 James Island	
	No.	%	No.	%	No.	%	No.	%	No.	%
Planter	82	58.6	88	65.7	23	76.7	35	53.8	27	36.5
Farmer									7	9.5
Physician/Dentist	14	10.0	7	5.2	2	6.7	3	4.6	4	5.4
Overseer	12	8.6	12	9.0	1	3.3	10	15.4	9	12.2
Clergy	7	5.0	7	5.2	1	3.3	4	6.1	3	4.0
Lawyer									2	2.7
Carpenter	7	5.0	1	0.7			1	1.5		
Factor									1	1.4
Storekeeper	5	3.6	5	3.7			2	3.1	2	2.7
Blacksmith	3	2.1	1	0.7			1	1.5		
Clerk	3	2.1							3	4.0
Nurse			3	2.2			2	3.1		
Butcher	2	1.4								
Laborer	2	1.4							3	4.0
Boat Builder			2	1.5			2	3.1		
Mechanic			2	1.5	2	6.7	2	3.1	3	4.0
Seaman	2	1.4							2	2.7
Teacher	1	0.7	5	3.7	1	3.3	2	3.1	2	2.7
Mantua Maker			1	0.7			1	1.5		
Other									6	8.1
	140		134		30		65		74	

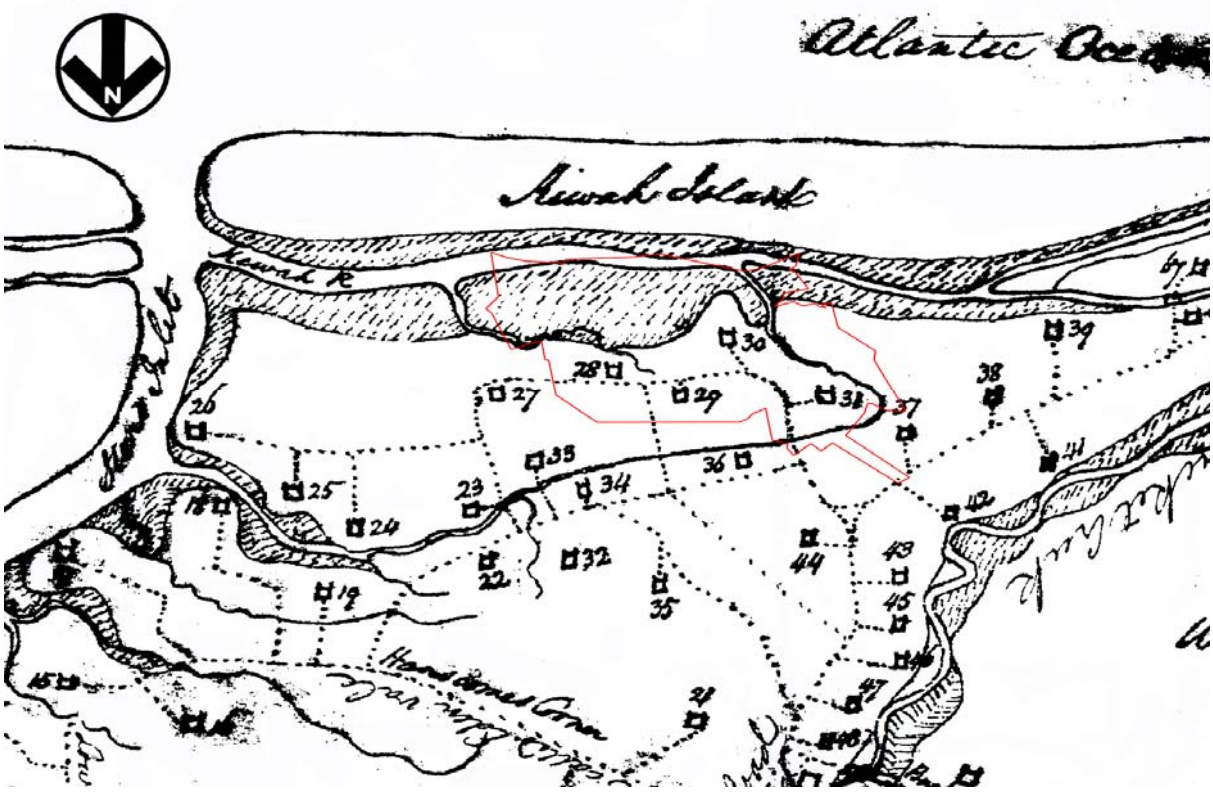


Figure 18. Portion of the ca. 1819 Kinsey Burden map of Johns Island, showing the project vicinity.

probably physicians and ministers (Johns and Edisto islands both had two year-round churches). Most, however, were also planters.

The 1850 and 1860 data are more revealing since they provide occupations. These are shown in Table 3. Although the category of physician continues to be prominent, it is clear from the census data that many of these physicians were also very successful planters. The quantity of overseers enumerated remains constant, as does the number of clergy and storekeepers or merchants. The number of teachers increases from 1850 to 1860.

Interestingly, we find three young Irish women in planter households with occupations listed as nurse, a task typically assigned to African American slaves. In England the nurse was not uniformly regarded, with many accused of drunkenness, thievery, and licentiousness. They were typically drawn from the working class and were domestic servants rather than medical staff (Olsen 1999:264). The mantua maker seen in 1860 was a mulatto woman living on Edisto Island. While this trade was common in cities such as Charleston, it seems uncommon on the islands where sewing was done by both plantation mistresses and slaves alike.

For the 1860 census we can separate out occupants on Johns Island and we get the impression that this island was more rural – or at least more agrarian – than other nearby islands. The community was composed almost exclusively of planters, with only two physicians, one clergyman, and one teacher. The proportion of overseers was also considerably lower, suggesting that more of the land owners either tended their own lands or used slave drivers. When we compare Johns Island to neighboring Edisto and James islands, we do notice that proximity to Charleston no doubt played a role. Edisto, which was further

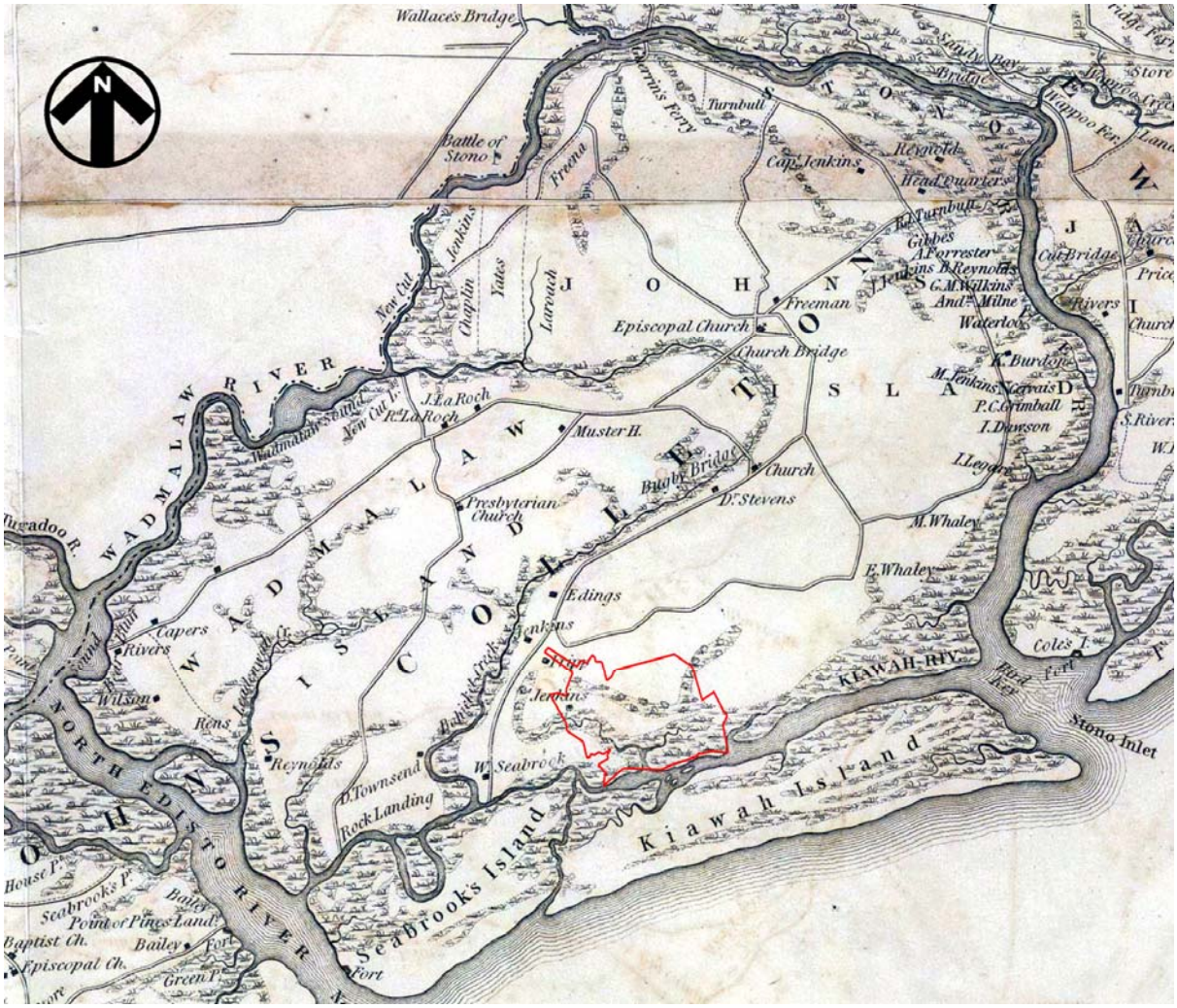


Figure 19. Portion of Mills' Charleston District showing Johns and Wadmalaw islands, and the study tract. Jenkins is not in the study tract, indicating some distortion in mapping.

removed from Charleston than Johns, had a lower proportion of planters and greater range of occupations.

The War of 1812 left little impact on St. Johns Colleton, although two fortifications were constructed in the area – one on the north end of Kiawah (shown on the 1822 "Map of South Carolina," by John Wilson) and another on Cole's Island. These two batteries were intended to maintain control of the Stono and Kiawah rivers, preventing British forces from repeating their Revolutionary War land assaults on Charleston. Mistakenly referred to in later years as a "tabby" fort, the Kiawah fortifications were little more than piled up shell embankments in the hard marsh at the edge of the river. The fortification was connected to the island's high ground by means of a causeway.

The ca. 1819 Kinsey Burden map and the 1826 Mills' *Atlas* provide two early antebellum views of the area. The Burden map must be viewed cautiously since it is uncertain if each numbered square designates a dwelling or if some may simply represent property owners. However, the map does provide us with a view of the island, showing 66 listed owners, as well

as the island's road system. The map must be seen as schematic since the shape of the island is significantly distorted.

In the vicinity of the study tract, Burden shows four owners: Hugh Wilson, B.D. Roper, S. Witter, and James Legare (from east to west).

Mills' map of Charleston District is more topographically correct and many of the same owners are shown. Mills' placement of these owners, while similar to Burden, is somewhat different. Thus, on Figure 19 we see that Jenkins and Fripp are both in the approximately correct locations, except that Jenkins has been shifted eastward. We know from detailed title examination that Jenkins was not an owner of the Mullet Hall tract. It is important to carefully interpret Mills' placement of properties. With Jenkins disposed of, we see that Mills fails to show any of the owners on the study parcel in the early antebellum. Although Mills does not show the Kiawah fort, he does show the Cole's Island fort. He also shows the two fortifications guarding the North Edisto – one on Seabrook and another close to Point of Pines on Edisto Island.

Speaking of the district as a whole, Mills explained that while rice and indigo were the staple crops of the eighteenth century, indigo lands, "being suitable for raising cotton" had been abandoned in favor of cotton, "being equally productive [and] being safer culture, both in regard to health and certainty of crops" (Mills 1972:389 [1826]). It may be that "certainty" was a euphemism for profitability, since by this time indigo was virtually extinct in South Carolina (Gray 1958:2:610-611).

While rice was still being grown, Mills suggests that many planters were turning their banked lowlands over to the cultivation of cotton, as well as "corn and pulse [legumes such as beans and peas] of various kinds" (Mills 1972:387 [1826]).

Mills explained that Charleston's sea islands had a "delightful" climate in the winter and spring. In the summer months, however, planters were obliged to "retire to the seashore, to enjoy the breezes of the ocean." Otherwise, the summer and autumn brought "bilious fevers and dysenteries" (Mills 1972:473 [1826]). Summer villages, such as Edingsville and Johnsonville, were developed all over Charleston District. Fick briefly mentions Rockville on Wadmalaw Island and Adams Run on the South Edisto (Fick 1992:30). Legareville was the retreat for Johns Island planters after 1838. Before that time it is suggested that planters erected summer cottages close to salt water, where mosquitoes were less common. Elias Vanderhorst on nearby Kiawah Island was routinely building a small house on the beach for a summer residence by at least the 1820s (Trinkley 1993:48-49), and the pattern of building "seashore houses" has been well documented on Waccamaw Neck (see Hobcaw Barony NRHP nomination, SCDAH, Columbia).

On nearby James Island, the plantation known today as McLeod was advertised for sale by the Estate of Mrs. Sarah P. Parker in 1850. On the tract was a dwelling house with outbuildings, accommodations for 90 slaves, and a "summer settlement" (advertisement in *Charleston Courier* beginning December 1850). Although the village of Rockville was well-established on Wadmalaw Island in 1851, when Benjamin S. Whaley bought Red House Plantation, the property description noted that the tract was bounded "east by William C. Bailey's summer residence and Bohicket Creek" – indicating that summer residences were still present. We even note their occurrence in Prince William's Parish. William Fripp's claim to the South Carolina State Auditor for losses during the Civil War included not only his winter residence, valued at $1,500, but also his summer residence, valued at only slightly less – $1,200 (SCDAH, Comptroller General/ State Auditor, Claims of property loss due to the enemy).

Although silent concerning Johns Island, Mills does provide a detailed discussion of Edisto, noting that like the rest of the district, indigo lands had been uniformly devoted to cotton and that the Edisto area was a poor producer of rice. Edisto lands sold for $30 to $60/acre. Mills commented that,

> The proximity of the island to Charleston, affords the planters an opportunity of disposing of the various productions of their plantations to advantage. They do not, however, in every case, make the most of these (Mills 1972:473 [1826]).

It would take another hundred years for the islands to turn to truck crops. He also mentions that the islands were major producers of sweet potatoes, with an acre typically producing about 300 bushels (Mills 1972:480 [1826]). On the other hand, he observed that Irish potatoes "are not planted in any quantity or extent" largely because "the negroes are averse to their use, and can hardly be prevailed upon to receive them as a substitute for the sweet potato" (Mills 1972:481 [1826]). The most common standing provision, however, was corn, with an acre producing between 15 and 25 bushels.

Mills also mentioned, for both the district and Edisto, that while the roads were in generally good condition most transportation was by boat except for travel on each island. Barely a decade before William Seabrook's inter-island steamboat, Mills notes that for Edisto,

> the islanders carry on their intercourse altogether by water. In transporting themselves, and the productions of their plantations to Charleston, &c they use boats made after the canoe models. These boats are built of cypress, and other curable materials; and are well adapted to the purposes of inland navigation; but ill calculated for encountering heavy seas., They are of various dimensions, from half a ton to six tons burden, and cost from one hundred to one thousand dollars. There are five or six workmen advantageously employed in constructing and repairing these boats [two were specifically mentioned in the 1860 census] (Mills 1972:476 [1826]).

Beyond these general observations, it is difficult to obtain good agricultural statistics for the early antebellum since published data has been merged by district. This blurs distinctions between areas such as Christ Church and Johns Island. For example, in 1860 the average value of Johns Island plantation was nearly $14,000, while a Christ Church plantation had an average value of less than $8,000. Edisto plantations had an average value of over $44,000. Consequently, we tabulated the agricultural census data for St. Johns Colleton. For 1860 it was possible to further refine the data, breaking St. Johns into Johns, Edisto, and Wadmalaw islands. James Island (St. Andrews) is also listed for comparison. These data are shown in Table 4.

For Charleston district as a whole, the number of farms increased by a mere 3% between 1850 and 1860 and acreage actually decreased (improved acreage by 30% and unimproved by 8%). The average farm value in 1850 was just over $7,100, declining by about $700 to $6,420 in 1860 – still significantly less than farm values in either Christ Church or Johns Island (in contrast, the average plantation value in St. James Goose Creek was only $3,007). This indicates that while there were pockets of very productive – and valuable – farm land in Charleston, there were also very modest farms on less than spectacular soils. On the other hand, we see that the value of farm implements per farm increased by 25% in the decade between 1850 and 1860. This suggests that the Charleston

Table 4.
Agricultural Census Data for Charleston District, 1850-1860

		Land Occupied or Improved						Livestock						
		Farms	Acres improved	Acres Unimproved	Value of farm	Value of farm (2006$)	Value of implements	Horse, asses, mules	Milch cows	Working oxen	Other cattle	Sheep	Swine	Value of livestock
Charleston	1850	786	183,236	636,056	5,599,093	147,344,542	265,377	5,023	14,887	2,482	24,564	13,415	30,247	663,250
St. Johns	1850	104	55,652	46,617	1,917,550	50,461,842	90,871	1,136	4,126	714	3,207	3,304	3,790	137,350
Charleston	1860	810	127,194	584,739	5,202,502	130,062,550	332,808	4,360	9,863	967	17,990	10,849	39,741	912,399
St. Johns	1860	132	63,183	175,010	3,559,010	88,975,250	111,972	1,239	3,725	1,039	4,531	4,303	5,014	294,511
Wadmalaw	1860	40	16,441	9,814	801,200	20,030,000	18,760	353	904	162	1,174	1,017	1,087	72,835
Edisto	1860	49	27,361	150,754	2,164,910	54,122,750	75,053	553	1,733	639	2,423	2,062	3,457	149,446
Johns Island	1860	43	19,381	14,442	592,900	14,822,500	18,159	333	1,088	238	934	1,224	470	72,230
Charleston Neck	1860	70	1,269	1,346	536,500	13,412,500	12,475	146	97	-	32	1	295	21,845
St. Andrews	1860	71	18,547	28,814	889,375	22,234,375	58,900	511	1,888	71	705	879	1,457	107,540

		Agricultural Products												
		Rye & oats, bu	Corn, bu	Rice, lbs	Cotton, bales	Wool, lbs	Peas & beans, bu	Irish potatoes, bu	Sweet potatoes, bu	$ Orchard Produce	$ Garden Produce	Butter, lbs	Hay, tons	Value animals slaughtered
Charleston	1850	40,664	416,577	16,906,273	7,757	18,636	77,673	7,728	657,172	-	-	104,847	2,440	97,084
St. Johns	1850	2,070	97,840	1,205,670	3,536	4,062	13,482	160	158,200	-	-	21,856	-	18,998
Charleston	1860	14,218	383,316	18,899,512	6,381	19,381	52,456	28,144	323,042	5,009	106,213	54,068	13,551	185,304
St. Johns	1860	280	102,666	1,500,000	4,265	16,297	15,894	2,135	223,858	500	4,900	29,860	2,665	132,104
Wadmalaw	1860	-	31,425	-	1,053	4,405	5,320	200	43,050	-	-	7,180	898	6,060
Edisto	1860	280	44,961	1,500,000	2,208	7,424	7,774	335	122,280	500	-	13,320	1,152	8,184
Johns Island	1860	-	26,280	-	1,004	4,468	2,800	1,600	58,528	-	4,900	9,360	615	117,860
Charleston Neck	1860	-	3,795	-	3		170	22,934	3,686	-	64,295	-	517	10,000
St. Andrews	1860	1,630	44,021	215,350	929	855	6,330	11,897	51,990	800	32,200	12,050	1,335	4,920

planters were active in seeking to maximize the profits from land that had been in cultivation for generations.

Cattle and milk production declined over the period, although the value of the county's livestock increased by nearly 38%. Given the decline in cattle and sheep, this increase must be attributable to swine and horses. However, even the value of animals slaughtered countywide more than doubled, and horsed were not valued for slaughter.

Turning to crops, the decline from 1850 is dramatic. Cotton production was down by 18%, peas by 33%, and sweet potatoes by 49%. Corn production was the bright spot – it was down by only 8%. The decline in cotton production may be related to the spike in prices – from 27.8¢/pound in 1850 to 47.0¢/pound in 1860. In an 1826 letter from Johns Island planter Kinsey Burden to Whitemarsh Seabrook, Burden explains that the island's soils were "partly of a low, heavy loam and sand, on a clay foundation, and partly high brown mould on sand and clay" and that his favorite manure was a combination of "salt mud, salt marsh, and the compost of salt marsh and rushes combined with animal manure." Using this combination his average crop was about 98 pounds of cotton per acre (Seabrook 1826:27-30).

Production of the other staple, rice, increased by nearly 12% in Charleston District. The price of rice, however, declined from 3.4¢ to 3.2¢/pound (Gray 1958:2:1027, 1030-1031).

In 1850 St. Johns (composed of Edisto, Wadmalaw, and Johns islands) consisted of 104 enumerated farms – 15% of the total in Charleston District. These plantations, however, account for over 43% of the tilled land in the district and over half of the farm value. We find 30% of the horses and mules, 38% of the milk cows, 40% of the oxen, nearly 33% of the sheep, and 26% of the livestock value in this parish. Only cattle and swine are proportionate to the number of farms.

Looking at agricultural production, St. Johns produced nearly 84% of Charleston's cotton, 30% of the corn, and 32% of the sweet potatoes. Only 8% of the district's rice was produced in St. Johns Parish, however.

Between 1850 and 1860 there were significant changes. While the number of farms increased district-wide by about 19% (although improved acreage remained flat), the enumerated farms in St. Johns increased by 27% (with the improved acreage increasing by 13%). The value of the farms in St. Johns increased by 86% (this is about a 76% increase when inflation is factored in). The value of farm implements did not keep pace with the value of land, but there was still an increase of about 23% (in addition, the most valuable – and costly – farming "implements" were the enslaved African Americans who are not included in this tabulation).

Table 5.
Agricultural Wealth Comparisons, 1860

	$ Value/ Improved Acre	$ Average Value/Farm	$ Value Livestock/Farm	Acres per bale Cotton	Acres per bu Corn
Charleston	40.90	6,422	1,126	19.93	0.33
St. Andrews	47.95	12,526	1,515	19.96	0.42
St. Johns Colleton	56.33	26,962	2,231	14.81	0.61
Edisto Is.	79.12	44,182	3,050	12.39	0.61
Johns Is.	30.59	13,788	1,680	19.30	0.74
Wadmalaw Is.	48.73	20,030	1,821	15.61	0.52

The quantities of livestock in St. Johns Colleton did increase between 1850 and 1860 – horses and mules by 9%, oxen by 46%, cattle by 41%, sheep by 30%, and swine by 32%. In fact, only milch cows declined (by 10%) and in spite of this decline, butter production rose by nearly 37%. The increase in numbers alone, however, does not seem to account for livestock value more than doubling. As both McGaw (1984) and Gray (1958:2:856) note, livestock breeding advanced during the late antebellum. Gray suggests that major advances coincide with the cotton depression of the 1850s. Thus, we believe that, at least in part, the increased value may reflect improved breeds.

Agricultural production also increased in St. Johns Colleton, following the county-wide trend. While improved acreage increased by a modest 13%, cotton production increased by 21%, corn increased by 5%, pease by 18%, and sweet potato yields increased by 41%. Even Irish potatoes saw a 13 fold increase. The production of hay in St. Johns Colleton in 1860 was greater than the yield of all of Charleston County in 1850. Only oat production fell.

The 1850 census shows that St. Johns was a very wealthy parish. Much of this wealth, however, was concentrated on Edisto Island and this becomes clear when the more refined 1860 census is examined (Table 5). For St. Johns Colleton, Edisto has the highest value per improved acre and highest average farm value, Johns Island has the lowest. This same trend is found in the value of livestock on the three islands. Edisto also produced the most cotton on the fewest acres – Johns Island took the most acreage. Only in acres per bushel of corn did Edisto come in second to Wadmalaw – with Johns Island still ranking third. Johns Island compares best to St. Andrews Parish (which includes James Island).

The 1860 census also enumerates eight tracts totaling 53 improved acres (average of 7 acres) and 8 unimproved acres. No individual owned more than 24 acres and most owned 4 or less acres. Three tracts had no value listed; the remainder were valued at $29,000, with an average value of $5,800. Only three listed livestock – horses, mules, and (primarily) milch cows – although three others listed significant values for slaughtered animals – $35,000 to $40,000. Three showed production of Irish potatoes, one a very small quantity of sweet potatoes, two produced hay, and four reported yields ranging from $300 to $3,000 worth of garden produce.

Of the eight owners, seven could be found in the 1860 census. Four lived in the 7th Ward, two lived in the 5th, and one lived on the neck – none appear to have lived on Johns Island. The occupations included a policeman, butcher, four farmers, and a salesman. Five of the seven owned slaves. Although three owned only one slave each, one person – the butcher,

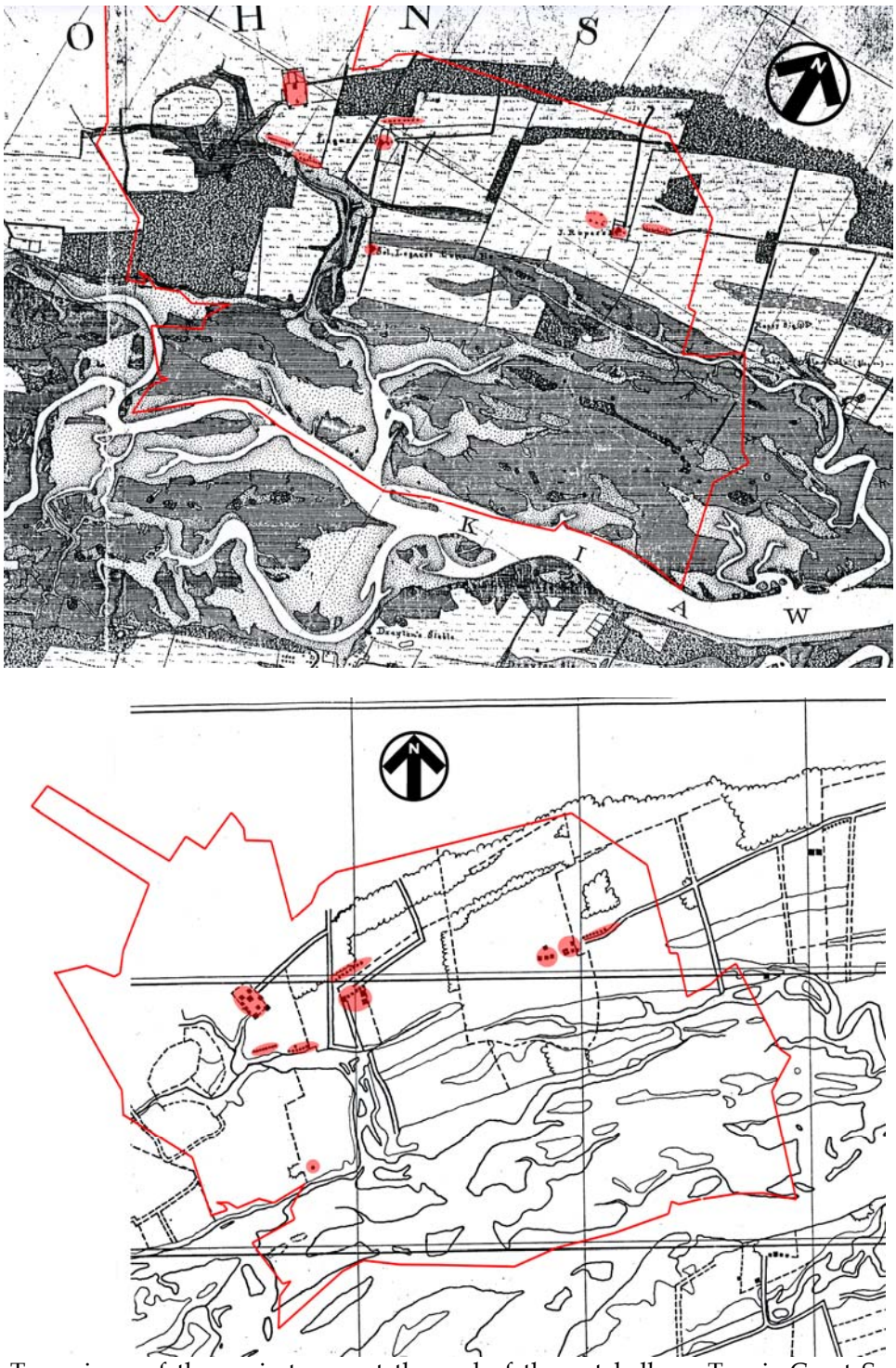


Figure 20. Two views of the project area at the end of the antebellum. Top is Coast Survey T491. Bottom is a tracing of T491 prepared during the Civil War. Structures or clusters are shown highlighted. From west to east these include James Legare, Solomon Legare, and M.J. Roper.

James Dunning – owned 17 and the farmer – W.R. Disher – owned 49. All of the slaves, however, are shown in Charleston.

Thus, while we have the large and small plantations on Johns Island, there are also small holdings for both intensive cattle production and an early form of truck farming – neither of which has been reported in any detail before.

Of course, the 1860 agricultural census for the Charleston Neck reveals significant truck farming of Irish potatoes and other garden produce.

By the eve of the Civil War we have two additional views of Johns Island, show in Figure 20. Shown are portions of three plantations: the "Legare" plantation belonging to the widow Lydia B. Legare, "Mullet Hall" or the "Home Place" of Solomon Legare, and Roper's plantation, The Oaks. The plans are most useful in helping to identify archaeological sites, but they also reveal the complexity of plantation landscapes at the time.

All three plantations consist of a network of interconnected roads and drainages in order to maximize the productivity of the fields for cotton. Relatively few areas have been retained in woods, in order that as much land could be cultivated as possible. As early as 1826 Mills warned that districts were "beginning already to experience a want of timber, even for common purposes" – the result of uncontrolled clearing for planting of cash crops (Mills 1972:383 [1826]).

A sea island cotton plantation was a commercial agricultural enterprise as well as the home of a sizeable residential community. Service buildings were required for every aspect of the plantation's operation. On every plantation were slave cabins, corn houses, pea houses, and blade houses (for the corn shucks used as animal fodder). There were other special-purpose buildings: kitchen, smoke house, meat house; wagon sheds and carriage houses; gin house, moting house, packing house. These last structures were crop-specific. Because high-grade cotton could be ruined by trash and fragments of seed, processing and storage buildings were kept free of dust and litter. The best cotton barns were two-story buildings with glassed windows to light the interior without admitting breezes (Porcher and Fick 2005:370-371). Surrounding these settlements were fences, suggesting orderly yards and perhaps kitchen gardens.

The majority of auxiliary buildings on every plantation were slave cabins. There might be a few close to the main house, but the dwellings of field laborers were grouped in clusters or lines set near the main house, along the entry drive, or near the working areas. Slave settlements laid out in single or double rows provided a tidy appearance while allowing convenient oversight and supervision (Porcher and Fick 2005:375). They also reinforced the world view of the planter, creating order and the appearance of a small English village.

At least four slave settlements are present on these plans, with 30 structures visible. The 1860 slave schedule for Johns Island enumerates 2,228 slaves living in 682 houses – yielding an average of 3.3 occupants per house, assuming that all houses were occupied at the time of the census. This average, however ranges from 2 slaves per structure up to almost nine per structure.

The Civil War

One regiment was raised on Johns Island, called Captain Walpole's Cavalry or the Stono Scouts. They were an independent company of mounted infantry composed largely of the sons of plantation owners. They patrolled Johns Island to prevent looting, acted as lookouts, and provide videttes (sentries on horseback) for the coast between the North Edisto and Stono rivers. A portion of the muster roll is reproduced by Haynie (2007:23) and the roll is also available online at

http://www.geocities.com/screbels_1864/StonoScouts.html.

With the fall of Hilton Head and Beaufort in November 1861, the entire coast of South Carolina was placed at risk. General Robert E. Lee was sent to South Carolina to assume command of the department of South Carolina, Georgia, and East Florida. Seeing the impossibility of holding the sea island, his strategy was to concede the islands – including Johns Island – and create a mobile defense relying on securing the Charleston and Savannah Railroad. In that way he hoped to protect the mainland and, in particular Charleston and Savannah. A string of fortifications were created to guard the railroad.

Johns Island was ordered evacuated in late November, although as late as May 22-23, 1862 Confederate forces moved to Johns Island to remove slaves that had been left behind – 200 were found and were sent to the Charleston "workhouse to be fed and taken care of by the owners." The Confederates were also destroying cotton on the island to prevent it from being seized by Union forces (OR20, pg. 18-19).

In March 1862 Lee was replaced by Major General John C. Pemberton, who set about devising a string of defenses on James Island. Meanwhile the Union forces were jumping from island to island, approaching Charleston. Edisto was almost continuously occupied by Union forces, with the William Seabrook house and Oak Island plantation used as the headquarters and for billeting officers.

In contrast, Seabrook, Kiawah, and Johns Island were less important to the Union strategy and were occupied repeatedly by both sides. In April 1862 the Third New Hampshire Infantry made a brief reconnaissance to Seabrook Island. Evidently little activity was found on either Seabrook or Kiawah, although Confederate troops were clearly established on John's Island (OR14, pg. 3-4). Johns Island in particular became a no-man's land. This resulted in destruction by troops from both sides.

When Arnoldus Vanderhorst IV visited Kiawah in March 1862 he told Adele (his wife):

> Our own troops had broken into the fine dwelling house [of his neighbor, Isaac Wilson] and maliciously destroyed the furniture, and left the house in such a condition that it scarcely ever will be habitable for a decent family. The Vandals were not satisfied with this shameful destruction of private property, but were low enough to rob the poor old negro who was left to take care of the place of all his chickens, and they even went in his house, and stole a new pair of shoes that his master had given him. Is it not melancholy to think that we have such Barbarians amongst us, and that these are the men that the country looks to to fight its battles (South Carolina Historical Society 12/200/12).

In October 1863 Confederate General Harry A. Wise complained of the constant movement of men through his area. He noted that many were involved in various "depredations" in the area (OR47, pg. 387; see also Jordan and Stringfellow 1998:149). Wise's headquarters on Johns Island were at the "Fripp House" (OR65, pg. 590), one of several plantations owned by members of the Fripp family on the island.

The Coles Island fort, constructed during the War of 1812, was apparently reworked in early 1861 to guard the Stono River entrance. A February 6, 1861 *New York Times* article remarks that on February 2 "Fort Palmetto, on Cole's Island, in the harbor of South Carolina, was completed, and the soldiers

there celebrated." The article explains that the work was conducted by "some fifty negroes."

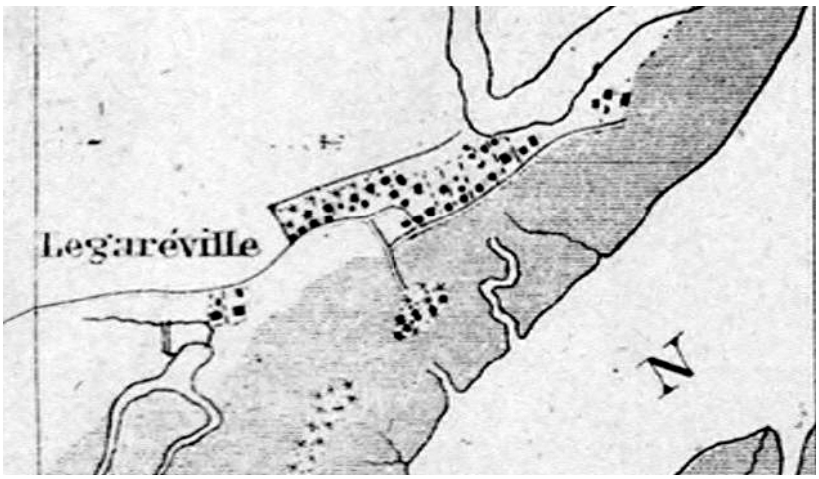


Figure 21. Legareville in 1863 (from US Coast Survey, Charleston Harbor and Its Approaches).

By March 7, however, the commanding officer, J.J. Pope, Jr. was complaining "the planters of John's Island, who volunteered to complete it, as I was informed, left it not half finished, and the troops have bestowed much labor upon it, to bring it to a defensible condition" (OR1, pg. 268). Of perhaps greater concern, the two 18 pound guns at the fort were unable to command the Stono. When fired their "balls failed to reach the Stono Channel."

Concerned that Charleston had insufficient men and artillery to protect itself, Confederate General John C. Pemberton ordered troops to abandon the Cole's and Folly Island defenses in March 1862 (Hagood 1910). The abandonment of these defensive lines allowed Union troops to move into the area without opposition in the Spring of 1862. It was at this time that the siege of Charleston began and the Civil War came to Johns Island.

The first major offensive on Charleston was the ill-fated June 1862 land attack of James Island. Just prior to this there was a brief skirmish on Johns Island with the Union troops overtaking a small party of Confederate pickets on June 7 at the "fork of the roads leading to Legareville and Haulover Bridge" (OR20, pg. 32). On June 9, Confederate troops sought to engage the Union forces in the vicinity of "Bryan's," but found that they had retired to Legareville (OR20, pg. 34).

On January 30, 1863 the Confederate batteries at Legare's Point Place on Johns Island (this was James Legare's "new" 1830 home west of Hancome's Point) and Grimball's on James Island, succeed in capturing the Union ship *Isaac Smith* on the Stono (OR20, pg. 201).

The second, equally disastrous, effort by the Union forces to take James Island was the combined naval and land attack in April 1863. In June 1863 the command of the islands around Charleston was given to General Quincy A. Gillmore and the previously defensive efforts were transformed into preparations to again launch an attack on Charleston. In July 1863 Union troops on Folly Island attacked adjacent Morris Island, easily establishing control over the southern end of the island. Three efforts to storm Battery Wagner were repulsed and the Union troops once again began siege tactics. In September the Confederate troops abandoned Morris Island, giving the Union forces a hollow victory and beginning the next phase in the long siege of Charleston. Union troops held a tenuous line along portions of Seabrook, Kiawah, Folly, and Morris islands, but failed to hold any significant portions of Johns or James Island.

The next mention of activities in the Johns Island area occurs on November 15, 1863. Union forces had been shelling the Haulover Cut area using a position at the bridge between Seabrook and Kiawah Island. A small contingent of Confederate forces sought to destroy the bridge, but discovered that the Union forces were much larger than anticipated. The Confederate dispatch revealed that Union

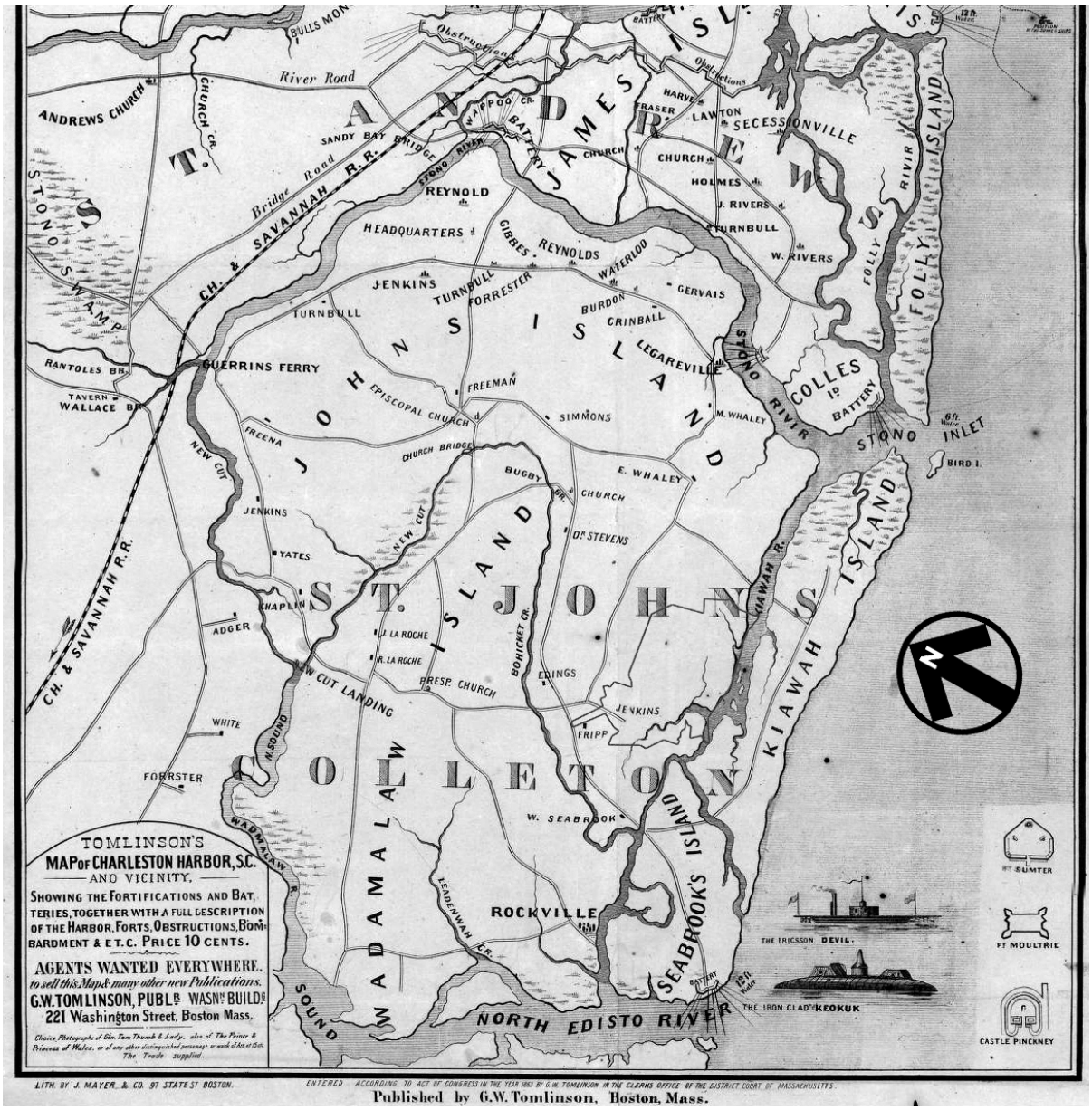


Figure 22. Johns Island in 1863 showing most of the locations referenced in the Civil War discussions (from Tomlinson's Map of Charleston Harbor, SC and Vicinity). Jenkins is misplaced and is actually west of the study area.

forces were well in control of Seabrook and were in the process of constructing an "observatory" at Clark's Bay (OR46, pg. 737-738).

This observatory was one of the signal towers being constructed from Hilton Head to Folly Island in an effort to allow uninterrupted communications along the coast. The tower was placed on the east end of Kiawah, "as so much smoke arises from the camps there and on Folly Island as to render it impossible to see a station on Folly Island from there [Botany Bay on Edisto Island]" (OR46, pg. 54).

The Legareville fortifications must have been reworked around December 1863. At that

time these emplacements held field artillery that fired on the Union gunboat *Marblehead* in the Stono River (December 25, 1863). The two upper batteries were sunken positions, while the one southern battery was a raised position. Other vessels came to the aid of the *Marblehead*, driving off the Confederate forces. The fortifications and two 8-inch siege howitzers were captured by the Union forces (OR46, pg. 752; OR111, pg. 16, 21).

It was probably these events that resulted in efforts by the Confederate forces to improve the defenses on Johns Island. Plans were developed for a "battery in embrasure for four field pieces at Ingle's old landing, opposite Thomas Becket's, on John's Island" (OR47, pg. 549). Even more elaborate works were suggested running across the island from the Stono to Bohicket Creek (OR65, pg. 527). None of this work, however, was ever conducted (OR65, pg. 528).

Always desperate for raw materials, in January 1864 Confederate General Harry A. Wise "ordered all the old iron to be picked up at and about deserted houses on John's Island and elsewhere throughout the district" (OR65, pg. 523).

Activities continued on Johns Island unabated in 1864. On February 9-11, 1864 the Union forces made a demonstration on Johns Island as a feint (OR65, pg. 31, 469, 582). The Union forces crossed over from Kiawah to Seabrook and from there crossed Haulover onto Johns Island. They traveled the Bohicket Road, meeting strong Confederate resistance at the junction of Bohicket and River roads – at what is called "the cocked hat." The Union forces retreated, leaving the Confederates again in control of Johns Island.

On June 3, 1864 Union forces conducted a reconnaissance of Johns Island as far as 3 miles west of Legareville (OR65, pg. 62). Another reconnaissance was conducted on June 19-22, 1864, this time with the battery near Legareville destroyed (OR65, pg. 13, 66).

Another major Union expedition to Johns Island resulted in a series of battles around Isaac Grimball's Waterloo Plantation on the Stono between July 2 and 10, 1864 (OR64, pg. 14-15; OR65, pg. 84-85, 266). These battles focused on the old ricefields, with the dikes serving as breastworks. The battle culminated in the July 9 action at Burden's causeway. Again Union forces retreated.

Although a small victory, the battle had no bearing on the war. Moreover, it did nothing to deter Union forces from returning to Johns Island. In mid-August the Union forces began tearing down some of the buildings at Legareville to use the lumber in their own camps. No longer able to mount any serious offensive against the incursion, the Confederate commander ordered the village burned rather than allow the Union forces to use the materials. Thus, on August 20, 1864 a Confederate raiding party under Major John Jenkins burned Legareville (OR65, pg. 268-269). It was about this time that the St. John's Parish Episcopal church, rebuilt after its loss during the Revolution, was destroyed by fire (MacCallum 1970:22).

By January 1865 the Confederate forces had again erected new batteries on Johns Island near the Stono. Although the communication does not indicate the location, it seems likely that it would have been in the same approximate location as those destroyed in June 1864 (OR99, pg. 49).

Although the Confederates held Johns Island, Charleston was a "mere desolated wreck." What remained of the Confederate forces after the fall of Atlanta and Savannah abandoned the city in February 1865. The city surrendered and, while it avoided Sherman, was nevertheless occupied by Federal troops on February 18, 1865.

The loss of the Civil War caused exceptional social and economic disruption throughout South Carolina. A labor force that

Table 6.
Losses Claimed by Johns Island Planters During the Civil War

Planter	Plantation Name	Date of Loss	Slaves #	Slaves $	House #	House $	Other Bldg. #	Other Bldg. $	Other Goods #	Other Goods $
Brown, James		May 1862	3	525.00						
Grimball, Isaac P.		May 20, 1862	79							
Townsend, Mrs. Mary S.	Head Quarters		42	37,800.00			steam engine, gins, machinery	2,000.00	utensils, carts, &c	200.00
Townsend, Mrs. Mary S.	Oakland		10	9,000.00						
Curtis, Dr. Thomas			13	11,550.00	damaged		2 corn hs, dairy, kitchen, poultry hs, cotton hs, stables, carriage hs, 8 negro houses		fencing	
Curtis, Francis S.		April 1862	4	4,000.00						
McElhenny, E.T.			7	7,000.00						
Burden, Est. Kinsey			10	8,300.00			cotton hs	500.00	sundaries, whippers, cotton frames, grain seive. Seives, foot seive, plough, hoes, corn sheller, xcut saws, whip saws, carpenter tools, anvils, fodder cutters, wheel barrows, tool chest, pick ax, grubbing hoe, weights, scale, block & tackle	1,119.00
Whaley, Edward C.		May 1862	6	5,500.00			corn hs	150.00		
Angel, Mrs. M.						4,000.00				
Angel, Dr. J.W.			6	1,800.00			machine hs	700.00		
Angel, Miss J.H.			3	1,800.00						
Pelot, Mrs. M.C.			3	3,000.00						
Totals				$90,275.00		$4,000.00		$3,350.00		$1,319.00

Planter	Household Goods #	Household Goods $	Boats #	Boats $	Carriages #	Carriages $	Cotton (bales) #	Cotton (bales) $	Corn #	Corn $	s #	s $	Pease #	Pease $	Stock #	Stock $
Brown, James			1 - 10 oar 1 - 4 oar	300.00	1 carriage	100.00	7	903.00	600 bu	750.00	4a		32a		10 cattle	125.00
Grimball, Isaac P.	furniture	2,500.00	1 - 12 oar 1 - 6 oar 1- 4 oar 4 - flats	1,000.00											40 cattle 24 sheep 3 mules	560.00
Townsend, Mrs. Mary S.	furniture	500.00						3,000.00								
Townsend, Mrs. Mary S.	furniture	500.00						2,200.00								
Curtis, Dr. Thomas	furniture	1,349.00	1 - 8 oar	230.00					259a		6a		32a		1 horse	275.00
Curtis, Francis S.															6 sheep	
McElhenny, E.T.	furniture	200.00							110 bu	165.00					6 cattle	250.00
Burden, Est. Kinsey	negro clothing, blankets; furniture, bedding, crockery &c	700.00	2 - canoes 2 - flats	350.00	1 carriage 5 wheels	290.00									3 horses	130.00
Whaley, Edward C.	furniture	200.00	1 - boat	80.00					250 bu	375.00					18 cattle 30 sheep 2 horses	610.00
Angel, Mrs. M.		500.00														
Angel, Dr. J.W.																
Angel, Miss J.H.																
Pelot, Mrs. M.C.																
Totals		$6,449.00		$1,960.00		$390.00		$6,103.00		$1,290.00						$1,950.00

had been previously depended on to make planters wealthy was no longer available. In fact, the entire financial system had collapsed.

These losses are perhaps nowhere better documented in the "Losses Due to the Enemy" where families itemized losses in the hopes of being reimbursed by the state. These data are shown in Table 6. Although interesting, they be carefully interpreted and certainly tell us more about a few of the individual properties than either about the island or the nature of the losses. For example, we do see an interesting assortment of structures, clearly supporting the wide variety described by Porcher and Fick (2005). We see that several plantations had steam engines to power their gins; we also get an idea of the cost of utilitarian buildings, such as cotton houses and corn houses – and the data again supports the assertion by Porcher and Fick (2005:370) concerning the care taken in construction of cotton houses. The data from the Kinsey Burden plantation gives us a better understanding of the range of tools and supplies present on a cotton plantation. Included are items of critical importance, such as the scale and weights for the cotton. We also see the range of "plantation boats," obtaining a better idea of their value.

Only three of the 16 accounts list cotton. Since the losses occurred in May the current year's crop would have only recently been planted. Thus, the cotton destroyed must have been held back from the previous year, perhaps in hope of better prices. The value of .43¢ a pound used by one claimant seems reasonable. Another, however, claimed for "cotton . . . abandoned in the field," which seems optimistic – and clearly a practice not followed by most claimants.

While corn was valued by the planters, those making claims for potatoes and pease simply listed the acreage – no value was assigned. This may suggest that these crops were not as highly regarded as either cotton or corn.

Some claims also make some general reference to the occurrence of the loss – most indicate that the losses were the result of abandonment (the property fell "into the hands of the enemy" or was abandoned "to them"). Some, however indicate other causes. Grimball, for example, explains that his sheep and mules were taken by Confederate forces. Thomas Curtis "regretted" that the losses "had been done by the troops of Confederacy." Burden claimed that some of blacks escaped as a result of the "insufficient guard of the Cavalry." Several planters also reported that their cotton houses and other plantation items were destroyed upon the orders of "Brig. Gen [N.G.] Evans."

Reconstruction

As the various Civil War accounts reveal, the abandonment of the sea islands was not complete. Many African Americans remained on plantations for the entire war (Schwalm 1997:157). In June 1862 Congress adopted legislation enforcing the Direct Tax Act of 1861 in the seceded states; it provided for forfeiture to the government of land whose owners failed to pay the tax and for its subsequent lease or sale.

General Sherman's Field Order No. 15 allotted the sea islands south of Charleston to the freedmen, a move that brought confusion among whites and ultimately disappointment to the black population. President Andrew Johnson rescinded the order in February 1866, but there were many delays in the restoration process.

While Assistant Commissioner of the Freedmen's Bureau in South Carolina, Robert K. Scott, sought to delay the process of restoration, General James C. Beecher, the brother of Harriet Beecher Stowe, was one of several military officers who took control of the low country out of the hands of Bureau, following military policy instead. Stationed in Summerville as a subassistant commissioner, Beecher developed his own policy of what would recognized as a

valid claim to land, intending to bring the possessory land titles of African Americans to a quick test.

To be valid, the claim had to be a written certificate, it must specify the number of acres, the plot had to have been "duly measured and staked out," and had to have been occupied by the claimant. If these tests were met, the claimant had a right to the soil only – "no land claim or warrant includes any buildings upon the ground claimed or upon the plantation, or right to occupy the same" (Saville 1996:83).

Using this approach, the more than 11,000 claims on Johns and Wadmalaw islands were reduced to a mere 11 valid certificates. By mid-February Federal troops under Beecher's command began to "clean out" settlers who refused contracts after their claims were judged invalid.

Island blacks struggled against these efforts. Schwalm explains that on Johns and Wadmalaw,

> freed people held public meetings, organized commissions, appointed delegations, and formed paramilitary guards to protest the accelerating process of restoration, and to prevent white landowners from setting foot on the islands and usurping their own claims to the land (Schwalm 1997:80).

Powell recounts an event on Johns Island when island blacks arrested a party of Northerners who landed on the island to visit land they were thinking of purchasing. The blacks marched the party to see the resident bureau chief. During the marsh the group grew to more than 150 armed and angry African Americans, threatening to kill any "cursed white man who cum on Jim or Jon for take he property" (Powell 1980:99-100).

Beecher's response was to arrest the black instigators. Elsewhere he issued orders prohibiting blacks from holding meetings. He also used the dispensing of rations as a control mechanism (Powell 1980:100).

By March 1866 the state office issued instructions on possessory titles. While more liberal, these rules allowed only about 450 certificates to be recognized on the islands (Saville 1996:84). This amounted to less than one-fifth of the African American families on Edisto, Johns, and Wadmalaw islands. By June 1866 Freedmen's Bureau inspectors found only 141 possessory titles survived to "encumber" 32 plantations – only a tenth of the 310 plantations that had originally been identified as abandoned on Edisto, Johns, Wadmalaw, and James islands in August 1865 (Saville 1996:85).

Beecher's reputation began to sour by the end of 1866 and he was not allowed to reenlist at the end of this tour. Critics accused him of doing the planters' bidding, rather than working for the best interests of the freedmen. One critic wrote, "The job of turning out of house and home the poor loyal freedmen, to make place for rebels steeped in treason, was given to Col. Beecher, because his name and his antecedents might make the inhumanity seem less inhuman" (Singleton 1999). Twenty years later, after suffering severe depression, Beecher took his own life in upstate New York (James C. Beecher's Suicide, *New York Times*, August 26, 1886, pg. 1).

Ultimately the efforts by blacks to retain their lands were unsuccessful and by the close of 1866, the planters were again in possession of almost all of the islands that had not been sold outright by the Direct Tax Commission. Former slaves had little choice but to work as wage laborers and tenant farmers (Bleser 1969:12).

In March 1869 the legislature created the Land Commission – a unique Reconstruction program intended to provide freedmen with affordable land. The commission was to

purchase land for the state, then subdivide it for sale on reasonable terms to the poor of both races. The law effectively excluded speculators; poor whites largely refused to participate. The program was adandoned in 1890 because of corruption, but not before at least 960 deeds were issued (Bleser 1969:146).

White planters in the St. Johns Colleton area, like elsewhere in South Carolina, experimented with wage labor immediately after the Civil War. Faced with uncertainty, but the need to begin planting immediately, many accepted the wage labor solution begun by the Union Army and later espoused by the Freedmen's Bureau. To support the wage system no less than seven major types of contracts were used by Southern planters (see Shlomowitz 1979).

For example, the Freedmen's Bureau "Register of land and occupants, 1865-1868" (Series M869, Reel 30) lists the population at the 670 acre Briars Plantation, east of the study tract, on January 26, 1866, when it was restored to Dr. B. D. Roper, Jr. Twenty-one people – six men, seven women, and eight children – were in residence, and Roper was required to draw up a labor contract with them (Series M869, Reel 32, pg. 586).

A number of white planters applied for government rations in February 1868. Among them was James Legare Walpole, who was,

> desirous of obtaining . . . provisions for the freedmen and women now on my plantation [Acorn Hill] on Johns Island who are in a destitute condition. I intend planting if I can procure this aid seventy acres of cotton, sixty acres of corn. I have now on my plantation eighteen men, twenty-one women, two infirm, and seventeen children. On account of the failure of crops last year the people have no means of support and I am unable to render any. My plantation is in thorough discipline and hope General that you will endeavor to aid us if it is in your power as soon as possible as we cannot commence operations until we receive aid." Approved, S. B. Thompson, Feb. 21, 1868 (Series 1910, Reel 85, pg. 227).

The St. Stephens planter Thomas L. Gourdin used a contract that agreed to share crops equally with the freedmen, except for cotton, two-third of which was retained by Gourdin. While he allowed them to remain in their houses, they must furnish all of their own food and clothing. They agreed to "submit at all times" to the Gourdin's control, "to behave in a respectfull [sic] and orderly manner" and to do a "reasonable days work," defined as 10 hours "such as formerly done on the plantation." The freedmen were prohibited from possessing firearms or liquor, entertaining company, or bringing animals onto the plantation (Theodor L. Gourdin Papers, Folder 16, South Carolina Historical Society). Such restrictive contracts were the norm and often resulted in appeals by planters to the Freedmen's Bureau to help restore order on plantations.

This system was doomed to failure, being disliked by both the Freedmen, who found it too reminiscent of slavery, and the plantation owners, who found that it gave the Freedmen too much liberty. While discussing the task system characteristic of the low country, Morgan observed that, "the preferences and ambitions of the freedmen reflected, above all, a desire for autonomy not only from the impersonal marketplace but also from individual whites" (Morgan 1981:596).

While land and labor policies generally worked to the disadvantage of island blacks, the Freedmen's Bureau did establish schools on Johns Island. In December 1865 a school was

established at McIlhenny's Plantation, north of Legareville, on the southwest side of Plowground Road and River Road and the school at Townsend Plantation (Rushland) was opened in March 1866 (Freedmen's Bureau Records, Series 803, Reel 29, pg. 35). At the end of 1866 the McIlhenny School had one African American teacher, 62 students, with an average attendance of 47. These schools expanded to five by November 1868, supported by Methodist Freedmen's Aid Association. The teachers were listed as Miss Mary L. Sharp, Israel Seabrook, Rev. W. H. Hunter, Mrs. Scudder (Freedmen's Bureau Records, Series 803, Reel 29).

Jackson provides another view of Johns Island schools, noting that the May 1866 issue of the *American Freedman* reported one school on Johns Island, operated by the non-sectarian New England Freedmen's Aid Society (Jackson 1923:22). As late as 1872 the Freedmen's Aid Society of the Methodist Episcopal Church was still teaching on Johns Island (Jackson 1923:26).

The Freedmen's Bureau also provided medical assistance to the island's blacks. While most of this work responded to immediate problems, there were also preventative health programs. On September 12, 1867, Col. M. K. Hogan, Surgeon in Chief, at Charleston wrote to J. L. Beckett, the Assistant Surgeon with the Bureau on John's Island,

> You will at once commence a thorough system of vaccination amongst the Refugees and Freed People of your sub district, and to make it as complete as possible, measurers should be taken to find out all persons who have not been vaccinated who, either through carelessness or from any other cause, fail to report themselves to you for this purpose. . . . On the reopening of schools, no person should be admitted who has not previously been vaccinated. . . . as the subject of vaccination is a very important one, you are requested to give it due encouragement amongst the people generally (Freedmen's Bureau Records, Series 1910, Reel 85, pg. 197).

Post Reconstruction

Ninety percent of the farm labor was African American, and local plantation owners complained that not only was adequate labor generally unavailable, but the quality of the labor had noticeably declined over the past five years (Anonymous 1884:47-48).

The monthly wage for farm labor was between $8 a month plus rations. Another reports that day labor, "while becoming very scarce" was paid at the rate of 50¢ a day (Anonymous 1880). "The system most in vogue is for the laborers to give two days in every week to the landowner for 8 to 10 acres of land and a house" (Anonymous 1884:48). This was the same system described by the 1880 census taker as "rent paid in labour. The Black's work 1 to 1¼ acre of Land for the Manager or owner for 5 to 8 acres for themselves." Hilgard (1884:516) reports the same system for Johns Island, "most . . . are engaged for two days' work a week by allowing them a house, fuel, and 6 or 7 acres of land free of rent." He notes, however, that the whites were already finding the system unsatisfactory. Land worked by whites was improving, while that worked by the blacks on their own account was deteriorating rapidly. He observed, "the labor is not so easily controlled as when cash wages are paid."

The comments concerning South Carolina lien law are particularly revealing:

> it demoralizes the labor, is bad for the farmers and is good for the merchants. It works injury to the white and colored farmers, as it induces idleness as

Table 7.
1870 Agricultural Census for Johns Island (NR = not reported in published compendium)

		Land Occupied or Improved						Livestock						
		Farms	Acres improved	Acres Unimproved	Value of farm	Value of implements	Wages pd./year	Horse, asses, mules	Milch cows	Working oxen	Other cattle	Sheep	Swine	Value of livestock
Charleston	1870	2,494	168,393	437,739	2,984,178	124,021	226,576	2,264	2,565	353	NR	2,869	10,390	433,011
St. Johns	1870	522	31,215	21,883	154,853	55,160	78,614	431	102	16	163	250	622	120,837
Johns Island	1870	400	9,759	9,607	138,424	11,151	16,533	119	39	12	149	189	388	21,385

		Agricultural Production										
		Rye & oats, bu	Corn, bu	Irish potatoes, bu	Sweet potatoes, bu	Peas & beans, bu	Butter, lbs	Rice, lbs	Value of garden produce	Cotton, bales	Wool, lbs	Value animals slaughtered
Charleston	1870	1,915	170,087	NR	62,984	NR	NR	4,329,217	43,601	5,512	2,257	36,302
St. Johns	1870	669	24,241	358	11,693	3,584	50	1,200,000	3,980	3,584	-	40
Johns Island	1870	618	16,709	84	9,492	1,824	-	-	3,980	385	-	-

> long as their supplies last. Famers who run on liens entirely rarely if ever do more than pay out at the end of the year (Anonymous 1884:48).

South Carolina's lien law was first passed in 1866, allowing the lender the first lien on the crop when the agreement was properly registered in the county clerk's office. The concept of the lien law was simple – it was intended to help farmers get credit in order to allow them to plant. It bolstered an economy that had been struggling since the end of the Civil War by allowing merchants to take a lien on the crop being raised.

The Republicans dramatically altered this law in 1873, allowing the renter the first claim on any crops he produced – thereby protecting the freedman farmer. Often liens would be issued by the landowner for use of the land, the merchant who provided supplies, and the fertilizer company that sold the guano. Some planters also required a lien against not only the prospective crop, but also the debtor's personal property, such as horses, mules, and oxen (Williamson 1965:171-172).

The 1877 legislature repealed the Republican's lien law. Suddenly realizing what they had done, in 1878 during Wade Hampton's administration the legislature reenacted the lien laws before the state's agricultural system was paralyzed.

However valuable the lien system may have been, it caused serious pain for the small farmer, especially blacks. The merchants who offered loans for planting also sold their goods for two prices – a lesser price being charged for cash. Goods bought on credit, in anticipation of a successful harvest, were more expensive and the interest charges were not assessed separately, but were buried in the inflated credit price. Estimates of these credit charges range from 30% to 110% (Woodman 1968:303; Hilgard 1883:517 reports similar figures – from 20 to 100% above the market value).

In 1882 it was reported that Charleston posted 1,331 liens, totaling $180,117.20 (South Carolina Legislative Reports and Resolutions, 1882).

Postbellum Agriculture

The first agricultural census after the Civil War reveals a proliferation of farms – representing the large number of freedmen in Charleston. On Johns Island the number of farms increased from 43 prior to the Civil War, to 400 in 1870. The average number of improved acres in a holding prior to the Civil War was about 450 acres. By 1870, this had declined to

just 24 acres. The total farm value for the island declined by more than three quarters.

Milk cows declined by 96%, from 1,088 to just 39. The overall value of livestock declined by 70%. Cotton production declined by over 60%, corn by over 50%, sweet potatoes by 84%. The agricultural economy of the island was devastated.

The value of garden produce shows the least severe drop – "only" 19%, suggesting that the islanders continued to engage in early truck farming. Johns Island was also the only district in St. Johns Colleton to report garden produce, although the island contributed only 9% of the county's total.

If the census data are correct, then Johns Island's cotton production was dwarfed by that of Edisto, which in 1870 produced 1,245 bales. On Edisto it seems clear that blacks and whites alike planted little besides cotton – they produced only 2,053 bushels of corn and 1,678 bushels of sweet potatoes. Edisto also produced the only rice from St. Johns Colleton – 1,200,000 pounds, nearly 28% of that reported from Charleston District. These data leave unaddressed the issue of decision making – exactly why we see the differences between the islands.

In 1879 the *New York Times* remarked that truck farming, which sprang up "almost immediately after the close of the war" was certain to be the "solution of the low-country problem" being as profitable if not more so than cotton. The article explains how the planting of crops such as strawberries and potatoes had taken over the Neck area between the Ashley and Cooper Rivers with 1,543 acres being planted. The article notes that truck farming, even this early, was not confined to the Neck, but was to be found in Christ Church, on James Island, in St. Andrew's Parish, and on Johns, Wadmalaw, and Edisto islands (Anonymous 1879).

By 1880 the number of farms in St. Johns more than doubled, increasing from 522 in 1870 to 1,285. In addition, 10,000 acres went out of production. Cotton fell from 3,584 bales to 3,079. On the other hand, the production of corn more than doubled, from 24,241 bushels to 56,796 bushels.

On Johns Island we find 115 owners compared to the 43 antebellum owners. This indicates around 72 new property owners, many of whom were African Americans.

Some were the blacks that had purchased the Townsend property, Rushland,

Table 8.
1880 Agricultural Statistics for Charleston by Township
(adapted from Butler 1883:Table V)

Township	No. Farms	Acres Tilled	Cotton		Rice, bu.	Corn, bu.
			Acres	Bales		
Christ Church	51	24,919	627	394	860	6,700
City of Charleston	-	696	-	-	-	-
St. Andrews	408	10,476	1,498	887	2,070	11,011
St. James Goose Creek	874	23,920	5,875	2,477	45,134	102,548
St. James Santee	210	6,126	158	71	50,703	8,982
St. Johns Berkeley	938	19,720	5,649	1,890	145,414	35,434
St. Johns Colleton (% of aggregate)	1,285 (45.2%)	21,073 (18.0%)	9,826 (39.6%)	3,079 (33.7%)	34,565 (10.6%)	56,796 (23.2%)
St. Stephens	300	6,394	990	290	3,300	18,929
St. Thomas/St. Dennis	60	3,419	177	53	45,108	4,766
Totals	2,841	95,670	14,974	6,062	292,589	188,370

Table 9.
Agricultural Data for Johns Island, 1880

Operator			Improved		Unimproved				Corn		Cotton		Sweet Potatoes		
Owner	Fixed Rental	Shares	Acres Tilled	Pasture	Forest	Other	Farm Value $	Livestock Value $	Acres	Bushels	Acres	Bales	Acres	Bushels	Tilled Acres With Other Crops
115	284	40	7,106	2,301	7,737	2,280	26,309,224	25,548	2,967	15,995	2,994	901	450	12,898	695

on the Stono. The property was sold by the Land Commission in small tracts and by 1872 there were 44 certificates of purchase. In 1880 there were still 29 blacks (two-thirds) in residence (Bleser 1969:162).

These owners, black or white, were in a minority – there were 324 tenants. Most of these were identified as paying a fixed rental. Forty (12%), however, were identified by the enumerator as "rent paid in labour. The Black's work 1 to 1¼ acre of Land for the Manager or owner for 5 to 8 acres for themselves." A relatively small proportion of the island's land – just over a third – was being cultivated. The remainder was in pasture (12%), woods (40%), or were old fields (12%). The quantity of old fields indicates that much of what was once cultivated had been abandoned.

The cultivated land was about evenly split between corn and cotton. The 439 farms raised 901 bales of cotton. Although this yields an average of 2 bales per farm, nearly double the production in 1870, the number is deceiving. A very large number of the small African American farmers, tilling only a few acres, reported harvesting as little as 1/8 or 1/6 bale – 50 to 70 pounds of cotton. At an 1880 market value of 31¢ a pound, they would have made only $15 to $20 gross, before any expenses were deducted. The per acre yield was also less than 1/3 bale or about 120 pounds per acre.

Corn production was roughly stable compared to a decade earlier. Sweet potato production, however, was up dramatically – from 9,492 bushels in 1870 to 12,898 bushels in 1880. It may be that the African Americans, realizing that they would be unable to feed their families on cotton and perhaps even resistant to planting the crop of slavery, sought to maximize their self reliance through corn and sweet potatoes.

An early review of the area is offered by the *News and Courier* in an 1880 article. Readers were told that the island contained around 40,000 acres (only 19,424 acres were enumerated) and that only about 17,560 acres were arable, the rest being swamp (this essentially agrees with the census data). The paper notes that, "the most fertile lands are on the outskirts running along the waters which surround it [the island], and the interior is one vast and almost impenetrable swamp." The population of the island was reported to be 5,000 Africans Americans and 200 whites, with cotton planted by only 26 of the whites, none had more than 45 acres in cotton. If correct, this indicates the difficulty of obtaining workers and the uncertainty that prevailed during this time.

Readers were told that, "the spirit of progress is not apparent among the John's Islanders as on the other islands, and they are much behind in their mode of cultivation." This complaint focused almost entirely on the failure to install "underdrainage" or tile drains to promote the drainage of fields for cotton.

The article explains that prior to the increased use of fertilizer, 100 pounds of cotton to the acre was about the best to be hoped for, with most blacks producing only 50 to 75 pounds. With fertilizer these yields doubled – the 120 pounds per acre reported by the census does seem to support this boosterism.

Postbellum Island Conditions

While the article reports that the price of land on Johns Island was about $10 an acre, Hilgard values Johns Island land from $2.50 to $20 an acre (Hilgard 1884:516). There were two white churches (the Episcopal and the Presbyterian) and 13 African American churches. There was no white school on the island, but there were 12 black schools, although "the attendance is not very regular, and the improvement in education is not so marked as on the other islands." The roads and bridges were reported to be in good condition and "well worked," although the residents were anxious to have the Bugby Bridge (connecting Wadmalw

and Johns islands), burned during the Civil War, replaced (Anonymous 1880).

It was around this time that Johns Island briefly joined Berkeley County, so the study area is included in Berkeley by the *News and Courier* in its 1880-1884 review. Unfortunately Berkeley County included over 2,000 square miles and ranged from Edisto Island at the southern tip to the Santee River in the north. Even a small portion of what is today southern Orangeburg County was included.

Nevertheless, Berkeley included 51 grist mills, 15 steam rice threshing mills, eight lumber mills, 30 turpentine stills, and three brick works (on the Wando and Cooper rivers). Given the agricultural variation, the author explained:

> Berkeley County is peculiarly an agricultural district, the products being mainly confined to sea island cotton and garden vegetables. John's Island, Wadmalaw Island and Edisto Island form the southern boundary of the county and produce the bulk of the sea island crop. Vegetable gardening is carried on most extensively in Christ Church and St. Andrew's Parishes and upon Wadmalaw Island. St. Andrew's Parish is largely devoted to phosphate mining. In the parishes of St. James Santee, Goosecreek, St. John's and St. Stephen's lie large and extensive rice lands (Anonymous 1884:47).

In spite of the size, the county could boast of only 17 sowers, 22 reapers, nine sulky plows, and 70 harrows. As an indicator of the fertilizer rage, however, there were 220 guano spreaders. The general complaint was that farm labor – meaning blacks – was less productive than last year and far less productive than five years ago. This may be seen in the increasing tendency for blacks to plant corn and sweet potatoes, rather than cotton.

There were 189 cotton gins, "mostly for long cotton." The average haul was 5 miles and the average cost of ginning was $9 a bale for long and $2 a bale for short.

The commentator summed up his observations by noting,

> It is a notorious fact that those farmers who have met with success have not made their money solely by cotton planting, but by combining with cotton planting; ginning for toll and store-keeping. The great mistake is that the farms have not been made self-supporting. Too little attention is paid to the raising of provision crops and to the raising of hogs and cattle (Anonymous 1884:48).

Butler (1883:668) fails to note any stores on Johns Island, although there were nine on Edisto Island, one in Rockville (on Wadmalaw Island), and seven in Enterprise (also on Wadmalaw Island, across the Wadmalaw River from the community of Yonges Island). This suggests that at the end of the nineteenth century Johns Island remained a very isolated, and largely self-sufficient, location.

Cotton

Cotton was the cash crop, with one respondent reporting 3,200 pounds of seed cotton per acre. The cost of raising cotton was $40 per 500 pound bale. With cotton selling at .12¢/pound in the mid-1870s, a bale would bring about $60, providing a reasonable margin of profit. By 1880 cotton was averaging about 9.8¢/pound, cutting the profit on a bale to only $9 (Woodman 1968:343).

Hilgard (1884) provides an overview of cotton cultivation on the sea islands. Although two of his informants were from James Island and a third was from Edisto, the fourth was W. Edings Fripp of Johns Island.

One of the most notable features of cotton tillage were the "remarkably high beds on which cotton is planted here, being from 18 inches to 2 feet high" (Hilgard 1884:505). These, he noted, in conjunction with open drains, were in lieu of the subsurface drainage used in other locations. Tile drains are mentioned only for James Island. Plows were coming into more common use throughout the area. Cotton was planted on fields every other year, with stock turned out on the fields during the intervening years. Hilgard notes that about half of the land had passed out of cultivation since the Civil War, with the proportion about the same on Wadmalaw, but much lower on the other islands (Hilgard 1884:502).

The planting began with hoeing off the weeds ("hurricane"), cutting up the cotton stalks, and burning off the litter. In early February "two furrows of a single-horse turning-plow are run in the old alleys, making a trench 7 to 8 inches deep." A subsoil plow may be used next, based on the character of the subsoil. In the trench made by the subsoiler, or in the middle of the alley if no subsoiler was used, manure was placed. This manure was generally about 20 cart-loads of marsh mud mixed with 1,000 to 1,400 pounds of cottonseed. Commercial fertilizer is then drilled into this compost. He comments that on Johns Island the typical fertilizer was a mixture of 250 pounds of acid phosphate, 200 pounds of kainit (German potash salt), and 200 pounds of calcined marl per acre (Hilgard 1884:510).

With this done the land was ready for listing – using a hoe to place soil from the tops and sides of the old bed on the manure. Some of the more modern farmers used a turning plow to accomplish this, the advantage being that the labor of a plow cost about 17½¢ an acre, compared to 80¢ for hoeing. He points out, however, that hoeing is far more accurate in getting the soil exactly where it needs to be. Afterwards, a double roller weighing about 800 pounds was used to compact the soil.

Planting might begin anytime after March 20, although April 1 through 10 was preferred. Hilgard contends that mechanical cotton planters weren't used on the sea islands, a view endorsed by Porcher and Fick (2005:168). Instead the work was done by three hands. The one in front chopped a hole on top of the bed at intervals of 12 to 18 inches using a hoe. Another dropped eight to 10 seeds in each hole, and the third hand followed, covering the seeds. Germination occurred in about eight to 12 days and the stand was "perfected" from the second week in April to the first week in May.

Table 10.
1870 Commercial Gins on Johns Island (Industrial Schedule)

									Production		
Firm	Capital	Gin	#	Males 16+	Females 16+	Child.	Total Yearly Wages	# Months	Cotton	Seed (lbs)	Value
Beckett & Walpole	$1,000	saw	1	4	1	1	$100	2	18 bales	24,000	$7,064
Beckett & Walpole	$1,000	McCarthy	2	4	1	1	$200	3	20 bags	14,000	$1,680
W.S. Whaley	$1,350	McCarthy	3	7	8	1	$240	4	11 bags	14,000	$1,970
William Gregg	$2,000	McCarthy	3	6	12	-	$1,000	3	50 bags	60,000	$9,000

Next came cultivation – a hoeing in early May, another in late May when some of the cotton would be thinned. Then a plow was used to "break out the middles (the spaces between the new beds where the old beds stood" (Hilgard 1884:511). Hands followed the plow, using hoes to pull up the loose soil to the foot of the cotton plants – a practice called "hauling." This prevented the cotton from "flagging" or falling down from its own weight. It also reduced competition from grass. There were four hoeing and hauling by the last week in July. During each one, additional cotton

would be thinned, so that by July only one stalk per bunch was left. At this time a side sweep plow would be used to sweep between the rows in August to destroy grass.

The first blooms appeared about the middle of June, when the cotton was about 15 inches high. The bolls opened toward the end of August, when the plants were about 4 to 5 feet high.

Table 11.
Stores operated in the Johns Island area, 1889
(R.G. Dun & Co. 1889)

Store	Possible Location	Financial Strength ($)	General Credit
Johns Island			
Andell, William	Andell's Bluff	5,000-10,000	good
Bailey, Charles E.		<1,000	limited
Brown, Charles (AA)		<1,000	limited
Bryan, Edward B.	Chaplin	<1,000	limited
Ellison, J.W.		<500	
Harding, George M.			fair
Legare, F.Y.	Mullet Hall	10,000-20,000	good
Nelson, F.L. (AA)		<500	
Nelson, W.A. (AA)			
Seabrook, E.M.	Ferry Field	<500	
Seile [Seele], Charles			
Struhs, H. (grocery & liquor)			
Walpole & Co.		<1,000	fair
Whaley, C.G.	Auld Reeckie	<500	
Enterprise			
Bailey, H.J.		<500	
Jenkins, R.H.		<1,000	
Lancaster, H.C.			fair
LaRoche, J.E.		<500	
Martin's Point			
Geraty & Towles			
Wadmalaw			
Jenkins, A.H.		<500	
Schaffer, E.A.	New Cut	1,000-2,000	fair

Cotton picking began the last week in August to the second week in September. For this first picking, when the crop was "thin" planters paid pickers 1½¢ per pound of seed cotton. The price fell to 1¢ a pound for subsequent pickings until the last of November, when it rose again to 1½ to 2¢ per pound. By December 15 the entire crop had been gathered.

Fripp observed for Johns Island that no improved planting implements were necessary – "any one hand, with ordinary implements and management, can make four times as much cotton as he can gather" (Hilgard 1884:511). It was complained that the cotton picker "already pockets one-sixth of the gross value of the crop, and is a heavy burden on the producer" (Hilgard 1884:511). While not discussed by Hilgard, it is likely that this "surplus" labor contributed to the large number of African Americans who left the cotton plantations to work in the phosphate mines during certain times of the year (Trinkley et al. 2006).

Hilgard (1884:514) observes that ginning, baling, and shipping the cotton are standard activities and there is nothing unusual about the practices in the coastal region. However, there were significant differences between Sea Island cotton ginning and packing and the methods used on the mainland.

Instead of the saw gin common elsewhere, long-staple cotton planters continued to rely on roller gins. With human-powered foot gins having largely been abandoned, the McCarthy roller gin, powered by either steam or animals, was ubiquitous (Porcher and Fick 2005: 219).

Hilgard observed that the roller gin (used for long staple cotton) with steam power made 400 to 600 pounds of lint in a 10 hour day. This lint was packed in round bags 7½ feet long. Fripp explained that it was done using "a hole in the floor, hung bag, iron pestle, and a negro" (Hilgard 1884:514). Three bags can be pressed a day, with the bag weight being about 350 pounds. He notes that 1,600 pounds of seed cotton is required to yield 400 pounds of lint. These bags were also not bound with ties, as were the bales of short staple cotton.

The 1870 Industrial Schedules note a steam-powered grist mill and a steam-powered cotton gin on James Island. At Enterprise Landing on Wadmalaw Island there was a steam grist mill and a steam gin with five McCarthy gins, operating six months a year with an average of twenty-five hands. The grist mill had a much smaller force, averaging one

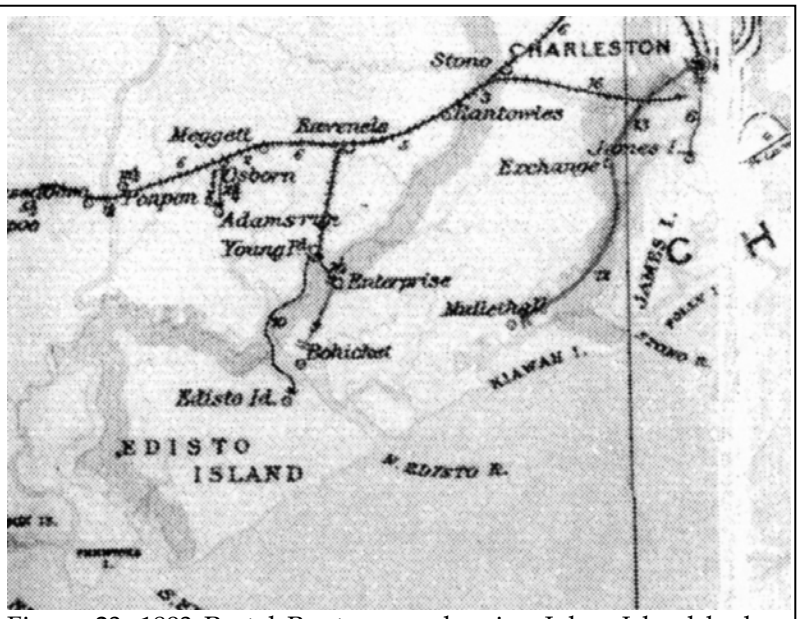


Figure 23. 1893 Postal Route map showing Johns Island had a post office at Mullet Hall by this time. Mail arrived by steamer from Charleston after a stop at the Exchange Post Office.

man and two women. There were four commercial gins on Johns Island (Table 10).

There was also a steam sawmill on Johns Island, operated by J. M. Humbert. He reported to the census that he operated for ten months of the year, averaging thirty hands (all men at least sixteen years old) and paying total wages of $8000 in 1869. He produced 1.4 million board feet of lumber, valued at $16,000.

We could not find individual industrial statistics for St. Johns, Colleton Parish in 1880. Nine commercial gin operations were enumerated on James Island.

The major threat to the crop was the cotton caterpillar (the boll weevil wouldn't arrive until 1919). The caterpillar arrived during warm, wet spells during the late summer and quickly ate the foliage. Planters, however, learned to control the pest with Paris green (copper(II)-acetoarsenite) using a mixture of 1 pound Paris green, 1 pound of rosin, and 40 pounds of flour. It was dusted over the crops by hand when the caterpillar was first seen.

The End of the Nineteenth Century

In 1889 the Johns Island area (including the Johns Island station on the mainland) boasted 12 general stores and one grocer (Table 11). Five of the general merchandise stores may be commissaries operated by planters. Three of the stores were operated by African Americans. A list from 1890-1891 includes six general merchandise stores, including Andell, Seabrook, Seel [Seele], Walpole & Co., and Whaley & Co. The only individual not on the earlier list was F.Y. Legare – who operated the Mullet Hall commissary (Anonymous 1890:268).

At the end of the nineteenth century the sad state of the state's agricultural economy is clearly outlined by Edgar (1998:428), who notes that the economy was in shambles. Not only were cotton prices down dramatically from the immediate post-war boom; but with a single-minded focus, the state's farmers planted cotton at the expense of provision crops, further compounding their problems. Add to this a series of droughts and other natural disasters, and the situation was bleak.

Edgar also observes that in spite of these problems, South Carolina's governors were out of touch with reality. For example, in 1882 Governor Johnson Hagood extolled to the Legislature the virtues of the state, with "happy and prosperous" citizens and a "well-ordered, smooth working, and economic" government. Four years later Governor John R. Richardson was equally out-of-touch by proclaiming that the "sun of prosperity" had "arisen from the dark clouds" (quoted in Edgar 1998:429). Yet during the 1880s thousands were losing their farms – statewide in just two years over a

million acres went on the auction block, with almost 8% of the farmland being foreclosed and auctioned (Edgar 1998:431). These frustrations helped propel Edgefield's Ben Tillman into the governor's seat in 1890.

Figure 24. Wilson's photograph after the Charleston earthquake entitled, "Track out of line." This image was taken about 3 miles west of the Rantowles Station, northwest of Johns Island and east of Ravenel.

Although a populist and appealing to the rural agrarian farmer, Tillman offered no substantial programs to address the needs of the debt-ridden farming class. Instead he promoted violence against blacks.

Natural Disasters

On August 31, 1886 at approximately 9:50 p.m. an estimated magnitude 7.3 earthquake struck the Charleston area, resulting in at least 83 deaths and extensive damage to the buildings of Charleston. Damage extended across an elliptical area measuring about 20 by 30 miles trending northeast between Charleston and Jedburg and including Summerville, centered at Middleton Place.

In Earl Sloan's detailed review of damage along the Charleston-Savannah Railroad, he noted "prostrated chimneys" and "craterlets" throughout the area, including on Wadmalaw at Enterprise, Martins Point, and in the center of the island (Peters and Herrmann 1986:61). The damage continued to Rockville and onto Seabrook Island. The rail line at the Rantowles Bridge was distorted and twisted (Peters and Herrmann 1986:63). On the north side of the Stono, Sloan observed a "large two story frame building of square plan" that was twisted, plaster walls were cracked, a partition wall was distorted, and the chimneys were damaged. On Johns Island he observed displaced stones in the Presbyterian cemetery, "craterlets . . . in great profession" interspersed with cracks. The store at Andells had goods thrown off shelves (Peters and Herrmann 1986:64). Although chimneys were damaged, it appears that the "very small frame structures" – probably tenant houses – were largely undamaged.

Jordan and Stringfellow (1998:198) report that the earthquake produced a "large pond" at Fair Oaks Plantation (situated between Legareville Road and River Road), although no pond is shown on the USGS topographic map. Côté (2006:74, 267) indicates relatively minor damage on the islands.

The South Carolina coast was hit by at least 11 hurricanes in the eighteenth and nineteenth centuries. At least six are thought to have been Category 4 or higher storms. None did more damage or caused more loss of life than the hurricane of August 1893.

The storm formed east of the Cape Verde Islands on August 15, becoming a hurricane on the 19th while crossing the Atlantic. By the evening of August 25th, the storm was a Category 3 approaching the Bahamas. During its approach it deviated arcing west-northwest, making landfall near Savannah, Georgia on August 27 as a Category 3 storm. The wind was reported to be 120 mph, the pressure is estimated to have been about 954 mbar at landfall and possibly as low as 931 mbar, and the storm surge – hitting at high tide – was 16

feet. The hurricane passed over South Carolina on August 28 and moved up the East Coast.

The destruction along the South Carolina coast was greatest in the Beaufort area, but extended along the entire coast. An estimated 1,000 to 2,000 were killed, although this figure is quite conservative. A February 1894 *Scribners Magazine* article reported the heaviest damage on those islands between Beaufort and Charleston – including Johns Island (Harris 1894). The initial report in the Charleston *News and Observer* on August 30 explained that while reports from Edisto, James, Johns, and Yonges islands were "meager," they all "describe the storm in those localities as the most terrible visitation which the inhabitants have had." Water in the Wappoo Cut was reported to have reached 18 feet, spreading "itself over the surrounding country like an endless inland lake."

An article on August 31, 1893 reported Kiawah "fearfully damaged." Dill and Ball reported, "We have heard from John's Island and the reports are that the crop has been under water and is stripped of its fruit . . . . Mr. Hofstetter, of Wadmalaw Island, reports that the cotton crop on the island is a complete loss." G.M. Pollitzer reported, "the losses on John's Island were very serious. The colored farmers felt it more especially, and I understand, lost all their cattle, crops, provisions and, in fact, are in a most destitute condition." Another reported that the Johns Island plantations along the riverfront "were under water and the cotton stalks were completely submerged" (Anonymous 1893:1).

On September 1 the news was much the same with reports of all the wharfs between Charleston and Kiawah destroyed. The steamer *St. Helena* was found stranded at the high water mark of the storm on F.Y. Legare's place (Mullet Hall), with the report that "she will have to be dredged out." Houses near Legare's were reported destroyed, as was the stock. Ravenel & Company reported that the cotton at Andell's Bluff on Johns Island was destroyed.

After four days, news describing the extent of the devastation began to reach Columbia and Governor Tillman responded by asking for donations. Local relief committees were formed and eventually very minor aid began to arrive. The governor grossly underestimated the damage and what it would take to help the area recover and it wasn't until mid-September before Tillman finally called on assistance from the American Red Cross. Clara Barton arrived on October 1.

After the Red Cross arrived, a warehouse of clothing and food was started in Beaufort. The Red Cross established rations, began organizing parties to dig over 300 miles of ditches in order to drain agricultural fields, and bought a million board feet of lumber to rebuild houses – in spite of both the South Carolina Legislature and the U.S. Congress denying appeals for assistance. The relief efforts were closed in May 1894 (Nash 2006).

The Phosphate Industry

Charleston's phosphate industry was a significant source of short-term revenue during the late nineteenth century (for a more detailed discussion see Trinkley et al. 2006). The plants involved the old elite in management and operations; the former slaves found mining an excellent supplement to farming. For a time phosphate was an economic boom for the low country. The 1892 political opposition led by Ben Tillman to state subsidies, new competition and better resources in Florida, and the 1893 hurricane all combined to seriously cripple the industry, which ceased entirely in 1911.

While Johns Island blacks worked in the nearby phosphate works on the mainland, we know of no mining on the island.

Table 12.
Stores Operated in the Johns Island Area, 1912
(R.G. Dunn & Co. 1912)

Store	Financial Strength ($)	General Credit
Johns Island		
Banov, A. (clothing, shoes)	<500	
Bolton Mines Co,	20,000-35,000	good
Bradley, P.B. & S.S.	>1,000,000	high
Ferri, E.		
Gadsden, Cyrus	<500	limited
Glover, J.E.	<500	
Harrod & Limehouse (Gin)		fair
Hart, Joseph S.	20,000-35,000	high
Limehouse, J.J.	3,000-5,000	fair
Linstedt, J.G.		
Lowrey, I.H.	<500	
Rivers, Frank W.	<500	limited
Struhs, Henry		
Enterprise		
Bailey, J.S.	<500	
Bailey & Barnwell (Gin, Cotton Buyers)	3,000-5,000	limited
Baxter, F.D.	<500	
Hart, W.R.		
Wadmalaw Mercantile Co.	3,000-5,000	fair
Wilson, W.H. (G.S. & Gin)		
Martin's Point		
Clement, R.L.	<500	
Cox, H.L.		
Towles, F.W.	20,000-35,000	high
Venning, W.C.	<500	
Whaley, H.S.	<500	
Wise & Wise	<500	
Mullet Hall		
Andell, William		
Johnson, J.J.	<500	
Muhler, H.C.	3,000-5,000	fair

The Beginning of the Twentieth Century

Mercantile interests in the Johns Island area increased from 21 in 1889 to 28 in 1912, although two of these later stores were associated with operating phosphate mines, and two others were primarily ginning establishments – thus the increase is minor. Moreover, as with the earlier listing, many of these establishments are located at the Johns Island station on the mainland, not on the island. Wadmalaw drops from the listings, being replaced by Mullet Hall. At Mullet Hall there are three listings. William Andell continued to be the owner of Andell's Bluff and this store was likely a commissary on that plantation. The H.C. Muhler listed in 1912 was the overseer on Andell's Bluff, in addition to the owner of the store on Legare's Mullet Hall (which he acquired after the 1905 death of F.Y. Legare). J.J. Johnson was the founder of the Edisto Island Industrial School for African Americans in 1897 (Tindall 1952:226). The 1900 census shows him as an African American clergyman living on Edisto. Seemingly absent is the Johns Island store of John F. Limehouse (Jordan and Stringfellow 1998:172), but this is almost certainly listed as J.J. Limehouse.

A 1905-1910 directory listed Mullet Hall, describing it as "a small town 35 miles from Charleston" and noting that the only merchant at the location was Francis Y. Legare, who operated a "general store and grist mill" (Anonymous 1905:435-436). The entry also lists 162 "farmers" for the community – the closest document we have providing a comprehensive list of both whites and blacks on the island (Table 14). Since all portions are represented, we believe this may be a listing of those using the Mullet Hall Post Office, which was, of course, the only post office on the island. Most, although not all, of these names are found in either the 1900 or 1910 census.

Although phosphates were still on the mind of low country property owners, there were only six mining companies listed by Watson in 1907 and they produced just over a $1.1 million in 1906 (Watson 1907:142). Agriculture remained the focus of South Carolina's economy with the state's 176,000 farms producing nearly $142,000,000 of products in 1909. Even the state's textile industry didn't

Table 13.
Charleston County Truck Crops in 1915 (Watson 1915:44)

Crop	Acres	Yield/acre	Total Yield	FOB Price	Total $
Irish potatoes	7,000	50 barrels	350,000	1.50 per barrel	525,000
Cabbage	5,500	180 crates	900,000	1.35 crate	1,336,500
Cucumbers	2,000	200 baskets	400,000	.50 basket	200,000
Beans	2,000	150 baskets	300,000	1.00 basket	300,000
Peas	600	100 baskets	60,000	1.25 basket	75,000
Sweet potatoes	1,000	100 sacks	100,000	1.25 sack	125,000
Cabbage plants	600	500,000	300,000,000	0.70/1000	210,000
Misc. vegetables	2,000				200,000
					$2,971,500

Table 14.
List of Farmers Using the Mullet Hall Post Office, 1905-1910

	1900 Census				1910 Census			
	White	Black	Census District	Other	White	Black	Census District	Other
Aimer, O.A.								
Andell, William	x		125		x		76	
Ball, J.A.								
Bennett, Richard		x	125			x	76	
Bennett, S.W.								
Bishop, Frank		x	124	Mathews		x	75	
Bishop, Lydia		x	124					
Bishop, Paul B.								
Blake, L.R.								
Blake, Marcus		x	123			x	74	
Blake, M.F.								
Blake, P.H.D.								
Blake, Ralph		x	123			x	74	
Boggs [Boags], Robb		x	125					
Brisbane, James						x	73	
Brisbane, Richard						x	75	
Brown, Byas [Bias]		x	123			x	73	
Brown, Clarence		x	123			x	73	
Brown, Daniel						x	73	
Brown, George P.		x	123			x	73	
Brown, Isabella		x	123					
Brown, James		x	124/125			x	74/76	
Brown, Robert		x	124					
Brown, January						x	73	
Brown, M.C.								
Brown, Robert								
Brown, Sarah		x	123			x	74/75/76	
Brown, Simon								
Brown, Thomas		x	123/125			x	73/76	
Brown, Titus		x	125					
Bryan, Ellen								
Bryan, E.B.		x	124	Chaplin	x		74	Briars Plnt.
Butler, Susan								
Bynum [Binum], George		x	125					
Campbell, Jacob						x	75	Mullet Hall Rd.
Capers, Ezekeil [Zekiel]		x	124					
Capers, G.A.								
Capers, Samuel		x	125			x	76	
Capers, W.C.								
Cash, Cyrus		x	125	Caper Plnt.		x	76	
Chisolm, Isabella		x	125			x	76	
Chisolm, J[ohn].C.		x	123			x	74	
Chisolm, Phillip								
Chisolm, Samuel								
Chisolm, Thomas								
Chisolm, Thomas								
Chisolm, William						x	75	Mullet Hall Rd.
Choice, Lewis		x	123			x	74	
Cool, Dennis						x	73	
Crawford, Abram		x	123			x	73	
Crawford, Joseph		x	123			x	73	
Crawford, Prince		x	123			x	73	
Crawford, Ransom								
Crawford, Sharper		x	123			x	73	
Cunningham, Andrew		x	123					
Dent, Hannah		x	125					
Dent, Samuel		x	123			x	73	
Eady [Eddy], Robert		x	123			x	73	
Emanuel, A.J.								
Fenn, W.H.								
Fludd, Fortune						x	75	Legareville
Fludd, Harry								
Ford, August		x	124					
Francis, Moses		x	123			x	74	
Francis, Samuel		x	123			x	74	
Fraser, Isaac		x	123			x	73	
Freeman, Cain		x	125			x	76	
Freeman, James		x	124			x	75	
Freeman, Kit		x	125			x	76	
Freeman, Richard						x	76	
Frip, A.R.						x	76	
Fripp, J.E.	x		124	Saxbie	x		75	
Fripp, W.E.	x		124	Legareville				
Frost, F.R.								
Gaillard, Charles		x	124	Rosebank				
Gaillard [Gilliard], Robert		x	124	Blacklock		x	74	
Geddes, Achy						x	74	
Geddes, Robert		x	125	Capers Plnt.				
Gibbes, Laurence [Lawrence]		x	124	Legareville		x	75	Legareville Rd.
Green, Andrew		x	125			x	76	
Green, Richard		x	123/124			x	76	
Green, Mingo								
Grimball, Eliza A.	x		123		x		73	
Hamilton, Morris						x	75	
Harrison, Joseph		x	123			x	74	
Hart, R[ichard].H.	x		123		x		73	
Heyward, M.W.								
Heyward, William		x	124	Mathews		x	75	Mullet Hall Rd.
Hollingston, Peter						x	74	
Hoyt, Emon [Enon]		x	124	Mathews				
Hunt, William		x	123					
Jenkins, A.M.								
Jenkins, C.B.								
Jenkins, M[ary].J.		x	123					
Jenkins, T.Y.								
Jenkins, William		x	123/124			x	73	
Johnson, John	x		124	Johnson's				
Johnson, Robert								
Johnson, Robin		x	124	Creek Side		x	76	
Johnson, William		x	123			x	75	Mullet Hall Rd.
Jones, Stepney						x	75	
Jones, T.S.						x	75	
Judge, Moses								
Laborde, John		x	124					
Lee, A.M.								
Legare, F.Y.	x			Mullet Hall	x			Mullet Hall
Legare, John		x	124	Miller Mill				
Legare, J.C.W.								
Legare, T.S.					x		75	
Logan, Richard						x	74	
McCoy, Jack								
McNeil, Alex								
McPherson, Benjamin						x	76	
Mack, Henry		x	123/124/125			x	75	
Mack, Richard		x	123			x	73	
Magill [McGill], Jackson						x	76	
Manigault, Frederick						x	75	
Matthews, J.E.								
Middleton, Frank, Sr.		x	125			x	76	
Middleton, Thomas		x	125					
Mickell, William, Sr.		x	124			x	75	
Mitchell, M.P.								
Morrison, London								
Murray, Tony								
Prioleau, Edward								
Reese, Joe		x	123					
Richardson, Chris								
Richardson, Richard								
Riley, M.J.						x	73	
Robinson, Roger						x	76	
Ryan, Jack								
Seabrook, A.E. [A.C.]					x		76	
Seabrook, C[lark].B.					x		74	
Seabrook, B[en].J.	x		122		x		75	Creek Side Plnt.
Seabrook, M.E.					x		76	
Saunders, Israel								
Simons, Cyrus		x	124					
Simons, Dennis		x	124					
Simons, Joe		x	124					
Simons [Simmons], Moses		x	124			x	75	Mullet Hall Rd.
Singleton, Isaac						x	75	Legareville Rd.
Small [Smalls], Sam		x	125					
Smith, David		x	124	Mathews		x	75	Mullet Hall Rd.
Stevens, A.J.								
Stevens, W[illiam].F.		x	124	Kiawah		x	74	
Taylor, Richard		x	124	Hopes		x	75	Mullet Hall Rd.
Taylor, Robert		x	125			x	76	
Waite [Wate], Jeffrey						x	73	
Waite [Wate], Joe		x	122			x	73	
Waite [Wate], John						x	73	
Waite, Paul								
Walpole, H.E.	x		124	Auld Ricke	x		75	
Washington, Caesar								
Whaley, A.K.								
Wigger, J.H.								
Williams, Adam		x	123			x	74	
Wilson, J.S.								
Wilson, M.V.								
Wine, A.W.								
Wright, Edgar								
Wright, Joseph		x	125			x	76	
Wright, Thomas		x	123/124			x	74/75	

Although using different divisions, both the 1900 and 1910 census divided Johns Island into four quadrants. Roughly, the NE quadrant was District 122 in 1900 and 74 in 1910; the NW quadrant was District 123 in 1900 and 73 in 1910; the SE quadrant was District 124 in 1900 and 75 in 1910; and the SW quadrant was District 125 in 1900 and 76 in 1910. The Mullet Hall tract was situated in District 124 in 1900 and District 75 in 1910.

Table 15
Agricultural schedule data for Charleston County, 1900-1940
(* rice, where reported in bushels, was converted to pounds as 1 bu. = 45 lbs.)

		Land Occupied or Improved					Livestock						
		Farms	Acres improved	Acres Unimproved	Value of farm	Value of implements	Horse, asses, mules	Milch cows	Working oxen	Other cattle	Sheep	Swine	Value of livestock
Charleston	1900	3,801	80,323	116,481	2,790,670	143,330	3,104	2,795	NR	4,588	3,358	6,921	328,944
Charleston	1910	3,403	66,492	111,194	4,445,157	217,182	3,718	3,028	NR	4,367	1,880	8,360	679,236
Charleston	1920	3,850	85,267	127,272	9,106,354	641,536	5,306	4,890	NR	7,617	2,606	22,710	1,891,221
Charleston	1930	1,957	56,402	99,544	9,043,677	494,253	2,812	1,470	NR	3,880	1,334	8,809	525,346
Charleston	1940	2,124	59,164	107,327	5,745,815	627,227	2,089	1,767	NR	672	603	5,136	440,274

		Agricultural Products													
		Rye & oats, bu	Corn, bu	Irish potatoes, bu	Sweet potatoes, bu	Peas & beans, bu	Value misc. vegetables	Butter, lbs	Hay, tons	Rice, lbs*	Cotton, bales	Wool, lbs	Beeswax, lbs	Honey, lbs	Value animals slaughtered
Charleston	1900	5,390	178,350	225,404	203,817	18,314	328,860	75,541	376	2,034,744	5,658	10,200	260	3,970	13,479
Charleston	1910	8,956	216,647	112,301	114,632	9,720	507,248	6,507	781	289,800	10,461	NR	58	1,205	9,503
Charleston	1920	9,854	451,195	312,880	233,804	38,681	2,068,578	13,374	572	420,210	9,620	4,835	8	503	NR
Charleston	1930	240	343,201	1,303,000	129,314	19,980	913,936	13,105	374	50,580	1,506	2,473	NR	353	NR
Charleston	1940	5,805	215,818	1,047,686	59,658	10,435	661,494	4,614	527	26,730	434	1,649	NR	157	NR

compare, with production of only $49 million in 1905 (Watson 1907:432). By 1907 Watson also remarked that the "trucking branch of the industry [of agriculture] has developed with remarkable speed" (Watson 1907:236). In fact, the future was "full of promise" to those tilling the soil.

Cotton remained the king. Between 1900 and 1906 the acreage statewide devoted to cotton increased by 5.9%. The number of bales produced increased by 19%; and the value of the cotton increased by 23%. In Charleston cotton acreage did increase, although by only 3.3%. Production, however, increased by nearly 35% (between 1900 and 1906 and by nearly 85% between 1900 and 1910). Corn production in Charleston also increased – by 21.5% between 1900 and 1910.

The cause of this increased production between 1920 and 1930 is not entirely clear. The per farm spending for fertilizer did increase appreciably from $252 in 1920 to $579 in 1930. However, the proportion of farms using purchased fertilizer declined from 67% in 1920 to 51% in 1930.

In addition, the agricultural statistics must be viewed cautiously since in 1911 St. Pauls Parish was added to Charleston. Thus, the 1920 statistics are not directly comparable to those of 1910.

The increase in cotton production was accompanied by about a 10% decline in the number of farms and a 17% decline in improved acreage in Charleston County. Farm value, however, increased by 59%.

There was, however, a price to pay for the focus on cotton. Irish potato production dropped by over 50%. Sweet potato production declined by 44%. Peas and beans also dropped by nearly half. Butter production dropped by over 90%. The value of home slaughtered animals dropped by nearly 30%.

The federal census shows a 54% increase in vegetable production between 1900 and 1910, although the 1910 production was still just $507,248. Watson, however, offered different data, indicating a 1210% increase between 1900 and the 1905 figure of $2,787,000 (Watson 1907:291). Even if this were significantly overstated, there was an increasing interest in vegetable production for Eastern markets.

The development of this industry was attributed by Watson to Wadmalaw Island,

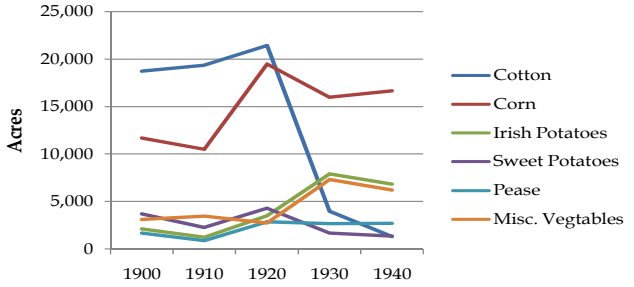


Figure 25. Acreage devoted to six major crops between 1900 and 1940.

where William C. Geraty and his partner, Frank W. Towles developed small scale operations at Martin's Point. Watson (1907:291) pointed out that Geraty was by 1907 the largest shipper of cabbage plants in the world, having shifted his operations to Yonge's Island. Other truck crops increased: asparagus, cucumbers, beets, strawberries, lettuce, beans, peas, Irish potatoes, and sweet potatoes (the last four items are enumerated separately in the federal census, perhaps explaining the differences in values). The Charleston truck crop area was described as including the,

> mainland, Yonge's Island, Mount Pleasant, McClellanville, St. Andrew's Parish, Edisto, Wadmalaw, and James Islands. Meggett's at Yonge's Island, is the center of the truck area in respect of business activity, although not the geographical center of the truck belt. About Meggett's are the largest farms and greater diversification of crops. Here are the farms of Norman H. Blitch, the "Cabbage King," so called from the fact that he raises a larger number of cabbages than any other individual planter in the world; W. C. Geraty, who makes a specialty of raising cabbage plants for replanting and cultivation in other sections, and other substantial truck raisers who have achieved reputation in the market in other respects (Watson 1907:297).

Watson did not mention Johns Island in his truck area, although his reasoning is uncertain. The Seaboard Coast Line opened a branch line across the Stono River to Johns Island in 1916. As a result, a complex of packing sheds was built at the junction of Main Road and Belvedere Road, near Chisolm Road. Where access to this rail line was difficult, such as along the Kiawah River and Abbapoola Creek, farmers used water transportation. Haynie (2007:62)

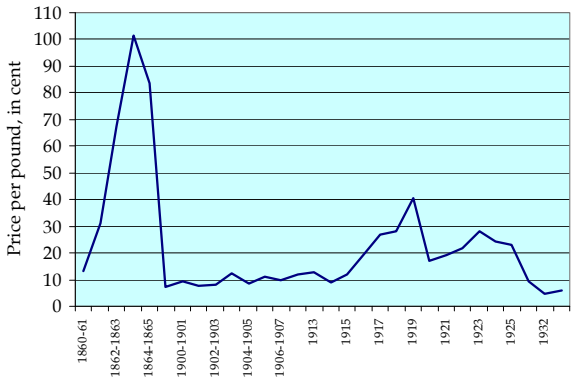


Figure 26. Cotton prices from the late antebellum through early 1930s (Anonymous 1927:132; Edgar 1998:499; Watson 1907:269).

notes that the Legare family operated a very large potato farm at Hanscome Point in the 1920s and 1930s. We also know that Reubin Bishopp operated a truck that shuttled between Charleston and the southern end of Johns Island during the late 1920s.

The huge crops of cabbage, Irish potatoes and early-spring vegetables were grown strictly for packing and shipping to northern markets. Although we have not examined island-level agricultural statistics for the twentieth century, anecdotal evidence suggests that some island farmers grew

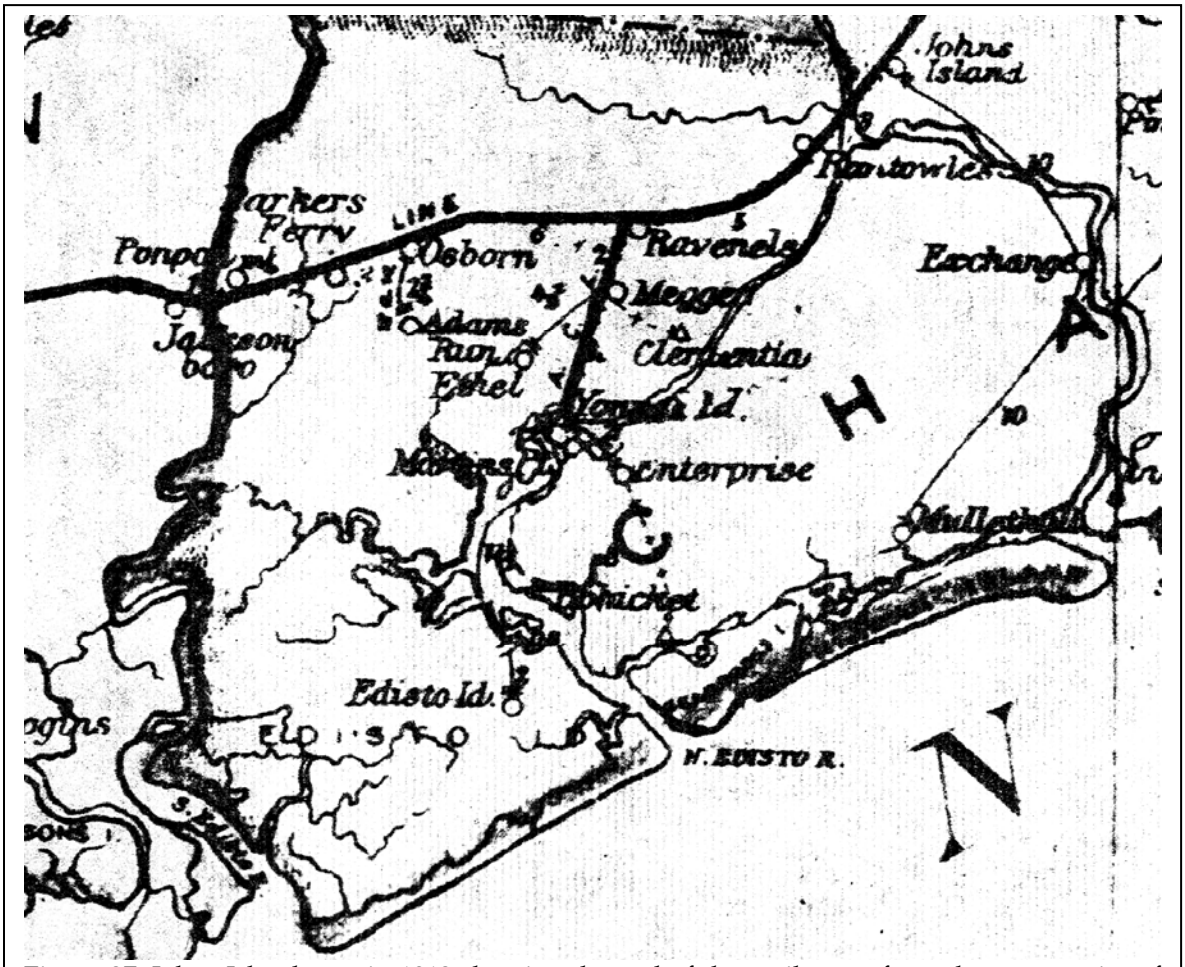


Figure 27. Johns Island area in 1912 showing the end of the mail route from the community of Johns Island on the mainland to Exchange and terminating at the Mullet Hall (shown as Mullethall) post office. Also shown is the route from Yonge's Island to Enterprise and terminating at Bohicket (Rockville).

vegetables for the Charleston market. Because of Johns Island's distance from the city, they were not as successful as the vegetable farmers on James Island.

Watson was no less enthusiastic about the vegetable industry in 1915, noting the center remained in the Charleston area (Watson 1915:43). Table 13 provides his data on Charleston truck crops, including the FOB prices.

By 1927 the truck crop industry had spread to Barnwell, Bamberg, Allendale, Edgefield, Saluda, Calhoun, Dorchester, and Hampton counties. Some crops were even grown in Sumter, Richland, and Lexington counties (Anonymous 1927:151). Charleston County, however, remained the center of the shipments, supplying 2,236 train cars or 61% of the state's total (Anonymous 1927:153). Cabbage that sold for $1.35 a crate in 1915 was selling for $2.50 a crate in 1927.

As late as 1937 Meggett continued to be known for its cabbage production, taking on the name, "Cabbage Patch." The cabbage season typically opened April 1 and closed May 10, with 11,517,000 pounds of cabbage being shipped out in Atlantic Coast Line cars

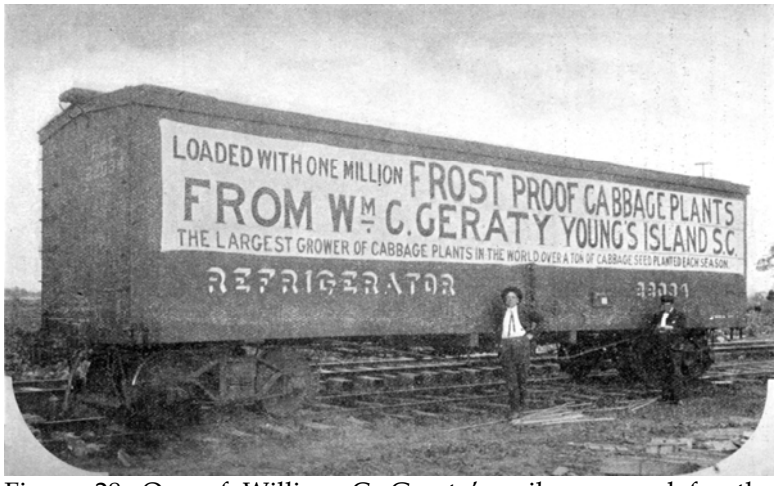


Figure 28. One of William C. Geraty's rail cars used for the shipment of cabbage plants from Meggett on Yonge's Island (adapted from Watson 1907:296).

(Anonymous 1937:8). In addition to the cabbage, the Yonge's Island area also produced Irish potatoes, broccoli, radishes, peas, beans, cucumbers, and tomatoes.

Figure 25 shows the variation in acreage, revealing that the land devoted to truck crops (as well as sweet potatoes, Irish potatoes, and pease) remained relatively stable through 1920. In contrast, acreage for corn and cotton both increased.

Cotton prices, like production, fluctuated (Figure 26). In general, American agriculture prospered during World War I and cotton prices were typically higher than they had been in years – accounting for increased production. Southern agriculture, however, contracted after the war, as European farmers recovered. Nevertheless, cotton farming was "not highly prosperous even during the war years." Although most sectors of the economy recovered relatively quickly, "agriculture did not ever fully recover," and in the "years following 1920, the cotton industry experienced little, if any, prosperity" (Dimsdale 1970:5).

One of the disruptions in South Carolina agriculture was the arrival of the boll weevil. At the door to Savannah in 1917, the weevil had spread through much of South Carolina by 1919 (including Charleston County) and by 1922 had covered most of North Carolina as well. Planters are said to have paid their tenants a penny per weevil in an effort to slow the spread and millions of pounds of arsenical dusts (primarily calcium arsenate) were applied. In spite of these efforts losses ranged between 30 and 60% of a crop (Haney et al. 1996). The most devastating year was 1922, when production statewide was only 30% of what it had been two years earlier (Anonymous 1927:130).

Sea Island cotton, with bolls softer than upland cotton, could never be made resistant to weevils, and planters abandoned it. However, short-staple cotton could be managed, given sufficient chemicals, and Johns Island farmers continued planting with this variety. Any remaining stands of Sea Island cotton produced hybridized seed, and the pure Sea Island type was lost.

In April 1930, John Rivers of the Dill, Ball Company sent to S. M. Hasell & Co., cotton merchants in Columbia, "samples of twenty-five bales of the long-length cotton which you request. This lot of 102 bales is still on hand . . . . We cannot get the parties who own the Sea Islands to name a firm price." A year later, in May 1931, Rivers wrote to Mr. Hue Thomas in Savannah, "The only Sea Island cotton that we know of was raised at the U. S. government experiment station on Wadmalaw Island" (Dill, Ball Company papers, The Charleston Museum).

The boll weevil, the flight of black labor, the rise of the mills – all were viewed as the reason for the cotton farmer's predicament. The decline in cotton production, however, was more than anything else the result of the expansion of cotton growing in the West and abroad. Southern farmers were competitively

handicapped by worn out land, expensive fertilizer, small farms, weeds, the boll weevil, and undependable rainfall. Speculators and a shaky economy added to these fundamental problems. The South's dependency on cotton has been claimed to be perhaps the most important factor leading to the agricultural depression of the 1920s (Holmes 1974:316). Forty-five banks failed in 1926 alone and between 1921 and 1929, 225 South Carolina banks, or roughly half of those active at the end of WWI, had failed. These failures were largely the result of the decline in the value of lands that served as loan collateral (Schultz 1992:3).

In spite of its problems, the state continued to hold an almost delusional sense of optimism. The 1927 state handbook's motto was, "South Carolina: The Comfortable State," and it extolled the state's virtues. Charleston County, in spite of its size and population had only four incorporated cities: Charleston, Maryville, Mount Pleasant, and McClellanville. In many respects Charleston remained a very rural area. By 1915 there was only one gasoline station outside the city (Yonge's Island Oil Company on Yonge's Island). Other industries included only the Bryan Spring Carbonating Company and the Hollywood Manufacturing Company that produced boxes, both on Yonge's Island, as well as McClellanville's Bull Bay Canning Company (Watson 1915: 129, 135-136, 237).

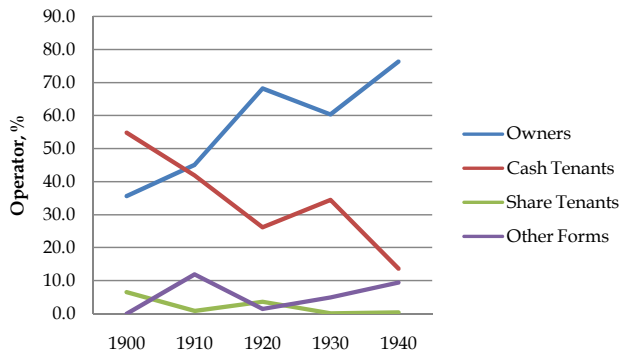


Figure 29. Farm operators in Charleston County from 1900 through 1940.

One of the needs recognized for the area and its improvement was the discontinuation "of long-time consumption credit, based on the mortgaging of crops and labor, which so long has operated to limit the accumulation of wealth by individuals working the soil"(Hager 1927:244).

Tenancy

Statewide tenancy increased every year between 1880 and 1930 – from 50.3 to 65.1%. Charleston, however, took a different path. Although there were fluctuations, the proportion of owner operated farms increased from 35.6% in 1900 (compared to the state average of 38.9%) to 76.4% in 1940 (compared to the state average of 43.9%). When South Carolina had the highest proportion of tenancy in 1930 of 65.1%, the tenancy rate in Charleston County was 39.5%.

While there were different forms of tenancy in Charleston – as revealed by Figure 29 – most tenants in the Charleston area were cash tenants, also known as cash renters. In this form of tenancy, the landlord furnished the tenant only with land, a house, and fuel at a fixed rental to be paid either in cash, which was most often the case, or its equivalent in crop value, typically lint cotton. The tenant furnished labor, work stock, feed for the work stock, tools, seed, fertilizer, and received all income after his rent was paid. The landlord only exercised supervision to prevent depletion, damage, or deterioration of the land and associated structures.

This type of tenant was slightly better off than most since the defined agreement on the amount of rent to be paid made him somewhat more independent. The landlord had no lien on his crop and the tenant could market his lint cotton wherever he chose.

Nevertheless, tenancy created a class from which escape was nearly impossible. In order to maximize profits and limit the mobility of the labor, owners of larger holdings – such as Mullet Hall – often began commissaries, limiting the options of croppers and tenants and ensuring indebtedness. Some issued their own coinage – also like Mullet Hall – that ensured ongoing debt peonage.

At the same time, planters became indebted to their own suppliers. F. Y. and Kate Legare, owners of Mullet Hall, received seed and fertilizer on credit, and they also took cash loans from Dill, Ball Company. While large farmers amassed large debts, small farmers also relied on Dill, Ball Company, their factor, to advance not only fertilizer and seed, but also cash and food rations. One small tenant on Johns Island, Caleb Chisolm wrote to Mr. Rivers, "I want you to send me three sacks of minnare [manure] and two bushels cotton seed. Please to try and send it today, I want to plant it by Thursday next week. Please sir to send the change for me, I need it very bad to get some rope for my horse. If I had a job to make anything I wouldn't worry you. PS - please to send it by Bellenger truck" (Letters 1920-1932, Dill, Ball Company Papers, The Charleston Museum).

In June 1929, Cephas Drayton wrote John Rivers from Mullet Hall, saying he needed $5 "very bad. Please send it, please sir don't disappoint me." Drayton requested $4.50 in June 1932, asking Rivers to "lend it on my wages." Cain Freeman asked Rivers to "please send me one sack corn today so I can finish plowing my cotton." In about 1930, one tenant on Johns Island sent an urgent note asking for an advance and trusting a good cotton crop,

> please let me have a little something to eat for I can go no more. The crop is fine, six acres cotton. Please sir send me, if only one bushel of rice and a bushel of grits and twenty-four pounds of flour and ten pounds of meat. And I was dependent on the potatoes and I didn't get nothing of the potatoes and now I don't got nothing to eat. Please sir send it with Joe Bishop (Dill, Ball Company Papers, Box 60, Folder 5A, The Charleston Museum).

As the economic situation became more desperate, merchants were unable to collect their debts. In the summer of 1932, W. S. Howell, proprietor of a gin and general merchandise store on Johns Island (at the corner of River Road and Edenvale), wrote to the Dill, Ball Company regarding their mutual debtors, many of whom had turned to Howell for their "seed cash." John Rivers replied that he "had no idea that you had advanced to so many of them," and agreed that they should share information. He sent a list of about 120 names (almost a third of them women) and their corresponding debts. Most were less than $25: the highest figure was $58.17, and there were credit balances as low as $3.14. He directed Howell, "if any of these send cotton to your gin, you will protect us to the amount of our account before paying them. . . . I would be glad to receive your list and to protect you against debt-dodging." In December 1932, Howell forwarded to Dill, Ball Company three bales of ginned cotton and the accounts of the growers. The cotton was remitted to Dill, Ball "all for loans" (Dill, Ball Company papers, Box 5E, The Charleston Museum).

With credit entanglements and competition among various gins and storekeepers, even African-American small producers had some flexibility in selecting their markets. In November 1929, John Rivers wrote to Christopher Freeman, "you are so slow in sending down your cotton" only one bale so far and "it is now high time that you send down the rest of it. We have understood that the gins on Johns Island are about to close down ginning, but we expect to run our gin on James Island

this coming Friday and so if you cannot get it ginned on Johns Island we can gin it out for you on Friday next." He also wrote to Harry Freeman "we have understood that you ginned a second bale of cotton . . . but have not brought it to us. Please send it as soon as possible" (Dill, Ball Company papers, The Charleston Museum).

In January 1930 John Rivers wrote to Mrs. C. R. Jones on Johns Island, "I have found out that John Fields has a bale on Johns Island, and Reubin Bishopp can haul this cotton to the gin . . . we will operate the gin . . . and can get your cotton ginned . . . Bishopp will pick it up" (Dill, Ball Company papers, The Charleston Museum).

In spite of the somewhat better conditions offered by Charleston, the county – as well as the state – saw a significant out migration. The first waves occurred in the late nineteenth century. Known as "Exodusters" after the biblical exodus from Egypt, many went west to Kansas, Oklahoma, and California. The Great Migration, however, took place between about 1916 and 1920 as blacks took advantage of a severe labor shortage during World War I. Destinations were primarily northern cities such as Chicago, Detroit, Washington, and Baltimore, although even some southern cities, such as Atlanta, gained.

This movement crippled cotton planters who relied on tenant labor to pick cotton. Resentment mounted among many who remained and,

> their protests were not always verbal. Some cotton pickers filled their sacks with green bolls or rocks before weighing (Cobb 1992:203).

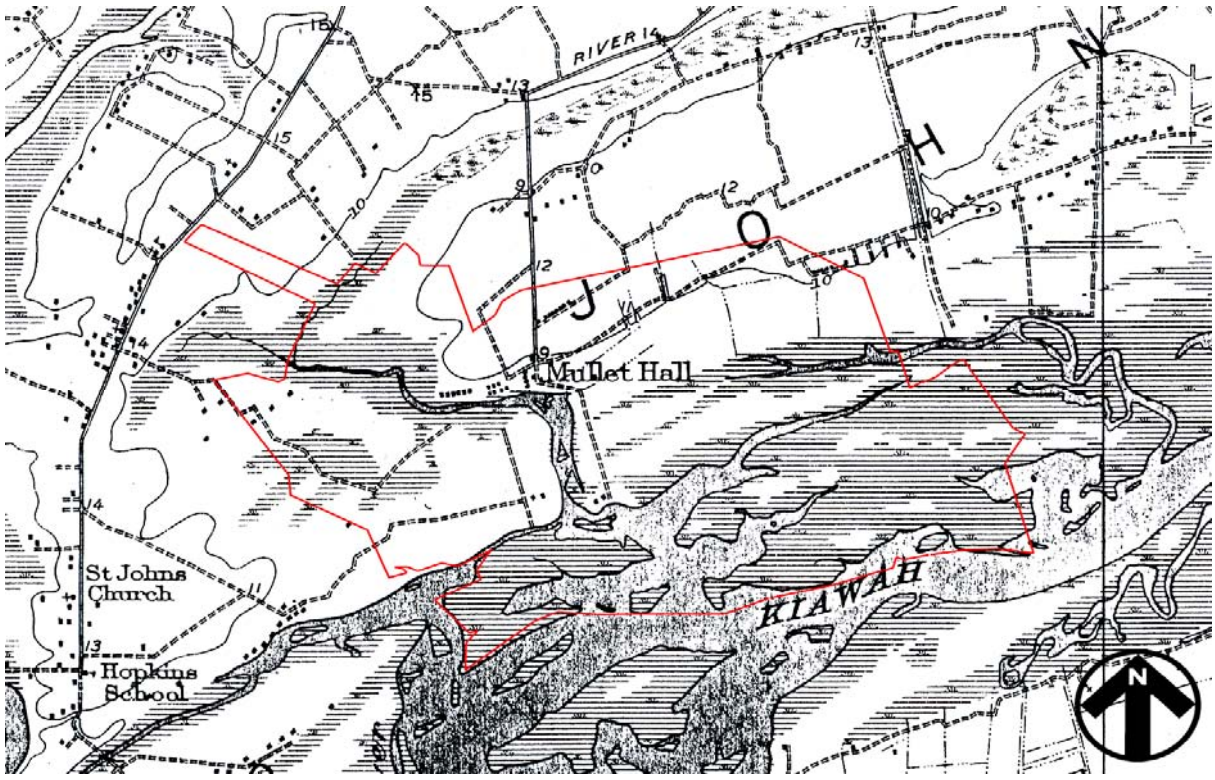


Figure 30. Mullet Hall area in 1919 (basemap is the 1919 Wadmalaw 15'). Comparison with the antebellum maps shows little change to the area over the previous 60 years.

The decline in African American population was not seen as devastating by all South Carolinians; one account said,

> This means a new freedom for South Carolina. It is the removal of a vague but always present shadow. South Carolina at last has become a white state (Anonymous 1927:22).

Although uncertain, it seems that the abundance of truck farming in Charleston County may have ameliorated the problems caused by the decline in African American labor.

Arrival of the Depression

Edgar notes that in 1930 the situation among South Carolina farmers was dire. Having gone on a spending spree when money was flowing, they had no reserves, and the decade of the 1920s was so bad that:

> South Carolina agriculture was about to go under. Farmland and buildings had lost more than one-half their value. One-third of the state's farms were mortgaged, and 70 percent of the state's farmers survived on borrowed money (Edgar 1998:485).

Schultz remarks that many remember the Depression years not for the "coming" of hard times, but instead "recall those days as a continuation of long-standing hardship" (Schultz 1992:3). By 1933 state government itself was on the verge of collapse – state employees were laid off and those that remained were paid with "state I.O.U.'s."

Statewide the average farm value dropped over 40% from $4,222 in 1920 to $2,400 in 1930. Yet in Charleston County the average farm value actually increased from an average of $2,365 in 1920 to $4,621 in 1930. A decline isn't seen until 1940, when the value sank to $2,705. In addition, while statewide a third of all farms were mortgaged, only 9.2% of Charleston farms had a mortgage on them. The debt to value ratio for Charleston farms was also slightly better (30.06) than the statewide average (40.06).

There were earlier signs of the depression in Charleston County, however; between 1920 and 1930 the value of farm implements declined by 23% and the value of livestock declined by a staggering 72%. Perhaps most ominously, the value of vegetable production fell from $2,068,578 to $913,936 – indicating that the truck farmers were being hit hard. Cotton production declined by 84%. In addition, while the rate of mortgaged farms in Charleston was low, the per farm mortgage was actually quite high. The state average was $1,747, but in Charleston the average mortgage was $4,150.

The 1930 census also gives us a view of the living conditions in Charleston County. Of the 1,957 farms, only 478 reported having automobiles and only 60 (about 3.1%) had electricity. Telephones were found in 134 farms and 127 had piped water into their houses. Over 40% of the farms were located on unimproved dirt roads; only 0.3% were adjacent to sand-clay roads. The average cash rent for farms in Charleston County was $89. In comparison, the average cash rental for Berkeley farms was $102 and $58 in Beaufort.

The situation is made even clearer by the Bureau of Home Economics (1939). This research surveyed over 15,000 tenant homes in South Carolina to arrive at a profile of the "typical" tenant house. They found that 38% of these houses were 25-49 years old, with another third between 10 and 24 years old. Nearly 80% were of unpainted frame construction (and slightly over 2% – as late as 1939 – were still constructed of logs). Islander G.C. Brown provided an oral history in which he remembers the numerous Johns Island houses made of logs

Table 16.
Net Income per Family by Tenure Status and Region, 1934
(Woofter 1936:Table 38) (2006$)

Region	Wage Hands	Croppers	Share Tenants	Renters
Atlantic Coastal Plain	199 (3,015)	519 (7,863)	833 (12,621)	536 (8,121)
Upper Piedmont	153 (2,318)	336 (5,090)	440 (6,667)	444 (6,727)
Black Belt	156 (2,363)	334 (5,060)	313 (4,742)	471 (7,136)

with stick and mud chimneys (Carawan and Carawan 1989:10).

Foundations were generally in fair to poor condition and roofs were largely in poor condition. Exterior walls were about evenly split between good, fair, and poor conditions. Doors and windows were typically in poor condition. Window screens were largely absent and, where present, were in poor condition. Interior walls and floors were generally in fair to poor condition.

Turning to household facilities statewide, less than 1% had gas, less than 4% had electricity, and only 0.1% had piped heating (meaning that virtually all depended on either fireplaces or wood stoves). In terms of refrigeration less than 1% had mechanical units (refrigerators). An additional 14.5% could boast of ice boxes, while the remaining 85% had no refrigeration at all. Only 0.1% had a power washing machine. Cooking was almost universally done using wood or coal stoves since less than 0.5% had either a gas stove or electric range.

Woofter (1936) also provides similar details, recounting that in South Carolina 97.4% of all tenants used a wood or coal stove. Over two-thirds of all tenants used an "unimproved" outdoor privy and over 28% had no toilet facilities whatsoever. As late as 1934, 72.1% of South Carolina tenants had a dug or bored well. An additional 13% relied on a spring for fresh water (absent on the sea islands). The typical tenant house in South Carolina had 2.7 bedrooms and 1.8 "other" rooms, including kitchens and parlors. In these 4.5 rooms there was an average of 1.3 occupants per room.

The disparity between black and white was clear. The average South Carolina value of white tenant houses was $454, compared to $238 for black tenants.

Woofter (1936:Table 38) also provides information on the average tenant incomes by region in South Carolina. These are shown in Table 16 – where we can begin to see the reality of tenancy. The modern HHS poverty level for a family of six (an average tenant family) would be just less than $26,000 – over eight times what a wage hand might be making in Charleston County and three times what a renter would be making.

Nearly two-thirds of the tenant's income was spent on food. The bulk of the food budget was spent on three items – flour (or cornmeal), lard and meat (almost universally fat salt pork). What may be surprising is the relatively significant portion of the income spent on condiments – 5.4%. Presumably this was an effort to make otherwise bland food palatable or it was because condiments could not be made at home.

These dietary habits – responsible for a variety of health ailments, such as the dietary deficiency pellagra – were deeply rooted in Southern tenants. Two studies from the late nineteenth century found African American diets dominated by "bacon, flour, corn meal, and molasses," and per man per day costs averaged between 8¢ and 11¢ ($1.86 and $2.56 in 2006$) (Atwater and Woods 1897, Frissell and Bevier 1899). It is, however, uncertain if the abundance of readily available vegetable crops in the truck farming area made a difference in these dietary practices.

Using even the lowest figure for the two adults in an average tenant family and assuming only one meal a day, a year's food would cost approximately $1,324 – about 60% of the wage hand's net family income. When we factor in children and at least some minor supper meal costs, we can sense the depth of poverty that tenants faced.

Partial Recovery

The effect of the Great Depression was devastating to all sectors of South Carolina's economy. Between 1920 and 1935, 80% of all high school and college graduates left the state. The value of the state's timber industry declined by 68%, its cotton mill industry declined by 33%, and mineral products declined by 63%. One reporter commented, "in almost every form of human progress South Carolina has sunk about as far as a state can sink" (quoted in Edgar 1984:4).

A bright spot in Charleston was the Navy Yard, which benefited from WPA and PWA activities, as well as the war boom (Hamer 2005). In 1937 *The News and Courtier* would brag that the WPA projects, which had employed an average of 1,200 men a year, had helped make Charleston "the Navy's youngest and fastest growing yard." By 1938 the WPA had spent $895,000 on improvements and the PWA $1,782,800. In 1939, the Navy Yard had a $3.5 million expansion and improvement program underway employing nearly 1,800 WPA and PWA workers. By the time WWII was declared, the yard had nearly 2,000 production workers compared to 241 in 1932.

A number of Depression era programs were initiated by President Franklin D. Roosevelt. One critical effort for the state's rural farmers and tenants was the Farm Security Administration. It began in 1933 as the Agricultural Adjustment Administration (AAA) and was initially responsible for the efforts to pay farmers to reduce agricultural production. This effort was successful – 10 million acres of cotton were plowed under and 5 million hogs were butchered. South Carolina was expected to plow under 30% of her 1.77 million acres of cotton (Charleston County's share would have been about 1,188 acres – far less than many surrounding counties). The AAA graduated payment was about $14 per acre (Hayes 2001:122). Ultimately 68,200 contracts were negotiated and 424,000 acres were taken out of cotton production, 24% of the crop.

Initially the AAA made payments to landowners, not tenants, for whom the reduced production meant the elimination of their tenancy or livelihood. In Charleston County the early efforts failed to reduce tenancy – the number of tenant operated farms nearly doubled between 1930 and 1935, going from 623 to 1,227.

By 1935, however, the AAA required that cash renters (the bulk of Charleston tenants) were to receive the entire payment – parity plus rental (Hayes 2001:126). With this incentive tenancy was significantly reduced, with Charleston losing 808 tenants (the number dropping 419 in 1940). Statewide, tenancy was reduced by nearly 30,000 farmers (Cooper and Terrill 1991:648).

Island life during this time is still remembered by the island's African American residents. Nancy Butler remembers the pay on the truck farms – 10¢ per sack of potatoes (Behre 2004). Belle Green reported being paid $3 a week for harvesting cabbage and potatoes on Johns Island (Carawan and Carawan 1989:7). Many of the island's blacks continued to live off the resources of the creeks, including fish, shrimp, and oysters. Carawan and Carawan (1989:8) report oral histories speaking of a plate of shrimp for 5¢ or islanders selling a string of fish for 10¢. While the City of Charleston was the recipient of much WPA funding through the political machinery of Mayor Burnet Maybank (Fraser 1989:379-383), the only WPA project we have identified on Johns Island was the construction of a 2-story brick school for white

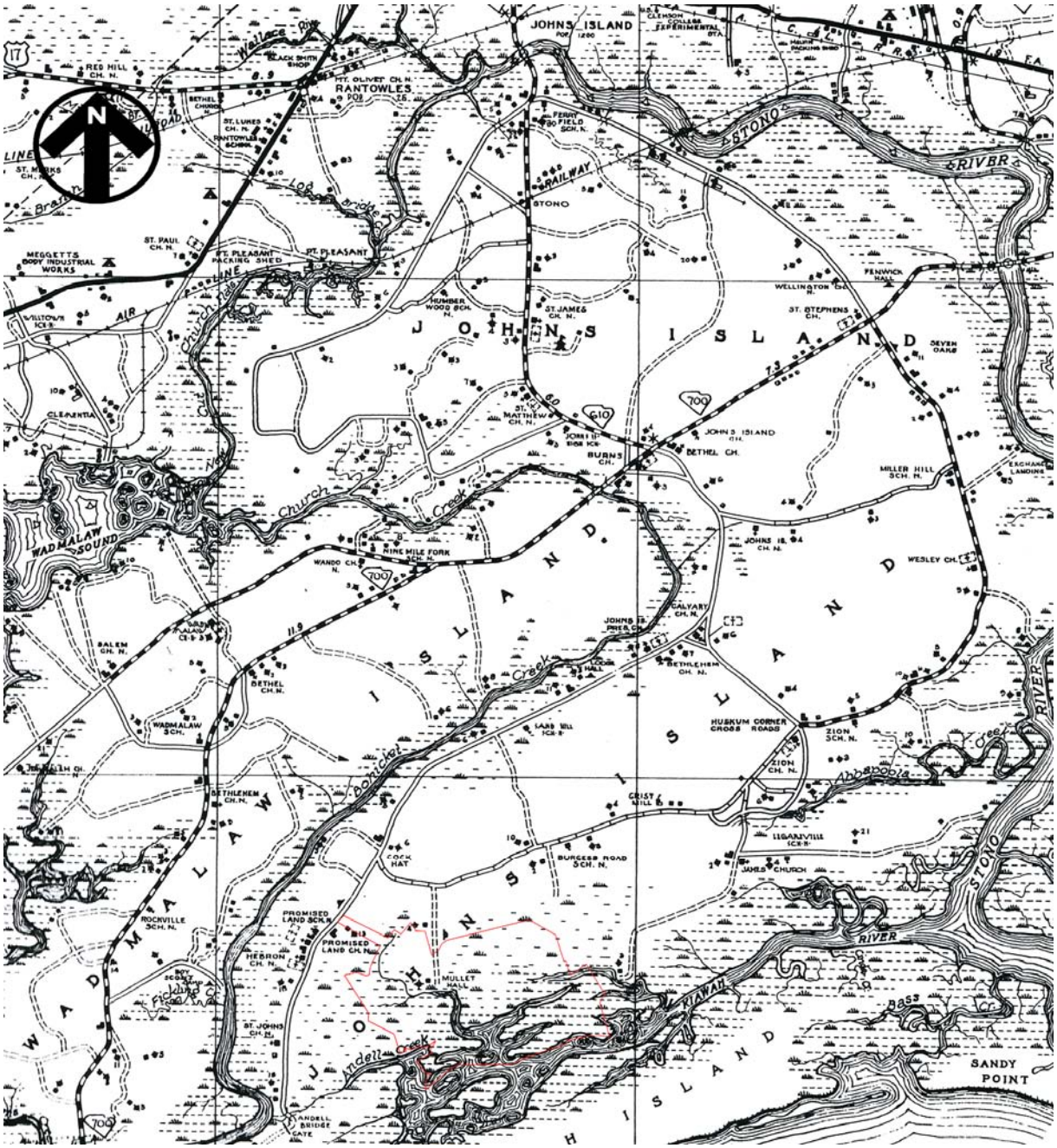


Figure 31. Johns Island in 1938 (General Highway and Transportation Map of Charleston County).

high school students (Carawan and Carawan 1989:9).

The WPA organized at least two small handwork businesses on Johns Island. The 1920 Agricultural Hall on Angel Oak Road hosted a sewing room where white women made clothes for weekly wages. On Main Road, close to John F. Limehouse's store, was a moss factory. Here African-American women collected Spanish moss, steamed and dried it, and packed it for use as mattress stuffing (Haynie 2007:70-71).

The 1938 General Transportation and Highway Map of Charleston County (Figure 31) shows the area around Mullet Hall as it was prior to World War II. There were two bituminous paved state highways on Johns Island – SC 610 or Main Road ran from the mainland community of Johns Island south through the island terminating at SC 700 or Maybank Highway. This highway had been paved only a decade earlier. Prior to that time many preferred to travel to Charleston by boat, a trip that required up to 6 hours (Vinson 2004:40).

Swing bridges had been built for both highways across the Stono in 1929 (with the Limehouse Bridge connecting the island to the mainland replacing a ca. 1917 swing bridge). SC 700 continued from James Island onto Wadmalaw. Main Road became an unimproved road that ran to Andell Bridge and a gate onto Seabrook Island. River Road, which ran from SC 700 along the edge of the Stono on the island's east side was also paved as far as Huskum [Hanscome] Corner. The continuation of River Road along the southern edge of the island was graded and drained, tying into Bohicket Road at what was by this time called "Cock Hat" (rather than "Cocked Hat").

At the terminus of Mullet Hall Road was a farm dwelling and a single tenant house. These are the only structures shown for the tract, although a second farm house and four tenant houses were found on the west side of the Mullet Hall Road, perhaps off the tract. On the east side of the road was a portable sawmill.

In close proximity to the west of Mullet Hall were three black churches: Hebron, Promised Land, and St. Johns. Both Hebron and Promised Land had graveyards. Just a few buildings to the north of the Promised Land Church was the Promised Land School (identified as for "Negroes"). Today Hebron Church is still shown on the modern USGS topographic map, although the cemetery is no longer shown. Promised Land School is shown, although both the church and the cemetery are no longer shown. St. John's Church is still shown and with it is a cemetery.

Along River Road to the east of Mullet Hall was Burgess Road School – also for the island's black community. A little further to the east was a grist mill. Neither are shown on the modern map.

Other landmarks no longer found today include Sand Hill School (N), Calvary Church (N), the cemetery for Bethlehem Church (N), Johns Island Church (N), Miller Hill School (N), Wellington Church (N), Ferry Field School (N), Humber School (N), Zion School (N), and Legareville School (N).

The 1940 census provides additional support for the idea that the depression continued to affect Charleston later than the rest of the state. While SC as a whole began to show some signs of improvement in 1940, Charleston's farms were still in trouble. The proportion mortgaged had increased from 9.2% in 1930 to 9.8% in 1940, although the amount of the average mortgage had dropped to $2,833 and the value to debt ratio had decreased slightly to stand at 28% – significantly lower than the state average of 34.9%. The average value of the Charleston farm dropped from the 1930 level of $4,621 to only $1,709 in 1940. The average farm size, however, remained relatively stable at 78.4 acres.

Rural electrification had made an impact, with 450 farms having electricity by 1940, although this still represented only 21.2% of the county's farming community. The number of automobiles rose very little – up from 478 to 544 – and the number of telephones on farms actually declined by 25%.

Truck cropping continued to decline in Charleston. In 1930 there were 1,018 farms with 7,311 acres harvesting vegetables for sale. By 1940 there were only 693 farms with 6,193 acres.

The value of the produce declined from $913,916 to $661,504 – a decline of 27.6%.

In 1940 Johns Island contained 937 dwellings, 663 or 70.7% of which were farm units. The remaining 274 were non-farm units. Of the total, 500 or 53.4% were owner occupied; the remainder were tenant housing. Nearly 74% of the houses were occupied by African Americans. Twenty-eight percent of the houses on Johns Island were classified as late as 1940 as needing major repairs and 90% lacked an indoor bath.

Even as late as 1950 the census study of farm housing units (conducted by economic subregions and looking at African American dwellings) found that 45% of the occupied units were dilapidated. Regardless of condition, 92% of farm houses in the area still lacked running water. Nearly 97% of the occupants, in 1950, were making less than $1,000/year ($8,333 in 2006$).

Tract Specific History

Introduction

The study tract, today owned by Kiawah River Plantation, LP, is part of a plantation that was known as Mullet Hall during the twentieth century and for much of the nineteenth century. The historic Mullet Hall Plantation was created by combining several tracts during the eighteenth and nineteenth centuries, with additional expansion during the late nineteenth and early twentieth centuries.

Members of the Legare family have been associated with Johns Island since at least the eighteenth century. The Huguenot Solomon Legare (d. 1760) was a goldsmith by profession; his son Solomon Legare Jr. (1703-1774) became a "currier" – one who prepares tanned hides for working as leather. His workyard on Tradd Street was supplied from his rural lands, first in Christ Church Parish and soon on the more convenient islands southwest of Charleston. In 1729, Solomon Legare Jr. of Charles Town paid £250 for 510 acres on Wambaw Creek (Christ Church Parish), then in 1744 he paid £2,000 for a 540-acre plantation on the Stono River on Johns Island. Although he kept a town house near the tanning business in Charleston, Solomon Legare, Jr. described himself as a planter "of St. Johns, Colleton," in 1750 when he bought another 100-acre plantation from the executors of Thomas Jinks. In 1768, Legare paid £2500 for 650 acres on Wadmalaw Island.

Solomon Legare gave some of his Johns Island land to his son Thomas Legare (1732-1801) the father of three men whose families were associated with Mullet Hall Plantation: James Legare (1762-1830), Thomas Legare (1766-1842), and Solomon Legare (1770-1799). James Legare occupied the Mullet tract and adjoining properties; Thomas Legare acquired land to the north. Solomon Legare's granddaughter married James Legare's son, and as his widow she managed Mullet Hall from 1850 to 1868.

Our study tract was historically made up of four plantations: Mullet Hall, "Home Place," Rosebank, and The Oaks. Mullet Hall and Home Place, each 600+ acres, were the halves of a larger Mullet Hall assembled by James Legare and divided between two of his children in 1830. The larger Mullet Hall was recombined from its two halves during the 1880s, with the Home Place name being lost. Rosebank (only a small part of which is part of our study tract) was a Fripp plantation added to Mullet Hall in 1855. The Oaks was a Roper plantation added to Mullet Hall in 1897.

Mullet Hall to 1830

James Legare was already a Johns Island planter in 1788 when he paid fellow-planter Peter Herne £930 current money of South Carolina for a "233-acre plantation, part of a tract formerly of Est. William Stanyarne. Butting and bounding east on part of Est. William Stanyarne, south on Charles Freer, southwest on Alexander McGillivray, northwest on Thomas Townsend" (Charleston County RMC DB D7,


Solomon Legare the Huguenot -1760
Daniel Legare
Thomas Legare
Solomon Legare the Younger
Daniel Legare the Younger
Solomon Legare, Jr. 1730-1774
Thomas Legare the Younger 1732-1801
Elizabeth Basnett 1734-1790
Thomas Legare 1766-1842
Ann Eliza Blackburn 1777-1838
Elizabeth B. Legare - ca. 1863
Rev. Elisha White 1795-1849
Ann Ashe Legare 1801-
James W. Holmes 1790-1833
James Hanscome Holmes
Martha Eliza Legare 1831-1907
Mary Wilkinson Legare 1824-1855
Maynard E. Carrere 1813-1879
Charles E. Carrere 1850-1893
Solomon Legare, Jr. 1797-1878
Ann Eliza Legare 1832-1909
George W. Seabrook, Jr. 1834-1861
Eliza S.W. Legare (1st) 1804-1847
Amelia Trescott Chapman 1817-1904 (2nd)
James Hanscome Holmes
Martha Eliza Legare 1831-1907
Julia Legare
Solomon Legare 1770-1799
Mary Swinton 1771-1843
Eliza Catherine Legare 1794-1842
John Bryan 1791-1848
Lydia Ball Bryan 1816-1868
James C.W. Legare 1806-1850
Edward Benjamin Bryan 1826-1891
Julia Grace Bryan 1821-1866
James Legare 1762-1830
Mary Wilkinson 1764-1841
James C.W. Legare 1806-1850
Lydia Ball Bryan 1816-1868
Eliza Slann Wilkinson Legare 1804-1847
Solomon Legare, Jr. 1797-1878
Martha Wilkinson Legare 1795-1856
Horace Walpole 1790-1860
Lydia Bryan Legare 1837-1899
John Basnett Legare Waloole 1824-1893
Horace Edward Walpole 1827-1887
Anna Louisa Warner 1836-1905
James Legare Walpole 1812-1880
James C.W. Legare 1834-1874
Lydia Bryan Legare 1837-1899
John Basnett Legare Waloole 1824-1893
Francis Yonge Legare 1850-1905
Catherine Seymour Walpole 1859-1945
Mary Wilkinson Legare 1841-1923
Thomas W. Whaley 1837-1917
Catherine Seymour Walpole 1859-1945
Francis Yonge Legare 1850-1905
Francis Yonge Legare 1890-1955
Mary V. Lee

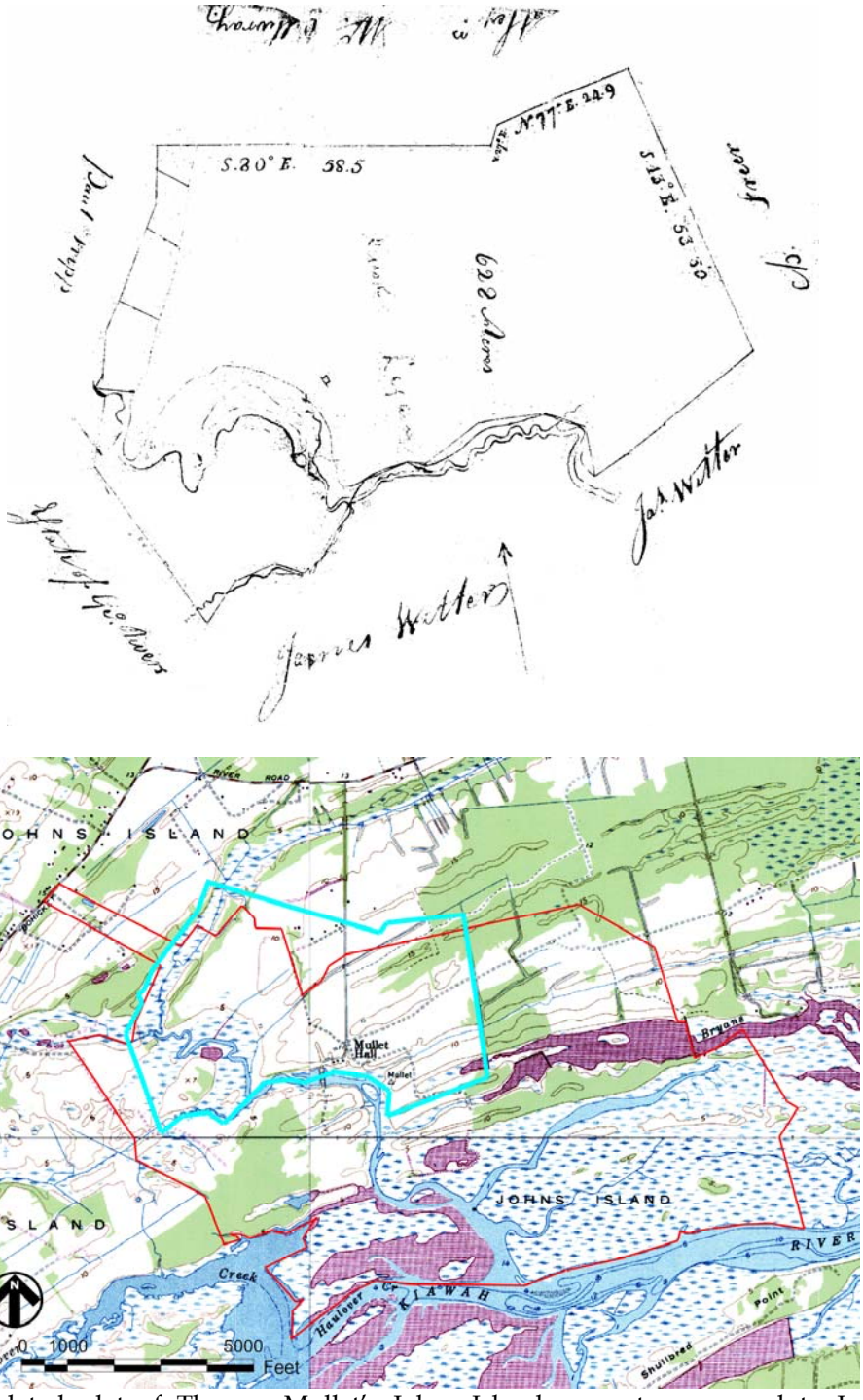


Figure 33. Undated plat of Thomas Mullet's Johns Island property conveyed to James Legare (McCrady Plat 4608) at the top; below is a modern topographic map showing the Mullet property (in blue) and the study tract (in red). Note the settlement along the creek edge and the rice fields to the west.

pg. 59; recorded December 1800). In 1792 he acquired the adjacent McGillivray tract at auction, a "very valuable plantation or tract of land, on John's Island, about 370 acres. Seized, taken in execution, and to be sold as late the property of Alexander McGillivray" (*Charleston City Gazette,* November 5, 1792). McGillivray's plantation had been seized by the sheriff to cover judgments in two suits, one of them brought by Benjamin Mathewes, a Johns Island planter who held McGillivray's mortgage (dated March 18, 1788). William Mathewes had owned a 470-acre plantation, but when James Legare paid £342.11/3 for 374.5 acres of it, Charles Freer already owned the east 95.5 acres. The portion purchased by Legare was bounded "northwest on the public road, northeast on Thomas Townsend and Peter Herne, east on Charles Freer (being the other part of the 470 acres), southwest on aforesaid Benjamin Mathewes and Paul Fripp" (Charleston County RMC DB D7, pg. 53; recorded December 1800).

We have not determined where James Legare and his wife, whom he had married in 1784, lived during this period. Although the Herne and McGillivray tracts comprised a sizable plantation, the Legare residence might have been elsewhere on Johns Island. In 1794, James Legare nearly doubled the size of his 607.5 acre plantation, paying £554 sterling money for a 597-acre plantation "bounding north on land late the property of Alexander McGillivray, deceased." This was the Mullet tract which gave the subject property its name.

In March 1793, Thomas Mullet of the City of London, merchant, had given his power of attorney to Thomas Morris, Joshua Ward and John Ward, Esquires, of Charleston, authorizing them to sell his property on Johns Island. The deed (Charleston County RMC DB D7, pg. 49; recorded December 1800) described a parcel that had been conveyed to Mullet by Benjamin Mathews and Mary his wife in 1791, and was bounded west on Paul Fripp and on George Rivers, south on James Witter, and east on Micah Jenkins. Paul Fripp's tract became Rosebank, see below; the Witter tract was later acquired by Solomon Legare as part of his "Home Place," see below; and the Micah Jenkins tract became known as The Oaks, see below.

Table 17.
Agricultural Schedules for Plantations in the Study Area*

	Slaves/Houses	Improved Acres	Unimproved Acres	Horses	Mules	Milch Cows	Oxen	Other Cattle	Sheep	Swine	Corn, bu.	Rice, lb.	Cotton, bales	Wool, lb.	Peas, bu.	Sweet Potates, bu.	Butter, lb.
1850																	
M. Jenkins Roper (The Oaks)	78	500	500	7		40	12	28	40	20	538		20	40	30	800	
Horace Walpole (Creekside)	124	500	160	2	3	69	8	20	40		600		41		100	1,200	200
Solomon Legare (Home Place, Legareville, etc.)	248	700	908	40	10	105	20	80	70	70	3,000	15,000	172	400	200	3,000	192
Est. Elipha White (n of Home Place)	50	647	200	2	2	30	6	20	4	5	500	900	15		50	1,00	120
1860																	
Simon Legare	230/59	1,530	734	16	10	160	24	20	95	45	25,000		89	255	150	6,500	1,560
James Walpole (Acorn Hill)	26/7	600	200	3	2	20	3	20	11	24	1,000		50	60	30	2,000	250
Lydia Legare (Mullet Hall)	107/30	650	225	14	2	30	3	40	52	60	1,300		45	200	20	3,000	250
William Roper (Brick House)	80/23	600	324	5	4	40	10	40	47		1,000		50	200	130	1000	300
B.D. Roper (Briars)		500	250	4	2	20	6	30	40	50	500		20	150	50	800	100

*Owners in red represent a portion of the study tract; others are surrounding tracts. The 1850 data for Solomon Legare include a portion of the study tract, although it is combined with multiple other St. Johns Colleton tracts. Owners of the study tract in 1850/1860 not shown in this table could not be identified in the agriculture schedules.

Little is known about Thomas Mullet, other than that he was a book dealer at 11 Size Lane, Budge Row, London from at least 1783 through 1786 (Lowndes 1783, 1786). Raven (2002:302-303) notes that bills were paid to Thomas Mullet, Esq. and Thomas Mullet & Company in 1795.

Much earlier – in 1735 – the marriage of Nicholas Mullet to Mary Brown shows up in the St. Philip's Church Register (Holcomb 1995:181). Nicholas died by 1747 when Mary was married to Abel Inman. The relationship of Nicolas and

Mary Mullet, if any, to Thomas Mullet is unknown.

It is also uncertain whether Thomas Mullet ever visited Johns Island. He owned his island property from 1791 to early 1793. The only record of his activity in Charleston that we have been able to find are two court cases dating from the late 1780s resulting in unpaid loans he made (Judgment Roll, Charleston Series, 1794, item 104A; 1798, item 412A).

However, archaeological evidence is clear that from an early date, there was a house on the tract conveyed by Mullet to Legare. This house seems to have predated William Mathewes, who sold the land to Mullet, but might have been built by an earlier generation of Mathews. Regardless, its location is clear on the plat of James Legare's 622 acres (Figure 33). Legare must have named his residence plantation "Mullet Hall" after the house on a tract briefly owned by Thomas Mullet.

James Legare retained Mullet Halll, about 1100 acres between the public road and the Kiawah River, for the rest of his life. At some point, he moved his primary residence to the northwest part of his property, then in the 1820s he bought two plantations on Abbapoola Creek. Over sixty years old in 1824, he paid taxes on 1,936 acres of land and 132 slaves (SCDAH, Individual Tax Returns 1824, item 2572). At about this time, he moved his residence from Mullet Hall to his Point Plantation on Stono River. Legare bought The Point from Thomas Hanscome in 1825, paying $9,720 for the 324 acres fronting the river (Charleston County RMC DB Q9, pg. 139), where he lived at the time of his death in 1830. This tract adjoined a larger plantation (later known as Creekside, home of his daughter Martha L. Walpole) which Legare had bought from Hanscome in 1821, paying $19,000 for 650 acres at the north side of Abbapoola Creek (Charleston County RMC DB J9, pg. 98).

When James Legare wrote his will in June 1828, he bequeathed Mullet Hall to two of his children, directing that it be divided by "a line running from the creek on the south to the line of Estate Jenkins" (Charleston County Will Book 38, pg. 682). He left the west part of Mullet Hall containing "the Settlement and Mansion house I lately resided in" to his son James C. W. Legare (1806-1850). To his daughter Eliza Slann Wilkinson Legare, the wife of Solomon Legare Jr., he left the ca. 600-acre east tract "so much of the plantation whereon I lately resided, called Mullet-Hall, as will make about six hundred acres taken from the eastern side … as it has been … laid out by a line lately run from the creek on the south to the line of Estate Jenkins."

The will specified that Eliza S. W. Legare was to have undisturbed use of the canal running from the division line between the two Mullet Hall tracts down to the Creek for the purpose of draining. In addition to the plantation, Legare also left slaves to James C. W. Legare (twenty-five people in seven families) and Eliza S. W. Legare (twenty-six people in six families).

Mullet Hall (West Half) After 1830

Upon his father's death in 1830, James C. W. Legare (1806-1850) inherited the west half of Mullet Hall Plantation, just over 600 acres including his parents' "Settlement and Mansion House" (Will of James Legare, Charleston County Will Book 38, pg. 682). Whether he occupied the residence immediately is not certain, but after his 1833 marriage to his cousin Lydia Ball Bryan (1816-1868) they settled at Mullet Hall.

James C. W. Legare planted Mullet Hall until his death in late 1850. The appraisal of his personal estate made in January 1851 details a large operation: 126 slaves, twenty-two gins, five plows, eleven oxen, and two mules. There was evidently no ginned cotton on the premises, but foodstuffs and feed included fodder, peas, corn, rice, seed potatoes, and cow potatoes. The

inventory of household goods indicates a residence of four bedchambers, equipped for year-around occupancy (Charleston County Inventory Book C, pg. 105). Although we have no plats for this tract, we believe that Legare continued to occupy the Mullet settlement shown in Figure 33.

Legare also owned land in St. Pauls Parish, near Toogoodoo Creek where other members of his family planted cotton. There he held thirty-three slaves, ten oxen, one mule, a plow, and two gins (Charleston County Inventory Book C, pg. 105).

managed to get some cotton picked before the mandatory evacuation in late fall, selling seven bales in April 1862, five in December, and eight in January 1863. The cotton sold in 1863 was probably grown near Orangeburg, where the family and "negroes" had moved in June 1862. Some of the slaves might have been sent there earlier, for Legare bought 217 bushels of corn ($217) in February 1862. Other corn purchases were necessary in May 1863 ($612) and January 1864 ($600) (Charleston County, Estate Account, audited and approved December 27, 1866, Probate Case 063025).

Table 18.
1870 Agricultural Schedules for Plantations and Farms in the Study Area

	Improved Acres	Unimproved Acres	Value of Farm ($)	Value of Implements ($)	Wages Paid ($)	Horses	Mules	Oxen	Sheep	Swine	Corn (bu)	Cotton (bales)	Peas (bu)	Sweet Potatoes (bu)	Market Produce ($)
Est. J.C.W. Legare (Mullet Hall)	350	300	5,000	10	100		1				25	4	25	25	
J.C.W. Legare (Rosebank)	225	90	1,500	25	50		1				50	2	25	25	
J.B.L. Walpole (Creekside)	450	1,100	5,000	600	200	2	4	6	5	1	125	10	40	20	
J.L. Walpole (Acorn Hill)	200	400	3,000	50	50	1	1				150	3	20	10	
James Brown	10	-	60	5		1					40	1	15	10	10
James Brown	6	-	60	2							22	1	15	11	25
Kitt Bishop	18	-	?	?		1				3	70	2	10	25	70
Johns Island mean	24.39	24.01	346.06	27.87	41.33	0.30	0.10	0.03	0.47	0.97	41.77	0.96	4.56	23.73	9.95

Known to be associated with the plantation was a James Brown among the freedmen Solomon Legare contracted with in 1865. Kitt Bishop is said to have been F. Y. Legare's foreman during the early twentieth century (Jordan and Stringfellow 1998, pg. 266).

James C. W. Legare's will provided for his widow to sell his Toogoodoo Plantation at her discretion, bequeathing his house and lot at Legareville to her for life, and the "rest and residue" of his estate, including his home plantation – Mullet Hall, to his widow Lydia Ball Bryan Legare and their children (Charleston County Probate Records, Case 063025).

In 1860 Lydia B. Legare held 110 slaves on Johns Island, all of them on Mullet Hall (Davidson 1970: 219).

Legare's Estate was handled by Lydia Legare while her children were minors. She was a successful planter, and the Estate accounts give an interesting picture of the early years of the Civil War. In the first quarter of 1861, Lydia Legare paid $5.88 for five gallons of gin oil. She

In September, 1865, Reuben Tomlinson reported to the Bureau of Refugees, Freedmen, and Abandoned Lands concerning the plantations which comprise the subject property and neighboring tracts:

> These lands have never yet been reported having been but lately settled. No crops were raised on them. The aggregate number on these places are 43 men, 60 women, 98 children. . . . All are dependent on government for support (Freedmen's Bureau Records, Series 1910, Reel 85).

The names of the "former owners" were given as Joseph Stephens, Sol Legare, Benjamin Roper, Jenkins Roper, A. Brown, Lydia Legare. James Legare, Widow Mathews, and William Jenkins (Freedmen's Bureau Records, Series

1910, Reel 85, pg. 253). The owners of the study tract were Sol Legare (eastern half of Mullet Hall, discussed below), Lydia Legare and her son James (west side of Mullet Hall and Rosebank), and Jenkins Roper (The Oaks, discussed below).

Lydia Legare died in 1868, leaving four children, her "only estate an undivided interest in certain real property worth about $1500: a plantation and a lot at Legareville" (Charleston County Probate Court, Case 212016). Her son James C. W. Legare was planting at Rosebank, her daughters were married, and her youngest son, Francis Y. Legare (1850-1905) took over Mullet Hall, managing the plantation and his father's estate.

In June 1872 F. Y. Legare settled his father's estate, selling some of Mullet Hall to effect a partition. In February 1873, Augustine Smythe, the family's attorney, bought 387 acres (Charleston County RMC DB H16, pg. 343) and immediately resold it to F. Y. Legare for the same price, giving him clear title (Charleston County RMC DB J16, pg. 120).

Also in February 1873, 169 acres of Mullet Hall was sold to Mary Legare and her husband Thomas Whaley. Six months later, the Whaleys sold their parcel to Alexander McLoy and J. W. Rice, trading partners doing business as McLoy and Rice. McLoy & Rice sold about sixty acres to Washington Capers, Samuel Robertson, and Richard Singleton, then in May, 1876, they lost the rest of the tract to a foreclosure suit, and in December it was sold at auction, together with storehouses, gins, engines, and all other buildings (Charleston County RMC DB G16, pg. 138). F. Y. Legare paid $1878 for the land and buildings.

It appears that McLoy and Rice had invested in a commercial gin operation on Mullet Hall. At least since the 1850s, one of the partners, McLoy, had been in Charleston, where he operated a dry goods store on King Street (Charleston City Directories, 1859, 1860). Sometime after the Civil War, J. W. Rice, formerly of Erie, New York, joined him in business. Rice was a prominent businessman in New York and Macon, Georgia. The company continued in business for a number of years after the 1876 sale of their land on Johns Island. The deed for that sale is complicated, with other parties besides McLoy and Rice having been objects of the foreclosure suit, and it does not indicate whether their gin had run profitably, if at all.

Francis Legare had already established himself as a mercantile operator when he bought McLoy and Rice's gin equipment. As early as 1871, his brother, who was planting at Rosebank (see below), agreed to market his crop through F. Y. Legare. Other small farmers in the area gave him crop liens in exchange for advances of planting supplies or cash credit. For example, in April 1874, John Small and Joseph Wright (who signed his own name) were planting at Hopkinsons, north of Mullet Hall. To secure repayment of up to $105 in goods or cash to be advanced to them, they gave him a lien on the crops grown on twenty-one acres (Charleston County RMC DB R15, pg. 387). In June, they increased their credit line, giving a mortgage on four horses to Legare (Charleston County RMC DB R15, pg. 387). In January, 1875, Small and Wright each agreed to a crop lien in exchange for advances of up to $200 (Charleston County RMC DB R15, pg. 388, 400), and a few months later each sold a horse to F. Y. Legare. He paid $60 each for a two-year old bay stallion and a four-year old black stallion (Charleston County RMC DB P16, pg. 565, 617). As his brother's estate administrator in 1874-1876, Legare was ginning cotton grown at Rosebank, and probably for other farmers as well.

By 1880, F. Y. Legare owned one farm (Mullet Hall) and rented additional acreage – either on "Home Place" (the east half of the original Mullet Hall), or Rosebank. His own land, 596 acres, was worth $5,000, comprising 155 acres improved, 160 pasture, 120 woods and forest, and 161 acres of fallow or "old field" land. There were implements and equipment

worth about $1,000, and he had spent $1,300 on buildings and repairs. The land he rented was 135 acres: 35 improved, 50 woods and forest, and 50 fallow, worth altogether $1,800. Production on the two tracts was dissimilar. He had spent only $20 to fertilize the rented tract, but $200 on his own land, where he paid $195 in laborers' (all African-Americans) wages for fifty weeks. The rented land produced crops worth $700: 100 bushels of corn on 15 acres, 7 bales cotton on 15 acres, 70 bushels sweet potatoes on 10 acres. At his own Mullet Hall he made $4,500 in crops: 200 bushels corn on 30 acres, 150 bushels oats on three acres, 42 bales cotton on 64 acres, and 200 bushels sweet potatoes on 10 acres. Legare held little livestock: four horses, two mules, 18 cows, and 8 chickens.

Without inherited land or access to capital, Legare's African-American neighbors operated much different farms than he did. Discussed below are three men, Jack Ryan, Henry Wright, and Joseph Wright. There were men by these names among the fourteen freedmen who signed contracts with Solomon Legare in 1866, but it is not certain that these are the same farmers.

In 1880 Jack Ryan was 32, being born in 1848. He was married to Phyllis and had four children. Ryan rented ten acres worth $120. The previous year he had spent $25 on buildings and/or repairs. Without buying any fertilizer, he produced 30 bushels of corn on four acres, two bales of cotton on four acres, and ten bushels of sweet potatoes on a quarter-acre. He had a horse, a milking cow (whose calf he sold), three pigs and forty chickens (collecting 50 dozen eggs in 1879). Ryan did not report growing any market produce for sale. His total production for the year was worth $200.

Henry Wright was 60 years old in 1880 and lived on Johns Island with his wife, Betty, and their four children. Wright rented eleven acres worth $100 in 1880. In 1879, he had produced crops worth $60. Four acres planted in corn gave him 40 bushels, he got two bales of cotton from six acres, ten bushels of sweet potatoes on one acre, and two bushels of peas from marginal land. Wright kept fewer animals than Ryan – one pig and six chickens; a milk cow and an ox, one of which died during 1879.

Joseph Wright, born in 1847, was married to 29 year old Lydia. They lived on Johns Island with their 6 children. Joseph Wright was slightly more prosperous than the others in 1880. He owned 28 acres, 20 improved and eight in pasture, worth $120 altogether. He spent $25 on fertilizer during the previous year, producing crops worth $400: 12 bushels of corn from two acres, four bales cotton from eight acres, 40 bushels sweet potatoes from a half-acre. He also kept 20 chickens, nine swine, three cattle (one a milk cow), and a horse.

Rosebank

Rosebank Plantation was appended to the 610-acre west half of James Legare's Mullet Hall in 1855. It had earlier been owned by Paul Fripp and his son Charles E. Fripp, whose heirs sold it to Lydia B. Legare, widow of James C. W. Legare.

Rosebank's earlier history has been generally researched. In 1783 Paul Fripp (1737-1800) of St. Helena Island paid £806/18/6 sterling money of Great Britain to Benjamin Mathewes and his wife Mary for a plantation of 185.5 acres bounding southeast on said Benjamin Mathewes, northeast on William Mathews Esq., northwest on Dr. Patrick Simpson, and southwest on Mr. George Rivers (Charleston County RMC DB O9, pg. 446-447).

In 1826 Charles Edward Fripp (1785-1843), a son of Paul Fripp (Rosengarten 1987:722-723), paid $1,600 to Thomas Philson and his wife Martha M. Philson for 92.75 acres, half of a 185.5-acre plantation that Paul Fripp had bought from Benjamin Mathews. The description of the tract gave its boundaries as southeast by the other half, owned by Charles E. Fripp; northeast on James Legare, northwest on

Est. Joseph Jenkins and the high road, southwest on Est. Richard Jenkins (Charleston County RMC DB R9, pg. 102-104). We have not explored how half the tract had come into Philson's ownership.

There might have been a planter's residence at Rosebank, and at least by 1840 the Fripp family kept a house at Rockville on Wadmalaw Island. Charles Fripp's will devised to his wife Mary Minott a 594-acre rice plantation at Chehaw in St. Bartholomews Parish, slaves, and the "use and occupation of my house at Rockville," which she was free to dwell in or to rent out for income. Fripp directed that his 194.5-acre plantation be "retained under the management of my executor until my children are of age. When the youngest is 21, then my plantation to be sold with stock, cattle horses, boats, and plantation utensils" (Charleston County WPA Will Book 43, pg. 717). In 1844, Fripp's will was probated and an inventory made of his personal estate. In St. Johns Colleton Parish, the Estate held thirty-one named slaves, nine iron foot gins, a cotton whipper, picking sheets and bags, steel yards, cotton bags, a six-oared boat, fishing boat, sailboat and sails, as well as 28 head cattle, a lot of tacky horses [marsh tackys; small ponies common to the coastal marshes and often used on plantations], two carriage horses, two cart horses, and a saddle horse. Although household furniture was noted and appraised, the inventory is not specific how many residences were furnished, and as is common, no indication of the number of buildings on any of Fripp's lands (Charleston County Inventory Book A, pg. 540).

The Fripp heirs held Rosebank until 1855, when the adult children confirmed their mother's sale of the plantation to Lydia B. Legare, widow and executrix of James C. W. Legare (Charleston County RMC DB P13, pg. 308, 309). The next year, James C. W. Legare (1834-1874), son of Lydia B. Legare, gave a mortgage on the land to Mary M. Fripp, securing a debt of $9,000. The mortgage was satisfied and released, evidently without incident (Charleston County RMC DB S13, pg. 329).

On March 23, 1868, J. C. W. Legare on Johns Island applied to R. K. Scott with the Freedmen's Bureau for

> government provisions to aid me in carrying on my plantation situated on Johns Island. My plantation known as Rose Bank is well organized there are on my plantation sixteen hands or adults. I intend planting forty acres of cotton, thirty acres corn, 12 acres potatoes. I have failed to obtain assistance from other sources to carry on my planting and unless I obtain rations from the government I will be unable to carry on my planting. I will need these rations until 1st of August (Freedmen's Bureau Records, Series 1910, Reel 85, pg. 241).

In March 1871, J. C. W. Legare was cultivating Rosebank, where he seems to have been living, and entered into an agreement with his brother F. Y. Legare. F. Y. Legare agreed to advance up to $100, either in supplies or hard money, in exchange for a crop lien and J. C. W. Legare's promise to sell his crop through F. Y. Legare. Further, he would send enough market crop by December to cover the total advanced (Charleston County RMC DB R15, pg. 265).

James C. W. Legare died intestate in December 1874, leaving a widow and four children. Francis Y. Legare became administrator of his brother's estate. He sold Rosebank's cotton through factors R. Roper and Son (Richard Roper and B. S. Roper), collecting $110.95 for a 317-pound bag in November 1874 (he kept $10.93 of the proceeds for the gin toll) and netting $300.05 for 776 pounds (two bags and a partial bag) in December 1875. This cotton

Figure 34. 1884 plat of Rosebank Plantation (McCrady Plat 2564) at the top; below is a modern topographic map showing the Rosebank property (in blue) and the study tract (in red). Note the two graveyards on Rosebank and the nine structures.

had all been grown during 1875, as there was none on hand when the estate inventory was taken in March (Charleston County Probate Court, Case 230013).

There is a reference to a plat (not found) made in 1880 by Simons and Huger, dividing Rosebank into 13 lots. A later plat, dated 1884, shows the plantation as 182.1 acres, divided into 7 lots for FY Legare (McCrady Plat 2564; Figure 34), and in 1886 he sold Lots 6 and 7, 40 acres together to Paul White.

Mullet Hall "Home Place"(East Half)
After 1830

When she came into ownership of the east half of Mullet Hall in 1830, Eliza S. W. Legare had been married to Solomon Legare, Jr. (1797-1878) for several years. He was her first cousin, a son of Thomas Legare of Johns Island. Thomas Legare was a landowner and planter, but we have not found any record of his having deeded property to his son Solomon, and his will of 1842 (Charleston County WPA Will Book 43, pg. 469) does not mention land previously given to any of his children (six sons and three daughters living at his death). The will directs only that his real and personal estate be sold after his death, the proceeds to be divided among the heirs. The assumption, therefore, is that Solomon Legare established his first independent planting career on his wife's Mullet Hall plantation, before her father's death.

Solomon Legare purchased other land on Johns Island. In 1831, his mother-in-law was living in Charleston, and decided to release The Point to her sons and sons-in-law. James C. W. Legare, Francis Y. Legare, Solomon Legare, and Horace Walpole agreed to pay Mary W. Legare $1,500 annually for her lifetime, in exchange for use of the 324-acre property (Charleston County RMC DB A10, pg. 435). After her death, in 1843 Legare bought the Point for $15,100 (Charleston County RMC DB I11, pg. 416).

In 1837, Solomon Legare purchased from Edward Whaley a "certain and well-known plantation," paying $23,500 for the 450 acres on the Stono River at the south side of Abbapoola Creek (Charleston County RMC DB R10, pg. 361), across from The Point plantation. Here Legare established a summer village, in 1838 selling lots to his fellow planters on condition that "if they use the public landing at the village" they would keep it in repair (Charleston County RMC DB W10, pg. 428, 430; DB O11, pg. 427 et. seq.). The village and the plantation became known as Legareville.

In 1839 Solomon Legare extended his "Home Place" to the south, acquiring most of James Witter's 238-acre tract on Kiawah River and Coles Creek. This plantation had been divided into thirds: for $4,753 Susannah Witter conveyed to Legare one-third (79.3 acres) of the land, and an undivided half-share of another third (RMC Deed Book V10, pg. 607). The remaining third, the southwest corner, was held by Mrs. Jane Holmes (the widow of John Holmes of nearby Hope Plantation, Jane was Susannah Witter's sister, and her parcel, too, eventually came into Mullet Hall). Upon Miss Witter's death, by prior agreement her executor conveyed an additional 100 acres to Solomon Legare in 1849. The boundaries were described as north partly on Solomon Legare (Home Place), partly on M. Jenkins Roper (The Oaks), east on M. J. Roper (The Oaks), west on Coles' Creek, south on marshes of Kiawah River (Charleston County RMC DB E11, p. 418).

In 1847, the year of his wife's death, Solomon Legare bought a nearby parcel from Charles Edmonston and James Louis Petigru, who had acquired a number of plantations in 1836 from the executors of merchant Adam Tunno. They sold 430.55 acres to Legare for the low price of $1,000, describing it as bounding northeast on public road and Paul Grimball Esq., south and east on Benjamin Roper Esq., and southwest on Dr. J. Stevens (Charleston County RMC DB X11, pg. 282). Tunno himself had purchased the plantation at auction in 1832

as 500 acres bounded west on the Est. William Stanyarne and Mrs. Ball, south and southwest by William Robertson deceased (Charleston County RMC DB N10, pg. 124). The boundary descriptions indicate that this parcel was separated from Mullet Hall by neighboring properties, being closer to Benjamin Roper's Rush Plantation.

James Legare had bequeathed Mullet Hall to his daughter Eliza for her life only, entailing it to her children. Her children were mostly grown when she died in 1847 and they filed for a division of her estate after their father's second marriage in 1849. The plantation was advertised for sale as,

> That valuable and well settled Plantation formerly belonging to the late James Legare Esq., containing upwards of 600 acres of Cotton and Provision Land, and some Rice Land, of which 150 or 200 acres are uncleared. It is contiguous to a bold landing on a creek which empties into Keewah or Stono; is under good banking and fencing, and was planted the past season by Mr. Solomon Legare. It contains a handsome and comfortable Dwelling House of 10 upright rooms and two garrets, Kitchen, Stable, a large Barn, Cotton and Gin House, with good negro Houses" (*Charleston Courier* 12/2/1850).

Solomon Legare paid $21,050 for the six hundred acres, keeping it in his ownership while allowing a distribution among the heirs. The January 1851 deed recites the boundaries of the plantation "known as Home Plantation" as south on Solomon Legare formerly Miss Witter, east on Dr. William J. Roper (The Oaks), west on James C. W. Legare (the western half of Mullet Hall), north on Estate Jenkins (Walnut Hill) and of John A. Fripp (Rosebank) (Charleston County RMC DB I12, pg. 139).

Solomon Legare owned his Home Plantation, the east half of Mullet Hall, together with the Witter tract, until his death in 1878. In 1857 he added to it again, purchasing about 200 acres from J. E. Mathews for $2500. The parcel was described as a "portion of the Richfield tract" south of the public road running east to west, and west of the road that ran south to the plantations of Dr. M. J. Roper (The Oaks) and B. D. Roper (Briars). Mathews also granted Legare "all the rights and privileges of digging, draining, and cleaning of all the old canals and water courses through the swamps . . . for the benefit of the 200 acres" (Charleston County RMC DB X13, pg. 135).

The 1860 census shows Solomon Legare holding 230 slaves on his Johns Island plantations, where there were 59 slave houses altogether. He organized the people by age for the census: 20 were more than 55 years old (some of them in their 80s), 30 between 40 and 55 years of age, 11 from 35 to 39, 25 between 26 and 34, 22 from 20 to 25 years old, 32 teenagers between 14 and 19, and 86 children under 14.

Solomon Legare was living in Charleston after the Civil War, and in October 1865 he applied for restoration of his residence on Greenhill Street as well as another dwelling on Tradd Street (Freedmen's Bureau Records, Series M869, Reel 28). He soon petitioned the U. S. government for restoration of his plantation lands. In January 1866, his two Stono River plantations on James Island, totaling 1,400 acres, were restored to him as being unoccupied by freedmen (Freedmen's Bureau Records, Series M869, Reel 32, pg. 490-494).

The freedmen living on Mullet Hall executed an agreement with Solomon Legare on March 25, 1866:

> *Article of Agreement between Solomon Legare and Freedmen and*

Women on Plantation on Johns Island known as Mullet Hall
Solomon Legare . . . agree with the Freedmen and Women, heads of families, to work my plantation on Johns Island known as Mullet Hall until the 1st of Jany. 1867, on the following terms – viz, to give them ½ of the Cotton Crop, to be divided when ginned and prepared for Market, and also ¾ of the corn raised by said Freedmen and Women, they agreeing to feed themselves, and furnish everything needed for planting and working the crop. They also agree to furnish from their own number a foreman to be selected conjointly by the employer and themselves, who shall be responsible for the order and subordination of the plantation. They agree to plant not less than 3 acres of cotton, and _ acres of provisions to each full hand (other than full hands in proportion).
Neither party shall sell or use any portion of the crop, until after the division of the same, without the consent of the other party. The crop to be worked by families, but all cotton to be placed in separate lots in one or more buildings, which shall be in charge of the foreman. It is agreed that the employees shall have the privilege of visiting the city, but in no case shall the crop be neglected by their so doing (National Archives Record Group 105, Records of the Bureau of Refugees, Freedmen and Abandoned Lands, copy in Pivnick Papers, Avery Institute, Charleston).

The agreement was approved by Assistant Commissioner for Refugees, Freedmen, and Abandoned Lands on April 14, 1866. Fourteen people signed using their marks: Primous Brown, Rector (?) Wise (?), James Henry (?), Ben Fludd, illeg, illeg, John Rivers, Jack Ryne (Ryan), July Jenkins, Henry Wright, Jery Smith, Jim Johnson, Stany (?) Wright, illeg.

Solomon Legare also put his other plantations back into production, although we have not located those contracts. However, by 1868, the lack of available food provisions on some farms created an impossible situation. In March 1868, urgent appeals were sent to the Freedmen's Bureau. Whether Mullet Hall was involved is uncertain, although documents from at least two other Legare plantations survive. In one case, the Bureau was told,

> application for government provisions to assist in planting the Hanscome Point plantation on this island, the term of our contract is to pay the owner of the plantation, Solomon Legare, one half the cotton we raise and one bushel corn to each family. The plantation is in a good state of organization, we have the necessary implements and three work animals.
> We shall require provisions for 13 adults and 8 children. We expect to plant 36 acres cotton, 51 acres corn, and three acres potatoes. We are entirely out of provisions and without this assistance from the government immediately we will be unable to plant.
> Signed [by mark] John Brown and James Brown (Freedmen's Bureau Records, Series 1910, Reel 85, pg. 231).

In another case, the Bureau received a letter from John B. L. Walpole,

> soliciting assistance for the freed people on Mr. Solomon Legare's plantation known as the Legareville Place, Johns Island.
> There are on this plantation twenty-nine working hands and six old persons who are entirely destitute of provisions and cannot plant a crop unless assistance is rendered.
> The plantation is organized and the people have begun to work under such a contract as will ensure the future support of all parties, each full hand agreeing to plant two acres of cotton and three of corn (Freedmen's Bureau Records, Series 1910, Reel 85, pg. 240).

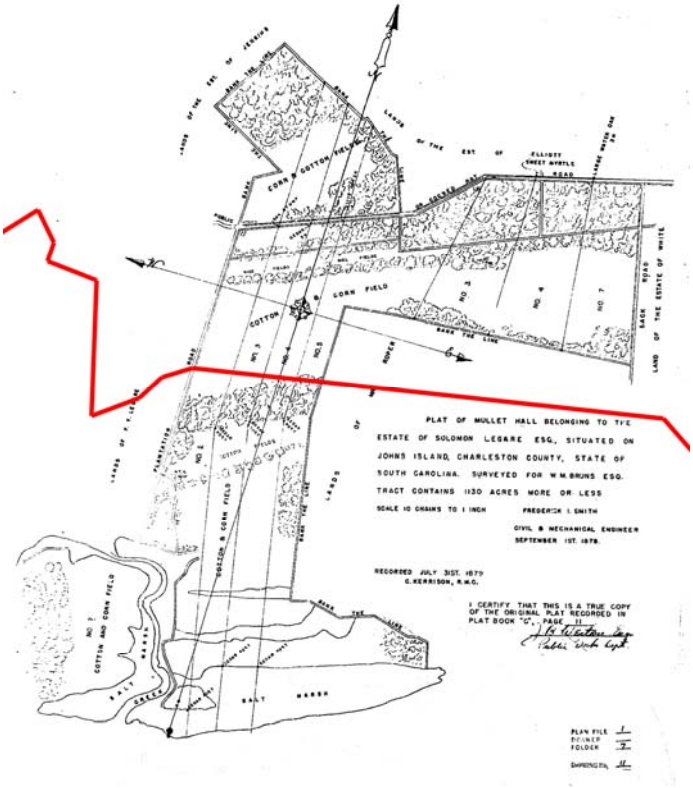
We assume these requests were approved, but we have not examined the Freedmen's Bureau records in sufficient detail to provide documentation.

Solomon Legare died at the age of seventy-five on April 30, 1878, leaving one grown son, Thomas Legare, to whom he bequeathed Edenvale Plantation and Point Place (near Hanscome Point and Legareville). His will, written on March 30, 1878 and probated on May 27, 1878, directed that his "Home Place" (the eastern half of Mullet Hall) should be sold as soon as his wife Amelia thought best, the proceeds divided among her as the widow, Legare's three daughters, and a grandson, Charles E. Carrere. The remainder of his land on Johns Island, and all his James Island property, were left to Amelia to rent or sell, dividing the proceeds among herself and the three daughters (Charleston County Estate Files 251-12).

Solomon Legare's house had been burned or otherwise demolished during the Civil War or shortly afterward. As a step in managing the Home Place, Amelia Legare had it sold at auction on August 29, 1878. The buyer, William M. Bruns of Charleston, paid only $500 for the 1,130 acres, known as Mullet Hall or the Home Place (Charleston County RMC Deed Book L17, p. 221). The low price is explained by the fact that Bruns, a lawyer practicing in Charleston, was acting as agent for the Legare family. He had a new survey drawn (Charleston County RMC PB C, pg. 11) and then conveyed parcels back to the family members beginning in September 1878. Figure 35 shows this plat, revealing that most of the Home Place soon came into the ownership of Francis Y. Legare, proprietor of James C. W. Legare's 1830 portion of Mullet Hall, but not all of it is within the study area.

Maynard E. Carrere (father of Charles Carrere) paid $200 for Tract No. 2, a long strip extending along the east side of the plantation's entry road, 207.3 acres which included Solomon Legare's Mullet Hall house (Charleston County RMC DB O17, pg. 208). Just two years later, in 1880 Charles Carrere sold this acreage to his cousin Francis Y. Legare (RMC Deed Book A16, pg. 94). Legare and his wife Kate built a new house east of the Solomon Legare house site (Limehouse, 2008).

Also in 1878, Ann Eliza Seabrook paid $150 for 140 acres known as "the island" (formerly James Witter's land, and called Summer House Island by later owners) and the 80-acre Tract No. 7 below Cocked Hat Road (Charleston County RMC DB O17, pg. 310). Martha E. Legare Holmes paid $125 for Tract 4, 227.9 acres in two portions: a strip of 143.3 acres parallel to Carrere, and 84.6 acres south of Cocked Hat Road (Charleston County RMC DB O17, pg. 311). Julia Harrison, the third Legare daughter, had inherited her portion as a trust managed by her mother. She paid Bruns $150 for Tract 3, being 228 acres in two portions: a 150.3-acre strip between Carrere and Holmes, and 77.77 acres south of Cocked Hat Road (Charleston County RMC DB O17, pg. 309). We did not find a conveyance of Tract No. 5 on the 1878 plat, but assume it was conveyed to Mrs. Amelia Legare.



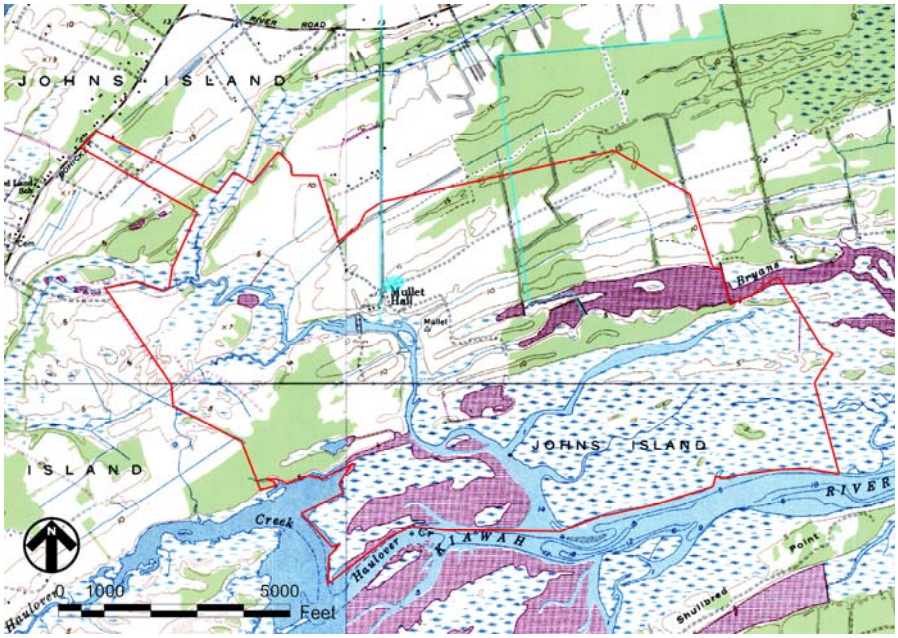


Figure 35. 1879 plat of Solomon Legare's Home Place or Mullet Hall (Charleston County RMC PB C, pg. 11) at the top; below is a modern topographic map showing the portion of the Home Place property (in blue) in the study tract (in red).

In 1879, the Solomon Legare Estate managed by his widow had twenty-three tenants paying rent at the "Village Place" near Legareville, and twelve on James Island. Some of the James Island land, as well as Legareville Plantation, were sold in that year. Other portions of these lands were held for tenant farming until 1887 (Charleston County Estate Files 251-12). With Mullet Hall divided among the heirs, the assumption is that the tracts were rented separately to one or more tenants after 1879, but we have not found records of its use. Records were filed with the Probate Court for the portion owned by Mrs. Julia Legare Harrison. Under the management of her mother, Mrs. Harrison's 228 acres of Mullet Hall was rented for $190 each year through 1887 (Charleston County Estate Files 251-12), and then sold to Francis Y. Legare in 1889 (Charleston County RMC DB A27, pg. 192).

After a decade of absentee management, the other heirs also conveyed their portions of the Mullet Hall Home Place to Francis Y. Legare. Ann Seabrook was first, in 1888 selling him the 140-acre island nearest Kiawah River for $1,000 (Charleston County RMC DB A32, pg. 201). The next year Martha Holmes sold him her 143-acre Tract 4 for $1000 (Charleston County RMC DB A32, pg. 242). We did not find the conveyance to F. Y. Legare of Tract 5, which we assume to have been held by Mrs. Amelia Legare.

Mullet Hall after the 1880s

Francis Yonge Legare (1850-1905) and his wife Catherine Walpole (Kate S. Legare, 1859-1945) operated Mullet Hall (both the western and eastern tracts, 610 acres and 1,180 acres) and Rosebank together, managing a total of almost 2,000 acres of farmland. In 1897, F. Y. Legare added the adjacent Oaks Plantation (see below). For the years between 1880 and 1920, deed indexes show dozens of conveyances of small parcels of land by the Legares to other individuals, and numerous acquisitions of land by them. Small independent farmers as well as their own tenants traded at the Mullet Hall store.

As discussed in the previous overview, in 1890 F. Y. Legare's general merchandise store had at least five competitors: the businesses of William Andell, E. M. Seabrook, Charles Seel, Walpole & Co., and C. G. Whaley. Legare had a decided advantage in the fact that Mullet Hall was a regular landing on the steamboat route connecting Exchange Landing (Wadmalaw Island) with the truck farms and cotton farms throughout southern Charleston County. Payroll for commercial farmers, including Legare's neighbor William Andell, was delivered to the Mullet Hall landing (Sidi Limehouse, personal communication 2008). The Mullet Hall Post Office, begun in 1893 with Francis Y. Legare the first postmaster, operated until 1918 when Frank Legare left Mullet Hall (http://carolana.com/SC/Towns/All_SC_POs_1783_to_1971_Sorted.htm).

The state business directory for 1905 shows Francis Y. Legare with a general store and grist mill near the Mullet Hall post office. Other farmers in the area included John Legare, J. C. W. Legare, and T. S. Legare (see previous discussion). However, Francis Y. Legare died in 1905, leaving his widow Kate and a fifteen year old son, Francis Y. (Frank) Legare. Henry Muhler, previously the farm overseer for William Andell's nearby operation, had been managing the store for Legare, and upon his death began renting the operation from Kate Legare for $120/year (Haynie 2007:36). Acting

Figure 36. Examples of the F.Y. Legare store tokens.

on the advice of her lawyers and factors, Mrs. Legare sold the stock of goods in the store to Henry Muhler for $414.84 in January 1906 (Charleston County Probate Court, Case 461029 and 461030). By 1912, R. G. Dun & Co. listed three merchants near Mullet Hall Post Office, including Muhler, with $3,000 to $5,000 capital, and fair credit worthiness (discussed in the overview). We have not learned how late the Mullet Hall store operated, or how long Muhler retained use of the commissary tokens marked "F. Y. Legare." A previous owner of the property remembers the commissary building standing at least through the early1940s (Sidi Limehouse, personal communication 2008; we were not able to identify the structure in the 1948 aerial photographs of the tract).

The Legares traditionally relied on the Charleston firm of Dill, Ball Company for credit and cash advances. As early as 1886, F. Y. Legare gave the company a mortgage on his 610-acre Mullet Hall to secure a loan (Charleston County RMC DB A31, pg. 262). After years of operating as a partnership, Dill, Ball, Company was incorporated in 1898 with officers Joseph T. Dill, J. Alwyn Ball, and John Rivers. Their charter allowed a "general factorage and commission business, advancing to planters and selling of Sea Island and upland cotton," also buying and selling Sea Island cotton bagging and twine, and selling cotton seed and "such other produce as may be consigned to it" (Charleston County RMC DB L23, pg. 37; Acts and Resolutions of 1899, pg. 263). Between 1901 and 1929, the firm also acquired a number of farms on Johns Island, evidently resulting from forced sales by indebted farmers. Most of the parcels were less than ten acres (Charleston County RMC Deed Index, 1898-1930).

Upon the death of Francis Y. Legare in New York, "where he had temporarily gone for his health for a few weeks," his widow Kate turned to the Dill, Ball Company. His death came in early October, "the midst of a business season," and they took over business management of his property – a total of 2,627 acres on Mullet Hall, Rosebank, The Oaks, and Briars.

The family's attorneys handled debts and legal affairs. On their advice, she sold the Briars Plantation, and began foreclosing on bad debts. She forced a sale of Lots 6 and 7 on Rosebank Plantation to recover a judgment against Richard Johnson, and bought the forty acres back in her own name, paying $100 (Charleston County RMC DB W23 pg. 118). Other parcels of Rosebank came back to her as well. The same day she bought in Lots 6 and 7, she paid $100 at the public auction of Lot 9, also 20 acres, which was being sold as a result of her claims against Susan Green (Charleston County RMC DB W23 pg. 119).

The lawyers arranged management of the gin, and authorized repairs to the Legares' house and other buildings. For several years, Dill, Ball Company continued to manage the farm and its tenants. In December 1908, they received $750 from E. M. Bailey, "½ rent for Mullet Hall," and in January 1909 W. B. Hills paid in $500 for an unspecified tract. The 1900 census has Hills, a white 21-year old farmer, living on Edisto Island.

Other rents were probably collected from cotton receipts: in the last six weeks of 1908, Dill, Ball credited Henry Mack, Cain Ryan, Pompey Scott, Joe LaBorde, Annie Ryan, Tom Murray, Jimmy White, Katie Capers, and July Mikell each with $25. Others paid smaller amounts - Elizabeth King, $22.50, John Ryan $5.38 – but Alfred Heyward paid $35. Only two of these names are on the 1905-1910 list for Mullet Hall (Table 14). Eight of these individuals can be identified in the 1910 census (Table 19).

Two entries on the rent rolls seem to indicate business tenants, P. S. Co, and W & R, but the amounts were small ($90 and $15) (Charleston County Probate Cases 461029 and 461030). W & R is likely Whaley and Rivers, while P.S. Co. is probably Porter-Snowden

Company. Both were cotton factors in Charleston (R.G. Dun & Co. 1907).

When Francis Yonge Legare (1890-1955) reached adulthood in 1911, the Estate of Francis Y. Legare, Sr., was closed. After graduating from The Citadel in 1912, Frank Legare (1890-1955) married Mary V. Lee and returned to Mullet Hall for a few years (Ben Legare, person communication 2008).

When the boll weevil reached the Sea Islands, the Legares and their young children left Johns Island. Kate Legare continued the agricultural operation with the help of the Dill, Ball Company. Their records between 1914 and 1918 show many small advances, either fertilizer or seed money, in the early spring each year: $35 in 1914, 1915, and 1916, increasing thereafter to $55 in 1917, $45 in 1918, and $60 in 1919 (Dill, Ball Co. Ledger Book 1909-1918, Charleston Museum, Charleston, South Carolina). In 1920 they advanced $1500 to F. Y. and Kate Legare (Dill, Ball Co. loose papers, Charleston Museum, Charleston, South Carolina).

Table 19.
Dill, Ball Renters at Mullet Hall in 1907
Found in the 1910 Census

Name	Age	Family
Capers, Katie	48	Widow, 1 child
LaBoord, Joe	35	Wife, 2 children
Mack, Henry	3 listed	
Mickell, July	70	Wife, 2 children
Murray, Tom	45	Wife, 4 children, 4 step children
Ryan, Cain	38	Wife, no children
Scott, Pompey	68	Wife, 2 children
Wright, Jimmy	59	Wife, 2 children

In March, 1920, Kate S. Legare repurchased Briars Plantation. E. B. Bryan, the 1906 buyer of Briars, had subdivided its 764 acres for sale in small parcels (see Charleston County RMC PB D, pg. 143). Seventeen purchasers are shown on the plat, but only the tracts conveyed to Alonzo S. Gray (30 acres) and Isaac Singleton (52.5 acres) were exempted from Briars when Bryan sold it to Ravenel & Company (J. R. P. Ravenel and John H. Roper) in 1908 (Charleston County RMC DB N25, pg. 95), or when they conveyed it to Kate Legare (Charleston County RMC DB P29, pg. 114). Although not researched, it may be that the other purchases defaulted.

Now the owner of Briars Plantation, free of the mortgages and liens that entangled Mullet Hall, Kate Legare presumably consented to a foreclosure action brought by Dill, Ball Company in 1923 against Mullet Hall. In July 1923 Mullet Hall was sold at public auction to the Dill, Ball Company for $10,000. It was described as the acreage that remained in Mullet Hall (originally 1,790 acres) after various conveyances by the Legares, together with 660 acres (The Oaks): 1675 acres in all, with an undetermined acreage of salt marsh (Charleston County RMC DB P31, pg. 572).

The Dill, Ball Company Years

The Charleston Museum's Dill, Ball Company notes include ledger and account books from several periods in the twentieth century (1914-1917; 1935-38; 1939-40). These primarily concern land on James Island – Centerville (WB Seabrook) and the Dills' Stono Plantation, and the James Island Ginning Company. There is no evidence that the firm held any large tracts besides these and Mullet Hall (Dill, Ball Company papers, Charleston Museum). They certainly forced the sales of other tracts in order to collect debts, occasionally buying the land, but there is no evidence of a systematic effort to amass large holdings.

Overtime the company grew significantly. In 1907 it was listed as having $35,000 to $50,000 in capital and good credit. By 1921 its capital had grown to $75,000 to $125,000 with high credit (R.G. Dun 1907, 1921).

We did not find records of the Dill, Ball Company for the first few years it owned Mullet Hall. Twentieth century deeds refer to a plat, "Map showing holdings of Dill-Ball Co.,

formerly of F. Y. and Kate S. Legare . . . 1685 acres surveyed December 1924 by Rene Ravenel," but this was not recorded with the deed and could not be found in the RMC plat indexes.

By 1928, the company had rented much or all of the land to Johns Island farmers. Their December 1928 lease agreement with F. L. Glover concerned a portion of the "Grave Yard Field," run from the creek opposite Glover's ownership

> on a straight line to the east of and including the grave yard and to run as far as the rod which runs east and west along a dam about 1/16 mile south of the graveyard. From this point you are to run your fence in a generally westerly direction to the creek, and to fence as much of this marsh land as the creek allows. The fence is yours and you will have the right to remove it. The rent is $30/year. Either party may terminate the lease before October 1st . . . you have the right to gather all crops remaining after the termination of the least, provided it does not extend so far into the succeeding year as to prevent the preparation of the land for crops for that year (Dill, Ball Company papers, Charleston Museum, Charleston, South Carolina).

The firm also undertook some improvements, the nature of which remains unclear. In an undated letter from Caleb Chisolm, John Rivers was informed that,

> I went to Mullet Hall Friday but the lumber did not come till late. I did make a little start but I did not do much. I will try to make a good stand by Monday." Chisolm followed with the report that "this window size is 2'6" X 4'6" . . . and I want you to send me one gallon of roofing cement because the cement that is in the roof will not be enough (Dill, Ball Company Letters 1920-1932, Charleston Museum, Charleston, South Carolina).

Mullet Hall farmers could be expected to send their cotton to Dill, Ball Company for ginning. Following established custom, each bale was tagged with its owner's name and sold when the factors deemed the best price had been obtained. The cotton seed, too, was marketed for sale, some to be pressed for oil and some for planting. In November 1928, Reubin Bishopp, whose pickup truck hauled bagged cotton and supplies for his neighbors, wrote, "Dear Mr. Rivers, this is just to remind you of the planting cotton seed I told you about some time ago. I want to get 15 bushel of the Mullet Hall seed. I will try and be down soon" (Dill, Ball Company Letters 1920-1932, Charleston Museum, Charleston, South Carolina).

In May 1929, John Rivers saw the possibility of selling Mullet Hall but retaining the management of it. He wrote to Cephas Drayton, one of the tenants there, "I have a party who wishes to go over Mullet Hall on horseback on Friday afternoon. Please have two horses with saddles for this gentleman and myself to ride. We also want you to go along to show us the lines, and so need three horses. We should be there 3:30 or 4 o'clock" (Dill, Ball Company Letters 1920-1932, Charleston Museum, Charleston, South Carolina).

This "gentleman" was a potential buyer, John Knapp Hollins. A son of Wall Street millionaire Harry B. Hollins, John K. Hollins was one of the many Long Island sportsmen who bought South Carolina plantations between 1890 and 1930. Harry B. Hollins was a founder

of the Pineland Club, member of the Okeetee Club, and late-nineteenth century owner of Good Hope Plantation in Jasper County (obituary, *New York Times* February 25, 1938). John K. Hollins, like his brothers Gerald V. Hollins (obituary, *New York Times* November 30, 1955) and H. B. Hollins, Jr., (obituary, *New York Times* December 8, 1956) grew up wintering in South Carolina, and eventually bought property in the Lowcountry.

John K. Hollins and his father were very active in real estate in Beaufort and Jasper counties, between 1898 and 1931 acquiring some fifty parcels as recorded in the Beaufort County RMC (Stephen G. Hoffius personal communication 2008). In 1906 he donated Indian artifacts to the Peabody Museum. John K. Hollins owned a share of Paul and Dalton Plantation in Colleton County (Anonymous 1931) and briefly owned Cotton Hall and Laurium, together 1,797 acres (Anonymous 1930) in Beaufort County as well as Brays Island. His brother Gerald owned Tomotley, and Harry B. Hollins, Jr., owned Cunningham's Bluff and Hall's Island, together 2000 acres, and Broadmarsh Plantation.

Although Dill, Ball Co. conveyed Mullet Hall and The Oaks to John K. Hollins in 1929, the deed was not filed with the RMC. We have not determined how long he held the property or how much he paid to Dill, Ball Company (he gave them a mortgage for the purchase price).

Hollins must have intended to resell Mullet Hall, and he began to consider ways to "improve" it. His attorney in Beaufort wrote John Rivers at Dill, Ball Company for permission to "destroy the old dilapidated buildings around the building site, and generally improve conditions around this spot, and repair and make passable the avenue . . . [we think you will agree] the buildings right around the old home site are valueless and I will be indeed fortunate if I can have them removed for the material to be salvaged" (J. Heyward Jenkins to John Rivers, October 8, 1929, Dill, Ball Company papers, Charleston Museum, Charleston, South Carolina).

Rivers consented immediately: "relative to pulling down the old buildings on Mullet Hall around the building site. It is perfectly agreeable to us to have you do this. I agree with you that the buildings are of not much value and you have our permission to take them down. . . . the quarters occupied by the several tenants on Mullet Hall are in quite bad repair, and we would suggest that you allow these tenants the use of this lumber in repairing their quarters if they would take it down for the material. We are glad you intend fixing up the road – in wet weather it is a great source of annoyance" (John Rivers to J. H. Jenkins, October 10, 1929, Dill, Ball Company papers, Charleston Museum, Charleston, South Carolina). Some of the work was carried out, but the correspondence is not specific about which "building site" was in discussion.

Hollins had paid for Mullet Hall with a mortgage; nevertheless, he was the owner and the rent money was due to him. However, Dill, Ball Company was his plantation manager, and retained half the rent. Rivers reported to Hollins' attorney "Enclosed is list of renters at Mullet Hall, with the amounts paid by each . . . . We have collected $190.50. Mr. Hollins' portion of this will be one-half, so we enclose our check for $95" (John Rivers to J. H. Jenkins, November 26, 1929, Dill, Ball Company papers, Charleston Museum, Charleston, South Carolina; no list of renters found in file). In 1931 there were four tenants paying rent: Joe LaBorde, Caesar Simons, Emma Jenkins, and Mary Wright (Folder 5C, Dill, Ball Company papers,Charleston Museum, Charleston, South Carolina).

Only Mary Jenkins can be identified in the 1930 census as living on Johns Island. Caesar Simons may have moved to Johns Island from the Beaufort area where an individual with the same name is shown in the 1920 census.

William Seabrook of Johns Island acted as Rivers' agent in financial dealings with the Mullet Hall tenants. Their affairs were complicated – advances to the tenants of fertilizer and seed; rent payments owed to Dill, Ball; payments to tenants for cotton; ginning and hauling tolls due. When the 1930 crop was being picked, Seabrook and Rivers spelled out the arrangement. The ginning toll was taken in seed. Remaining seed was sold to a cotton oil company, or held for sale as planting seed. First out of the proceeds of each tenant's baled cotton came Dill, Ball's repayment for fertilizer advances, and then the rent was taken out. Anything left after the rent was collected went toward other advances made by Dill, Ball; anything left after that could be paid to the tenant. (William Seabrook to Dill, Ball Co., October 2; Rivers to Seabrook October 4, 1930, Dill, Ball Company papers, Charleston Museum, Charleston, South Carolina).

Clearly the rents at Mullet Hall could not carry Hollins' mortgage, and although there were still northerners eager to buy a southern hunting plantation, he does not seem to have tried to resell it as such. Instead, in 1931 he sent his $1,400 interest five months late, thanking John Rivers for allowing the late payment: "You may be interested to know that by so doing you are allowing me to continue the employment of three families" (J. K. Hollins to John Rivers, June 22, 1931, Dill, Ball Company papers, Charleston Museum, Charleston, South Carolina).

Hollins eventually lost any inclination to improve or otherwise use Mullet Hall. In December 1931, Dill, Ball Company requested an interest payment; he replied that he was "in no position to pay interest." In June, Rivers ordered a Bradstreet report on Hollins, receiving a positive reply as to his financial stability, but a year later the company said,

> we have no recent correspondence with Mr. J. K. Hollins. In January 1932 we corresponded with him at Beaufort, and June 1931 his address was Meadow Farm, East Islip, Long Island. We think a letter to him at Beaufort would be forwarded" (John Rivers to Julian Mitchell, July 13, 1933, Dill, Ball Company, Charleston Museum, Charleston, South Carolina).

Mullet Hall and The Oaks into Julian S. Limehouse

Six years after losing John K. Hollins as a buyer, in about 1938 the Dill, Ball Company leased or sold Mullet Hall and The Oaks to Julian S. Limehouse, Jr. (Sidi Limehouse, personal communication 2008), giving him title in June 1942. Limehouse paid $12,000 for 1,685 acres plus salt marsh with two fingers of high land, south to the Kiawah River (Charleston County RMC DB L43, pg. 197).

The residence built by Francis Y. Legare, and several tenant houses remained on Mullet Hall at the time Limehouse purchased it. His father soon built a new two-story house near the water. Although delayed by World War II-era shortages, Limehouse managed the evolution of Mullet Hall from a tenant-based cotton farm to a productive vegetable and livestock operation. Equipment sheds and trailer houses replaced tenant houses, and tractors with subsoil tillers replaced hoes and plows.

Mullet Hall in the Modern Age

In 1994, the heirs of Julian S. Limehouse, Jr., conveyed 738 acres of their Mullet Hall plantation (which included The Oaks) to Charleston County Park and Recreation Commission (Charleston County RMC DB Y243, pg. 235). The remainder of the property, about 2,207 acres, was sold to The Beach Company. Portions remained in agricultural production under the management of Rosebank Farms/ Sidi Limehouse.

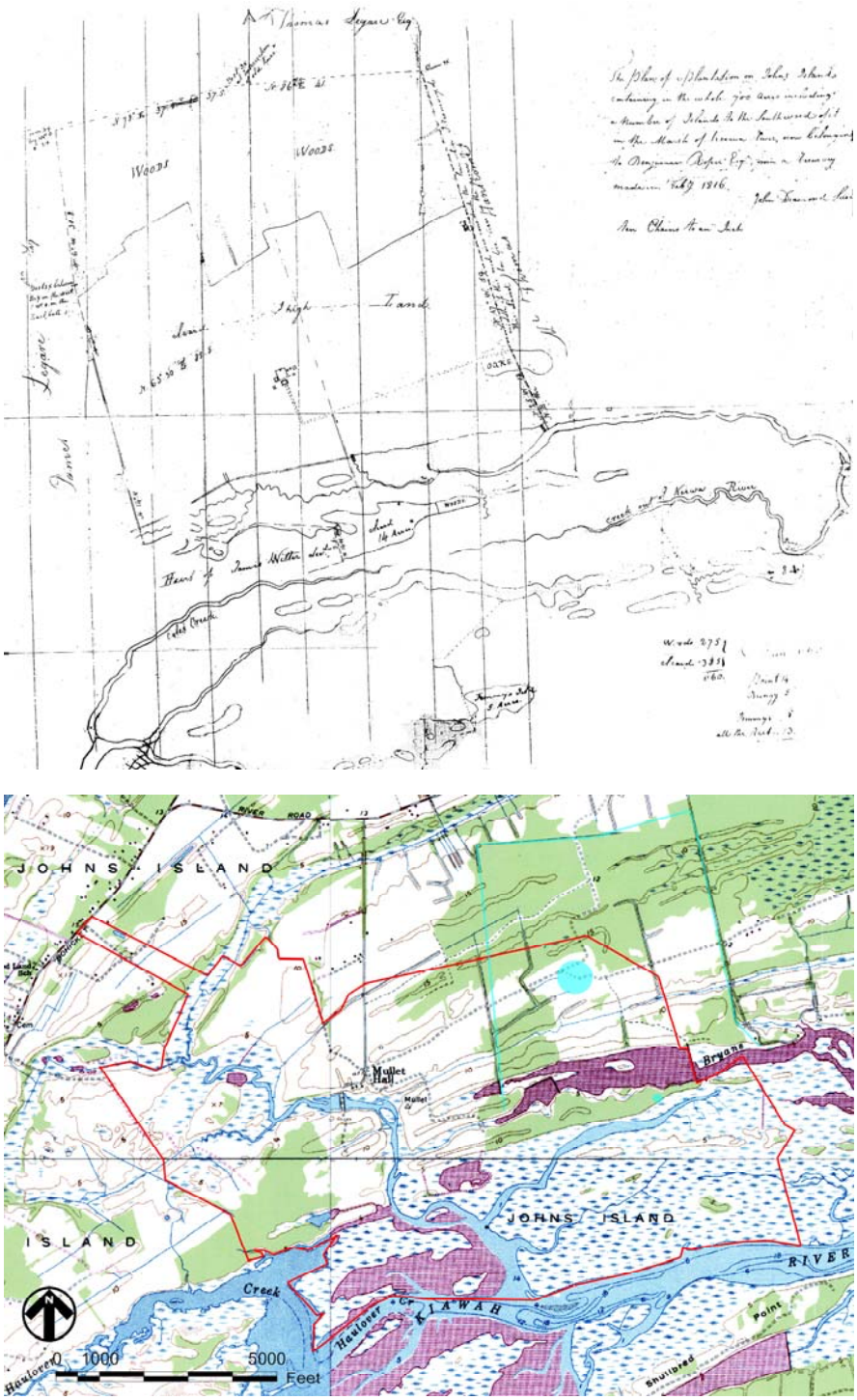


Figure 37. 1816 plat of Benjamin Roper's Oaks Plantation (McCrady Plat 4577)) at the top; below is a modern topographic map showing the portion of the The Oaks (in blue) in the study tract (in red).

The Oaks – into Francis Yonge Legare 1897

In 1897 Francis Y. Legare acquired the plantation adjoining the east side of Mullet Hall, known as The Oaks. This tract, described variously as 700 acres or 660 acres, had been held by the Roper family since the nineteenth century. Figure 37 shows the tract in 1816.

In 1843, planter Benjamin Dart Roper gave The Oaks to his son, planter/physician Micah Jenkins Roper (1812-1859) (Will of Benjamin Dart Roper, Charleston WPA Will Book 46, pg. 201). With his wife Susan Elizabeth Edwards, M. Jenkins Roper settled at The Oaks, which was bounded to the east by the Briars Plantation, owned by his brother Benjamin Dart Roper, Jr., also a medical doctor.

M. J. Roper died a fairly young man, but the inventory of his personal property made in early 1860 shows him to have been a wealthy planter, with 119 slaves on Johns Island. The appraisal of household goods included the furniture and furnishings typical of a planter's residence, being notable for its inclusion of three bookcases with valuable books, and several medicine chests: one mahogany, two of leather, and two of wood. Livestock on the plantation was counted as eighteen oxen, sixty steers, twenty-nine cows, two bulls, and twenty calves and yearling. There were also eighty sheep (45 ewes, 32 lambs, 3 rams) and several horses, four ox carts, several plows, a carriage, buggy, and sulky. The appraisers included five hundred bushels of corn and a corn sheller, but did not record any gins or ginned cotton (Charleston County Inventory Book F, pg. 25).

After the Civil War, William Roper of Brick House Plantation, who was M. Jenkins Roper's brother and also a practicing physician, managed The Oaks for Susan Roper and her children. In February 1868, Dr. Roper applied to the Freedmen's Bureau for,

> aid from the government to enable me to plant my own plantation and that of the Estate of M. J. Roper [Oaks] which is under my charge . . . . I have failed to obtain aid elsewhere and unless assisted by the government will not be able to plant the plantations. I require corn and bacon for 120 adults and eight children. I shall plant 260 acres of cotton and 260 acres of corn. I shall require these provisions for five months. Approved by Special Agent S. B. Thompson (Freedmen's Bureau Records, Series 1910, Reel 85, pg. 226).

Susan E. Roper and her two children held the Oaks until 1897 when F. Y. Legare paid M. Jenkins Roper, Jr. $3,200 for the "plantation known as 'Oaks' 660 acres, bounded north and west on a plantation formerly belonging to Solomon Legare, south on Kiawah River, east by a road separating it from the plantation formerly of BD Roper [Briars]" (Charleston County RMC DB X15, 227, Q22, pg. 128).

METHODS

Introduction

The primary goals of this survey are to identify, record, and assess the significance of archaeological sites within the approximately 1,083 acre tract. No major analytical hypotheses were created prior to the field work and data analysis. This research design proposed for this study is, as discussed by Goodyear et al. (1979:2), fundamentally explorative and explicative.

In spite of this, several lines of research were used to maximize the results of the study in an effort to ensure that all significant sites were identified. One line was the use of the previous reconnaissance level archaeological study (Adams and Trinkley 1994). Twelve sites were examined during that study with seven identified as potentially eligible and worthy of both protection and additional investigation during an intensive survey stage. A second line of research was the use of oral history. Discussions with individuals who were familiar with and had farmed the property, provided information not only on site locations, but also on land use history that might affect archaeological preservation. Finally, the results of the historical research were used to identify areas of suspected settlement.

Archaeological Methods

The field techniques involved the placement of shovel tests at 100-foot intervals along transects placed at 100-foot intervals. All soil was screened through ¼-inch mesh, with each test numbered sequentially by transect. Each measured about 1 foot square and was taken to a depth of at least 1.0 foot or until subsoil was encountered. All cultural remains were collected, except for mortar and brick, which were qualitatively noted in the field and discarded. Notes were maintained for profiles at encountered sites.

At most sites additional, close interval, shovel testing was also conducted. This consisted of filling in the transect grid around the identified sites with shovel tests at 25 to 50 foot intervals. For this work the shovel tests were given grid coordinates, rather than transect and sequential shovel test numbers. We used a modified Chicago grid based on an arbitrary 0R0 point located at the southwest edge of the site. Shovel tests are identified by their coordinates relative to this datum. Thus, 100R50 is 100 feet to the north and 50 feet right (or east) of the data.

In a few instances ambiguous site results prompted additional investigation beyond shovel testing. In these cases we chose to use 3-foot test units. These units were excavated by natural soil zones – typically an Ap horizon overlying subsoil. The larger units allowed clearer profiles to be recorded and also provided larger artifact assemblages for analysis. The units, while still unlikely to produce features, do better allow evidence of deep plowing to be identified. The deep plowzone (extending up to 2.0 feet in depth) was apparent in much of the project area, so only a sample of shovel tests extended below the A horizon to test for intact remains.

The information required for completion of South Carolina Institute of Archaeology and Anthropology revisit site forms was collected and photographs were taken, if warranted in the opinion of the field investigators.

A total of 375 transects were set up covering the study tract (Figure 38). A total of

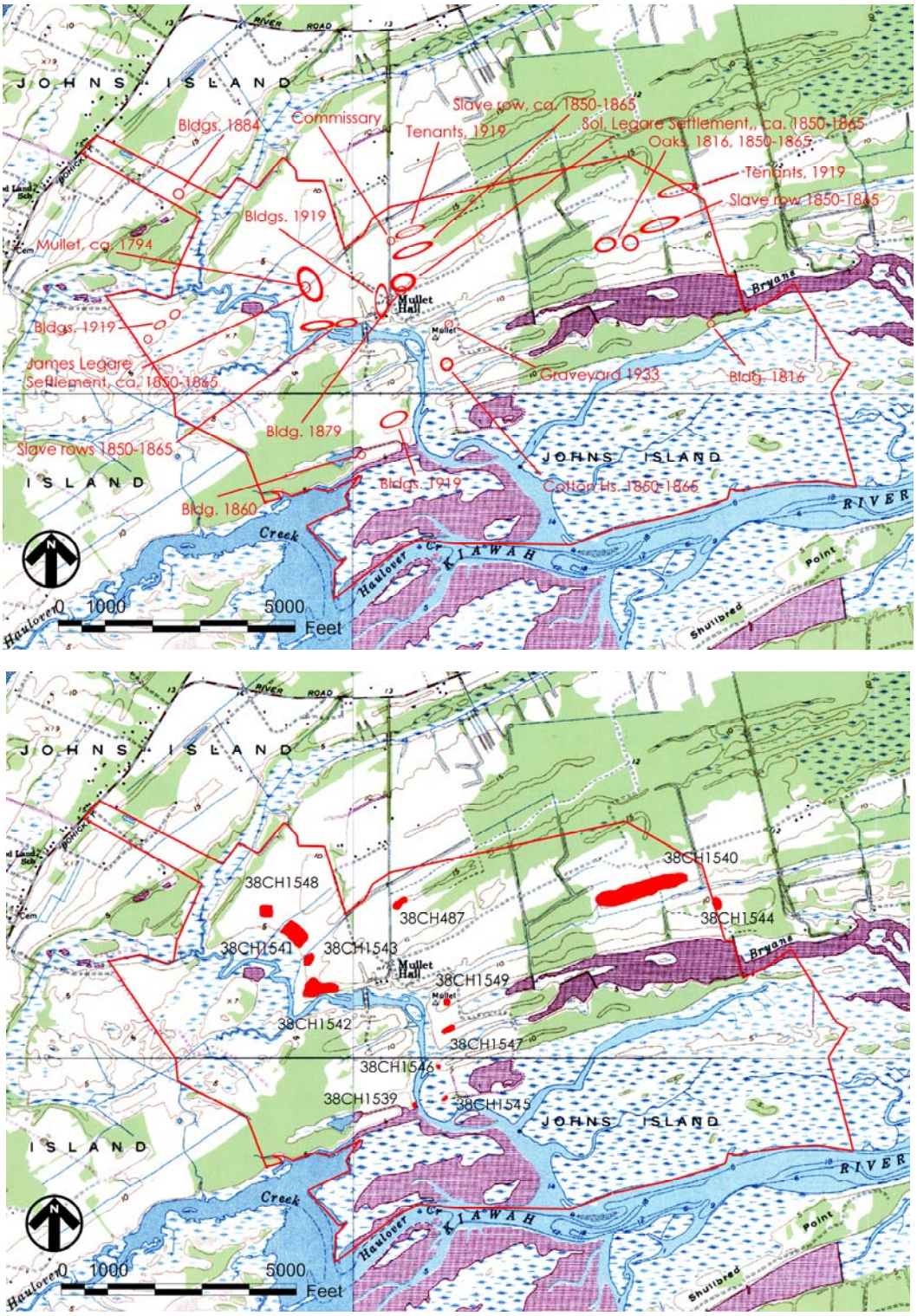


Figure 38. Data incorporated in the survey methodology. Top shows sites identified in historic documentation. Bottom shows previously identified archaeological sites.

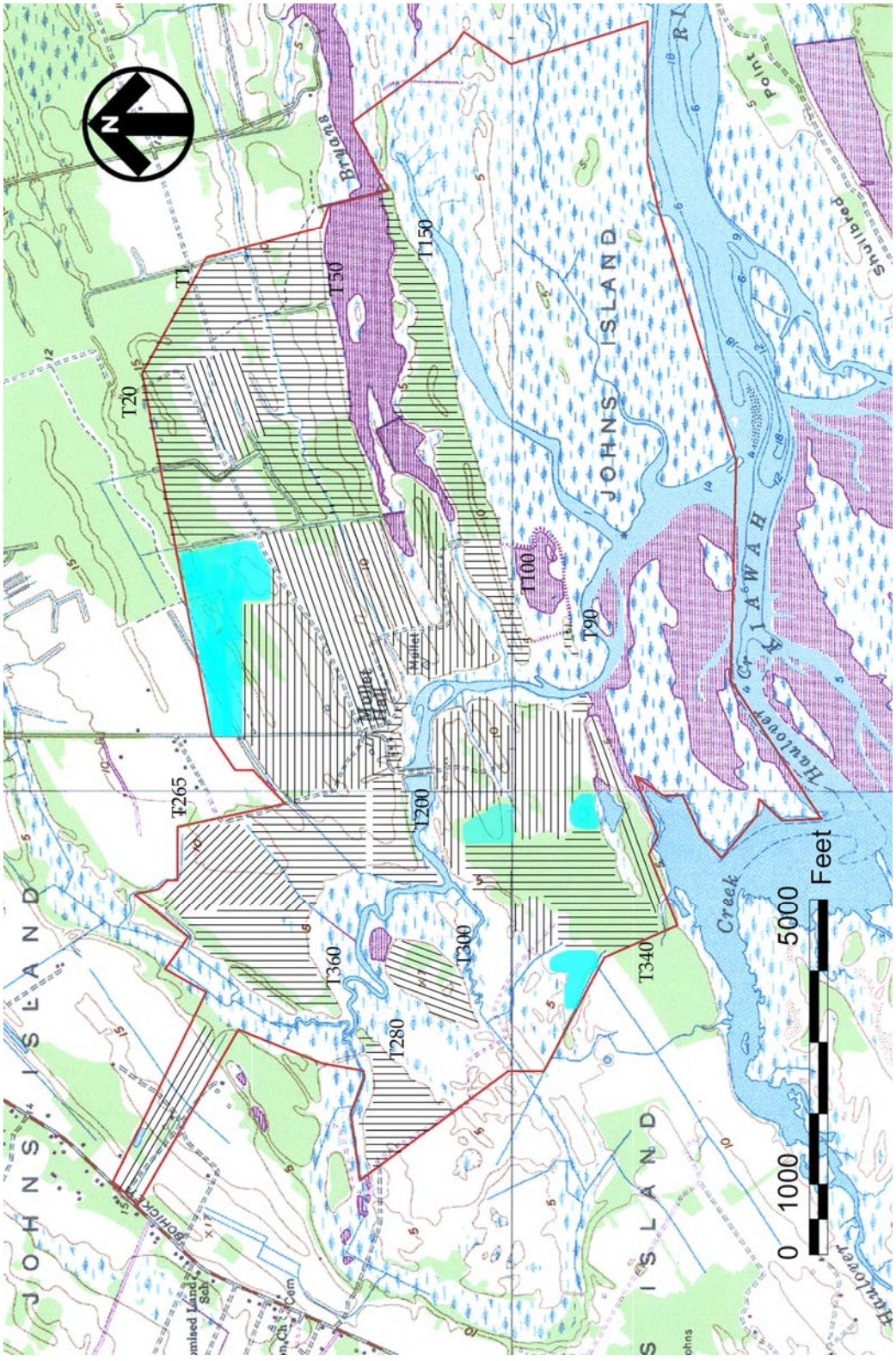


Figure 39. Topo showing tract boundaries, transects, and areas covered with pedestrian survey (blue).

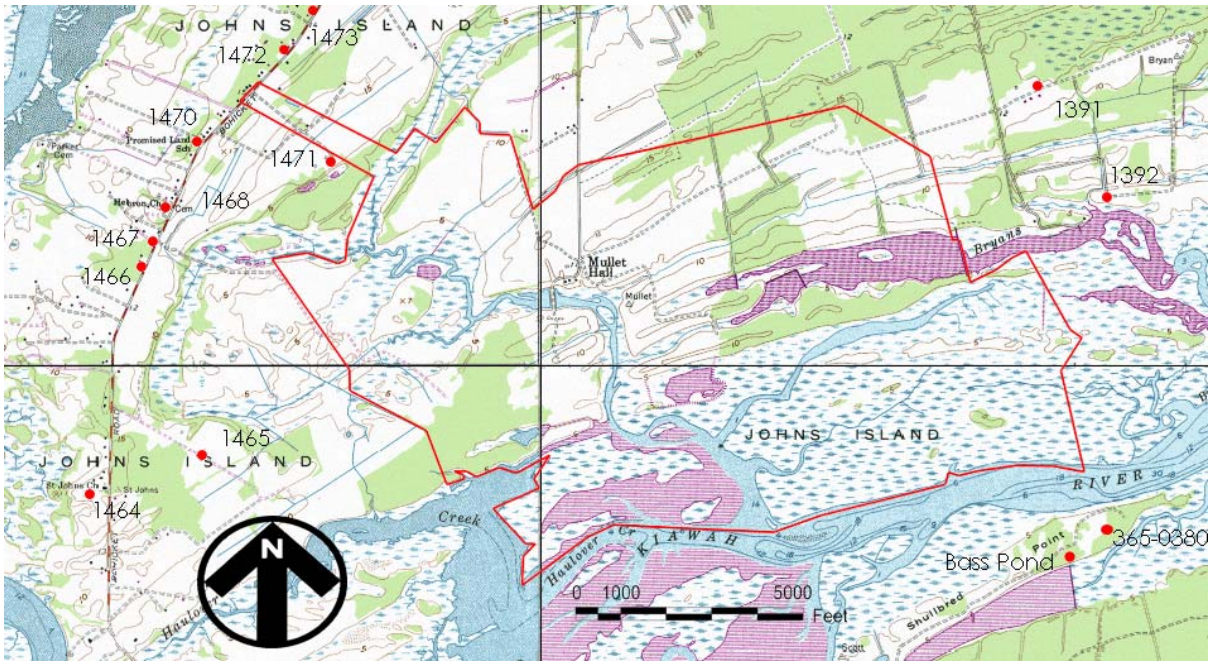


Figure 40. Previously recorded architectural sites within a 0.5 mile APE.

4,199 shovel tests were excavated. The wetland areas were subjected to a pedestrian survey. The offshore marsh islands were identified as not being proposed for development. As a result, these islands were not incorporated in this study.

The GPS positions of the sites were taken with a WAAS enabled Garmin 76 rover that tracks up to twelve satellites, each with a separate channel that is continuously being read. The benefit of parallel channel receivers is their improved sensitivity and ability to obtain and hold a satellite lock in difficult situations, such as in forests or urban environments where signal obstruction is a frequent problem. WAAS or Wide Area Augmentation System, is a system of satellites and ground stations that provide GPS signal corrections, yielding higher position accuracy – generally an accuracy of 10 feet or better 95% of the time in open areas of the study tract.

Architectural Survey

The 0.5 mile APE for the study tract identified thirteen previously identified architectural sites – seven of which are along Bohicket Road to the west, and two others are in an area already being developed to the east. These thirteen structures were identified during the very detailed, comprehensive survey of Johns Island (Fick et al. 1989). Only one of these sites, 1468, Mount Hebron Presbyterian Church, is eligible; the remaining sites have all been determined not eligible for inclusion on the National Register of Historic Places. The NRHP, Bass Pond Site, has been subjected to data recovery and is no longer an issue.

Given the thoroughness of the 1989 study, we elected to focus on the identification of any structures on the study tract that, since not accessible by public roads, would not have been recorded by Fick and her colleagues during the 1989 work. As with other studies, in order to be recorded, buildings, sites, structures, and objects must appear to have been constructed before 1950 and must retain "some measure of . . . historic integrity" (Vivian n.d.:5)

For any such identified resource we would complete a Statewide Survey Site Form and take at least two representative photographs. Permanent control numbers would be assigned by the Survey Staff of the S.C. Department of Archives and History at the conclusion of the study. The Site Forms for the resources identified during this study would be submitted to the S.C. Department of Archives and History.

Site Evaluation

Archaeological sites will be evaluated for further work based on the eligibility criteria for the National Register of Historic Places. Chicora Foundation only provides an opinion of National Register eligibility and the final determination is made by the lead federal agency, in consultation with the State Historic Preservation Officer at the South Carolina Department of Archives and History.

The criteria for eligibility to the National Register of Historic Places is described by 36CFR60.4, which states:

> the quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and
>
> a. that are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> b. that are associated with the lives of persons significant in our past; or
>
> c. that embody the distinctive characteristics of a type, period, or method of construction or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
> d. that have yielded, or may be likely to yield, information important in prehistory or history.

National Register Bulletin 36 (Townsend et al. 1993) provides an evaluative process that contains five steps for forming a clearly defined explicit rationale for either the site's eligibility or lack of eligibility. Briefly, these steps are:

- identification of the site's data sets or categories of archaeological information such as ceramics, lithics, subsistence remains, architectural remains, or sub-surface features;
- identification of the historic context applicable to the site, providing a framework for the evaluative process;
- identification of the important research questions the site might be able to address, given the data sets and the context;
- evaluation of the site's archaeological integrity to ensure that the data sets were sufficiently well preserved to address the research questions; and
- identification of important research questions among all of those which might be asked and answered at the site.

This approach, of course, has been developed for use documenting eligibility of sites being actually nominated to the National Register of Historic Places where the evaluative process must stand alone, with relatively little reference to other documentation and where

typically only one site is being considered. As a result, some aspects of the evaluative process have been summarized, but we have tried to focus on an archaeological site's ability to address significant research topics within the context of its available data sets.

For architectural sites the evaluative process would be somewhat different. Given the relatively limited architectural data available for most properties, we would focus on evaluating these sites using National Register Criterion C, looking at the site's "distinctive characteristics." Key to this concept is the issue of integrity. This means that the property needs to have retained, essentially intact, its physical identity from the historic period.

Particular attention would be given to the integrity of design, workmanship, and materials. Design includes the organization of space, proportion, scale, technology, ornamentation, and materials. As *National Register Bulletin* 36 observes, "Recognizability of a property, or the ability of a property to convey its significance, depends largely upon the degree to which the design of the property is intact" (Townsend et al. 1993:18). Workmanship is evidence of the artisan's labor and skill and can apply to either the entire property or to specific features of the property. Finally, materials – the physical items used on and in the property – are "of paramount importance under Criterion C" (Townsend et al. 1993:19). Integrity here is reflected by maintenance of the original material and avoidance of replacement materials.

Laboratory Analysis

The cleaning and analysis of artifacts was conducted in Columbia at the Chicora Foundation laboratories. These materials have been catalogued and accessioned for curation at the South Carolina Institute of Archaeology and Anthropology, the closest regional repository. The site forms for the identified archaeological sites – as well as revisit forms for those previously recorded – have been filed with the South Carolina Institute of Archaeology and Anthropology. Field notes have been prepared for curation using archival standards and will be transferred to that agency as soon as the project is complete. Non-archival digital photographic materials will be retained by Chicora for 60 days.

Analysis of the collections followed professionally accepted standard with a level of intensity suitable to the quantity and quality of the remains. In general, the temporal, cultural, and typological classifications of prehistoric materials were defined by such authors as Blanton et al. (1986), Oliver et al. (1986), and Yohe (1996). The temporal, cultural, and typological classifications of the historic remains follow such authors as Noël Hume (1978), Price (1970), and South (1977).

Mean dates rely on South's (1977) mean ceramic dating technique, using primarily the mean dates that he has developed. A very few of our colleagues occasionally use Carlson (1983) in addition to South. Carlson observes that a drawback to South's technique is that it gives the same weight to ceramics manufactured for long periods (say from 1700 to 1800, yielding a mean date of 1750) as it does to those produced for only short periods (say from 1740 to 1760, with the same mean date of 1750). While this is true – and is certainly an understandable issue – it seems that overall it results in only a few years error (especially with larger collections). Moreover, it seems that relatively few investigators have chosen to implement the changes proposed by Carlson.

Also of importance in an area such as Mullet Hall, where at least a portion of our research focuses on when different structures or site areas were used, is the occupation span reflected by the ceramics. One method used to determine the occupation span of the excavations is South's (1977) bracketing technique. This method consists of creating a time line where the manufacturing spans of the various ceramics are placed. Determining where at least half of the ceramic type bars

touch places the left bracket. The right bracket is placed the same way, however, it is placed far enough to the right to touch at least the beginning of the latest type present (South 1977:214). We have chosen to alter South's bracketing technique slightly by placing the left bar at the earliest ending date when that ending date does no overlap with the rest of the ceramic type bars.

Since South's method only uses ceramic types to determine approximate period of occupation, Salwen and Bridges (1977) argue that ceramic types that have high counts are poorly represented in the ceramic assemblage. Because of this valid complaint, a second method – a ceramic probability contribution chart – was used to determine occupation spans. Albert Bartovics (1981) advocates the calculation of probability distributions for ceramic types within an assemblage. Using this technique, an approximation of the probability of a ceramic type contribution to the site's occupation is derived. This formula is expressed:

$$Pj/yr. = \frac{fj}{F \times Dj} \quad \text{where}$$

Pj=partial probability contribution
Fj=number of sherds in type j
F=number of sherds in sample
Dj=duration in range of years.

RESULTS OF SURVEY

Introduction

As a result of this cultural resources survey, 11 of the previously identified sites (38CH487, 38CH1539-1543, and 38CH1545-1549) were revisited and evaluated and 15 additional sites (38CH2240-2254) were identified. See Table 1 for a summary of these sites. Figure 41 shows all these sites with new boundaries.

The architectural survey did not identify any structures or other resources beyond those identified by the 1992 survey of Charleston County (Fick 1992) or the 1989 survey of James and Johns islands (Fick et al. 1989). None of the eligible structures or the NRHP property can be seen from the current project area. The standing structure on the Mullet Hall property does not retain the integrity needed to warrant a National Register nomination.

Archaeological Resources

38CH487

Site 38CH487 (Figure 42) is an eighteenth to twentieth century settlement located on a ridge at an elevation of about 10 feet AMSL. A GPS UTM for the site is 582389E 3610809N (NAD27 datum). The site is currently located in a fallow field.

The site was initially recorded in 1980 during a survey of seventeenth century settlement patterns (South and Hartley 1980). Although no

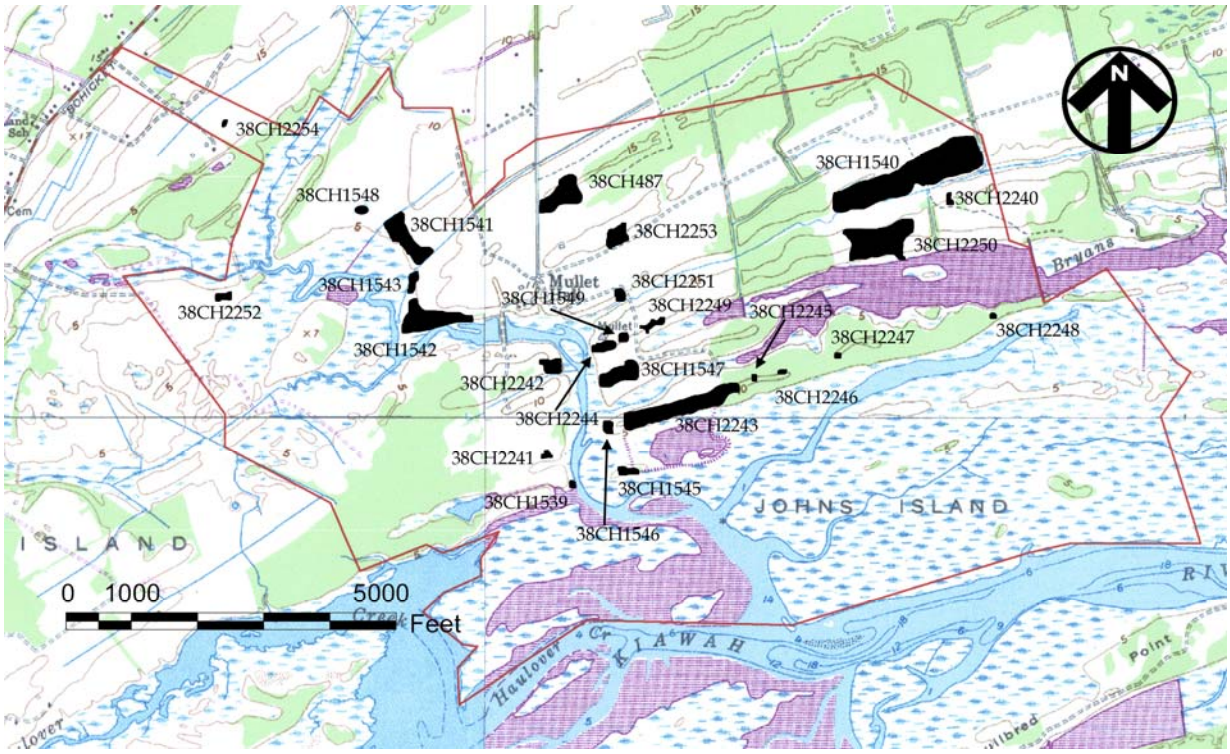


Figure 41. Sites identified during the survey.

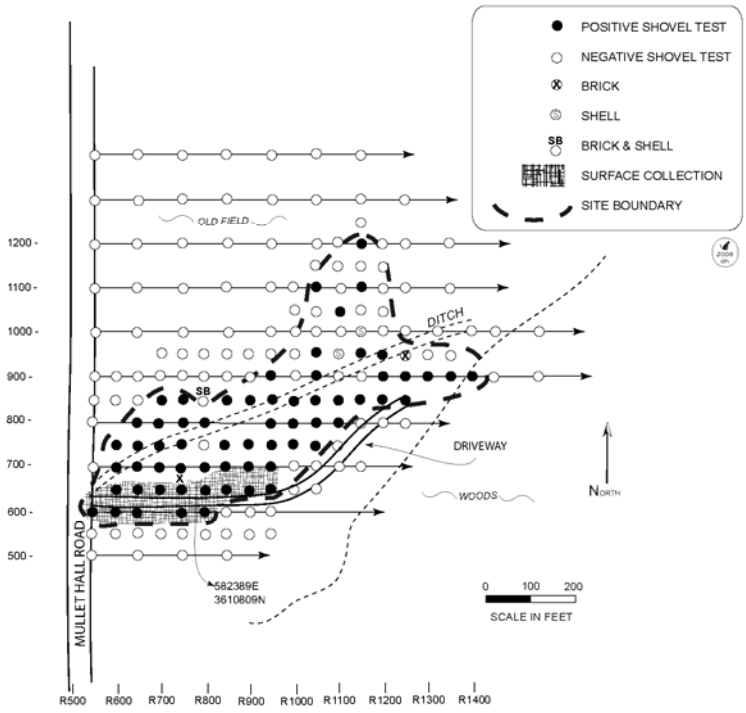


Figure 42. Sketch map of 38CH487.

seventeenth century artifacts were found at the site, it was still briefly recorded. No description of artifacts was given in the site form.

The 1994 reconnaissance revisited and examined the site area (Adams and Trinkley 1994:27). A total of 24 shovel tests were excavated with eight positive (33%). The artifact collection, found in an area about 850 feet east-west by 100 feet north-south, produced artifacts dating from the nineteenth to twentieth centuries.

Additional work was suggested, including stripping, to look for possible subsurface features. The site was recommended potentially eligible for the National Register.

The current survey excavated 100 shovel tests with 63 positive (63%) with artifacts. Shovel tests were performed at 50-foot intervals until two consecutive negative shovel tests were encountered along the cardinal directions. This work expanded the site dimensions to 900 by 600 feet. The soil profiles resembled Seabrook soils, which have an Ap horizon of very dark grayish brown (10YR3/2) loamy fine sand to a depth of 0.8 foot over a dark brown (10YR4/3) or dark yellowish brown (10YR4/4) loamy fine sand. All artifacts were recovered in the plowzone or Ap horizon.

As previously mentioned, the site produced artifacts dating from the eighteenth to the nineteenth centuries (Table 20). Seven artifact groups are represented at this site including Kitchen (73%), Architecture (19%), Arms (0.5%), Tobacco (3%), Clothing (2%), Personal (0.2%), and Activities (2%).

This assemblage does not precisely match any of the previously proposed artifact patterns, although it certainly bears close resemblance to the Revised Carolina Artifact Pattern, generally associated with late eighteenth and early nineteenth century main settlements. The pattern most commonly associated with antebellum slave settlements bears little or no resemblance to the pattern from 38CH487, nor does the pattern associated with Piedmont tenant farmers (there is no well developed coastal tenancy pattern). The overall pattern also does not compare well for the one other low country store that has been briefly examined (Table 21). The failure to achieve a clear

Table 20.
Artifacts from 38CH487

	600 R540	600 R590	650 R590	700 R590	750 R590	600 R640	650 R640	700 R640	750 R640	800 R600	650 R690	700 R690	750 R690	800 R710	850 R710	600 R740	700 R740	750 R740	600 R790	700 R790	800 R810	700 R840	750 R840	850 R860	700 R890	750 R890	850 R910	700 R940	750 R940	800 R960	850 R960
Kitchen Group																															
English Porelain, undec.		1																													
Refined earthenware, burned																															
Coarse red earthenware																															
Stoneware, Ginger Beer																															
Stoneware, Bristol																							1								
Stoneware, Albany glazed																															
Stoneware, alkaline glazed				1				1																							
Stoneware, brown SG					1																										
Stoneware, brown																				1											
Creamware, poly HP																															1
Creamware, annular, banded																															
Creamware, annular, cabeled																															
Creamware, annular																							1								
Creamware, undec.					1											1															
Pearlware, green edged																										1					
Pearlware, blue edged																						1									
Pearlware, blue HP		1																													
Pearlware, blue TP								1																						1	
Pearlware, annular, banded																															
Pearlware, annular																															
Pearlware, undec.							1											1													
Whiteware, blue edged																															
Whiteware, poly HP																1															
Whiteware, blue HP																															
Whiteware, purple TP																															
Whiteware, black TP									1																					1	
Whiteware, blue TP																														2	
Whiteware, annular, banded																															
Whiteware, annular								1											1												
Whiteware, tinted, modern																															
Whiteware, undec.		4			1		1		2		1				1				1	1		2			1	1		3	1	2	
Yellow ware, molded			1																									1			
Yellow ware, annular, banded																															
Yellow ware, undec.																															
Colonoware												1																			
Glass, melted																										1					
Glass, manganese																						5		1			1		1		1
Glass, cobalt																					1										
Glass, blue																															
Glass, aqua																														1	
Glass, green																1											1				
Glass, light green																						1			2				2		1
Glass, brown											3															2					
Glass, clear	1			2									1				1					4	1		4	3	1	2	3		
Glass, milk																															
Glass, black											1			1											1				1	1	
Architecture Group																															
Window glass					1	1						1										1			1			1			
Cut nails																															
Cut nail fragments																															
Nail, fragment									4							1					1	4			3	1	1	2	1	2	1
Tobacco Group																															
Tobacco, pipe bowl, Kaolin																						2			2	1					
Tobacco, pipe stem, Kaolin																													1		
Clothing Group																															
Button, brass																															
Button, milk glass																														1	
Clothes hook																															
Eyelet, brass																														1	
Activities Group																															
Metal, UID																															
Barb wire										1																					
Slate																															
Faunal									1													1					1		3		
Personal Group																															
Jewelry setting, brass																															
Arms Group																															
Percussion cap, brass																															
Shell casing, .38 caliber																															
Prehistoric Group																															
Sherd, small																															
Subtotal	**1**	**6**	**1**	**3**	**4**	**1**	**2**	**3**	**8**	**1**	**5**	**2**	**1**	**1**	**1**	**4**	**1**	**1**	**2**	**2**	**2**	**21**	**3**	**1**	**14**	**10**	**5**	**9**	**13**	**12**	**4**
TOTAL																															

HP : Hand paint LG : Lead glaze SG : Salt glaze TP : Tranfer print undec. : undecorated

Table 20 continued.
Artifacts from 38CH487

	900 R960	750 R990	800 R1010	820 R1010	650 R1040	750 R1040	800 R1060	850 R1060	900 R1060	950 R1060	1100 R1060	650 R1090	800 R1110	850 R1110	1050 R1110	650 R1140	850 R1160	950 R1160	1100 R1160	1250 R1160	650 R1190	850 R1210	900 R1210	950 R1210	900 R1260	900 R1360	900 R1310	900 R1410	Surface Collection	**Subtotal**	**Total**
Kitchen Group																														**274**
English Porelain, undec.							1					1																1	**4**	
Refined earthenware, burned													1																**1**	
Coarse red earthenware																												1	**1**	
Stoneware, Ginger Beer							1																						**1**	
Stoneware, Bristol																											1		**2**	
Stoneware, Albany glazed							1																						**1**	
Stoneware, alkaline glazed																													**2**	
Stoneware, brown SG			1					1																				1	**4**	
Stoneware, brown																							1						**2**	
Creamware, poly HP																													**1**	
Creamware, annular, banded	1																												**1**	
Creamware, annular, cabeled																												1	**1**	
Creamware, annular																													**1**	
Creamware, undec.								1								1													**4**	
Pearlware, green edged																													**1**	
Pearlware, blue edged																													**1**	
Pearlware, blue HP																													**1**	
Pearlware, blue TP																													**2**	
Pearlware, annular, banded																												1	**1**	
Pearlware, annular							1																						**1**	
Pearlware, undec.																										1		1	**4**	
Whiteware, blue edged		1																	1										**2**	
Whiteware, poly HP												1				1	1									1			**5**	
Whiteware, blue HP		1																											**1**	
Whiteware, purple TP																										1			**1**	
Whiteware, black TP																1													**3**	
Whiteware, blue TP																												4	**6**	
Whiteware, annular, banded																										1			**1**	
Whiteware, annular						1																	1						**4**	
Whiteware, tinted, modern																	1												**1**	
Whiteware, undec.		6			1	1	3					1										1				3		7	**45**	
Yellow ware, molded																													**2**	
Yellow ware, annular, banded																												1	**1**	
Yellow ware, undec.							1	2					1			1	5												**10**	
Colonoware																													**1**	
Glass, melted																													**1**	
Glass, manganese		6				1		1					5				3									3		5	**33**	
Glass, cobalt																												2	**3**	
Glass, blue																												1	**1**	
Glass, aqua						3	2								1										1			5	**13**	
Glass, green			1										2			1	1												**7**	
Glass, light green		5	3					1	1																				**16**	
Glass, brown		3				1		1					1																**11**	
Glass, clear		5	3		2	1	5					2				1	4		1									2	**49**	
Glass, milk																												1	**1**	
Glass, black		4	1			1							1				3	1			1				1	1			**19**	
Architecture Group																														**77**
Window glass		2				1						1					1												**11**	
Cut nails		2																								1			**3**	
Cut nail fragments			2																										**2**	
Nail, fragment		4	3	1	1	7	10	5		1			3				3					1						1	**61**	
Tobacco Group																														**11**
Tobacco, pipe bowl, Kaolin		2											1			1													**9**	
Tobacco, pipe stem, Kaolin																										1			**2**	
Clothing Group																														**7**
Button, brass					2																								**2**	
Button, milk glass																1													**2**	
Clothes hook														1															**1**	
Eyelet, brass		1																											**2**	
Activities Group																														**17**
Metal, UID													1				2			2		1							**6**	
Barb wire																													**1**	
Slate																												1	**1**	
Faunal								1														1				1			**9**	
Personal Group																														**1**
Jewelry setting, brass							1																						**1**	
Arms Group																														**2**
Percussion cap, brass		1																											**1**	
Shell casing, .38 caliber						1																							**1**	
Prehistoric Group																														**2**
Sherd, small											2																		**2**	
Subtotal	**1**	**43**	**14**	**1**	**6**	**18**	**26**	**13**	**1**	**1**	**2**	**4**	**11**	**8**	**1**	**8**	**24**	**1**	**2**	**2**	**1**	**2**	**2**	**2**	**2**	**1**	**13**	**1**	**36**	**391**	
TOTAL																														**391**

HP : Hand paint LG : Lead glaze SG : Salt glaze TP : Tranfer print undec. : undecorated

match is likely the result of mixing at the site, the consequence of the long and varied occupation (slave, tenant, and commissary).

Within the Kitchen Group, glass makes up the bulk with 57% of the total group. Black glass appears to be one of the earliest dating to the seventeenth century at the earliest (Jones and Sullivan 1985:14). Manganese glass was common in the late nineteenth century.

European ceramics comprise about 42% of the Kitchen Group. The mean ceramic date (MCD) for the site is 1846.4 (Table 22). The earliest ceramic is undecorated creamware, which has a MCD of 1791. The most recent ware is a piece green tinted whiteware, which may be associated with a structure located on the site at least into the mid-twentieth century. A single piece of Colono ware, a slave-made pottery, was found.

Table 21.
Pattern analysis of 38CH487

	38CH487 Pattern	Revised Carolina Artifact Pattern[1]	Townhouse Pattern[2]	Dual-Function Pattern[2]	Georgia Slave Artifact Pattern[3]	Carolina Slave Artifact Pattern[1]	Yeoman Pattern[4]
Kitchen Group	73.0	51.8 - 65.0	58.4	63.1	20.0 - 25.8	70.9 - 84.2	40.0 - 61.2
Architectural Group	19.0	25.2 - 31.4	36.0	25.0	67.9 - 73.2	11.8 - 24.8	35.8 - 56.3
Furniture Group	-	0.2 - 0.6	0.2	0.1	0.0 - 0.1	0.1	0.4
Arms Group	0.5	0.1 - 0.3	0.3	0.2	0.0 - 0.2	0.1 - 0.3	-
Tobacco Group	3.0	1.9 - 13.9	2.8	6.0	0.3 - 9.7	2.4 - 5.4	-
Clothing Group	2.0	0.6 - 5.4	0.9	1.2	0.3 - 1.7	0.3 - 0.8	1.8
Personal Group	0.2	0.2 - 0.5	0.2	0.1	0.1 - 0.2	0.1	0.4
Activities Group	2.0	0.9 - 1.7	1.1	4.1	0.2 - 0.4	0.2 - 0.9	1.8

[1] Garrow 1982
[2] Zierden et al. 1988
[3] Singleton 1980
[4] Drucker et al. 1984

The Arms Group produced a .38 caliber shell casing and a brass percussion cap. Percussion caps were first patented in 1818, and were used through the Civil War (Peterson 1964:228-230).

The collection also produced ten pieces of faunal material, one piece of slate, and two small prehistoric sherds.

Table 22.
Mean ceramic date of 38CH487

Ceramic	Date Range	Mean Date (xi)	(fi)	fi x xi
Creamware, annular	1780-1815	1798	2	3596
Creamware, hand painted	1790-1820	1805	1	1805
Creamware, undecorated	1762-1820	1791	4	7164
Pearlware, blue hand painted	1780-1820	1800	1	1800
Pearlware, blue trans printed	1795-1840	1818	2	3636
Pearlware, edged	1780-1830	1805	2	3610
Pearlware, annular/cable	1790-1820	1805	3	5415
Pearlware, undecorated	1780-1830	1805	5	9025
Whiteware, blue edged	1826-1880	1853	2	3706
Whiteware, poly hand painted	1826-1870	1848	7	12936
Whiteware, blue trans printed	1831-1865	1848	6	11088
Whiteware, non-blue trans printed	1826-1875	1851	4	7404
Whiteware, annular	1831-1900	1866	7	13062
Whiteware, undecorated	1813-1900	1860	46	85560
Yellow ware	1826-1880	1853	9	16677
Total			101	186484
Mean Ceramic Date	1846.4			

For the Architecture Group, unidentifiable nails make up 81% of the group. The identifiable machine cut nails were common by the 1820s (Howard 1989:54).

Bartovics' (1980) dating analysis shows a small occupation from around 1760 to 1810, then a distinct increase in occupation that remains steady until 1900.

Historic research also revealed at least three maps showing structures in this area. The earliest, dated 1860 (Figure 43), shows a slave row and main house (part of Solomon Legare's property). Two 1919 maps (Wadmalaw (see Figure 30) and Legareville) still show the slave rows, which had likely turned into tenant structures, accounting for some of the later wares at the site. Oral history described a trailer and modern house on the site into the twentieth century (Sidi Limehouse, personal communication 2008).

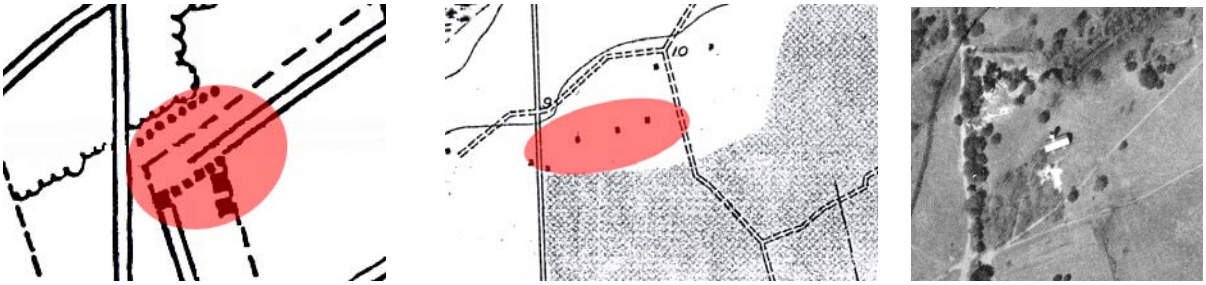


Figure 43. Historic maps and aerial showing the vicinity of 38CH487. From left to right: T-491 tracing, ca. 1863; Wadmalaw topographic map, 1919; aerial, 1949.

Mr. Limehouse (personal communication 2008) also reveals a commissary was located at the site that was said to have been standing into the 1940s. Mullet Hall tokens have been found at this site. Used in lieu of money, several of these tokens (see Figure 36) are at the Johns Island museum, Rosebank Farms.

Site 38CH487 exhibits a variety of data sets, including a large and varied assortment of artifacts. Contributing to this data set are detailed maps of the settlement. We also have both economic and oral history concerning the commissary thought to be found at this site. The shovel testing, while failing to reveal features, does indicate dense remains – a conclusion also documented by the number of artifacts found in the bisecting ditch.

This report has clearly established several contexts for investigation, including the lifeways of African American slaves on the island, as well as the transition to tenancy. At Mullet Hall these topics are of special interest since we are dealing with several contiguous plantations. A context for which there is very little data is that of plantation commissary. Although such stores are frequently mentioned by both historians and archaeologists, there has not been the opportunity to examine one in any detail. The only comparable research is the very limited testing conducted at 38CH886 (Trinkley 1987:75-80). The problem anticipated from any such investigation is the inability to clearly separate commercial from domestic refuse. This, however, is no different from the situation encountered by Martha Zierden in her urban archaeology research in downtown Charleston. In spite of the problem, she has managed to devise the dual-function pattern, reflecting street level commercial operations with overhead dwellings (Zierden et al. 1988).

Thus, 38CH487 may represent an opportunity to begin the exploration of these plantation commissaries. Even if the results are not conclusive, we believe it is an opportunity that should not be dismissed. Although we see mixing of patterns at this macroscopic level of investigation, there are viable studies suggesting that plow zone artifacts are not entirely mixed. Julia A. King, for example, clearly notes that,

> While the damage to these archaeological resources cannot be minimized, the spatial distributions of artifacts and soil chemicals remain relatively intact. Information about room and building use and yard organization and layout, for example, are easily recovered from plow-disturbed soils ("The Importance of Plow Zone Archaeology, Julia A. King, http://www.chesapeakearchaeology.org/AboutTheProject/PZArchaeology.htm, accessed July 21, 2008).

This same conclusion was reached by NPS researchers several decades earlier (Talmage and Chesler 1977). Thus, while plowing may have been extensive, this does not necessarily affect the integrity of the site. We believe that the site can

address significant research questions through a process of more intensive site sampling, followed by stripping, and careful investigation of identified structures.

Site 38CH487 is recommended eligible for the National Register of Historic Places. No work should be performed in this area pending review by the State Historic Preservation Office and the development of a data recovery plan.

38CH1539

Site 38CH1539 is a dump site created with fill containing nineteenth century artifacts. It is located on a creek edge in an attempt to prevent erosion. The elevation is about 5 feet AMSL. The site's location on Jacks Island is at 582480E 3609560N (NAD27 datum).

Figure 44. View of brick remains at 38CH1539.

The site was originally recorded during a reconnaissance in 1994 and was described as "a scatter of structural debris and artifacts along the bank of Mullet Hall Creek" (Adams and Trinkley 1994:28). At that time, eight shovel tests were excavated with only one test, located near the shoreline, positive. The collection, which also consisted of surface artifacts, included pearlwares, whitewares, pipe stems, and bottle glass. A conversation at the time with Mr. W.L. Limehouse revealed that the fill was brought from Charleston, although no information concerning when this happened and from was available The site was recommended not eligible for the National Register since it was "out of context and cannot address significant questions about Charleston area lifeways" (Adams and Trinkley 1994:28).

The current investigations excavated six shovel tests at 50-foot intervals around the site area and revealed results similar to those from the 1994 reconnaissance. Only one shovel test was positive, which was located on the edge of the creek. This test produced two pieces of creamware, which, given the history of the site, were noted and discarded in the field.

Brick building remains are still located in the flood zone of the creek and look to be found exactly as they were in 1994 (Figure 44). The site encompasses an area of about 50 feet north-south by 10 feet east-west.

The current investigations pro-duced identical results as the 1994 reconnaissance. This site is unable to address significant research questions about the history at Mullet Hall.

Site 38CH1539 is recommended not eligible for the National Register of Historic Places. No additional management activity is recommended pending the review and concurrence by the State Historic Preservation Office.

38CH1540

Site 38CH1540 (Figure 45) is an eighteenth to twentieth century plantation complex, located on a ridge at an elevation of about 10 feet AMSL. A GPS UTM, taken toward the western end of the site, is 583841E 3610905N (NAD27 datum). The site is located in areas of planted long-leaf pines, plowed fields, and dense pine and hardwood forests.

The site was originally recorded as part of the 1994 reconnaissance of the property (Adams and Trinkley 1994:28-30). Four different loci were recorded as a result of the brief study – the main house, cemetery, early slave row, and late slave row (Figure 46). Intact brick deposits were recorded in the main house area, so it was believed that the site would probably be found eligible for the National Register of Historic Places. At the time, the site dimensions were estimated to be 2,400 feet east-west by 500 feet north-south.

The current survey performed shovel testing at 50-foot intervals across the site area. A total of 540 shovel tests were excavated with 151 positive (28%) with artifacts. An additional 31 shovel tests contained only shell, 15 contained brick, and 9 contained only brick and shell.

Soils in the area generally resemble the moderately well drained Seabrook Series, which has an Ap horizon of very dark grayish brown (10YR3/2) loamy fine sand to a depth of 0.8 foot over a dark brown (10YR4/3) or dark yellowish brown (10YR4/4) loamy fine sand to a depth of 1.7 feet. Most of the shovel tests had an Ap horizon of at least 2.0 feet in depth, the result of subsoiling in the site area.

As with the reconnaissance, several loci were identified, however, the cemetery (Locus 2) was not found. The three loci include the western portion of the site (originally identified as Locus 3 -- an early slave row), the middle portion of the site (originally identified as Locus 1 -- the main house), and the eastern portion of the site (originally identified as Locus 4 -- a late slave row and later tenant structures). The new site dimensions are estimated to be 2400 feet east-west by 950 feet north-south.

The site is shown on a nineteenth century map as J. Roper's Oaks Plantation (Figure 47), which has the main house, a row of seven slave structures to the east, and four structures to the west. The entire site encompasses several status occupations, so the initial analysis of artifacts will cover the site as a whole.

The artifacts collected represent five different groups – Kitchen (71%), Architecture (23%), Tobacco (2%), Clothing (0.6%), and Activities (4%). The prehistoric component, which accounts for 9% of the artifact total, only produced one diagnostic artifact – a plain Deptford sherd. The remaining artifacts were small sherds (n=48) and chert fragments (n=2), which are not diagnostic and cannot address any significant research questions about prehistoric life.

The Kitchen Group produced the largest amount of artifacts for the site. Within this group, ceramics account for 47% of the collection. A MCD for the site is 1841.9. Eight pieces of Colono ware, a slave-made pottery, were also identified, which is attributed to the eighteenth century.

Bartovics (1980) dating analysis shows an increase in density from around 1760 to 1810. Around 1810, there is an increase in occupation until around 1900 when disposal ends abruptly. We do know that some tenant structures were around into the twentieth century, but those artifacts were not found in high enough quantities to register on the analysis. Salwen and Bridges' analysis shows a fairly lengthy occupation span from around 1735 to at least 1905.

The Architecture Group is dominated by nails, which account for 75% of the collection. Three types of nails are represented, hand wrought, machine cut, and wire nails. Hand wrought nails are the earliest, generally predating 1800 (Howard 1989:54). Machine cut nails were

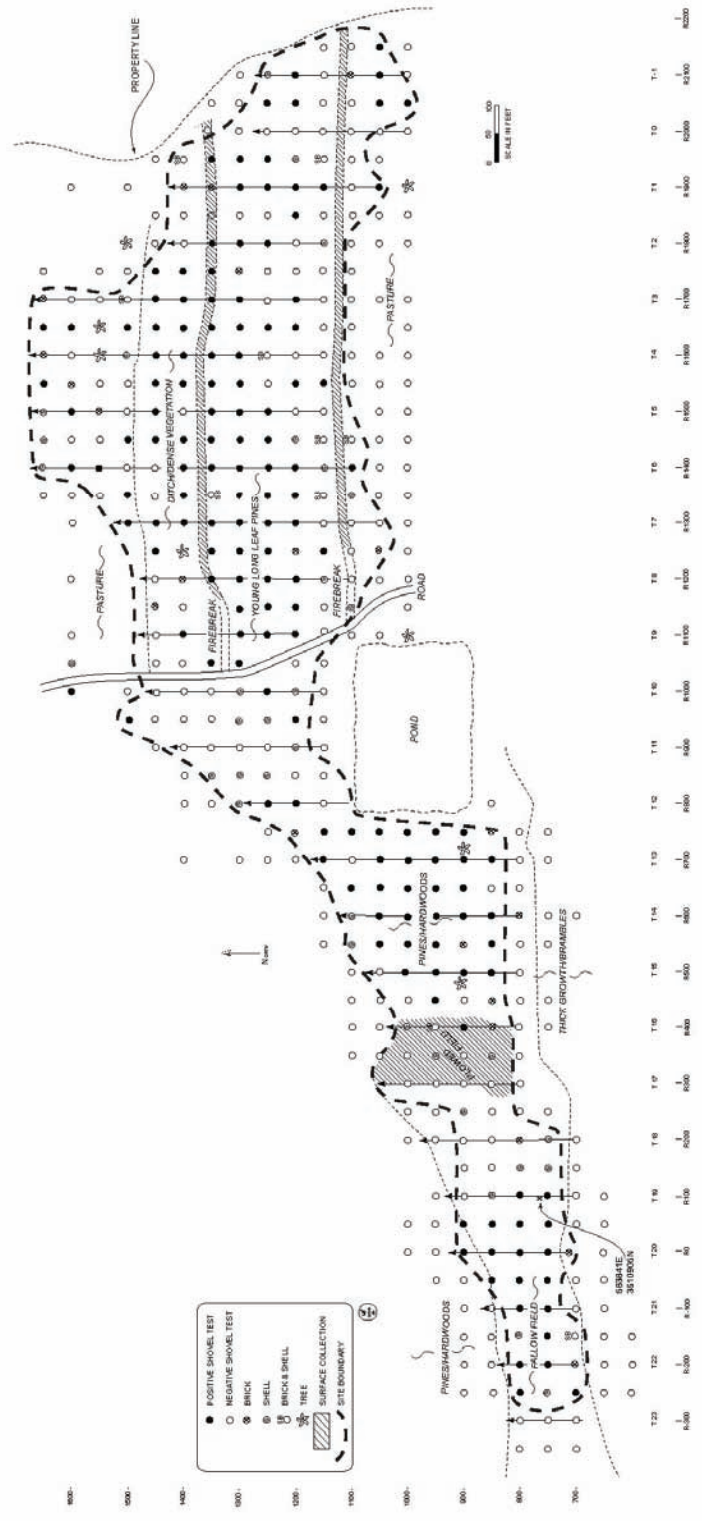


Figure 45. Sketch map of 38CH1540.

common by the 1820s and wire nails were generally used after 1880 (Howard 1989:54-55). Window glass (n=26), a strap hinge, and a roofing tack were also found at the site. In the field, a large number of shovel tests contained brick, but it was in the main house area (Locus 1) where some tests produced dense brick rubble. The 1994 reconnaissance reported rubble in the area (Adams and Trinkley 1994:28), however vegetation was extremely dense. With testing at 50-foot intervals, an area of dense brick remains could have been overlooked.

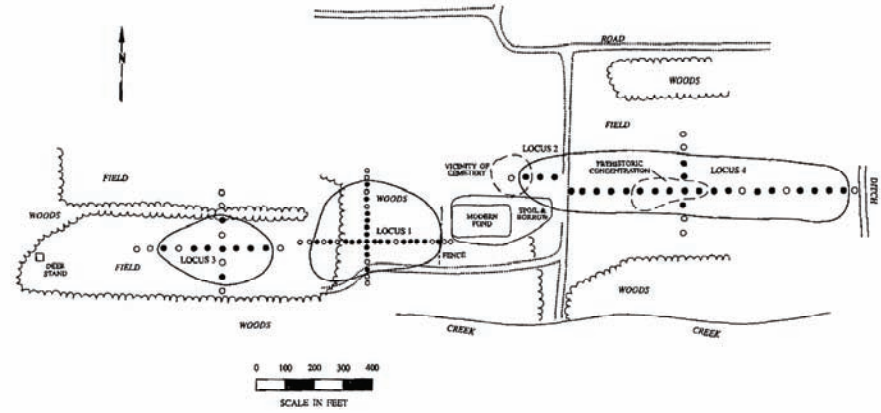


Figure 46. Sketch map from the 1994 reconnaissance showing 38CH1540.

The Tobacco Group contained mostly pipe stems, which account for 75% of the group total. Pipe bowls account for the rest of the group. All of the artifacts are made of kaolin, except two pipe stems that are made of red clay. One of the red clay pipe stems has the words "CLASC" on one side and "ELMAN" on the other side.

The Clothing Group includes two buttons and a brass eye. One button is white porcelain and the other is milk glass.

The Activities Group contains mostly unidentifiable iron. Also present is an iron staple, a nut, and part of a hoe.

A pattern analysis (Table 23) of this site shows that it very closely resembles the Carolina Slave Artifact Pattern, with exception of the Activities Group artifacts, which are higher at 38CH1540. We know, however, that this information is skewed since an entire plantation complex is represented by 38CH1540.

If the patterns are examined for the two largest loci – the main house area and the slave settlement – we begin to see some distinctions. For example, the main house exhibits significantly reduced kitchenware and increased architectural remains – as we expect for the Revised Carolina Artifact Pattern. The one anomaly is the large proportion of activities items. Thus, Locus 1 provides a good match for the main settlement. The slave settlement area (Locus 4) exhibits a pattern not significantly different from that identified as the Carolina Slave Artifact Pattern. What is unusual here is that this pattern is typically associated with eighteenth century settlements where the slave structures are of wall trench construction – affecting the low proportion of architectural remains. The reason for this anomalous pattern is uncertain.

Figure 47. Nineteenth century map showing J. Roper's Oaks Plantation.

Table 23.
Pattern Analysis for 38CH1540

	38CH1540 Combined	38CH1540 Locus 1 Main Hs.	38CH1540 Locus 4 Slave	Revised Carolina Artifact Pattern[1]	Georgia Slave Artifact Pattern[2]	Carolina Slave Artifact Pattern[1]
Kitchen Group	71.0	52.4	73.8	51.8 - 65.0	20.0 - 25.8	70.9 - 84.2
Architectural Group	23.0	36.2	20.5	25.2 - 31.4	67.9 - 73.2	11.8 - 24.8
Furniture Group	0.0	0.0	0.0	0.2 - 0.6	0.0 - 0.1	0.1
Arms Group	0.0	0.0	0.0	0.1 - 0.3	0.0 - 0.2	0.1 - 0.3
Tobacco Group	2.0	1.9	1.4	1.9 - 13.9	0.3 - 9.7	2.4 - 5.4
Clothing Group	0.6	0.9	0.6	0.6 - 5.4	0.3 - 1.7	0.3 - 0.8
Personal Group	0.0	0.0	0.0	0.2 - 0.5	0.1 - 0.2	0.1
Activities Group	4.0	8.6	3.7	0.9 - 1.7	0.2 - 0.4	0.2 - 0.9

[1] Garrow 1982

[2] Singleton 1980

A brief look at the ceramics (Table 24) from Locus 1 (the main house area) shows a MCD of 1826.5, close to fifteen years early than the MCD for the entire site (Table 25). The Bartovics' (1980) analysis shows a pattern similar to that of the entire site – a slow increase in density until 1810, when there is a steep increase until 1900, at which point there is a seemingly sudden end to the occupation. The only difference is the beginning of the occupation, which at Locus 1 starts at around 1660 and remains stable until 1760.

Locus 3 (Table 26) (western slave settlement) provided a MCD (Table 27) of 1828.1, similar to that of the main house in Locus 1. Bartovics (1980) analysis shows a somewhat interesting graph. It shows a short occupation from 1740 to 1770, then a drop for 10 years before there is a substantial increase that remains relatively stable until 1900 when, like the main house and site as a whole, there appears to be a sudden end of the occupation. One anomaly shown on this graph is a spike that occurs from 1820 to 1830.

The MCD of Locus 4 (eastern slave settlement/tenant) is 1846.8, around 20 years later than the main house MCD (Table 28 and 29). It is this locus that seems to have made the largest imprint on the site area – the Bartovics' (1980) analysis is exactly the same as the site as a whole. South's (1977) bracketing technique shows a span from about 1795 to 1905, accounted for by the later tenancy in this area.

Table 24.
Artifacts from 38CH1540, Locus 1

	900 R500	950 R500	1000 R500	850 R550	950 R550	1000 R550	1050 R550	850 R600	900 R600	950 R600	1000 R600	1000 R600	1050 R600	900 R650	950 R650	1000 R650	1050 R650	1100 R650	850 R700	900 R700	950 R700	1000 R700	1050 R700	1150 R700	900 R750	950 R750	1000 R750	1050 R750	1100 R750	1150 R750	1200 R800	1250 R800	Surface Plowed Field	Subtotal	Total
Kitchen Group																																		**55**
Chinese Porcelain, blue HP																			1					1									**2**	
English Porelain, undec.																1																	**1**	
Rockingham																1																	**1**	
Stoneware, grey SG																																1	**1**	
Stoneware, alkaline glazed										1																							**1**	
Creamware, undec.																		1														1	**2**	
Pearlware, green edged										1																						1	**2**	
Pearlware, undec.																							1					1					**2**	
Whiteware, blue edged																																1	**1**	
Whiteware, blue TP																																1	**1**	
Whiteware, undec.											1	1							1				1									5	**9**	
Yellow ware, annular										2																							**2**	
Glass, aqua										2																					1	1	**4**	
Glass, light green																																1	**1**	
Glass, black								1		3	1						1	1							4					1		3	**15**	
Glass, clear										8																						2	**10**	
Architecture Group																																		**38**
Window glass	1	3	1		1					5						1						1								1			**14**	
Nail										1					1																		**2**	
Nail, fragment	1	1								4	7				4		1								1	1	1		1				**22**	
Tobacco Group																																		**2**
Tobacco, pipe stem, Kaolin		1																														1	**2**	
Clothing Group																																		**1**
Button																						1											**1**	
Activities Group																																		**21**
Iron, UID							2			4					1																1		**8**	
Iron, staple																					1												**1**	
Faunal						3							1	1			2					1					3	1					**12**	
Prehistoric Group																																		**5**
Sherd, small				2				2	1																								**5**	
Subtotal	**2**	**5**	**1**	**2**	**1**	**3**	**2**	**3**	**1**	**31**	**9**	**1**	**1**	**1**	**6**	**3**	**4**	**2**	**1**	**1**	**1**	**3**	**1**	**1**	**1**	**5**	**4**	**2**	**1**	**1**	**2**	**2**	**18**	**122**	
TOTAL																																		**122**

HP : Hand painted SG : Salt glazed TP : Transfer print undec. : undecorated

The purported cemetery within the site area is an issue of concern. The 1994

Table 25.
Mean ceramic date of 38CH1540, Locus 1

Ceramic	Date Range	Mean Date (xi)	(fi)	fi x xi
Underglazed blue porc	1660-1800	1730	2	3460
English porc	1745-1795	1770	1	1770
Creamware, undecorated	1762-1820	1791	2	3582
Pearlware, edged	1780-1830	1805	2	3610
Pearlware, undecorated	1780-1830	1805	2	3610
Whiteware, blue edged	1826-1880	1853	1	1853
Whiteware, non-blue trans printed	1826-1875	1851	1	1851
Whiteware, undecorated	1813-1900	1860	9	16740
Yellow ware	1826-1880	1853	2	3706
Total			22	40182
Mean Ceramic Date	1826.5			

reconnaissance (Adams and Trinkley 1994) attempted to locate the cemetery, but found no evidence of stones or depressions. The report says that Ms. Betty Stringfellow heard that the stones were removed and used as the base for a causeway (Adams and Trinkley 1994:28). The current survey again attempted to locate the cemetery, however dense vegetation prevented any possible depressions or stones from being seen. Two aerial photographs, from 1948 and 1973 (Figure 48), show plowed fields in this area with a wooded area among the fields. This wooded area seems to stay the same size in the 25 year time span and it is probable that a cemetery would be avoided by agricultural activities. Kiawah River Plantation, LP has already taken a proactive approach to the cemetery by recording it on the modern survey of the property. The cemetery, however, is likely much larger than has been recorded. If construction is to take place in this area, we would recommend an area the size of the woods from the historic aerials be greenspaced or, alternatively, stripping be conducted to accurately identify cemetery boundaries.

Apart from the cemetery, site 38CH1540 produced a large number of artifacts from many data sets. Although the site has been subjected to cultivation and logging, features, such as areas of brick rubble, still remain. Site 38CH1540 provides an excellent opportunity to study a complete eighteenth century plantation complex.

Table 26.
Artifacts from 38CH1540, Locus 3

	700 R-250	800 R-250	750 R-200	800 R-200	750 R-150	750 R-100	800 R-100	750 R-50	800 R-50	850 R-50	750 R 0	700 R 0	850 R 0	900 R 0	750 R50	800 R50	850 R50	900 R50	750 R100	**Subtotal**	**Total**
Kitchen Group																					**27**
Stoneware, white SG													1							**1**	
Stoneware, brown SG													1							**1**	
Creamware, undec.																	1			**1**	
Pearlware, blue HP									1											**1**	
Pearlware, blue TP													1							**1**	
Pearlware, undec.														1		1				**2**	
Whiteware, green edged	1																			**1**	
Whiteware, undec.			1			1	1			1			1						1	**6**	
Colonoware											1				1					**2**	
Glass, black				1	1			2				1			4			1		**10**	
Glass, clear								1												**1**	
Tobacco Group																					**1**
Tobacco, pipe bowl, Kaolin		1																		**1**	
Activities Group																					**3**
Faunal, bone								3												**3**	
Prehistoric Group																					**1**
Sherd, small						1														**1**	
Subtotal	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**6**	**1**	**1**	**1**	**1**	**4**	**1**	**5**	**1**	**1**	**1**	**1**	**32**	
TOTAL																					**32**

HP : Hand painted SG : Salt glazed TP : Transfer print undec. : undecorated

Site 38CH1540 is recommended eligible for the National Register of Historic Places. No work should be performed in this area until sufficient testing or data recovery has been implemented. This recommendation is pending the review and concurrence by the State Historic Preservation Office.

Table 27.
Mean ceramic date of 38CH1540, Locus 3

Ceramic	Date Range	Mean Date (xi)	(fi)	fi x xi
White salt glazed stoneware	1740-1775	1758	1	1758
Creamware, undecorated	1762-1820	1791	1	1791
Pearlware, blue hand painted	1780-1820	1800	1	1800
Pearlware, blue trans printed	1795-1840	1818	1	1818
Pearlware, undecorated	1780-1830	1805	2	3610
Whiteware, green edged	1826-1830	1828	1	1828
Whiteware, undecorated	1813-1900	1860	6	11160
Total			13	23765
Mean Ceramic Date	1828.1			

38CH1541

Site 38CH1541 (Figure 49) is an eighteenth to twentieth century settlement once belonging to James Legare. It is situated on the edge of a marsh at an elevation of about 5 feet AMSL. A GPS UTM taken at the western portion of the site is 581630E 3610691N (NAD27 datum).

The site was first recorded during the 1994 reconnaissance (Adams and Trinkley 1994:30). A series of 29 shovel tests were excavated at 50-foot intervals in a cruciform pattern with 14 positive (48%). Based on the shovel testing and surface scatter, the site dimensions were estimated at 300 feet east-west by 600 feet north-south.

At the time of the reconnaissance, enough specimens were recovered, dating from the eighteenth to twentieth centuries, for investigators to believe that the site was likely eligible for the National Register of Historic Places.

The current survey excavated approximately 225 shovel tests at 50-foot intervals within the site area. Of those, 109 shovel tests were positive (48%) – the same percentage as established by the reconnaissance. A large surface collection was also recovered.

Soils in the site area resemble the moderately well drained Seabrook Series. These have an Ap horizon of very dark grayish brown (10YR3/2) loamy fine sand to a depth of 0.8 foot over a dark brown (10YR4/3) or dark yellowish brown (10YR4/4) loamy fine sand.

Table 28.
Mean ceramic date of 38CH1540, Locus 4

Ceramic	Date Range	Mean Date (xi)	(fi)	fi x xi
English porc	1745-1795	1770	2	3540
Lead glazed slipware	1670-1795	1733	1	1733
Creamware, undecorated	1762-1820	1791	4	7164
Pearlware, blue hand painted	1780-1820	1800	3	5400
Pearlware, blue trans printed	1795-1840	1818	1	1818
Pearlware, edged	1780-1830	1805	3	5415
Pearlware, undecorated	1780-1830	1805	7	12635
Whiteware, green edged	1826-1830	1828	1	1828
Whiteware, poly hand painted	1826-1870	1848	3	5544
Whiteware, blue trans printed	1831-1865	1848	6	11088
Whiteware, non-blue trans printed	1826-1875	1851	4	7404
Whiteware, annular	1831-1900	1866	13	24258
Whiteware, tinted glaze	1911-1970	1941	1	1941
Whiteware, undecorated	1813-1900	1860	53	98580
Yellow ware	1826-1880	1853	4	7412
Total			106	195760
Mean Ceramic Date	1846.8			

Table 29.
Artifacts from 38CH1540, Locus 4

	1200 R950	1500 R950	1250 R1000	1600 R1000	1300 R1050	1350 R1050	1200 R1100	1250 R1100	1300 R1100	1400 R1100	1220 R1150	1250 R1150	1300 R1150	1200 R1200	1250 R1200	1300 R1200	1300 R1200	1150 R1250	1250 R1250	1300 R1250	1350 R1250	1450 R1250	1200 R1300	1250 R1300	1300 R1300	1350 R1300	1400 R1300	1450 R1300	1500 R1300	1200 R1350	1250 R1350	1300 R1350	1400 R1350
Kitchen Group																																	
English Porcelain, HP overglaze																																	
English Porelain, undec.																																	
Redware, clear LG					1																												
Stoneware, alkaline glazed																																	
Stoneware, brown SG																																	
Stoneware, brown																																	
Red Coarse earthenware, clear LG																																	
Refined earthenware						1																											
Slipware, lead glazed																																	
Creamware, undec.																																	1
Pearlware, blue edged																																	
Pearlware, blue HP		1																															
Pearlware, blue TP						1																											
Pearlware, undec.																								1									
Whiteware, green edged																										1							
Whiteware, poly HP																									1								
Whiteware, black TP		1	1																														
Whiteware, green TP																																	
Whiteware, blue TP													1			1																	
Whiteware, annular					1				1						1		1				1					1							
Whiteware, tinted																																	
Whiteware, undec.	1				2		1		1											1	3					1	1		1	1			
Yellow ware, annular									2																	1							
Colonoware																																	
Glass, melted																																	
Glass, manganese					1										2	1			2														
Glass, aqua																							1										
Glass, blue																					1												
Glass, green																										1							
Glass, light green																																	
Glass, amber																																	
Glass, brown					2				2																								
Glass, black					1	1				1		1					1		3	3	2				1		1	1				1	
Glass, clear					1		1	1												3	1									1	3	
Architecture Group																																	
Window glass															1		1								1								
Nail								1																						1			
Nail, fragment			1		1				1			1			1	2		1	2		2			4	1						1	
Nut											1																						
Tobacco Group																																	
Tobacco, pipe bowl, Kaolin																						1									1		
Tobacco, pipe stem, Kaolin																																	
Tobacco, pipe stem, red clay																																	
Clothing Group																																	
Button																																	
Brass eye																																	
Activities Group																																	
Iron, UID																1				1											1		
Roofing tack																																	
Strap hinge fragment																																	
Hoe fragment																																	
Faunal, bone					1										2										1								
Prehistoric Group																																	
Sherd, small			1											1				1	2	1				3				1		1	3		
Chert fragment				1																													
Subtotal	**1**	**2**	**3**	**1**	**11**	**3**	**2**	**2**	**7**	**1**	**1**	**2**	**1**	**1**	**7**	**5**	**3**	**2**	**9**	**9**	**10**	**1**	**4**	**1**	**7**	**7**	**2**	**2**	**1**	**2**	**7**	**5**	**1**
TOTAL																																	

HP : Hand painted LG : Lead glazed SG : Salt glazed TP : Transfer print undec. : undecorated

	1500 R1350	1100 R1400	1200 R1400	1250 R1400	1300 R1400	1350 R1400	1400 R1400	1550 R1400	1600 R1400	1250 R1450	1300 R1450	1350 R1450	1400 R1450	1450 R1450	1500 R1450	1250 R1500	1300 R1500	1350 R1500	1450 R1500	1600 R1500	1150 R1550	1200 R1550	1300 R1550	1350 R1550	1400 R1550	1450 R1550	1650 R1550	1300 R1600	1350 R1600	1400 R1600	1450 R1600	1200 R1650	1250 R1650	1300 R1650
Kitchen Group																																	
English Porcelain, HP overglaze																																	
English Porelain, undec.																																	
Redware, clear LG																																	
Stoneware, alkaline glazed																							1										
Stoneware, brown SG																													1				
Stoneware, brown					1																				1								
Red Coarse earthenware, clear LG																													1				
Refined earthenware																																	
Slipware, lead glazed																																	
Creamware, undec.											1													1									
Pearlware, blue edged						1																											
Pearlware, blue HP				1																													
Pearlware, blue TP																																	
Pearlware, undec.					1																										1		
Whiteware, green edged																																	
Whiteware, poly HP																							1										
Whiteware, black TP																																	
Whiteware, green TP																													1				
Whiteware, blue TP																		1											1				
Whiteware, annular					1													1										1	1				
Whiteware, tinted																	1																
Whiteware, undec.				1	3						3	1					1						2						2	2		2	1
Yellow ware, annular																	1																
Colonoware																																	
Glass, melted																													1				
Glass, manganese					2	1	1	1			1						1	4					2		1				1	3			
Glass, aqua											1	2			1						1		1	1				1	1	2			
Glass, blue																																	
Glass, green																																	
Glass, light green							1		1							1			1										2				
Glass, amber																	2													1			
Glass, brown											1															1			1	1			
Glass, black		1										1	1			1		3	1				1	2	1	1	1		1				
Glass, clear					3	1					2							2					2	1					2			1	
Architecture Group																																	
Window glass	1																	1					1	2		1				1			
Nail																		1						1									
Nail, fragment							1				1	1					1	1					2	5	1			1	7	1			
Nut																																	
Tobacco Group																																	
Tobacco, pipe bowl, Kaolin																																	
Tobacco, pipe stem, Kaolin																																	
Tobacco, pipe stem, red clay											1																						
Clothing Group																													1				
Button																									1								
Brass eye																																	
Activities Group																							1	1						1			
Iron, UID					1																					1							
Roofing tack																																	
Strap hinge fragment																																	
Hoe fragment																																	
Faunal, bone											1														2								
Prehistoric Group																																	
Sherd, small		2	3							1			3						1		1	1	2										
Chert fragment																															1		
Subtotal	**1**	**3**	**3**	**2**	**10**	**4**	**4**	**1**	**1**	**1**	**11**	**6**	**1**	**3**	**1**	**2**	**6**	**16**	**2**	**1**	**1**	**1**	**15**	**15**	**2**	**6**	**4**	**1**	**3**	**23**	**11**	**3**	**2**	**2**	**1**

Table 29 continued.
Artifacts from 38CH1540, Locus 4

	1350 R1650	1400 R1650	1450 R1650	1500 R1650	1600 R1650	1650 R1650	1200 R1700	1300 R1700	1350 R1700	1400 R1700	1450 R1700	1350 R1750	1400 R1750	1450 R1750	1250 R1800	1300 R1800	1350 R1800	1200 R1850	1050 R1900	1150 R1900	1200 R1900	1250 R1900	1300 R1900	1250 R1950	1300 R1950	1350 R1950	1050 R2100	1200 R2100	1000 R2050	1200 R2050	1250 R2050	1050 R2150	Surface Firebreak #1	Surface Firebreak #2	Subtotal	Total
Kitchen Group																																			**262**
English Porcelain, HP overglaze																																1		1	
English Porelain, undec.																																1		1	
Redware, clear LG																																		1	
Stoneware, alkaline glazed																																		1	
Stoneware, brown SG																																1		2	
Stoneware, brown																																		2	
Red Coarse earthenware, clear LG																																		1	
Refined earthenware																																		1	
Slipware, lead glazed																																1		1	
Creamware, undec.					1																													4	
Pearlware, blue edged														1																		1		3	
Pearlware, blue HP																																1		3	
Pearlware, blue TP																																		1	
Pearlware, undec.																					1				1							2		7	
Whiteware, green edged																																		1	
Whiteware, poly HP																																1		3	
Whiteware, black TP																																		2	
Whiteware, green TP																																1		2	
Whiteware, blue TP													1									1												6	
Whiteware, annular	1																		1													1		13	
Whiteware, tinted																																		1	
Whiteware, undec.	1											1						1						1				1				12	1	50	
Yellow ware, annular																																		4	
Colonoware													1														3		1			1		6	
Glass, melted																																		1	
Glass, manganese	1			1												1								1				1						29	
Glass, aqua		1														1					1									1		1	1	18	
Glass, blue																																		1	
Glass, green																				1														2	
Glass, light green																												1			1			8	
Glass, amber																																		3	
Glass, brown																1							1											10	
Glass, black			1	1					1		1						1					1						1						39	
Glass, clear		1							1									1				2		2				1				1		34	
Architecture Group																																			**73**
Window glass																								1								1		12	
Nail	1																																	5	
Nail, fragment			1					1	2	1	2	3							2									3						55	
Nut																																		1	
Tobacco Group																																			**5**
Tobacco, pipe bowl, Kaolin																																		2	
Tobacco, pipe stem, Kaolin										1																								1	
Tobacco, pipe stem, red clay																														1				2	
Clothing Group																																			**2**
Button																																		1	
Brass eye																																		1	
Activities Group																																			**23**
Iron, UID													1									2												10	
Roofing tack																																		1	
Strap hinge fragment																																1		1	
Hoe fragment																																1		1	
Faunal, bone									1		1											1												10	
Prehistoric Group																																			**41**
Sherd, small	2	1				1	1	1	1			1			1										1			1						39	
Chert fragment																																		2	
Subtotal	**6**	**3**	**2**	**2**	**1**	**1**	**1**	**2**	**6**	**2**	**4**	**5**	**3**	**1**	**1**	**3**	**1**	**2**	**3**	**1**	**2**	**7**	**1**	**4**	**1**	**2**	**3**	**9**	**1**	**1**	**2**	**1**	**28**	**2**	**406**	
TOTAL																																				**406**

HP : Hand painted LG : Lead glazed SG : Salt glazed TP : Transfer print undec. : undecorated

Seven different artifact groups were represented in the collection (Table 30), including Kitchen (82.7%), Architecture (8.4%), Furniture (0.1%), Tobacco (5.9%), Clothing (0.3%), Personal (0.1%), and Activities (2.5%) groups.

This pattern is not dissimilar to both the Revised Carolina Artifact Pattern and the Carolina Slave Artifact Pattern. We suspect that at least some of the ambiguity here is the result of the shovel tests blurring several structural areas together. Reference to Figure 50 reveals that there were nine structures surrounding the main house and enclosed within the fenced yard. It seems likely that at least some of these structures may represent dwellings for those slaves serving in the owner's house. Thus, we again have a blurring of several patterns at this survey stage.

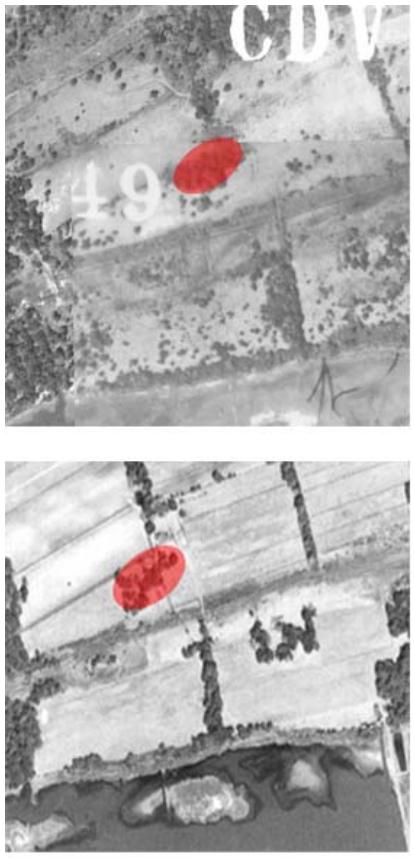


Figure 48. 1948 and 1973 aerials showing the approximate location of the cemetery at 38CH1540.

The Kitchen Group produced the highest percentage of artifacts. Ceramics (excluding Colono ware) account for 80% of the group total, while Colono ware makes up 4% of the total. The MCD for 38CH1541 is 1801 and contains a variety of ceramics (Table 31). The assemblage includes lead glazed slipware, a common eighteenth century pottery that was exported to the colonies in great numbers. As John Cushion observes, the slipware potters were "primarily concerned with producing the everyday necessities for the more humble table" (Cushion 1976:79). This common ware, however, stands in contrast to the white salt glazed stones and porcelains – both far more characteristic of a planter of higher status and both likely evidencing the British participation in the Chinese tea ritual (e.g., Hobhouse 1987:111).

The Architecture Group predominately produced window glass (60% of the group total). Unidentifiable nail fragments account for 35% of the total. Only one identifiable nail, machine cut, was identified in the collections. Machine cut nails were commonly used by the 1820s (Howard 1989:55). Four pieces of mortar were found as was brick, however, the brick was noted and discarded on site.

Tobacco Group artifacts accounted for the third highest group percentage. Both kaolin pipe stems and bowls were represented with the stems accounting for 68% of the group total.

The Clothing Group contained three buttons – one milk glass and two brass. One of the brass buttons has a design worn by the U.S. Navy. The button dates c. 1830-1849 (Luscomb 1967:11).

For the Personal Group, a wire wound black bead was found.

The Activities Group primarily produced unidentifiable iron fragments. One tool, an iron wrench fragment, was recorded.

Bartovics' (1980) dating technique shows limited occupation from about 1740 to 1760 then a steep increase that lasts until around 1820. There is a decrease in occupation until around 1830 when another steady occupation is apparent, lasting to 1900, when the settlement appears to cease. This is consistent with the historic research, suggesting site occupation prior to its late eighteenth century ownership by Mathews and Mullet, with the most intensive settlement being developed by James Legare.

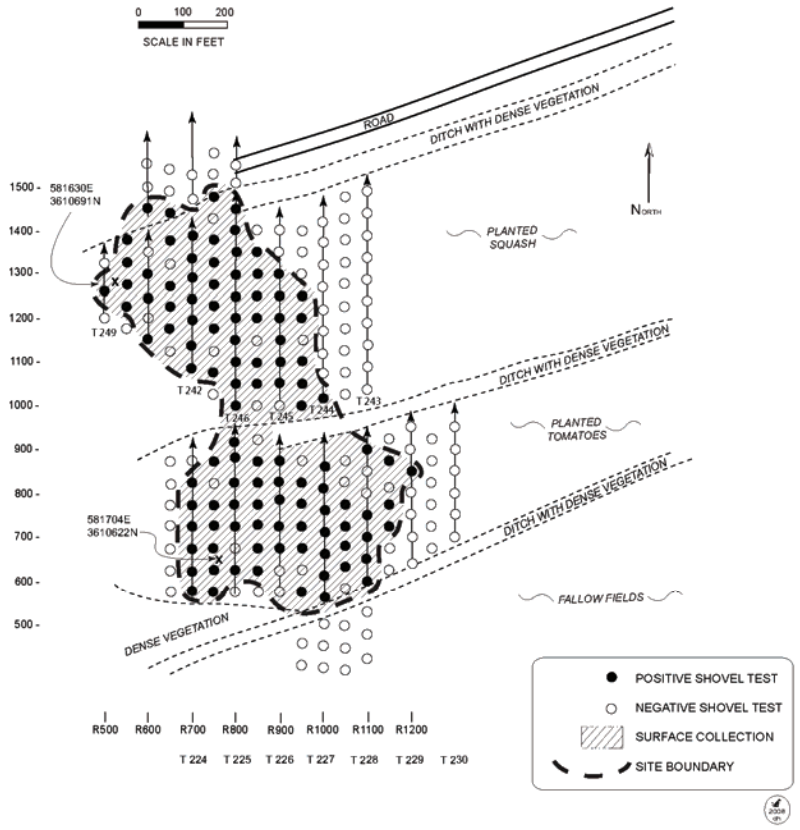


Figure 49. Sketch map of 38CH1541.

The prehistoric component accounts for only 3% of the artifact total. A total of 26 small sherds, three chert flakes, and one chert core were identified. Nothing from this assemblage is diagnostic.

The site area measures approximately 700 feet east-west by 900 feet north-south and was located in planted tomatoes, squash, and zucchini at the time of the survey.

The data sets identified from 38CH1541 consist of a broad range of eighteenth and nineteenth century artifacts consistent with a plantation settlement that is documented by the historic research already conducted. Shovel testing did not reveal features, but it did allow the recovery faunal remains. This settlement is the earliest on the property, providing evidence of Johns Island planters in the early colonial period. It is likely that the settlement will yield data concerning change and continuity among the island's planters. We are particularly fortunate to have the opportunity to examine three contiguous settlements during the nineteenth century, allowing for comparisons and contrasts in settlement patterns, plantation architecture, diet and faunal exploitation, and planter lifeways. Given the artifact patterns there is also a potential for the recovery of African American dwellings at this site, further allowing comparisons and contrasts between field and house slaves, eighteenth and nineteenth century slaves on the same plantation, and of course between the three settlements known to be present.

As discussed previously, we recognize that there has been extensive plowing at Mullet Hall. Research over the past 30 years, however, has demonstrated that plowing does not preclude the ability to distinguish structures and collect the types of data necessary to address the research questions anticipated for the site. The presence of faunal remains in the shovel testing suggests that the soils offer some preservation, while the presence of brick, mortar, and shell indicate the possibility for subsurface remains.

Site 38CH1541 is recommended eligible for the National Register of Historic Places for its

Table 30.
Artifacts from 38CH1541

	1250 R500	1230 R550	1280 R550	1330 R550	1390 R550	1150 R600	1250 R600	1300 R600	1400 R600	1450 R600	1170 R650	1220 R650	1270 R650	1370 R650	1440 R650	580 R700	630 R700	680 R700	730 R700	780 R700	830 R700	1080 R700	1130 R700	1180 R700	1230 R700	1280 R700	1330 R700	1380 R700
Kitchen Group																											
Chinese Porcelain, poly HP																											
Chinese Porcelain, blue HP																											
Chinese Porcelain, undec.																											
English Porcelain, blue HP																											
English Porcelain, TP																											
English Porelain, undec.																			1	1							
Refined earthenware, burned		1																									
Elers ware																											
Rockingham									1																		
Westerwald																											
Stoneware, white SG, scratch blue																											
Stoneware, white SG, annular																											
Stoneware, white SG, slip dip																											
Stoneware, white SG																											
Stoneware, grey SG																											
Stoneware, Bristol																											
Stoneware, Ginger Beer																											
Stoneware, alkaline glazed													1														
Stoneware, brown SG																											
Stoneware, burned																											
Refined red earthenware, clear LG																											
Coarse red earthenware, black LG												1															
Coarse red earthenware, brown LG																											
Coarse red earthenware, green LG																											
Coarse red earthenware, clear LG																											
Coarse red earthenware																						1					
Spanish Olive jar																											
Tortoise shell																											
Slipware, LG												1								1			1				1
Delftware, blue HP																											
Delftware, sponge																											
Delftware, undec.																							1				
Delftware, no glaze																											
North Devon, gravel temper											1																
Creamware, green edge																		1									
Creamware, poly HP overglaze																											
Creamware, blue HP																											
Creamware, clouded																											
Creamware, annular																								1			
Creamware, undec.			1	1		1	1						1					2	2	1					1	1	1
Pearlware, green edged																											
Pearlware, blue edged																											
Pearlware, poly HP																											
Pearlware, blue HP																											
Pearlware, blue TP														1													
Pearlware, annular																	1										
Pearlware, undec.									1									2	1	1					1		
Whiteware, green edged																											
Whiteware, blue edged																											
Whiteware, poly HP																											
Whiteware, red TP																											
Whiteware, brown TP																											
Whiteware, black TP																											
Whiteware, blue TP																				1							
Whiteware, annular																											
Whiteware, sponge dec.																											
Whiteware, undec.													1					1		1							
Yellow ware, annular																											
Yellow ware, undec.								1																			
Colonoware, rim												1		1													
Colonoware							2		2	1		2	2								2	2	5	3			
Glass, melted																	1										
Glass, manganese		1																									
Glass, aqua																											
Glass, green																											
Glass, light green		1																									
Glass, clear										1				1						1	1						
Glass, black					1		1		1			1		2						2					1		1
Architecture Group																											
Window glass																	1			1			1				
Nail, fragment															1	1	1	1		1	1		1				
Mortar																											
Furniture Group																											
Furniture tack																											
Staple																											
Tobacco Group																											
Tobacco, pipe bowl, Kaolin																		1						2			1
Tobacco, pipe stem, Kaolin	1						1										1					1					1
Clothing Group																											
Button																											
Personal Group																											
Bead																											
Activities Group																											
Metal, UID									1			1												1			1
Slate																											
Faunal																1		1	2								
Tool Group																											
Iron wrench fragment													1														
Prehistoric Group																											
Sherd, small											1														2	6	
Flake, chert																							1				
UID point fragment, chert																											
Core, flint																											
Subtotal	**1**	**3**	**1**	**1**	**1**	**1**	**5**	**1**	**6**	**2**	**2**	**7**	**6**	**5**	**1**	**2**	**5**	**9**	**6**	**11**	**4**	**4**	**10**	**4**	**3**	**5**	**7**	**6**
TOTAL																											

HP : handpaint LG : Lead glaze SG : Salt glaze TP : Transfer print undec. : undecorated

Figure 30 continued.
Artifacts from 38CH1541

	580 R750	630 R750	680 R750	730 R750	780 R750	880 R750	1070 R750	1170 R750	1220 R750	1270 R750	1320 R750	1370 R750	1470 R750	630 R800	730 R800	780 R800	830 R800	880 R800	930 R800	1000 R800	1050 R800	1100 R800	1200 R800	1250 R800	1300 R800	1350 R800	1400 R800	1450 R800
Kitchen Group																												
Chinese Porcelain, poly HP																												
Chinese Porcelain, blue HP																												
Chinese Porcelain, undec.																												
English Porcelain, blue HP																												
English Porcelain, TP																												
English Porelain, undec.																												
Refined earthenware, burned																												
Elers ware																												
Rockingham																												
Westerwald																												
Stoneware, white SG, scratch blue																												
Stoneware, white SG, annular																		1										
Stoneware, white SG, slip dip																												
Stoneware, white SG																												
Stoneware, grey SG																												
Stoneware, Bristol																												
Stoneware, Ginger Beer																												
Stoneware, alkaline glazed																												
Stoneware, brown SG					1																							
Stoneware, burned																												
Refined red earthenware, clear LG																												
Coarse red earthenware, black LG																												
Coarse red earthenware, brown LG															1													
Coarse red earthenware, green LG																												
Coarse red earthenware, clear LG																												
Coarse red earthenware																												
Spanish Olive jar																												
Tortoise shell																												
Slipware, LG								2																			1	
Delftware, blue HP																		1										
Delftware, sponge																												
Delftware, undec.																												
Delftware, no glaze																							1					
North Devon, gravel temper																												
Creamware, green edge																												
Creamware, poly HP overglaze																												
Creamware, blue HP																												
Creamware, clouded																												
Creamware, annular																												
Creamware, undec.														1														
Pearlware, green edged																												
Pearlware, blue edged																												
Pearlware, poly HP																												
Pearlware, blue HP																												
Pearlware, blue TP																												
Pearlware, annular																												
Pearlware, undec.																1		1										
Whiteware, green edged																												
Whiteware, blue edged																												
Whiteware, poly HP												2																
Whiteware, red TP																												
Whiteware, brown TP																												
Whiteware, black TP																												
Whiteware, blue TP					1																							
Whiteware, annular																			1									
Whiteware, sponge dec.																												
Whiteware, undec.		1	1							1		2			1													
Yellow ware, annular																												
Yellow ware, undec.																												
Colonoware, rim																												
Colonoware																				1		1			2	2		
Glass, melted																												
Glass, manganese																												
Glass, aqua																												
Glass, green																								1				
Glass, light green																												
Glass, clear					1																							
Glass, black		1	1		1	1	1						1				1	1			1	1			1			1
Architecture Group																												
Window glass		1			2	1											1	1	2						1			
Nail, fragment	1		1	1	3	1																2						
Mortar																												
Furniture Group																												
Furniture tack																												
Staple																												
Tobacco Group																												
Tobacco, pipe bowl, Kaolin		1																										
Tobacco, pipe stem, Kaolin																												
Clothing Group																												
Button																												
Personal Group																												
Bead									1																			
Activities Group																												
Metal, UID			1														1											
Slate																												
Faunal		1													1													
Tool Group																												
Iron wrench fragment																												
Prehistoric Group																												
Sherd, small								3			3	1																
Flake, chert																												
UID point fragment, chert																												
Core, flint																												
Subtotal	**1**	**5**	**4**	**1**	**9**	**3**	**1**	**5**	**1**	**1**	**3**	**5**	**1**	**1**	**3**	**1**	**3**	**5**	**3**	**1**	**1**	**4**	**1**	**1**	**4**	**2**	**1**	**1**
TOTAL																												

Figure 30 continued.
Artifacts from 38CH1541

	630 R850	680 R850	730 R850	780 R850	830 R850	880 R850	1050 R850	1100 R850	1200 R850	1250 R850	1300 R850	1350 R850	680 R900	760 R900	780 R900	830 R900	880 R900	1050 R900	1100 R900	1150 R900	1200 R900	1250 R900	1300 R900	570 R950	670 950	720 R950	770 R950	820 R950
Kitchen Group																												
Chinese Porcelain, poly HP																												
Chinese Porcelain, blue HP																												
Chinese Porcelain, undec.																												
English Porcelain, blue HP																									1			
English Porcelain, TP																												
English Porelain, undec.				1									1															
Refined earthenware, burned																												
Elers ware																												
Rockingham																												
Westerwald				1			1																					
Stoneware, white SG, scratch blue																												
Stoneware, white SG, annular																												
Stoneware, white SG, slip dip																		1										
Stoneware, white SG																												1
Stoneware, grey SG																												
Stoneware, Bristol																												
Stoneware, Ginger Beer																												
Stoneware, alkaline glazed																												
Stoneware, brown SG												1																1
Stoneware, burned																												
Refined red earthenware, clear LG																												
Coarse red earthenware, black LG																												
Coarse red earthenware, brown LG																												
Coarse red earthenware, green LG																												
Coarse red earthenware, clear LG			2																									
Coarse red earthenware																												
Spanish Olive jar																												
Tortoise shell																												1
Slipware, LG				1													1		1									
Delftware, blue HP	1						1																					
Delftware, sponge																												
Delftware, undec.																												
Delftware, no glaze																												
North Devon, gravel temper																												
Creamware, green edge																												1
Creamware, poly HP overglaze																												
Creamware, blue HP																												
Creamware, clouded																												1
Creamware, annular																												
Creamware, undec.		1																		1	1					1		
Pearlware, green edged																												
Pearlware, blue edged																					1							
Pearlware, poly HP																												
Pearlware, blue HP																												
Pearlware, blue TP		1	1				1																					
Pearlware, annular																												
Pearlware, undec.																		1										
Whiteware, green edged																												
Whiteware, blue edged																												
Whiteware, poly HP																												
Whiteware, red TP																												
Whiteware, brown TP																												
Whiteware, black TP																												
Whiteware, blue TP																												
Whiteware, annular			1	1																	1							
Whiteware, sponge dec.																												
Whiteware, undec.		1						1					1							1								
Yellow ware, annular																												
Yellow ware, undec.																												
Colonoware, rim																												
Colonoware							2				1	1									1							
Glass, melted	1																									1		
Glass, manganese																												
Glass, aqua																												
Glass, green																												
Glass, light green				1																								
Glass, clear					2		1					1			1													
Glass, black	1		3		3							1	1				1	2					1		1	1		
Architecture Group																												
Window glass				1				1		1	1			1		1	1	1	1			2				1	1	
Nail, fragment			2	1		1															1			1		1	2	2
Mortar					2											1												
Furniture Group																												
Furniture tack																									1			
Staple																				2								
Tobacco Group																												
Tobacco, pipe bowl, Kaolin										1																		
Tobacco, pipe stem, Kaolin																		1										
Clothing Group																												
Button																												
Personal Group																												
Bead																												
Activities Group																												
Metal, UID																												
Slate																												
Faunal																	1											
Tool Group																												
Iron wrench fragment																												
Prehistoric Group																												
Sherd, small									1														1					
Flake, chert																												
UID point fragment, chert																												
Core, flint																												
Subtotal	**3**	**3**	**9**	**7**	**7**	**1**	**6**	**2**	**1**	**2**	**2**	**4**	**3**	**1**	**1**	**2**	**4**	**5**	**3**	**4**	**5**	**2**	**2**	**1**	**1**	**3**	**6**	**8**

Figure 30 continued.
Artifacts from 38CH1541

	1050 R950	1100 R950	1200 R950	1250 R950	560 R1000	610 R1000	660 R1000	710 R1000	760 R1000	810 R1000	860 R1000	1020 R1000	630 R1050	680 R1050	730 R1050	780 R1050	600 R1100	650 R1100	700 R1100	750 R1100	900 R1100	730 R1150	780 R1150	880 R1150	850 R1200	Surface T244-249	Surface	**Subtotal**	**Total**
Kitchen Group																													**788**
Chinese Porcelain, poly HP																										1	**1**		
Chinese Porcelain, blue HP																									3	18	**21**		
Chinese Porcelain, undec.																										5	**5**		
English Porcelain, blue HP									1																	6	**8**		
English Porcelain, TP																										1	**1**		
English Porelain, undec.											1														2	11	**18**		
Refined earthenware, burned				1									1		1											8	**12**		
Elers ware																										1	**1**		
Rockingham																											**1**		
Westerwald																									1	6	**9**		
Stoneware, white SG, scratch blue																										1	**1**		
Stoneware, white SG, annular																											**1**		
Stoneware, white SG, slip dip																											**1**		
Stoneware, white SG																									1	25	**27**		
Stoneware, grey SG																			1							9	**10**		
Stoneware, Bristol																										1	**1**		
Stoneware, Ginger Beer																										2	**2**		
Stoneware, alkaline glazed																										2	**3**		
Stoneware, brown SG	1																								4	10	**18**		
Stoneware, burned																										1	**1**		
Refined red earthenware, clear LG																										1	**1**		
Coarse red earthenware, black LG																									1	5	**7**		
Coarse red earthenware, brown LG																									1	2	**4**		
Coarse red earthenware, green LG																										1	**1**		
Coarse red earthenware, clear LG																										3	**5**		
Coarse red earthenware																					1					1	**3**		
Spanish Olive jar																									2	4	**6**		
Tortoise shell															1											1	**3**		
Slipware, LG						1														2					6	9	**28**		
Delftware, blue HP																									1	5	**9**		
Delftware, sponge																										1	**1**		
Delftware, undec.																										9	**10**		
Delftware, no glaze										1																	**2**		
North Devon, gravel temper																									1	1	**3**		
Creamware, green edge																										1	**3**		
Creamware, poly HP overglaze																										5	**5**		
Creamware, blue HP																										1	**1**		
Creamware, clouded														1												2	**4**		
Creamware, annular																									2	4	**7**		
Creamware, undec.			1		1																				18	82	**120**		
Pearlware, green edged																1									3	10	**14**		
Pearlware, blue edged																									3	3	**7**		
Pearlware, poly HP																									3	2	**5**		
Pearlware, blue HP																										1	**1**		
Pearlware, blue TP																									1	10	**15**		
Pearlware, annular																										4	**5**		
Pearlware, undec.							1																	1	9	45	**65**		
Whiteware, green edged																										3	**3**		
Whiteware, blue edged																										5	**5**		
Whiteware, poly HP																									1	4	**7**		
Whiteware, red TP																										1	**1**		
Whiteware, brown TP																										1	**1**		
Whiteware, black TP																										1	**1**		
Whiteware, blue TP																									1	15	**18**		
Whiteware, annular																									1	14	**19**		
Whiteware, sponge dec.																										1	**1**		
Whiteware, undec.				1																					3	76	**93**		
Yellow ware, annular																										2	**2**		
Yellow ware, undec.																									1	5	**7**		
Colonoware, rim																											**2**		
Colonoware															1										1		**34**		
Glass, melted																										4	**8**		
Glass, manganese																											**1**		
Glass, aqua								1																			**1**		
Glass, green																									1	1	**3**		
Glass, light green																										3	**5**		
Glass, clear											1											1			1	5	**18**		
Glass, black						1	1								1				2			1	1		3	34	**81**		
Architecture Group																													**80**
Window glass	1	1				1		1				1							1	1					1	13	**47**		
Nail, fragment																										2	**29**		
Mortar																										1	**4**		
Furniture Group																													**3**
Furniture tack																											**1**		
Staple																											**2**		
Tobacco Group																													**56**
Tobacco, pipe bowl, Kaolin																									2	10	**18**		
Tobacco, pipe stem, Kaolin																						1			12	19	**38**		
Clothing Group																													**3**
Button																										3	**3**		
Personal Group																													**1**
Bead																											**1**		
Activities Group																													**56**
Metal, UID																		1							3	9	**19**		
Slate																										2	**2**		
Faunal																											**7**		
Tool Group																													**1**
Iron wrench fragment																											**1**		
Prehistoric Group																													**25**
Sherd, small																	1		1							1	**21**		
Flake, chert																									1	1	**3**		
UID point fragment, chert																											**0**		
Core, flint																										1	**1**		
Subtotal	**2**	**1**	**1**	**2**	**1**	**3**	**2**	**2**	**1**	**1**	**2**	**1**	**1**	**1**	**4**	**1**	**1**	**1**	**5**	**3**	**1**	**3**	**1**	**1**	**1**	**94**	**558**	**1013**	
TOTAL																												**1013**	

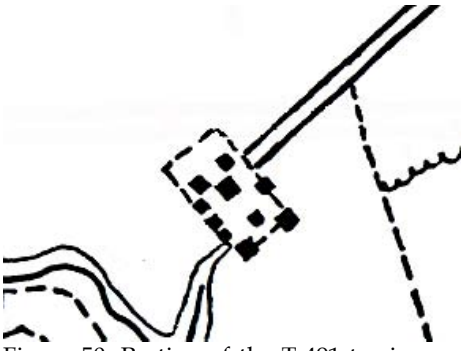


Figure 50. Portion of the T-491 tracing, ca. 1863 showing the James Legare settlement, which was earlier the location of the eighteenth century Mullet settlement.

information potential of early plantation life. No work should be performed in this site until sufficient testing and data recovery have been performed. Of course, this is pending the review and concurrence by the State Historic Preservation Office.

38CH1542

Site 38CH1542 (Figure 51) is a prehistoric and nineteenth to twentieth century settlement located on the edge of what is referred to as Mullet Hall Creek at an elevation of about 5 feet AMSL. A GPS UTM taken at the eastern end of the site is 582043E 3610341N (NAD27 datum).

The site was originally recorded during the 1994 reconnaissance of the Mullet Hall property (Adams and Trinkley 1994:30-31). Shovel testing was performed at 50-foot intervals in a cruciform pattern on the eastern side (with 8 of 11 positive) and the western side with 12 of 18 positive). The site, which appears as two separate slave rows on an 1863 map and the 1919 topographic survey, had largely disappeared by the mid-twentieth century (Figure 52). Artifacts collected during the reconnaissance dated from the mid-nineteenth to twentieth century at the eastern portion and late eighteenth to twentieth century at the western portion (Adams and Trinkley 1994:30-31). Although testing was limited, the site was assumed to be eligible for the National Register of Historic Places.

The current survey set up a series of transects along Mullet Hall Creek from east to west at 50-foot intervals. Shovel testing was performed at 50-foot intervals to the north until two consecutive negative tests were encountered. A total of 190 shovel tests were excavated with 78 positive (41%). An additional nine shovel tests contained only shell, two contained only brick, and six contained brick and shell.

Shovel tests produced soil profiles that closely resemble the moderately well drained Seabrook soils. This series has an Ap horizon of very dark grayish brown (10YR3/2) loamy fine

Table 31.
Mean ceramic date of 38CH1541

Ceramic	Date Range	Mean Date (xi)	(fi)	fi x xi
Overglazed enamelled porc	1660-1800	1730	1	1730
Underglazed blue porc	1660-1800	1730	27	46710
English porc	1745-1795	1770	26	46020
Westerwald	1700-1775	1738	9	15642
White salt glazed stoneware	1740-1775	1758	27	47466
White sg sw, scratch blue	1744-1775	1760	1	1760
White sg sw, slip dip	1715-1775	1745	1	1745
Lead glazed slipware	1670-1795	1733	28	48524
Clouded wares	1740-1770	1755	4	7020
Decorated delft	1600-1802	1750	10	17500
Plain delft	1640-1800	1720	12	20640
North Devon	1650-1775	1713	3	5139
Creamware, annular	1780-1815	1798	7	12586
Creamware, hand painted	1790-1820	1805	6	10830
Creamware, undecorated	1762-1820	1791	120	214920
Pearlware, poly hand painted	1795-1815	1805	7	12635
Pearlware, blue hand painted	1780-1820	1800	1	1800
Pearlware, blue trans printed	1795-1840	1818	15	27270
Pearlware, edged	1780-1830	1805	23	41515
Pearlware, annular/cable	1790-1820	1805	5	9025
Pearlware, undecorated	1780-1830	1805	65	117325
Whiteware, green edged	1826-1830	1828	3	5484
Whiteware, blue edged	1826-1880	1853	5	9265
Whiteware, poly hand painted	1826-1870	1848	5	9240
Whiteware, blue trans printed	1831-1865	1848	18	33264
Whiteware, non-blue trans printed	1826-1875	1851	3	5553
Whiteware, annular	1831-1900	1866	19	35454
Whiteware, sponge/splatter	1836-1870	1853	1	1853
Whiteware, undecorated	1813-1900	1860	93	172980
Yellow ware	1826-1880	1853	9	16677
Total			554	997572
Mean Ceramic Date	1800.7			

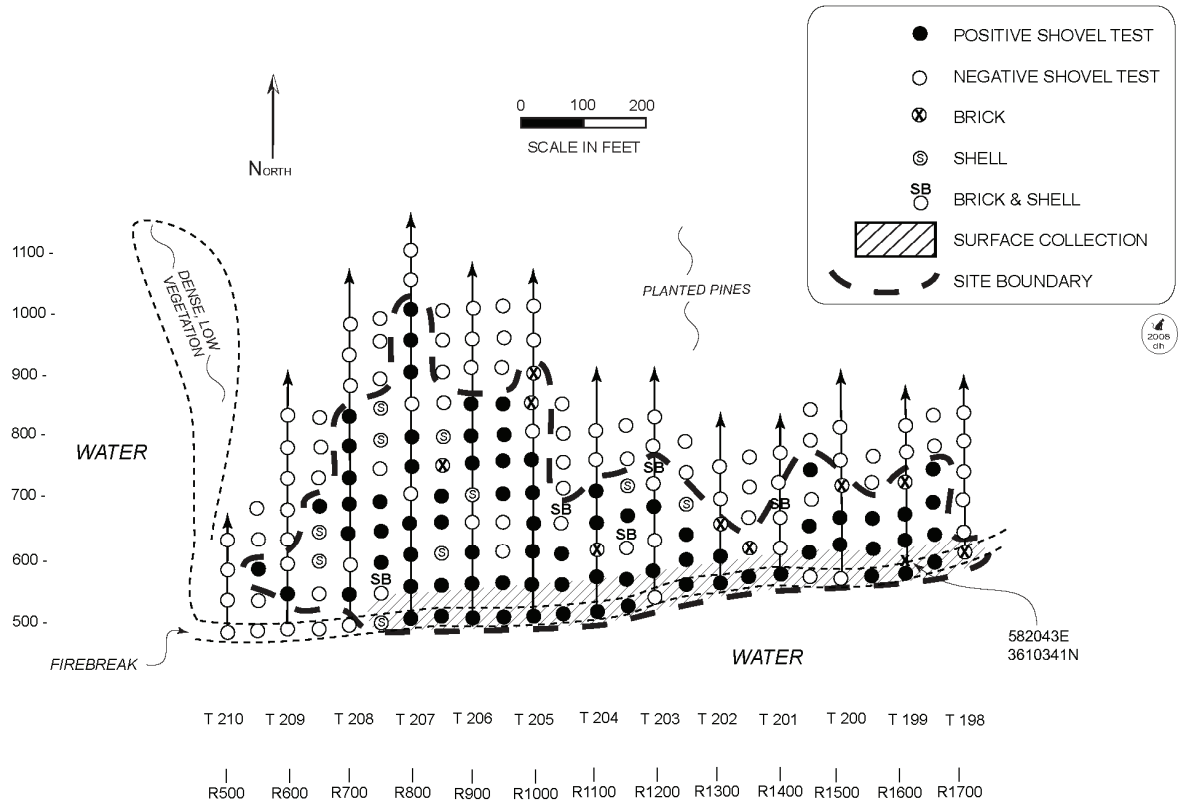


Figure 51. Sketch map of 38CH1542.

sand to a depth of 0.8 foot over a dark brown (10YR4/3) or dark yellowish brown (10YR4/4) loamy fine sand. All artifacts were found in the plow zone.

The prehistoric component of the site (11% of the total artifact assemblage) consists of small sherds, a chert flake, and a chert projectile point fragment. None of the artifacts are diagnostic.

The historic assemblage contained six different data sets – Kitchen (83.7%), Architecture (10%), Furniture (0.3%), Tobacco (2.0%), Clothing (1.4%), and Activities (2.6%) groups (Table 32). This pattern closely resembled the Carolina Slave Artifact Pattern, typically associated with eighteenth century slave settlements where the structures are ground fast (i.e., of wall trench construction). As we have noted for several other sites, this seems unusual given the abundance of nineteenth century specimens. It is tempting to

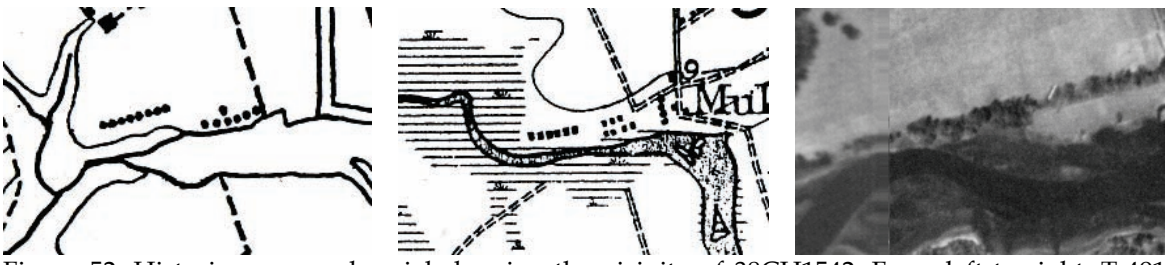


Figure 52. Historic maps and aerial showing the vicinity of 38CH1542. From left to right: T-491 tracing, ca. 1863; Wadmalaw topographic map, 1919; aerial, 1949.

Table 32.
Artifacts from 38CH1542

	580 R550	540 R600	690 R650	540 R700	640 R700	690 R700	740 R700	790 R700	840 R700	600 R750	650 R750	700 R750	510 R800	560 R800	610 R800	660 R800	760 R800	810 R800	910 R800	960 R800	1010 R800	510 R850	560 R850	660 R850	510 R900	560 R900	610 R900	760 R900	810 R900	860 R900	510 R950	560 R950	710 R950	760 R950	810 R950	860 R950	510 R1000	560 R1000	610 R1000	660 R1000
Kitchen Group																																								
English Porcelain, blue HP																																							
English Porelain, undec.																																							
Stoneware, grey SG					1																																		
Stoneware, Bristol																																							
Stoneware, Albany interior																																							
Stoneware, alkaline glazed																																							
Stoneware, brown																					1																		
Refined earthenware, burned																																							
Creamware, undec.																																							
Pearlware, green edged																																							
Pearlware, blue HP																																							
Pearlware, blue TP																																							
Pearlware, sponge dec.																																							
Pearlware, undec.										1																													
Whiteware, green edged																																							
Whiteware, blue edged																																							
Whiteware, poly HP																																							
Whiteware, decal																																							
Whiteware, red TP																																							
Whiteware, blue TP																																							
Whiteware, flow blue																																							
Whiteware, annular																						1																	1
Whiteware, sponge dec.																																							
Whiteware, tinted																																							
Whiteware, undec.	1												1		1											1	1				1					1		1		
Colonoware																																				1				
Glass, melted																																							
Glass, manganese																						1																		
Glass, milk																																							
Glass, aqua																																							
Glass, blue																																							
Glass, green																																							
Glass, light green										1																													
Glass, black			2								2				1	1				1				1												2	1		
Glass, brown														1											1														
Glass, clear															1	1				2			1	1	1						1								
Architecture Group																																							
Window glass																									1					1									
Nail, fragment				1					1		1		1	3	1							1			1	1					2					1			
Mortar																																							
Furniture Group																																							
Furniture tack																																							
Tobacco Group																																							
Tobacco, pipe bowl, Kaolin																																					1		
Tobacco, pipe stem, Kaolin																																							
Clothing Group																																							
Button																																							
Activities Group																																							
Iron, UID										1																													
Faunal																									1	1											2			
Prehistoric Group																																							
Sherd, small		2	4			2	1	1				1					4	1	1					2			1	2	2	1		1	1	1	1				1
Flake, chert																		1																					
UID point fragmet, chert																																							
Subtotal	**1**	**2**	**6**	**1**	**1**	**2**	**1**	**1**	**1**	**3**	**3**	**1**	**2**	**4**	**4**	**2**	**4**	**2**	**1**	**3**	**1**	**3**	**1**	**4**	**5**	**3**	**1**	**1**	**2**	**2**	**2**	**4**	**1**	**1**	**1**	**1**	**7**	**2**	**1**	**2**
TOTAL																																							

HP : Hand painted SG : Salt glazed TP : Transfer print undec. : undecorated

	710 R1000	760 R1000	510 R1050	560 R1050	610 R1050	520 R1100	570 R1100	670 R1100	720 R1100	520 R1150	570 R1150	670 R1150	590 R1200	690 R1200	540 R1250	550 R1250	600 R1250	650 R1250	560 R1300	610 R1300	570 R1350	570 R1400	610 R1450	660 R1450	760 R1450	620 R1500	670 R1500	580 R1550	630 R1550	680 R1550	580 R1600	630 R1600	680 R1600	600 R1650	650 R1650	750 R1650	Surface Collection	**Subtotal**	**Total**
Kitchen Group																																						**298**
English Porcelain, blue HP																																				2	**2**	
English Porelain, undec.															1																					11	**12**	
Stoneware, grey SG																																				2	**3**	
Stoneware, Bristol																																				2	**2**	
Stoneware, Albany interior																																				1	**1**	
Stoneware, alkaline glazed													1																							1	**2**	
Stoneware, brown																																				1	**2**	
Refined earthenware, burned																																				4	**4**	
Creamware, undec.																																				7	**7**	
Pearlware, green edged																																				4	**4**	
Pearlware, blue HP																																				1	**1**	
Pearlware, blue TP																																				4	**4**	
Pearlware, sponge dec.																																				1	**1**	
Pearlware, undec.																																				5	**6**	
Whiteware, green edged																																				1	**1**	
Whiteware, blue edged																																				1	**1**	
Whiteware, poly HP																																				3	**3**	
Whiteware, decal																																				4	**4**	
Whiteware, red TP																																				1	**1**	
Whiteware, blue TP																																				2	**2**	
Whiteware, flow blue																																				1	**1**	
Whiteware, annular															1																					11	**14**	
Whiteware, sponge dec.			1																																	2	**3**	
Whiteware, tinted																																				3	**3**	
Whiteware, undec.			1	1											1	2		1				1			1				1	1						69	**87**	
Colonoware																										1											**2**	
Glass, melted																																	1			1	**2**	
Glass, manganese							1																1						1		1					22	**27**	
Glass, milk																																				2	**2**	
Glass, aqua				1						1									1									1								10	**14**	
Glass, blue																																				4	**4**	
Glass, green																																				3	**3**	
Glass, light green																																				4	**5**	
Glass, black										1	1			2				1		2															1	16	**35**	
Glass, brown																					1															2	**4**	
Glass, clear			2		1	1	2										1									1	1					1				11	**29**	
Architecture Group																																						**35**
Window glass											1	1											1								1			1		2	**9**	
Nail, fragment				1			3			2			1		1	1							1										1				**25**	
Mortar											1																										**1**	
Furniture Group																																						**1**
Furniture tack																																				1	**1**	
Tobacco Group																																						**7**
Tobacco, pipe bowl, Kaolin															1															1						1	**4**	
Tobacco, pipe stem, Kaolin																					1															2	**3**	
Clothing Group																																						**5**
Button																																				5	**5**	
Activities Group																																						**15**
Iron, UID				1	1		2	1											1								1		1							**9**	
Faunal			1																									1								**6**	
Prehistoric Group																																						**46**
Sherd, small	1	1							1	1					1					4								1			4			1	4	**44**	
Flake, chert												1																								**1**	
UID point fragmet, chert																																				**1**		
Subtotal	**1**	**1**	**5**	**4**	**2**	**1**	**8**	**1**	**1**	**5**	**4**	**1**	**2**	**2**	**5**	**3**	**1**	**2**	**2**	**2**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**3**	**3**	**3**	**1**	**2**	**5**	**2**	**1**	**2**	**234**	**407**	
TOTAL																																						**407**

HP : Hand painted SG : Salt glaze TP : Transfer print undec. : undecorated

use the tenant occupation as an explanation, but the Yeoman pattern should slightly ameliorate the abundance of kitchen items, not further emphasize these materials at the cost of architectural remains. Since this has been seen at several sites, it may be a pattern development specific to these owners or perhaps to Johns Island – in any event, the anomaly is worthy of additional study.

Some decorative motifs tend to be more

Table 33.
Mean ceramic date of 38CH1542

Ceramic	Date Range	Mean Date (xi)	(fi)	fi x xi
Creamware, undecorated	1762-1820	1791	7	12537
Pearlware, blue hand painted	1780-1820	1800	1	1800
Pearlware, blue trans printed	1795-1840	1818	4	7272
Pearlware, edged	1780-1830	1805	4	7220
Pearlware, undecorated	1780-1830	1805	6	10830
Whiteware, green edged	1826-1830	1828	1	1828
Whiteware, blue edged	1826-1880	1853	1	1853
Whiteware, poly hand painted	1826-1870	1848	3	5544
Whiteware, blue trans printed	1831-1865	1848	2	3696
Whiteware, non-blue trans printed	1826-1875	1851	1	1851
Whiteware, poly decalcomania	1901-1950	1926	4	7704
Whiteware, annular	1831-1900	1866	14	26124
Whiteware, sponge/splatter	1836-1870	1853	3	5559
Whiteware, tinted glaze	1911-1970	1941	3	5823
Whiteware, undecorated	1813-1900	1860	87	161820
Total			141	261461
Mean Ceramic Date	1854.3			

expensive than others and this can serve as a rough guide to the status of the site's occupants. For example, annular wares tend to be very inexpensive. Transfer prints tend to be more expensive. Plain wares are problematical since they begin their history as expensive but rather quickly become less expensive. When we examine the 38CH1542 collection we find that, excluding the plain wares, nearly two-thirds (63.3%) of the decorative motifs are those associated with inexpensive ceramics – annularwares, mocha, and edged wares. If the undecorated ceramics are added, then nearly 92% of the collection represents low status wares. This is certainly consistent with African American slavery (and tenancy).

The Kitchen Group was composed of ceramics (57% of the group) and glass (43%). The MCD of the ceramics is 1854.3 (Table 33). The assemblage contains no wares that are noticeably earlier. Even Colono ware is nearly absent from the collection, as are slipwares and delft. Evidence of tenant occupation is provided by the seven examples of decalcomania and tinted whitewares – ceramics that are characteristic of the twentieth century (and which are consistent with the 1919 topographic map showing dwellings still at this location).

The Architecture Group contained mostly unidentifiable nail fragments, which accounted for 73% of the group total. Window glass was also found.

Bartovics' (1980) dating analysis shows little occupation prior to 1810, at which time occupation increases dramatically and occupation remains steady until about 1900. We then see only a thin smear through the mid twentieth century – suggesting that the tenant dwellings may have been only in limited use.

The site area is approximately 1,200 feet east-west by 500 feet north-south. It is today located in an area of planted pines, although during the 1994 reconnaissance it was a plowed field.

The data sets identified for 38CH1542 include a variety of artifact groups expected to be associated with a slave settlement. The pattern analysis, while somewhat ambiguous supports this interpretation, as does an examination of the decorative motifs present in the assemblage. Another data set is the presence of faunal remains. We need to also add the abundant historic research as a valuable data set. For example, we know that James Legare's widow, Lydia, reported 30 slave houses on the 1860 census. The available historic plat of the property, however, reveals only 15 in these two settlements – thus we must recognize that we have a sample of perhaps only half was what was originally present.

The exploratory potential at Mullet Hall is exceptional – not only do we have three different plantations – each with its own slave settlement –

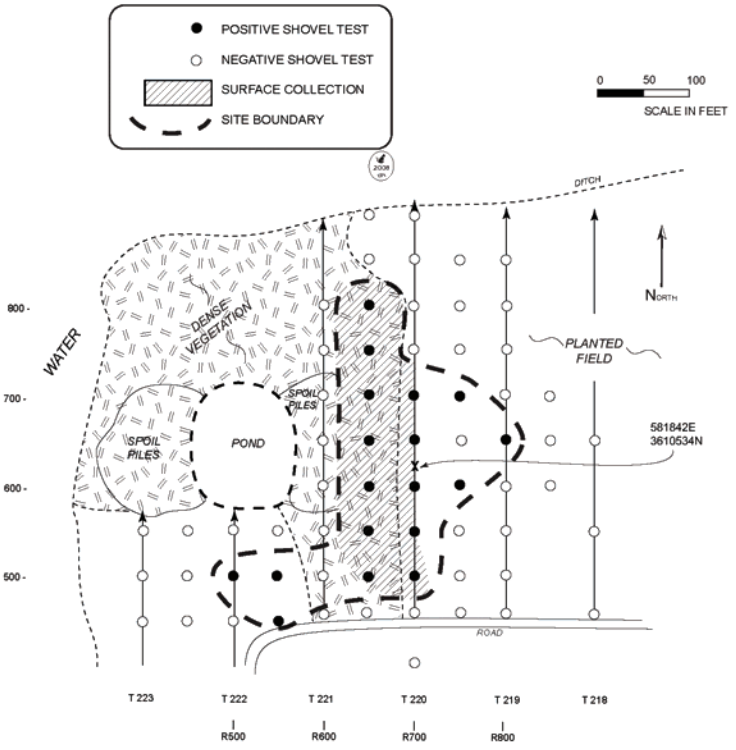


Figure 53. Sketch map of 38CH1543.

but at James Legare's settlement we have two distinct settlements. Was one settlement older than another? If so, might this difference be seen in architecture or identified in the artifact assemblages? Were the settlements representative of two different groups of slaves? This need not be as drastic as field and house slaves, but may perhaps represent groups that worked different fields. If so, will we see any artifactual or dietary differences? Certainly, we have a variety of significant research questions available for study.

Site integrity here, as at other sites, has been affected by plowing. Yet the presence of relatively large historic ceramics – as well as the recovery of faunal remains in plow zone contexts – suggests that plowing may not be as dramatic as might be presumed. We have also cited commentary by other archaeologists who have examined plow zone contexts in detail and find that they remain worthy of careful study.

Site 38CH1542 is recommended eligible for the National Register of Historic Places for its potential to address significant research questions. No work should be performed in this area until an MOA can be established and implemented. Of

Table 34.
Artifacts from 38CH1543

	500 R500	450 R550	500 R550	500 R650	550 R650	600 R650	650 R650	700 R650	750 R650	800 R650	500 R700	550 R700	600 R700	650 R700	700 R700	600 R750	700 R750	650 R800	Surface Collection	Subtotal	Total
Kitchen Group																					**24**
Canton Porcelain, blue HP																			1	**1**	
Stoneware, grey SG																			1	**1**	
Stoneware, Ginger Beer											1									**1**	
Slipware, lead glazed																			2	**2**	
Delftware, plain														1						**1**	
Creamware, annular																			1	**1**	
Creamware, undec.																			1	**1**	
Pearlware, blue HP			1																	**1**	
Pearlware, blue TP																			1	**1**	
Whiteware, undec.															1					**1**	
Colonoware							3		1				2	1			1	2		**10**	
Glass, black	1			1										1						**3**	
Architecture Group																					**3**
Nail, fragment				1				1		1										**3**	
Tobacco Group																					**6**
Tobacco, pipe bowl, Kaolin																1			1	**2**	
Tobacco, pipestem, Kaolin																			4	**4**	
Activities Group																					**8**
Metal, UID		5			1	2														**8**	
Prehistoric Group																					**5**
Sherd, small					1							2							2	**5**	
Subtotal	**1**	**5**	**1**	**2**	**2**	**2**	**3**	**1**	**1**	**1**	**1**	**2**	**2**	**3**	**1**	**1**	**1**	**2**	**14**	**46**	
TOTAL																					**46**

HP : Hand painted TP : Transfer print undec. : undecorated SG : Salt glazed

course, this is pending the concurrence by the State Historic Preservation Office.

38CH1543

Site 38CH1543 (Figure 53) is an eighteenth to nineteenth century scatter located on a marsh edge at an elevation of about 5 feet AMSL. A central GPS UTM is 581800E 3610520N (NAD27 datum).

The site was originally recorded during the 1994 reconnaissance (Adams and Trinkley 1994:31). The site was described as "a small scatter of 18th century materials in a plowed field" (site form dated 9/12/94). An agricultural pond was north of the site and appeared to have damaged the site since artifacts were observed eroding out of the wall of the pond. The site dimensions were estimated to be 75 feet north-south by 100 feet east-west.

Table 35.
Mean ceramic date of 38CH1543

Ceramic	Date Range	Mean Date (xi)	(fi)	fi x xi
Underglazed blue porc	1660-1800	1730	1	1730
Lead glazed slipware	1670-1795	1733	2	3466
Plain delft	1640-1800	1720	1	1720
Creamware, annular	1780-1815	1798	1	1798
Creamware, undecorated	1762-1820	1791	1	1791
Pearlware, blue hand painted	1780-1820	1800	1	1800
Pearlware, blue trans printed	1795-1840	1818	1	1818
Whiteware, undecorated	1813-1900	1860	1	1860
Total			9	15983
Mean Ceramic Date	1775.9			

The current survey revisited and examined 38CH1543 with 50-foot interval shovel tests. A total of 65 shovel tests were excavated in the site area with 18 positive (28%). Soils resemble the moderately well-drained Seabrook Series, which has an Ap horizon of very dark grayish brown (10YR3/2) loamy fine sand to a depth of 0.8 foot over a dark brown (10YR4/3) or dark yellowish brown (10YR4/4) loamy fine.

The site expanded to an area of about 300 feet square. A large portion of the site (to the east) is located in a cultivated field. The pond identified during the 1994 reconnaissance is still visible and while a few positive shovel tests were found south of the pond, the pond and spoil piles do appear to bisect the site. Most of the positive shovel tests found to the east of the pond.

Table 36.
Artifact Pattern Analysis for 38CH1543

	38CH1543	Revised Carolina Artifct Pattern[1]	38BK1900 Area B 18th Cen. Overseer[2]	38CH1278 18th Cen. Overseer[3]	Carolina Slave Artifact Pattern[1]	Georgia Slave Artifact Pattern[4]
Kitchen	58.5	51.8-65.0	65.2	78.1	70.9-84.2	20.0-25.8
Architecture	7.3	25.2-31.4	21.2	8.9	11.8-24.8	67.9-73.2
Furniture	0.0	02-0.6	0	0.1	0.1	0.0-0.1
Arms	0.0	0.1-0.3	0.3	0.2	0.1-0.3	0.0-0.2
Tobacco	14.6	1.9-13.9	10.2	11.4	2.4-5.4	0.3-9.7
Clothing	0.0	0.6-5.4	0.1	0.2	0.3-0.8	0.3-1.7
Personal	0.0	0.2-0.5	0.1	0.2	0.1	0.1-0.2
Activities	19.5	0.9-1.7	2.9	1.1	0.2-0.9	0.2-0.4

[1]Garrow 1982
[2]Trinkley et al. 2003
[3]Trinkley et al. 2005
[4]Singlton 1980

The artifacts are representative of four artifact groups including Kitchen (58.5%), Architecture (7.3%), Tobacco (14.6%), and Activities (19.5%) groups (Table 34). In the Kitchen Group, ceramics make up the bulk (88% of the group total) of the collection. Colono ware, an eighteenth century slave-made pottery, accounts for almost half of the ceramics at 38CH1542. The MCD for the site is estimated to be 1775.9 (Table 35).

The Architecture Group consists of only unidentifiable nail fragments. The Tobacco Group contained both kaolin pipe bowls and stems. The Activities Group may be somewhat skewed since

the entire collection is unidentifiable metal pieces.

The site is located in an area that was historically part of the Mullet Hall property, owned by James Legare. Around 1795 the property was purchased by Legare and he built his house, which is thought to be 38CH1541, to the north. Site 38CH1543 does not contain the density of artifacts to be considered a main plantation house, but appears to possibly represent either a summer house (James Legare's?) or overseer settlement.

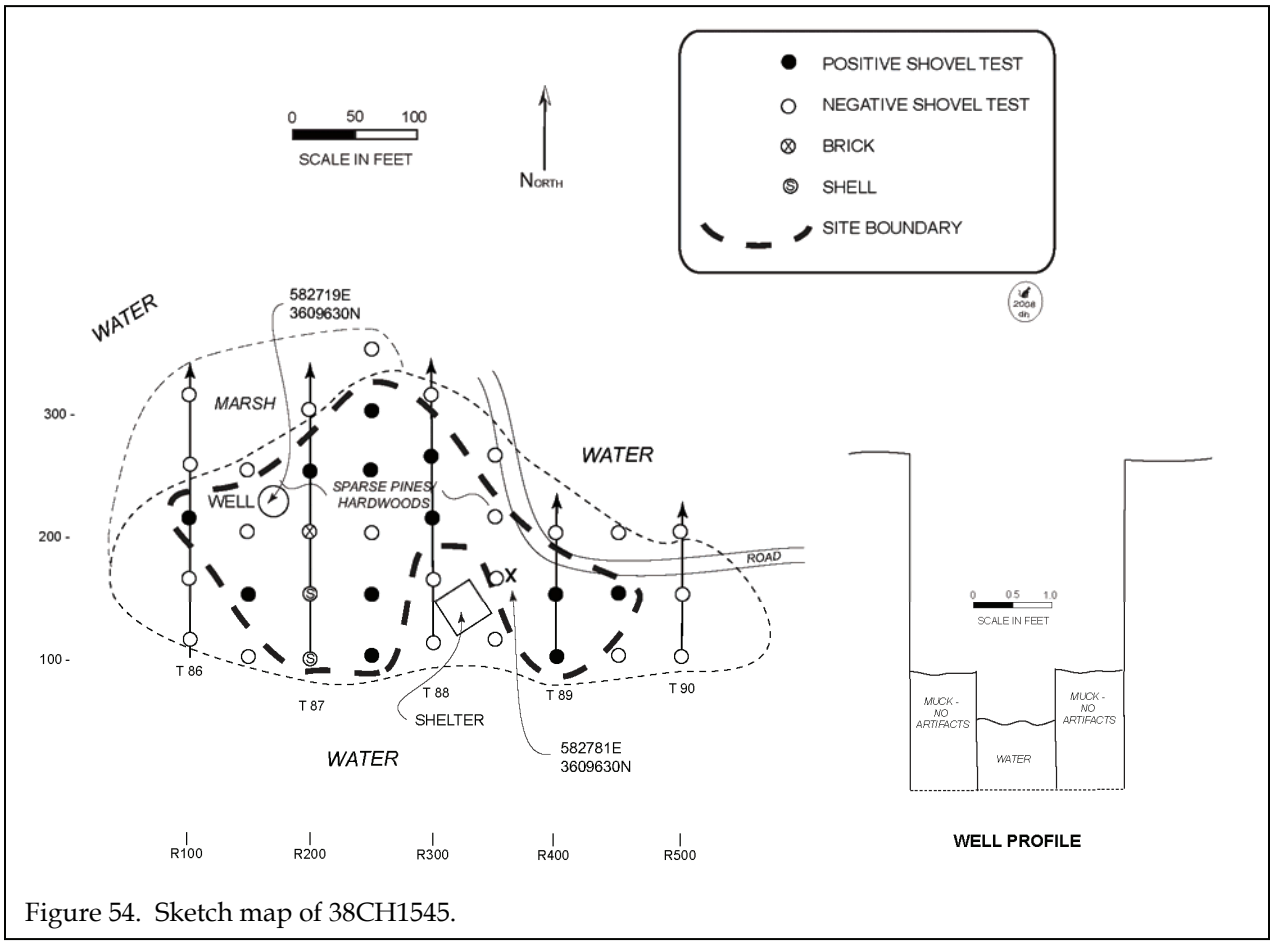


Figure 54. Sketch map of 38CH1545.

The pattern analysis of the settlement, based on a rather small collection, is ambiguous. As Table 36 suggests, the collection could represent an eighteenth century slave settlement, an eighteenth century overseer, or an eighteenth to nineteenth century main settlement (or perhaps summer home). But expensive (porcelains) and inexpensive (annular) wares are present – and even overseer and slave sites have exhibited small quantities of porcelain. Likewise, colono wares can be found at the owner's table as easily as a slave's – although the quantity in a larger assemblage will be dramatically different. Thus, at the present time, we do not have adequate data to suggest a clear site function.

38CH1543 is the earliest site identified on the property and, as such, assumes some considerable significance. Nevertheless, we cannot define appropriate research questions since the site context is not well established. As a result, we recommend the site potentially eligible; additional testing should be conducted with goals being to achieve a larger collection and better assess how much of the site remains. We recommend auger testing at 15 foot intervals. Keel (1999) recently demonstrated that structures could be defined in a

plantation context using 25 foot intervals, although he notes that a closer interval might be preferable (Keel 1999:78). We believe that a closer interval is of special importance at 38CH1543 given its circumscribed site dimensions.

This close interval testing should be followed by the excavation of two 10-foot units. This large unit provides the best opportunity to determine if features are present and will provide a good representation of the site stratigraphy. It will unambiguously demonstrate the effects of plowing and the potential for subsurface remains.

Figure 55. View of 38CH1545.

Bartovics' (1980) probability distribution shows a gradual increase in settlement from about 1640 to 1670, then a stable occupation until about 1780. The peak of occupation appears to be from 1780 to 1820, then there is a steady decline.

No work should be performed at 38CH1543 until additional testing can be performed and the integrity and function of the site is evaluated.

38CH1545

Site 38CH1545 (Figure 54) is a twentieth century and prehistoric scatter located on an

Table 37.
Artifacts from 38CH1545

	210 R100	150 R150	250 R200	100 R250	150 R250	250 R250	300 R250	210 R300	260 R300	100 R400	150 R400	150 R450	Subtotal	Total
Kitchen Group														**2**
Glass, clear			1										**1**	
Glass, black										1			**1**	
Architecture Group														**11**
Window glass	1	1											**2**	
Nail, fragment			9										**9**	
Activities Group														**3**
Metal, UID					3								**3**	
Prehistoric														**11**
Sherd, small				1	2	1	1	1	1	1	1		**9**	
Sherd, Deptford, plain								1				1	**2**	
Subtotal	**1**	**1**	**10**	**1**	**5**	**1**	**1**	**2**	**1**	**2**	**1**	**1**	**27**	
TOTAL														**27**

island off a branch of the Kiawah River referred to as Mullet Hall Creek (Figure 55). The elevation of the site is about 5 feet AMSL. A central GPS UTM is 582781E 3609630N (NAD27 datum).

The site was originally recorded during the 1994 reconnaissance of the property (Adams and Trinkley 1994:31-32). During that investigation, a total of 12 shovel tests were excavated with 7 positive (58%). The site was estimated at 175 feet east-west by 150 feet north-south. An area of dense brick rubble was noted at the site (described as structural debris) and a well was described as being present although it was not located during the reconnaissance (Adams and Trinkley 1994:32).

Figure 56. View of the well at 38CH1545.

The site form (Natalie Adams 9/14/94) listed the artifacts as prehistoric sherds, whiteware, and glass. Additional work was recommended since there was possible structural debris and a well located in the area. The site was described as a late nineteenth and early twentieth century domestic scatter.

During the current investigations of the site, a total of 38 shovel tests were excavated with 12 positive (31%). Soils resemble the somewhat poorly drained Kiawah Series. Kiawah soils have an Ap horizon of very dark grayish brown (10YR3/2) loamy fine sand to 0.7 foot over a dark grayish brown (10YR4/2) loamy fine sand to 1.2 feet in depth.

Of the positive shovel tests, only 5 or 42% contained historic artifacts (Table 37). The prehistoric component comprised 75% of the site (or 9 out of 12 positive shovel tests). No diagnostic historic artifacts were found during the investigation. While the prehistoric assemblage produced some large sherds (n=2 Deptford plain), all of these were found in the upper Ap horizon of soil. The size of the site, which incorporates both the historic and prehistoric components is about 350 feet east-west by 200 feet north-south.

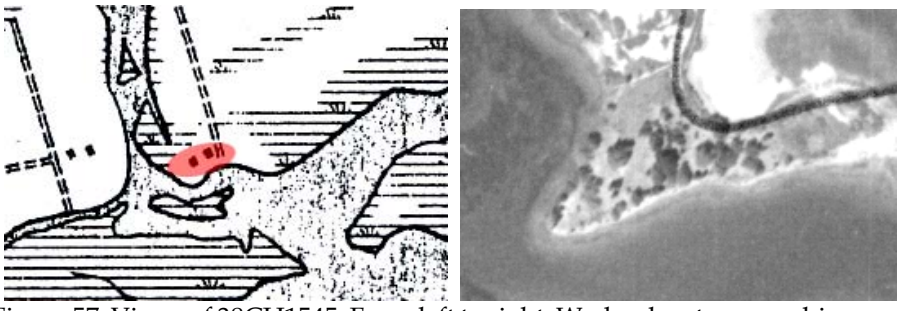


Figure 57. Views of 38CH1545. From left to right: Wadmalaw topographic map, 1919; aerial, 1949.

No evidence of the brick debris was found

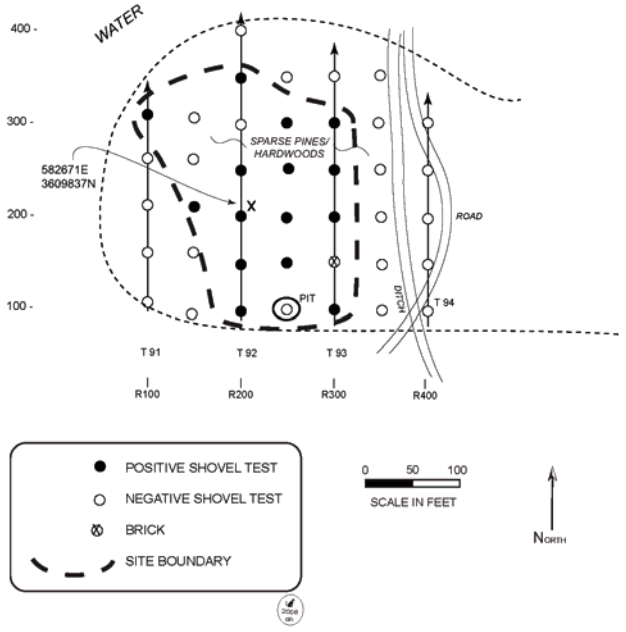


Figure 58. Sketch map of 38CH1546.

during the current survey; however, the well was identified (Figure 56). The well is brick lined with an ovular opening about 2.8 by 2.4 feet. Soil was found starting at a depth of 2.8 feet below the ground surface. Post hole diggers were used to sample the soil in an attempt to identify any artifacts that may be present. The "soil" was found to consist of humic debris and water was encountered at 0.8 feet below grade (3.6 feet below the ground surface). The water level appears to be tide dependent and we failed to find clear evidence that the well had ever been intentionally filled. The consistently damp conditions would offer exceptional preservation to organic debris that might have been lost – or discarded – in the well.

The earliest document showing any structures on this island is the 1919 topographic map (Figure 57), which reveals two buildings. The island is accessed by a road that runs along the east side of Mullet Hall Creek across a tidal flat. The structures do not appear on the 1948 aerial photograph, although the tidal flat and the access road are still clearly visible. The modern impoundment to the east had not yet been constructed. The island is relatively open, suggesting that the area had been cultivated in the past. These views suggest that the structures were present by 1919, but had been abandoned or demolished by 1949. While helping to provide a terminal date, this does not resolve the origin – or function – of the structures and well at 38CH1545 since the brickwork appears to predate the twentieth century.

Oral history identifies this site as a summer home for a previous plantation owner (Sidi Limehouse, personal communication 2008), although this seems in conflict with the historic documents and the archaeology.

Although more abundant than historic remains, the prehistoric specimens are still sparse. The data set consists entirely of pottery, most of which is under an inch in size. No lithics, faunal remains, or intact midden were encountered. All

Table 38.
Artifacts from 38CH1546

	310 R100	210 R150	100 R200	150 R200	200 R200	250 R200	350 R200	150 R250	200 R250	250 R250	300 R250	100 R300	200 R300	250 R300	300 R300	Subtotal	Total
Kitchen Group																	**3**
Creamware, undec.							1									**1**	
Glass, manganese														1		**1**	
Glass, aqua	1															**1**	
Architecture Group																	**5**
Window glass							3								1	**4**	
Nail, fragment											1					**1**	
Activities Group																	**1**
Faunal											1					**1**	
Prehistoric Group																	**20**
Sherd, small		1	1	2	2	1		3	3	1		4	1		1	**20**	
Subtotal	**1**	**1**	**1**	**2**	**2**	**1**	**4**	**3**	**3**	**1**	**2**	**4**	**1**	**1**	**2**	**29**	
TOTAL																	**29**

of the prehistoric material was found in a plow zone context (consistent with the 1949 aerial's suggestion of previous plowing). The combination of sparse remains and lack of integrity indicate that the prehistoric component cannot make a significant research contribution. This component is recommended not eligible for inclusion on the National Register.

The historic component is more difficult to assess. These data sets are also very sparse – glass and a few architectural items. The historical documents are largely silent concerning the site and the oral history is almost certainly incorrect. The most significant data set may be the well itself and it is difficult to write off this unusual feature. Preservation in place is unlikely since the feature might be considered an attractive nuisance that requires filling.

If preservation in place is not possible, then we recommend the site as potentially eligible. Testing should focus on exploration of the well as well as stripping of open areas to determine if structural remains can be identified.

38CH1546

Site 38CH1546 (Figure 58) is an eighteenth to twentieth century and prehistoric scatter. It is located at the tip of an island east of what is referred to as Mullet Hall Creek at an elevation of about 10 feet AMSL. A central GPS UTM is 582671E 3609837N (NAD27 datum).

The site was originally recorded during the 1994 reconnaissance when six shovel tests were excavated in the area (Adams and Trinkley 1994:32). Three of those tests were positive and a small surface scatter was collected. The remains were described as late nineteenth to early twentieth century consisting of whiteware, aqua glass, and manganese glass. The site was described as consisting "entirely of ceramics and bottle glass" (Adams and Trinkley 1994:32). The site dimensions were estimated at 100 feet north-south by 25 feet east-west.

The current survey excavated a total of 35 shovel tests with 15 positive (43%). While the reconnaissance recorded an entirely historic site, the current survey produced a 69% prehistoric assemblage. All of the prehistoric artifacts, however, were small undiagnostic sherds.

Soils in the area resemble the moderately well drained Seabrook Series. Seabrook soils have an Ap horizon of very dark grayish brown (10YR3/2) loamy fine sand to a depth of 0.8 foot over a dark brown (10YR4/3) or dark yellowish brown (10YR4/4) loamy fine sand to a depth of 1.7 feet. All of the artifacts were found in the upper Ap horizon.

Artifact density for the historic assemblage is sparse, producing only eight artifacts (Table 38). One piece of faunal material was found, but its association is uncertain. The only diagnostic artifact is a single piece of undecorated creamware, which was manufactured from 1762 to 1820. Two pieces of glass, one manganese and one aqua, both generally date to the late nineteenth century (Jones and Sullivan 1985).

The testing during the current survey increased the site dimensions to 200 feet east-west by 250 feet north-south.

The site lacks the quantity and quality of remains necessary to address significant research questions about both prehistoric and historic sites. In addition, the site area has been cultivated and logged, which has caused damage to the site (evidenced by the prehistoric materials located within the plow zone). Site 38CH1546 is recommended not eligible for the National Register of Historic Places. No additional management activity is recommended pending the review and concurrence of the State Historic Preservation Office.

38CH1547

Site 38CH1547 (Figure 59) is a prehistoric and eighteenth to nineteenth century scatter situated on a ridge at an elevation of about 10 feet AMSL. A central GPS UTM is 582706E 3610070N

(NAD27 datum). There is a dirt road running north-south through the site area with the vegetation to the west consisting of sparse hardwoods, while to the east are planted pines (Figure 60).

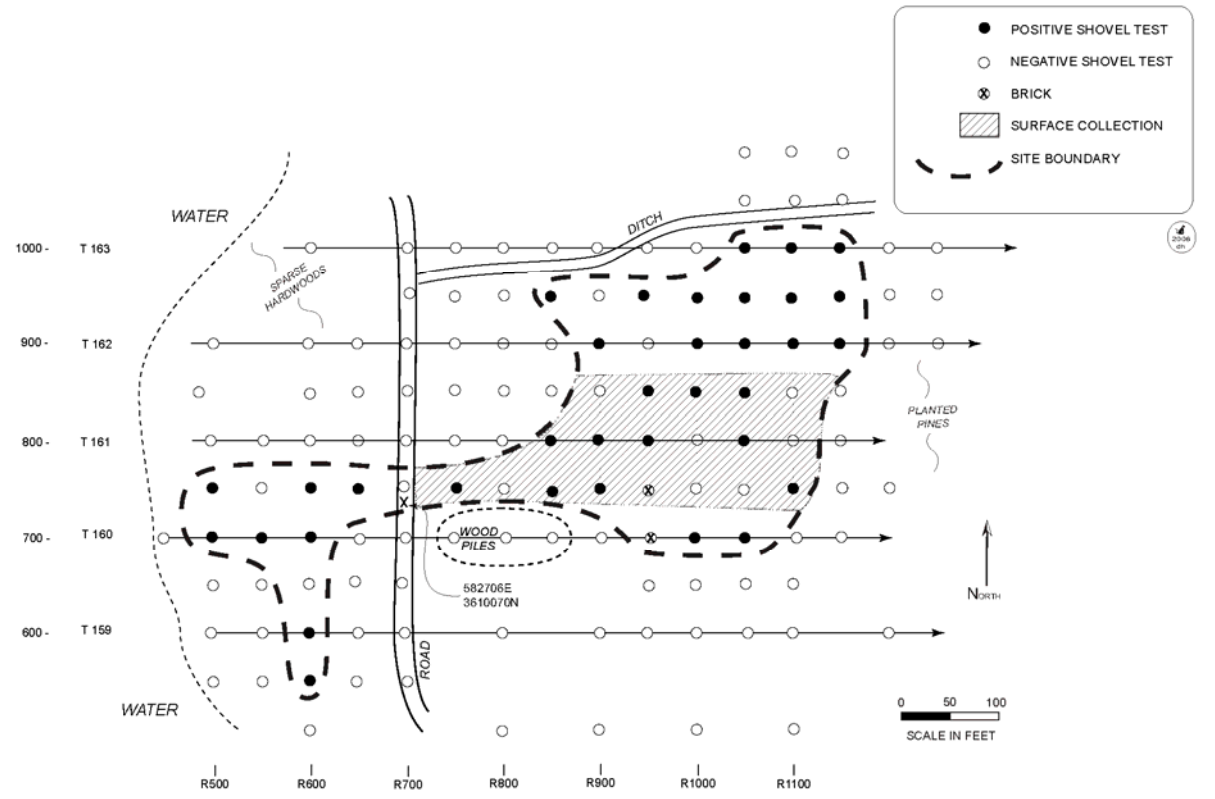


Figure 59. Sketch map of 38CH1547.

The site was originally recorded during the 1994 reconnaissance when artifacts were found in a plowed field (Adams and Trinkley 1994:32). Thirteen shovel tests were excavated at 50-foot intervals in a cruciform pattern with six positive (46%). The site dimensions were identified as 300 feet east-west by 100 feet north-south.

The current survey relocated the site, testing it at 50-foot intervals until two consecutive negative shovel tests were found along the cardinal directions. A total of 120 shovel tests were excavated with 35 positive (29%). A collection of surface artifacts was also made from the site.

Shovel tests resemble the somewhat poorly drained Kiawah Series. These soils have an Ap horizon of very dark grayish brown (10YR3/2) loamy fine sand to 0.7 foot over a dark grayish brown (10YR4/2) loamy fine sand to 1.2 feet in depth.

The prehistoric remains consist of small sherds and a chert core. This component accounts for 4% of the entire artifact assemblage.

The historic assemblage is represented by four artifact groups – Kitchen (97.5%), Architecture (0.4%), Personal (0.4%), and Activities (1.7%) (Table 39). The Kitchen Group is composed entirely of ceramics and glass. Ceramics make up 81% of this group and has a MCD of 1801.6 (Table 40). Five pieces of Colono ware, a slave-made pottery, were also found. One interesting piece of ceramic is a brown stoneware with "WEESP ANCHOR GIN" written on it.

Weesp is a town in Holland that was known for its porcelain factory and its distilling center (Forbes 1970). According to Forbes (1970:190) the "production of gin rose to fourfold in the period from 1733 to 1792" and by "the end of the eighteenth century [Holland] found the United States of America as a large consumer of Dutch gin."


Figure 60. View of 38CH1547.

Bartovics' (1980) probability distribution of ceramics shows the site starting about 1760 and ending somewhat suddenly at about 1830, although a very small occupation extends to about 1880.

The site, measuring about 650 feet east-west by 450 feet north-south, appears to be an early slave settlement, although the pattern analysis of artifacts does not closely identify with any previously recorded pattern. 38CH1547 seems closest to the Carolina Slave Artifact Pattern (Table 41), which has a high percentage of Kitchen Group artifacts, however the Architecture Group from 38CH1547 is very low. The low proportion of Architecture Group artifacts could be representative of wall trench construction, which would have produced few architectural remains. Also, the soils with their high acidity and salinity may be affected iron preservation.

An examination of the decorative motifs is also equivocal. Inexpensive motifs such as annular and edged account for only 43% of the assemblage, while expensive motifs such as hand painted and transfer print account for 58%. Only when the plain wares are added, does the balance shift to support a low status occupation. This does not preclude a slave settlement since many owners provided their slaves with discarded pieces from their own tables.

The lack of Furniture and Arms groups artifacts is not unusual, but the absence of Tobacco and Clothing groups, while generally quite low for slaves, creates more questions about the function of this site. Personal Group artifacts at 38CH1547, even though represented by only one specimen, gives a higher percentage than slave artifact patterns generally produce. The Activities Group percentage seems similar to patterns of slave artifacts.

The only map showing activity at this location is the antebellum Coast Survey Chart (Figure 61) where Solomon Legare's Cotton House (typically a prominent, two story structure) was used as a back sight. Cotton houses were centers of plantation activity during the harvest season and it would be reasonable to find a variety of artifacts associated with them. The one cotton house explored archaeologically was identified on nearby Kiawah Island by Chicora archaeologists in 1990-1991 (Trinkley 1993:213-216). It produced an assemblage not dissimilar from the nearby Shoolbred mansion, offering no clear indication of its function without careful excavation. What is

Table 39.
Artifacts from 38CH1547

	700 R500	750 R500	700 R550	550 R600	600 R600	700 R600	750 R600	750 R650	750 R750	750 R850	800 R850	950 R850	750 R900	800 R900	900 R900	800 R950	850 R950	950 R950	700 R1000	850 R1000	900 R1000	950 R1000	700 R1050	800 R1050	850 R1050	900 R1050	950 R1050	1000 R1050	750 R1100	900 R1100	950 R1100	1000 R1100	900 R1150	950 R1150	1000 R1150	Surface Collection	**Subtotal**	**Total**
Kitchen Group																																						**232**
Refined earthenware, stained																														1							**1**	
Refined earthenware, burned																													1								**1**	
Elers-like ware																																			1		**1**	
Coarse red earthenware														1																							**1**	
Coarse red earthenware, clear LG																							1								1						**2**	
Coarse red earthenware, black LG																								1												6	**7**	
Agateware																																				1	**1**	
Westerwald																																				1	**1**	
Stoneware, white SG																																				2	**2**	
Stoneware, brown SG														1																						3	**4**	
Stoneware, brown																																				1	**1**	
Slipware, LG																																				6	**6**	
Creamware, annular																													1							1	**2**	
Creamware, undec.	2																1							1	1			1	1	3		1			1	50	**62**	
Pearlware, green edged																																				1	**1**	
Pearlware, blue edged																																				6	**6**	
Pearlware, poly HP											1																									6	**7**	
Pearlware, blue HP																																				7	**7**	
Pearlware, blue TP																																				9	**9**	
Pearlware, annular																						1				1										4	**6**	
Pearlware, splatter																					1																**1**	
Pearlware, undec.											2				2			1						1			1				1					29	**37**	
Whiteware, blue edged																																				5	**5**	
Whiteware, blue HP																																				2	**2**	
Whiteware, black TP																	1																				**1**	
Whiteware, blue TP																																				3	**3**	
Whiteware, annular																																				1	**1**	
Whiteware, undec.																				1																4	**5**	
Colonoware														1								1														3	**5**	
Glass, aqua																														1						1	**2**	
Glass, green																					1															1	**2**	
Glass, light green												1																								4	**5**	
Glass, clear				1																														1		6	**8**	
Glass, black		1	2						1					2		1								2												18	**27**	
Architecture Group																																						**1**
Nail, fragment									1																												**1**	
Activities Group																																						**4**
Iron, UID													1																				2			3	
Slate																																			1	1		
Personal Group																																						**1**
Bead																																			1	1		
Prehistoric Group																																						**9**
Sherd, small					2	3	1	1		1									1																	9	
Subtotal	**2**	**1**	**2**	**1**	**2**	**3**	**1**	**1**	**2**	**1**	**3**	**1**	**2**	**4**	**2**	**1**	**2**	**1**	**1**	**1**	**1**	**2**	**1**	**3**	**4**	**1**	**1**	**1**	**1**	**5**	**3**	**2**	**1**	**2**	**1**	**184**	**247**	
TOTAL																																						**247**

HP : Hand painted LG : Lead glaze SG : Salt glaze TP : Transfer print undec. : undecorated

perhaps most interesting is that the distribution of plantation refuse was so homogenous across the Shoolbred landscape that no distinct cotton house pattern was discernable.

This cautions us that we must be careful in our interpretation of this site, especially when based on very limited survey data. While the collection best fits an eighteenth century slave settlement – and we know that James Legare pieced together his holdings from several earlier tracts, each of which may have had a slave settlement – additional field investigations are necessary to confirm this interpretation.

We recommend 38CH1547 potentially eligible for inclusion on the National Register. If green spacing is not possible, we recommend additional testing, consisting of very close interval (15-20 feet) augering following by the excavation of 2-3 10-foot units. This strategy will provide very detailed aerial coverage, allowing identification of artifact concentrations. The use of several large test units will permit better identification of features, while at the same time assisting with the recovery of a collection better able to identify site function.

Table 40.
Mean ceramic date of 38CH1547

Ceramic	Date Range	Mean Date (xi)	(fi)	fi x xi
Westerwald	1700-1775	1738	1	1738
White salt glazed stoneware	1740-1775	1758	2	3516
Lead glazed slipware	1670-1795	1733	6	10398
Creamware, annular	1780-1815	1798	2	3596
Creamware, undecorated	1762-1820	1791	62	111042
Pearlware, poly hand painted	1795-1815	1805	7	12635
Pearlware, blue hand painted	1780-1820	1800	7	12600
Pearlware, blue trans printed	1795-1840	1818	9	16362
Pearlware, edged	1780-1830	1805	7	12635
Pearlware, annular/cable	1790-1820	1805	7	12635
Pearlware, undecorated	1780-1830	1805	37	66785
Whiteware, blue edged	1826-1880	1853	5	9265
Whiteware, poly hand painted	1826-1870	1848	2	3696
Whiteware, blue trans printed	1831-1865	1848	4	7392
Whiteware, annular	1831-1900	1866	1	1866
Whiteware, undecorated	1813-1900	1860	5	9300
Total			164	295461
Mean Ceramic Date		1801.6		

38CH1548

Site 38CH1548 is the nineteenth to twentieth century Bishop Cemetery, located on an interior plain at an elevation of about 5 feet AMSL. A UTM for the site is 581490E 3610820N (NAD27 datum). This cemetery is situated on what would have originally been the western half of Mullet Hall, initially owned by James Legare. Vegetation at the site is extremely dense with hardwoods and undergrowth (Figure 62).

Table 41.
Pattern analysis of 38CH1547

	38CH1547 Pattern	Revised Carolina Artifact Pattern[1]	Townhouse Pattern[2]	Dual-Function Pattern[2]	Georgia Slave Artifact Pattern[3]	Carolina Slave Artifact Pattern[1]	Yeoman Pattern[4]
Kitchen Group	98.0	51.8 - 65.0	58.4	63.1	20.0 - 25.8	70.9 - 84.2	40.0 - 61.2
Architectural Group	0.4	25.2 - 31.4	36.0	25.0	67.9 - 73.2	11.8 - 24.8	35.8 - 56.3
Furniture Group	-	0.2 - 0.6	0.2	0.1	0.0 - 0.1	0.1	0.4
Arms Group	-	0.1 - 0.3	0.3	0.2	0.0 - 0.2	0.1 - 0.3	-
Tobacco Group	-	1.9 - 13.9	2.8	6.0	0.3 - 9.7	2.4 - 5.4	-
Clothing Group	-	0.6 - 5.4	0.9	1.2	0.3 - 1.7	0.3 - 0.8	1.8
Personal Group	0.4	0.2 - 0.5	0.2	0.1	0.1 - 0.2	0.1	0.4
Activities Group	1.2	0.9 - 1.7	1.1	4.1	0.2 - 0.4	0.2 - 0.9	1.8

[1] Garrow 1982
[2] Zierden et al. 1988
[3] Singleton 1980
[4] Drucker et al. 1984

The 1994 reconnaissance identified five headstones, but the dense vegetation prevented accurate boundary determinations (Adams and Trinkley 1994:32-33). At that time, although the site form associated with the site (documented by Natalie Adams 1994) recommended additional work, the reconnaissance report said that the cemetery was likely eligible for the National Register (Adams and Trinkley 1994:34).

The current survey made an attempt to locate the original five headstones identified during the 1994 reconnaissance. All but one (Mary E. Bishop) were found and representative photographs were taken of their condition. In addition, six more headstones were found and recorded. Table 42 lists the stones located in the cemetery.

Only one death date was recent enough (post-1915) to find a death certificate – Pompey Scott, an African-American male who died October 12, 1915 (Figure 63). The death certificate lists his occupation as farmer who died at age 68. The cause of death is listed as "other." The headstone in the cemetery lists his age as 66 and has the words "Faithful Servant" on the marble stone. The death certificate (#21316) lists the place of burial as Johns Island and the address as Mullet Hall, so unfortunately the historic name of the cemetery is still unknown. The undertaker is listed as P.P. Deas, who was also from Mullet Hall. Deas is not listed as a South Carolina undertaker (Trinkley 2005), although he is found in the 1910 census as Paris P. Deas. His occupation was listed as farmer on his own account, although he appears to have rented his home on Mullet Road. At the time he was a 47 year old widower and her probably practiced undertaking as a part-time activity.

There were several Bishops (also spelled Bishopp) in the Mullet Hall area who are listed as farmers in the 1900 census (see Table 14). It appears that these farmers, along with many of the people buried in this cemetery,

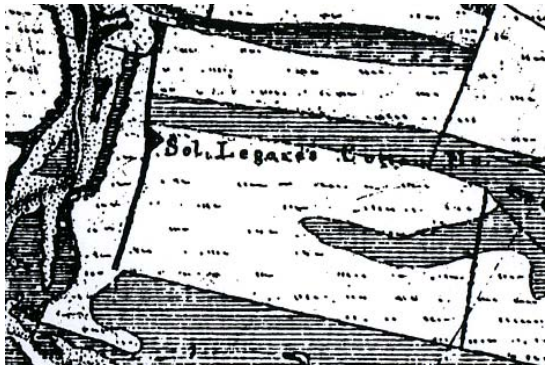


Figure 61. T-491 chart showing Sol. Legare's Cott. Hs. at 38CH1547.

are African- American. At first look, 38CH1548 does not appear to possess characteristics typical of African-American cemeteries.

For example, all of the stones in this

Figure 62. View of dense vegetation surrounding 38CH1548.

cemetery are marble headstones – no hand-made markers or field stones were located. In addition, we failed to identify any grave goods, such as ceramics, within the cemetery. Although some purposefully planted bulbs were noticed, no evidence of yucca, common in African-American cemeteries, was found. Several grave depressions were noticed.

Once vegetation is removed, we may find more evidence of the burial customs (i.e. kin-based groupings), folkways, and artistic traditions. A brief penetrometer survey was attempted within the cemetery, however, the dense vegetation prevented much of the area from being examined. Figure 64 shows aerials from 1948 and 1973 of the cemetery. The penetrometer measures soil compaction in an attempt to locate unmarked graves as revealed by a lower soil compaction, generally between 75 and 150 pounds per square inch (psi). The areas of the cemetery that were subjected to the penetrometer revealed a low soil compaction, generally at about 100 psi. We also measured the area around the cemetery to see if the current delineation was correct. The soil compaction was higher, generally over 200 psi. While this higher compaction could be the result of logging in the

Table 42.
Individuals with Stones Identified at 38CH1548

Name	Born	Died	Footstone	Notes regarding stone	Genealogical Notes
Annie S. Bishopp	July 26, 1858	November 3, 190[1]	A.S.B.	Headstone is broken into 2 pieces; wife of P.B. Bishop	Annie Bishopp in 1900 census, born 1860, wife of Paul Bishopp; mother of 7 children, 5 living, occupation listed as "Farm Laborer"
Hannah Bishopp	Febrary 15, 1868	October 20, 1908	H.B.	Headstone is broken into 3 pieces; wife of Kit Bishop	Hannah Bishop in 1900 census, born 2/1873, mother of 7 children, 4 still living, occupation listed as "Farm Laborer," married to Kit Bishop (b. 1865)
Kitt Bishopp	July 26, 1826	February 26, 1900	n/a		
Kitt Bishopp		September 1885	n/a	"Aged 95 years"	Kit Bishopp in 1880 census, occupation listed as "Laborer;" wife was Lydia Bishopp, occupation listed as "Washing"
Kitt L. Bishopp			K.L.B.	"In Memoriam"	
Lydia Bishopp		February 29, 1906	L.B.	"Aged 90 Years"	Lydia Bishop in 1900 census, born ca. 1840, occupation "Chamber Maid"
Mary E. Bishop	September 15, 1887	February 10, 1919	unknown	not identified during current survey	Mary Bishopp in 1900 census, daughter of Paul and Annie Bishop; born 9/1887; shown "At School"
Oliver C. Bishop	January 15, 1879	January 2[8], 1895	no inscription		Oliver Bishopp in 1880 census; born ca. 1878, son of Paul and Annie Bishopp
Paul B. Bishopp	June 15, 1855	June 26, 1901	n/a		Paul Bishopp in 1900 census, born 1/1855, occupation listed as "Farmer," owned farm
James Chisolm	October 27, 1882	March 26, 1904	n/a		Shown in the 1900 census as living at 14 Tradd St. in Charleston; occupation listed as "Steamboat Deckhand"
Pompey Scott		October 12, 1915	n/a	"Aged 66 Years"	Pompie Scott in the 1900 census, born 6/1847, married to Emma Scott who had 6 children; occupation listed as "Farmer," renting; SC Death Certificate 21316

vicinity, the boundary of the cemetery appears to be accurate.

Site 38CH1548 is potentially eligible for the National Register of Historic Places.

Figure 63. View of the headstone of Pompey Scott at 38CH1548.

Cemeteries may generally provide good bioanthropological data about lifeways and give good insight to diet, disease, and ethnicity. A more in depth archival study of the people buried here may provide additional information concerning the relationship of those using the cemetery.

The State Historic Preservation Office has mandated a minimum 25-foot buffer around all cemeteries. We have estimated the boundary to be about 150 feet square, so with the buffer, no construction should take place within an area measuring about 200 feet by 200 feet. Care should be taken by construction crews to avoid the cemetery. Kiawah River Plantation, LP has already taken a proactive approach to the cemetery by recording it on modern survey maps of the property.

38CH1549

Site 38CH1549 is a cemetery located on an interior ridge at an elevation of about 10 feet AMSL. It is situated amidst a second growth pine and hardwood forest. A GPS UTM is 582726E 3610248N (NAD27 datum). This graveyard is situated on the eastern half of Mullet Hall, on the portion owned historically by Solomon Legare.

The 1994 reconnaissance recorded this cemetery when Mr. W.L. Limehouse pointed out the area (Adams and Trinkley 1994:33). At the time, Limehouse remarked that the cemetery was damaged by hurricane Hugo in 1989 and that existing markers were knocked over (W.L. Limehouse, personal communication 1994). The report also explains that the markers may have been removed with the logging that took place during the hurricane clean-up (Adams and Trinkley 1994:33). Regardless, no stones were found during the reconnaissance.

This cemetery was clearly visible to USGS surveyor Ray L. Schoppe in 1933 when the Mullet Horizontal Control Point was laid out adjacent to a small creek running into the Kiawah River (Figure 65). It was situated on the edge of what was described at that time as an "old field" and was just north of the Mullet Reference Point 1 (U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Survey, Quad 320801, Station 1138).

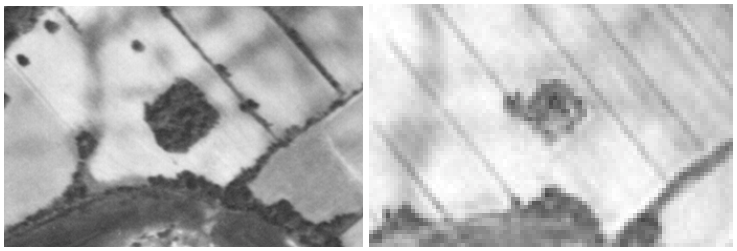


Figure 64. Aerial photos of the cemetery at 38CH1548 in 1948 (left) and 1973 (right).

The current survey attempted to define the boundaries of the cemetery by visual inspection of grave depressions and the use of a penetrometer to measure soil compaction. An attempt to locate stones was also made during the investigation.

The cemetery was relocated by the original UTM coordinates given by the 1994 site form. The area is covered in a second growth of vegetation, which was dense. While probing the ground in an attempt to locate fallen stones was unsuccessful, we did observe multiple depressions that gave the topography an undulating appearance.

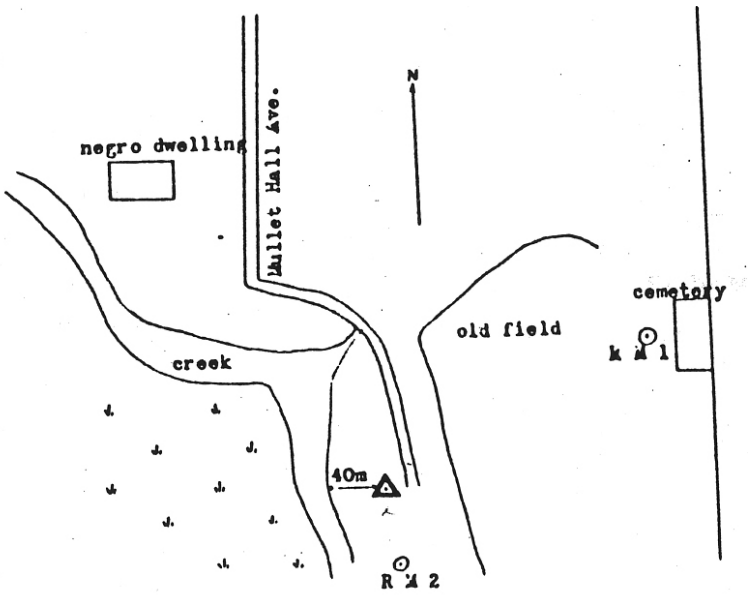


Figure 65. 1933 sketch map of Mullet Reference Point 1, showing the cemetery at 38CH1549.

We were unable to discern the boundaries through the penetrometer survey. Inside the known area of the cemetery, readings were around 100 psi. Outside the cemetery in areas known to not contain remains also gave readings similar to the cemetery. Without a more intensive effort such as GPR or stripping, the boundaries may remain imprecise.

Figure 66. View of a piece of manganese glass found at 38CH1549.

Within the cemetery, we were unable to identify any plants or "living memorials" or grave goods, possibly the result of logging activities resulting from the 1989 Hurricane Hugo clean-up. Identification was also hindered by the dense second growth vegetation. One piece of manganese glass, a handle to a cup (Figure 66), was identified, however it did not appear to be directly associated with a grave depression. A push pile of soil was also located in the cemetery, so it is uncertain the extent of damage is uncertain.

We recommend this site as potentially eligible for inclusion on the National Register of Historic Places for its information potential. An assessment of eligibility would require careful hand cleaning of the cemetery to reduce the second growth vegetation and allow plotting of graves identified through depressions, additional penetrometer study, and possibly ground penetrating radar. With careful plotting it may be possible to distinguish grave clusters representative of kin-based burial patterns. The work may also identify stones that have fallen, providing additional information on those buried in the cemetery. The cemetery should also be examined in the fall to determine if flowering bulbs are present since these, too, may help define

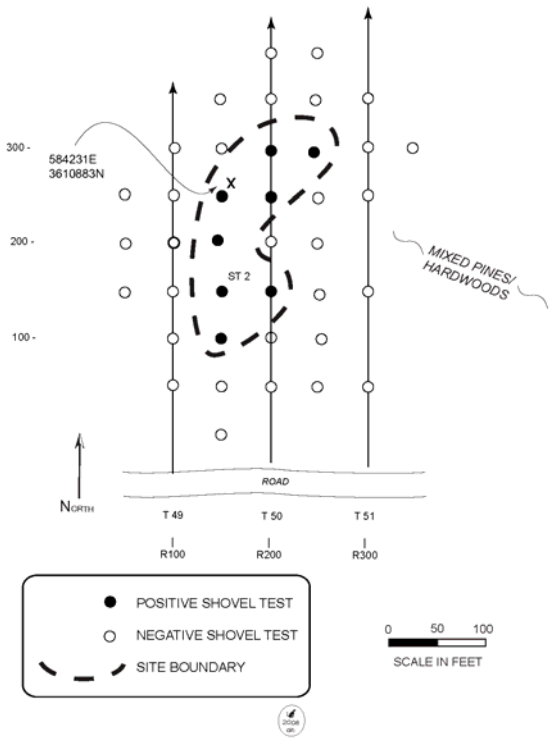


Figure 67. Sketch map of 38CH2240.

individual burials. It is possible that oral history may provide information on this cemetery; no attempt has thus far been made to inquire concerning the cemetery in the African American community on the island. Another avenue of potential research is the scanning of Charleston County death certificates for additional references to Mullet Hall; this may provide information not only on burials, but also on the original name of the cemetery.

Kiawah River Plantation LP has already taken a proactive step in protecting this cemetery by recording it on the development maps. Although the exact dimensions have not been determined, this plan shows the cemetery measuring about 150 feet square. While this may be accurate, the 0.5 acre seems somewhat small for a traditional African American burial ground. With the State Historic Preservation Office mandated minimum 25-foot buffer, the total site area would expand to about 1 acre. We recommend increasing the buffer to 50 feet – setting aside approximately 1.4 acres. This area should have a temporary construction fence erected and maintained through all construction phases for the protection of the cemetery. In addition, construction crews should be instructed to monitor for any remains that might be found outside the fenced area, immediately reporting them to Chicora. Any finds of human remains would necessitate that work in the area stop and the Charleston County Coroner be notified.

38CH2240

Site 38CH2240 (Figure 67) is a prehistoric pottery scatter located on an interior ridge at an elevation of about 10 feet AMSL. A central UTM for the site is 584231E 3610883N (NAD27 datum). Mixed pines and hardwoods surround the site.

The site was identified during shovel testing when Transect 50, Shovel Test 2 was positive, producing a small sherd. Close interval shovel testing was resumed at 50-foot intervals until two consecutive negative tests were encountered along the cardinal directions. A total of 40 shovel tests were excavated with 9 positive (23%). Site dimensions are 150 feet east-west by 200 feet north-south.

Soils in the site area resemble the moderately well drained Seabrook Series. Seabrook soils have an Ap horizon of very dark grayish brown (10YR3/2) loamy fine sand to a depth of 0.8 foot over a dark brown (10YR4/3) or dark yellowish brown (10YR4/4) loamy fine sand to a depth of 1.7 feet. All of the artifacts were found in the upper Ap horizon.

All of the artifacts consist of small sherds. A total of nine sherds were found with all shovel tests containing one artifact, except Transect 49.5, Shovel Test 2, which contained two sherds. A modern topographic map, dated 1971, shows this area as being cultivated, which may explain the small size of the artifacts and sparseness of the site.

Site 38CH2240 failed to produce any diagnostic artifacts, which would be necessary to address significant research questions about prehistoric life. In addition, site integrity has been

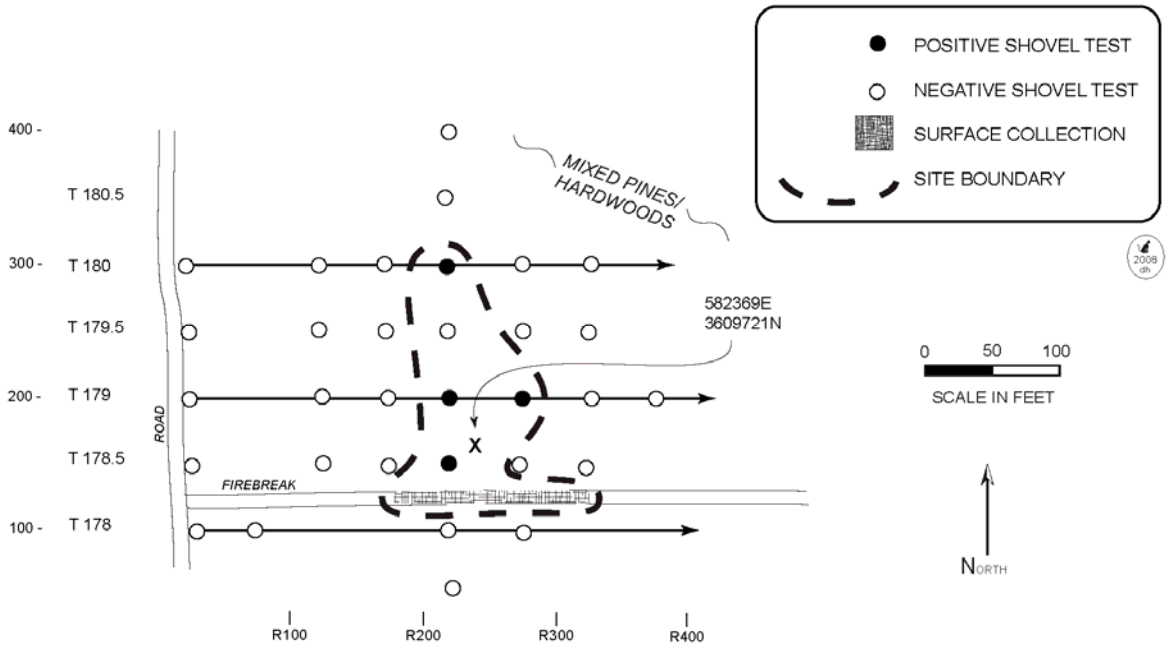


Figure 68. Sketch map of 38CH2241.

damaged by cultivation and probable logging – we were unable to identify any intact remains.

This site is recommended not eligible for the National Register of Historic Places. No additional management activity is recommended pending the review and concurrence by the State Historic Preservation Office.

38CH2241

Site 38CH2241 (Figure 68) is a nineteenth to twentieth century domestic site. It is situated on a branch of the Kiawah River, sometimes referred to as Mullet Hall Creek at an elevation of about 5 feet AMSL. A central UTM coordinated is 582369E 3609721N (NAD27 datum).

The site was identified during shovel testing when Transect 179, Shovel Test 3 produced a piece of manganese glass. Close interval testing continued at 50-foot intervals until two consecutive negative tests were encountered in the cardinal directions. A total of 27 shovel tests were excavated with 4 positive (15%). A small surface collection was also found in a firebreak south of the tests.

Soils in the site area, which was covered in a new growth of pines and hardwoods, resemble the somewhat poorly drained Kiawah Series. Kiawah soils have an Ap horizon of very dark grayish brown (10YR3/2) loamy fine sand to 0.7 foot over a dark grayish brown (10YR4/2) loamy fine sand to 1.2 feet in depth.

The 1919 Wadmalaw map shows two structures in this vicinity (Figure 69). The artifacts

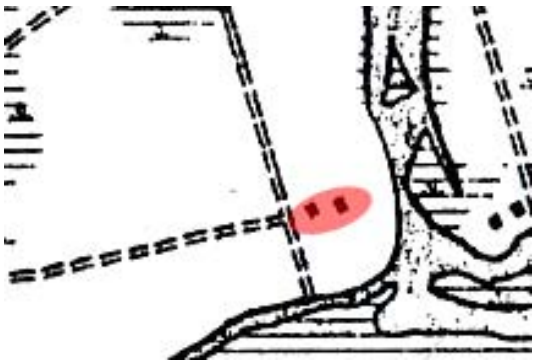


Figure 69. 1919 Wadmalaw map showing the structures at 38CH2241.

recovered confirm this date for the site, which measured about 150 feet east-west by 200 feet

Table 43.
Artifacts from 38CH2241

	300 R220	150 R230	200 R230	200 R280	Surface	Subtotal	Total
Kitchen Group							**14**
Whiteware, undec.				1	4	**5**	
Glass, manganese			1			**1**	
Glass, clear					5	**5**	
Glass, aqua					1	**1**	
Glass, brown				1	1	**2**	
Architecture Group							**1**
Nail, fragment	1					**1**	
Activities Group							**1**
UID iron		1				**1**	
Subtotal	**1**	**1**	**1**	**2**	**11**	**16**	
TOTAL							**16**

undec. : undecorated

north-south (Table 43). For example, manganese glass was common from the late nineteenth to early twentieth century (Jones and Sullivan 1985:13). Whiteware has a broader range, generally giving a mean ceramic date (MCD) of 1860, but actually being made well into the twentieth century.

This site produced somewhat sparse remains given that two structures were once located here. The modern topographic map (dated 1971), however, shows the area as being cultivated. The firebreak to the south may have also contributed in the destruction of the site.

Although this site has been identified on a historic map, no architectural remains were found that could identify the function of the site. Only a few small pieces of brick were identified. In addition, the integrity of the site has been damaged by cultivation and a bulldozed firebreak. The artifacts in the collection are common to turn-of-the-century sites, so it is unlikely that this site will be able to address significant research questions about tenancy on the property.

Site 38CH2241 is recommended not eligible for the National Register of Historic Places. No additional management activity is recommended pending the review and concurrence of the State Historic Preservation Office.

38CH2242

Site 38CH2242 (Figure 70) appears to be an eighteenth century slave settlement and prehistoric pottery scatter, situated on a ridge nose at an elevation ranging from 5-10 feet AMSL. A GPS UTM, taken from the southern edge of the site, is 582391E 3610077N (NAD27 datum).

The site was encountered in shovel testing when Transect 191, Shovel Test 6 (400R800) was positive, producing one colono ware and one small prehistoric sherd. Shovel testing was continued at 50-foot intervals until two consecutive negative tests were encountered in the cardinal directions. A total of 65 shovel tests were excavated with 22 positive (34%). An additional two shovel tests produced only shell.

Soils in the area resemble the excessively drained Wando Series, which has an Ap horizon of dark brown (10YR4/3) loamy fine sand to 0.7 foot in depth over a brown (7.5YR5/4) loamy fine sand. Most of the shovel tests in the site area, however, produced the dark brown Ap horizon to well over 1.0 foot in depth, typical of subsoiling.

A sparse pine and hardwood second growth has replaced this once cultivated field, but surface visibility is still relatively high, especially in a plowed firebreak, which borders the southern and eastern portion of the site. The site dimensions, including shovel testing and the surface collection, measure approximately 400 feet east-west by 300 feet north-south.

As previously mentioned, this site has both a prehistoric (18% of the total) and historic (82% of the total) component (Table 44). All of the prehistoric sherds are small, so they cannot be attributed to a specific time period. The historic

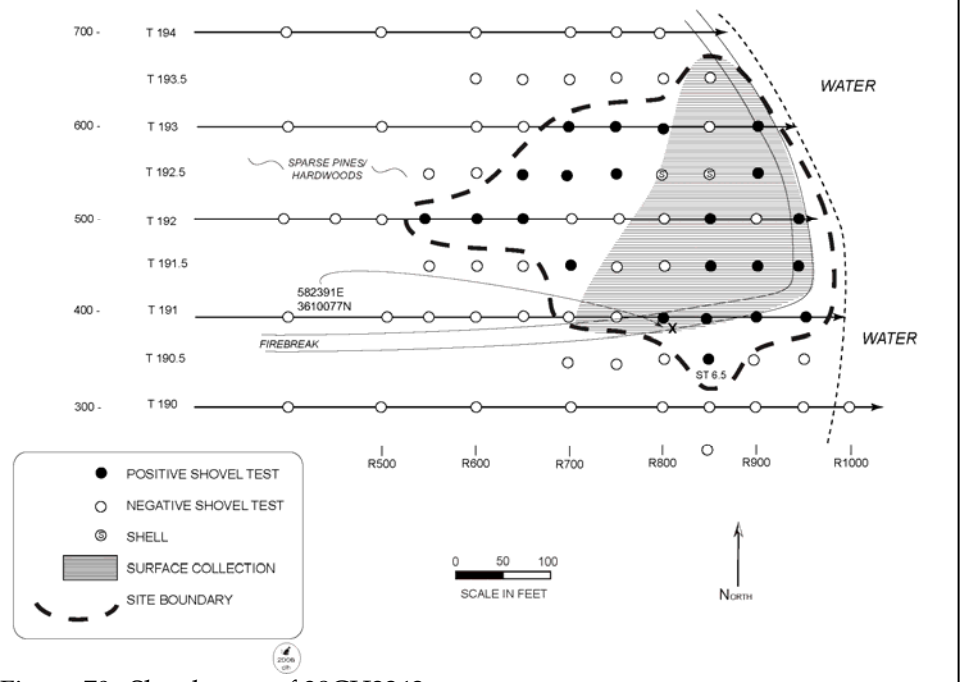


Figure 70. Sketch map of 38CH2242.

component had four pieces of ceramic that could be used for a MCD for the site – white salt-glazed stoneware (n=2) and lead glazed slipware (n=2). Using these ceramics, we get a MCD of 1745.5. While this number may not be entirely accurate given the small sample of datable ceramic, we feel that it is close. Most of the remaining artifacts appear to fit with this time period. For example, Colono ware is generally recognized as an eighteenth century slave-made pottery. In addition, black glass can be found as early as the seventeenth century (Jones and Sullivan 1985:14).

Four artifact groups make up this site, including Kitchen (87%), Tobacco (10%), Personal (2%), and Activities (1%) groups. The absence of any architectural remains, including brick, is somewhat problematic, however, a very early slave site would probably incorporated wall and trench construction. While architectural remains – such as nails – are found associated with wall trench structures (see, for example, Trinkley et al. 2003:110), they are not widely distributed across the site, even with plowing. Instead, they tend to be excellent indicators of structure locations (for example, compare the smear produced by plotting ceramics with the plot of nails using 25-foot test intervals in Keel 1999:72-74). We suspect that our 50-foot testing interval was simply unable to

Table 44.
Artifacts from 38CH2242

	500 R550	500 R600	500 R650	550 R650	450 R700	550 R700	600 R700	550 R750	600 R750	400 R800	600 R800	350 R850	400 R850	450 R850	500 R850	400 R900	450 R900	550 R900	600 R900	400 R950	450 R950	500 R950	Surface	**Subtotal**	**Total**
Kitchen Group																									**80**
Stoneware, white saltglaze																							2	**2**	
Lead glaze slipware																							2	**2**	
Tortoiseshell																							1	**1**	
Colono ware			3			2	1		2	1					2	3		2	3	2		1	47	**69**	
Glass, black																							3	**3**	
Glass, brown																							1	**1**	
Glass, manganese																							1	**1**	
Glass, green and milk																							1	**1**	
Tobacco Group																									**9**
Pipebowl, kaolin																							4	**4**	
Pipestem, kaolin																1							4	**5**	
Personal Group																									**2**
Bead																					1		1	**2**	
Activities Group																									**1**
Lead fragment																1								**1**	
Prehistoric Group																									**21**
Sherd, small	1	3		1	1		1	2		1	1	1	1	1			1						6	**21**	
Subtotal	**1**	**3**	**3**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**2**	**5**	**1**	**2**	**3**	**2**	**1**	**1**	**73**	**113**	
TOTAL																									**113**

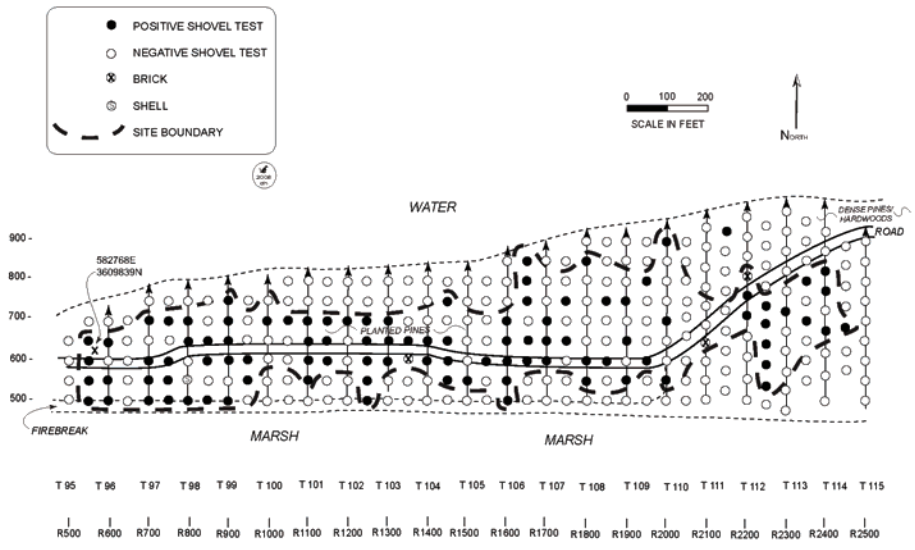


Figure 71. Sketch map of 38CH2243.

structure locations. Even with the absence of obvious architectural artifacts, the presence of other artifacts such as tobacco pipes/stems and beads lead us to believe that this site may have the potential to provide some interesting information about the lifeways of early slaves.

We recommend 38CH2242 potentially eligible for inclusion on the National Register. If green spacing is not possible, we recommend additional testing, consisting of very close interval (15-20 feet) augering followed by the excavation of 2-3 10-foot units. This strategy will provide very detailed aerial coverage, allowing identification of artifact concentrations. The use of several large test units will permit better identification of features, while at the same time assisting with the recovery of a collection better able to identify site function. No work should be conducted in the site area until plans for either green spacing have been approved by the State Historic Preservation Office or additional site assessment and evaluation have been completed.

38CH2243

Site 38CH2243 (Figure 71) is a prehistoric and eighteenth to nineteenth century scatter located in an area of planted pines along a ridge at an elevation of about 10 feet AMSL. A GPS UTM taken at the western end of the site is 582768E 3609839N (NAD27 datum).

The site was first encountered during shovel testing at 100-foot intervals when Transect 96, Shovel Test 0 (500R600) was positive, producing a small sherd. Transects were completed at 50-foot intervals and additional transects were added at 50-foot intervals. A total of 300 shovel tests were excavated in the site vicinity with 97 positive (32%).

Soils resemble the moderately well drained Seabrook Series. This soil has an Ap horizon of very dark grayish brown (10YR3/2) loamy fine sand to a depth of 0.8 foot over a dark brown (10YR4/3) or dark yellowish brown (10YR4/4) loamy fine sand. All artifacts were found in the upper Ap horizon.

The site, which covered an area of approximately 1,850 feet east-west by 400 feet north-south, was dominated by the prehistoric component, which accounted for 79% of the total artifact assemblage. A total of 98% of the prehistoric component consisted of small sherds, none of which are identifiable as to type. Two pieces of worked chert were also recovered.

The historic component, which accounted for 21% of the total artifact assemblage, produced only 35 artifacts (Table 45). The majority are representative of the Kitchen Group (63%). Ceramics dominate this group with 68% of all the ceramics consisting of Colono ware, a slave-made pottery. Only three other European ceramics were recovered, yielding a MCD of 1818.7.

The Architecture Group accounts for 34%

Table 45.
Artifacts from 38CH2243

	500 R550	550 R550	600 R550	650 R550	500 R600	550 R600	650 R600	500 R700	550 R700	600 R700	700 R700	500 R750	550 R750	600 R750	700 R750	500 R800	650 R800	700 R800	500 R850	600 R850	650 R850	500 R900	600 R900	650 R900	700 R900
Kitchen Group																									
Creamware, undec.																									
Pearlware, undec.																									
Whiteware, undec.																									
Colonoware			1			1																			
Glass, clear				1																					
Glass, black																									
Architecture Group																									
Nail, fragment																								1	
Activities Group																									
UID iron fragment														1											
Prehistoric Group																									
Sherd, small	2	8	1		1	2	1	1	3	2	1	1	2	1	1	1	1	3	1	1	2	1	2		1
Flake, chert																									
Subtotal	**2**	**8**	**2**	**1**	**1**	**3**	**1**	**1**	**3**	**2**	**1**	**1**	**2**	**2**	**1**	**1**	**1**	**3**	**1**	**1**	**2**	**1**	**2**	**1**	**1**

	750 R900	550 R950	600 R950	700 R1000	700 R1050	550 R1100	600 R1100	650 R1100	700 R1100	600 R1150	650 R1150	700 R1150	700 R1200	500 R1250	550 R1250	600 R1250	650 R1250	700 R1250	600 R1300	650 R1300	700 R1300	650 R1350	600 R1400	650 R1400	550 R1450
Kitchen Group																									
Creamware, undec.																					1				
Pearlware, undec.																									
Whiteware, undec.																									
Colonoware						1			1																
Glass, clear																									
Glass, black																									
Architecture Group																									
Nail, fragment										1											1				
Activities Group																									
UID iron fragment																									
Prehistoric Group																									
Sherd, small	2	3	1		1	1	2	1		1	2	3	2	1	1	4	1	1	4	1		1	1	1	
Flake, chert				1																					1
Subtotal	**2**	**3**	**1**	**1**	**1**	**2**	**2**	**1**	**1**	**2**	**2**	**3**	**2**	**1**	**1**	**4**	**1**	**1**	**4**	**1**	**2**	**1**	**1**	**1**	**1**

	600 R1450	650 R1450	750 R1450	550 R1500	600 R1550	500 R1600	550 R1600	600 R1600	650 R1600	700 R1600	600 R1650	560 R1650	750 R1650	800 R1650	850 R1650	600 R1700	650 R1700	700 R1700	650 R1750	750 R1750	550 R1800	600 R1800	850 R1800	600 R1850	750 R1850
Kitchen Group																									
Creamware, undec.																									
Pearlware, undec.																									
Whiteware, undec.																									
Colonoware						1							1				3	3	3						
Glass, clear																									
Glass, black																									
Architecture Group																									
Nail, fragment														1											
Activities Group																									
UID iron fragment																									
Prehistoric Group																									
Sherd, small	1	1	1	1	1		2	1	2	2	3	1			1	1				1	3	1	1	2	1
Flake, chert																									
Subtotal	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**2**	**2**	**3**	**1**	**1**	**1**	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**1**	**1**	**2**	**1**

	550 R1900	650 R1900	750 R1900	600 R1950	800 R1950	550 R2000	700 R2000	900 R2000	930 R2150	760 R2200	690 R2200	710 R2200	540 R2250	590 R2250	640 R2250	740 R2250	720 R2300	300 R2350	700 R2350	660 R2450	690 R2450	760 R2450	820 R2450	**Subtotal**	**Total**
Kitchen Group																									**22**
Creamware, undec.																								**1**	
Pearlware, undec.																1								**1**	
Whiteware, undec.																				1				**1**	
Colonoware																								**15**	
Glass, clear						1						1												**3**	
Glass, black										1														**1**	
Architecture Group																									**12**
Nail, fragment	1										1				3		2						1	**12**	
Activities Group																									**1**
UID iron fragment																								**1**	
Prehistoric Group																									**123**
Sherd, small		1	1	1	2		1	1	1	1		1	1	1			1	1	2		2	1		**121**	
Flake, chert																								**2**	
Subtotal	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**2**	**1**	**2**	**1**	**1**	**3**	**1**	**3**	**1**	**2**	**1**	**2**	**1**	**1**	**158**	**158**
TOTAL																									

undec : undecorated

of the historic component. Only unidentifiable nail fragments were found.

Although this site covers a very large area (approximately 17 acres), the data sets are mediocre. The prehistoric component failed to produce any diagnostic remains and the historic component did not produce the quality of remains needed to answer significant research questions about early life on the property, including the function of this site.

In addition, cultivation and logging appear to have heavily damaged the site. Artifacts are evenly dispersed with no areas of distinct clusters of artifacts. Although brick and shell were noted at the site, no concentrations were found that might be a midden or structure remains.

Site 38CH2243 is recommended not eligible for the National Register of Historic Places. No additional management activity is recommended pending the review and concurrence by the State Historic Preservation Office.

38CH2244

Site 38CH2244 (Figure 72) is a prehistoric pottery scatter and eighteenth to twentieth century site. It is located on a ridge side slope at an elevation of 10 feet AMSL. A central UTM for the site is 582663E 3610209N (NAD27 datum).

The site was located when shovel testing produced a positive at Transect 166, Shovel Test 0 (600R750). Ten artifacts (Table 46) were found in this test including salt glazed stoneware, Colono ware, and prehistoric sherds. Testing commenced at 50-foot intervals until two consecutive shovel tests were found in each of the cardinal directions. A total of 85 shovel tests were excavated with 28

positive (33%). Two additional tests were found with only brick; one test was found with only shell; and one test was found with brick and shell. Based on this shovel testing the site measures 500 east-west feet by 250 feet north-south.

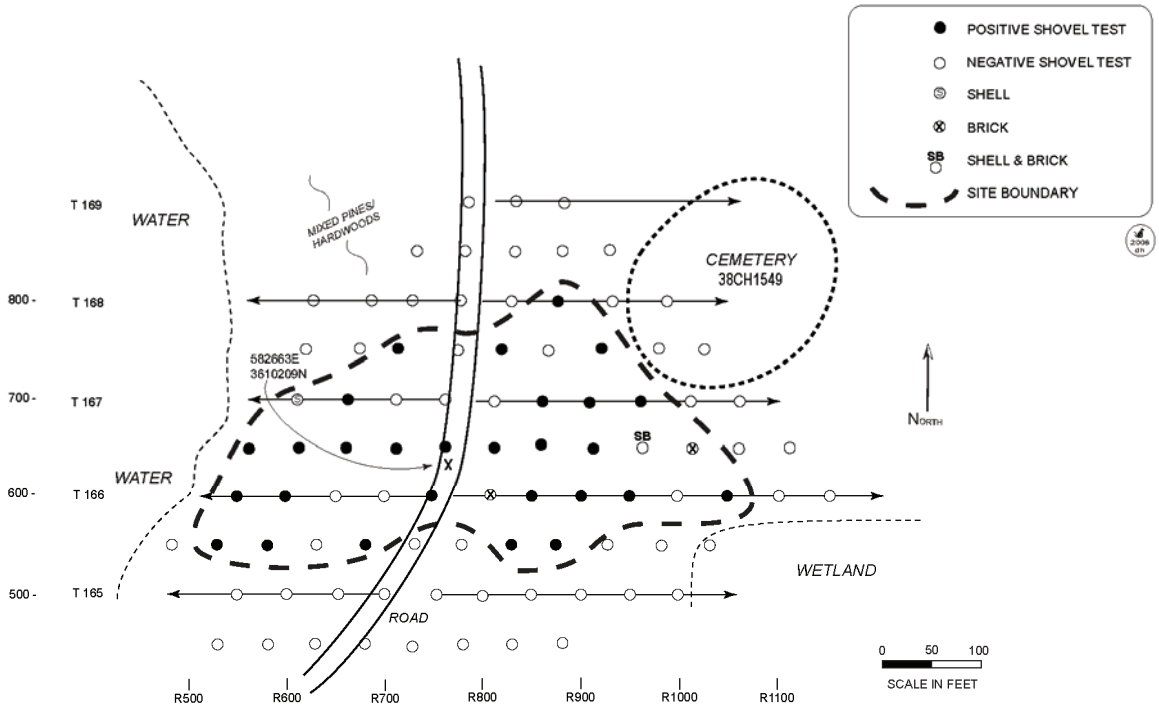


Figure 72. Sketch map of 38CH2244.

The soils in the site area resemble the excessively drained Wando Series, which has an Ap horizon of dark brown (10YR4/3) loamy fine sand to 0.7 foot in depth over a brown (7.5YR5/4) loamy fine sand to a depth of 2.7 feet. The prehistoric sherds from this site were all found in the upper Ap horizon.

Artifacts from the prehistoric component (consisting of 16% of the total) consisted entirely of small sherds, none of which could be attributed to a specific time period. No other prehistoric remains, such as lithics or worked tools were identified.

The historic component, while ranging over three decades in time, can still be somewhat divided between early slave (eighteenth century) and the nineteenth-twentieth century artifacts. The twentieth century artifacts appear to be located at the western portion of the site, closer to the water, while the earlier eighteenth to nineteenth century artifacts are found primarily in the eastern half of the site.

The only piece of ceramic that could be accurately dated was a single piece of lead glazed slipware, which has a MCD of 1733. The other ceramics at the site including Colono ware and stoneware can generally be attributed to the eighteenth century. The more recent artifacts consist of such items as milk glass, which became popular in the late nineteenth century (Jones and Sullivan 1985:14).

Kitchen Group artifacts dominate the collection accounting for 57% of the total with both the Architecture and Activities groups providing 2% of the total. (The remaining 39% of the total consists of the prehistoric sherds.)

Table 46.
Artifacts from 38CH2244

	550 R530	550 R580	550 R680	550 R830	550 R880	600 R550	600 R600	600 R750	600 R850	600 R900	600 R950	600 R1050	650 R560	650 R610	650 R660	650 R710	650 R760	650 R810	650 R860	650 R910	700 R660	700 R860	700 R910	700 R960	750 R720	750 R820	750 R920	800 R880	Subtotal	Total
Kitchen Group																														**45**
Stoneware, grey SG								1																					**1**	
Earthenware																									1				**1**	
Slipware, LG										1																			**1**	
Colonoware		2		1	1			3	1	4	1	1					2		3	1		2	4	1	1				**28**	
Glass, milk													1			1													**2**	
Glass, light green															1														**1**	
Glass, clear													2	1				1		2	1								**7**	
Glass, black									2	1	1																		**4**	
Architecture Group																														**2**
Nail	1		1																										**2**	
Activities Group																														**3**
Iron, UID													1	1															**2**	
Faunal																				1									**1**	
Prehistoric Group																														**27**
Sherd, small			1			1	2	6										1	7	5	2						1	1	**27**	
Subtotal	**1**	**2**	**2**	**1**	**1**	**1**	**2**	**10**	**3**	**6**	**2**	**1**	**4**	**2**	**1**	**1**	**2**	**2**	**10**	**9**	**3**	**2**	**4**	**1**	**1**	**1**	**1**	**1**	**77**	
TOTAL																														**77**

LG : Lead glaze SG : Salt glazed

This site is situated next to a reported slave cemetery (site 38CH1549) to the east.

We recommend the historic component at 38CH2244 potentially eligible for inclusion on the National Register (the prehistoric component is a non-contributing resource). If green spacing is not possible, we recommend additional testing, consisting of very close interval (15-20 feet) augering followed by the excavation of 1-2 10-foot units. This strategy will provide very detailed aerial coverage, allowing identification of artifact concentrations. The use of several large test units will permit better identification of features, while at the same time assisting with the recovery of a collection better able to identify site function. No work should be conducted in the site area until plans for either green spacing have been approved by the State Historic Preservation Office or additional site assessment and evaluation have been completed.

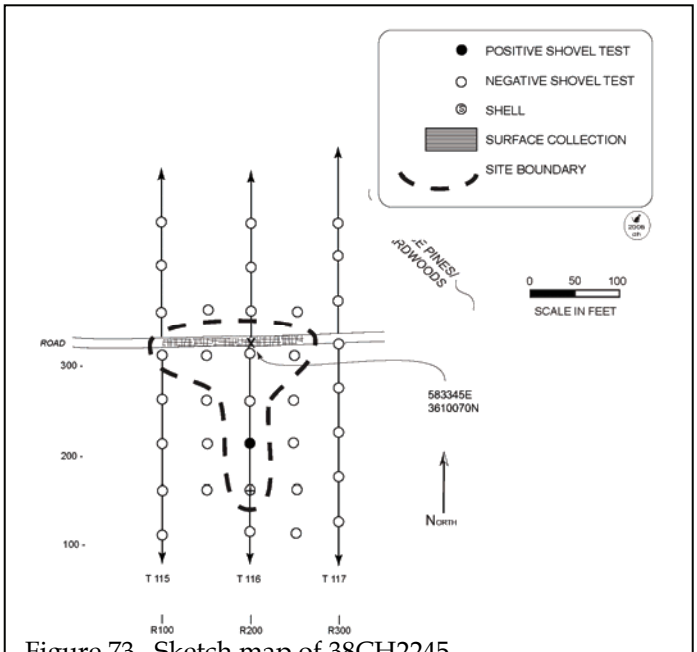


Figure 73. Sketch map of 38CH2245.

38CH2245

Site 38CH2245 (Figure 73) is a nineteenth to twentieth century scatter located on a ridge at an elevation of about 10 feet AMSL. The vegetation consists of a dense pine and hardwood forest. A UTM, taken at the north edge of the site is 583345E 3610070N (NAD27 datum).

Although shovel testing was performed in this area at 100-foot intervals, the site was initially identified through the surface scatter along the road. Because of this, shovel testing was performed at 50-foot intervals, however, only one shovel test, Transect 116, Shovel Test 1 south, was positive (4% of all the tests excavated), producing a piece of whiteware and a piece of clear glass.

Soils around the site area were the well drained Seabrook Series. Seabrook soils have an Ap horizon of very dark grayish brown (10YR3/2) loamy fine sand to a depth of 0.8 foot over a dark brown (10YR4/3) or dark yellowish brown (10YR4/4) loamy fine sand to a depth of 1.7 feet.

Table 47.
Artifacts from 38CH2245

	210 R200	Surface	Subtotal	Total
Kitchen Group				**12**
Whiteware, undec.	1	1	**2**	
Whiteware, annular		2	**2**	
Stoneware, alkaline glaze		1	**1**	
Glass, black		1	**1**	
Glass, manganese		1	**1**	
Glass, brown		2	**2**	
Glass, clear	1	2	**3**	
Architecture Group				**1**
Window glass		1	**1**	
Subtotal	**2**	**11**	**13**	
TOTAL				**13**

The site, which encompasses an area of about 150 feet square, produced 13 artifacts, 92% of which were Kitchen related (Table 47). The other 8% consisted of a single piece of window glass. The artifacts appear to be consistent with a small turn-of-the-century tenant site. The undecorated whiteware ranges in date from 1813 to 1900, while annular whiteware tends to be a bit later, from 1831 to 1900. Manganese glass became common at the end of the nineteenth century. A piece of clear glass that appears to have a portion of a palm frond as decoration was also recovered. This decoration appears to be part of a South Carolina dispensary bottle. The dispensary system in South Carolina lasted from 1893 to 1907 (Huggins 1971:v).

Site 38CH2245 has lost its integrity through logging and cultivation. The majority of the site was found exposed in the road. While it may be possible to find additional artifacts through closer interval shovel testing, we do not feel that the quality of the remains warrant that intensive a survey.

Site 38CH2245 is recommended not eligible for the National Register of Historic Places. No additional management activity is recommended pending the review and concurrence by the State Historic Preservation Office.

38CH2246

Site 38CH2246 (Figure 74) is a prehistoric pottery scatter located on a ridge at an elevation of about 10 feet AMSL. The site is located in a dense pine and hardwood forest. A central UTM for 38CH2246 is 583482E 3610108N (NAD27 datum).

Shovel testing was performed at the originally proposed 100-foot intervals until Transect 121, Shovel Test 1 north (450R500) was positive, producing two small sherds. Shovel testing

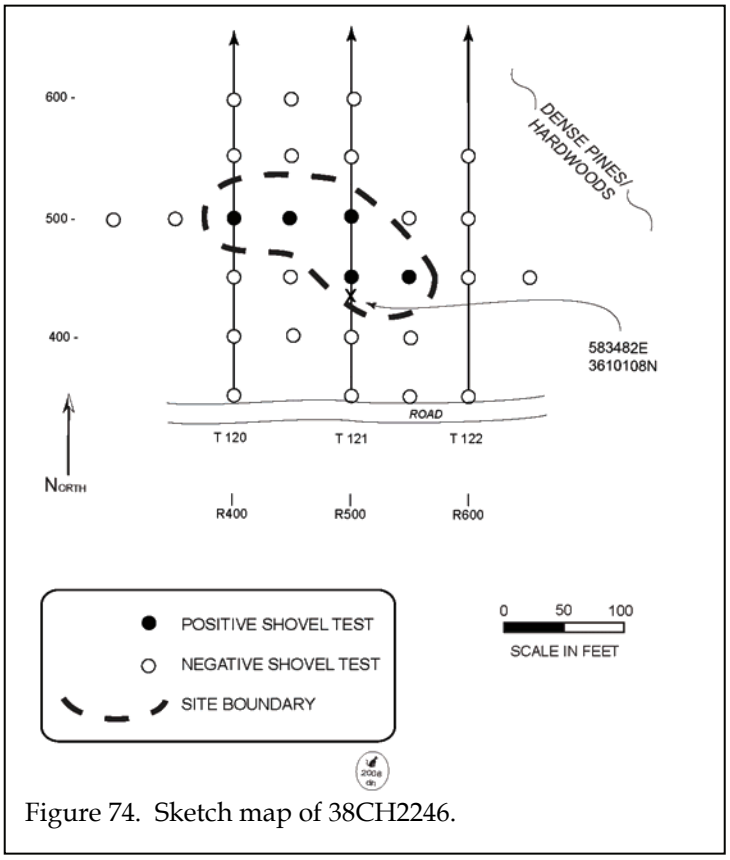


Figure 74. Sketch map of 38CH2246.

resumed at 50-foot intervals until two consecutive negative tests were found in all directions. A total of 28 shovel tests were excavated with five being positive (18%).

Soils in the site area resemble the moderately well drained Seabrook Series. Seabrook soils have an Ap horizon of very dark grayish brown (10YR3/2) loamy fine sand to a depth of 0.8 foot over a dark brown (10YR4/3) or dark yellowish brown (10YR4/4) loamy fine sand to a depth of 1.7 feet. All of the artifacts were found in the upper Ap horizon.

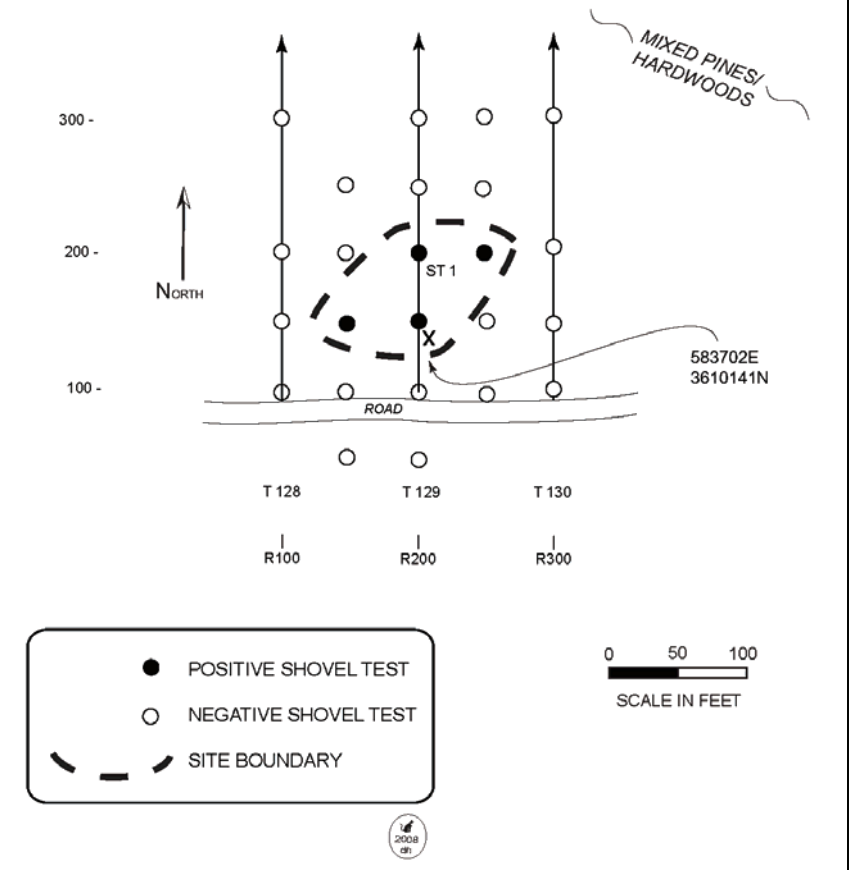


Figure 75. Sketch map of 38CH2247.

As previously mentioned, the site consisted of only prehistoric pottery. A total of eight small sherds were found, which comprise an area of approximately 150 feet east-west by 50 feet north-south. Because of their small size (under 1-inch), none of the sherds are diagnostic. This is likely the result of intensive cultivation and logging in the area. It is unlikely that this site will be able to address significant research questions about prehistoric life.

Site 38CH2246 is recommended not eligible for the National Register of Historic Places. No additional management activity is recommended pending the review and concurrence by the State Historic Preservation Office.

38CH2247

Site 38CH2247 (Figure 75) is a small Middle Woodland pottery scatter, situated on a ridge at an elevation of about 10 feet AMSL. The site is in a mixed pine and hardwood forest with a UTM coordinate of 583702E 3610141N (NAD27 datum).

The site was identified through shovel testing when Transect 129, Shovel Test 1 was positive, producing a small sherd. Shovel testing resumed at 50-foot intervals until two consecutive negative tests were encountered along the cardinal directions. A total of 20 shovel tests were excavated with 4 positive (20%).

Soils in the site are attributed to the Seabrook Series, which has an Ap horizon of very dark grayish brown (10YR3/2) loamy fine sand to a depth of 0.8 foot over a dark brown (10YR4/3) or dark yellowish brown (10YR4/4) loamy fine sand to a depth of 1.7 feet. All of the artifacts were found in the upper Ap horizon.

A total of five artifacts were found, consisting of four small sherds and one large

sherd. The large sherd was identified as Deptford cord-marked. The four positive tests make up an area about 50 feet square.

Although we can identify the time period with which the site is associated, remains are too sparse to address significant research questions about prehistoric life. In addition, no evidence of bone, shell, or ethnobotanical remains were found that might have aided in the development of significant research questions. All of the remains were encountered in the site's Ap horizon or plow zone.

Because of the lack of integrity and the inability to address significant research questions, 38CH2247 is recommended not eligible for the National Register of Historic Places. No additional management activity is recommended pending the review and concurrence by the State Historic Preservation Office.

38CH2248

Site 38CH2248 (Figure 76) is an eighteenth to nineteenth century domestic scatter located on a peninsula at an elevation of about 5 feet AMSL. The area is currently covered in sparse pines and hardwoods. A central GPS UTM is 584432E 3610336N (NAD27 datum).

The site was originally identified through a brick scatter in the dirt road (Figure 77). Shovel testing, however, produced a positive at Transect 154, Shovel Test 0 (200R200). This test contained a whiteware ceramic, lead glaze slipware, and window glass. Close interval testing was performed at 25-foot intervals until two consecutive negative tests were encountered in the cardinal directions. A total of 45 shovel tests were excavated with nine positive (20%). At least eight additional shovel tests contained only brick and two shovel tests contained only shell.

Two 3-foot square units were also excavated in the site area. Test unit 1 was placed near 200R300 where the shovel test produced high numbers of nails and brick (Figure 78). Test unit 2 was placed near 175R235, where a shovel test produced a high density of brick.

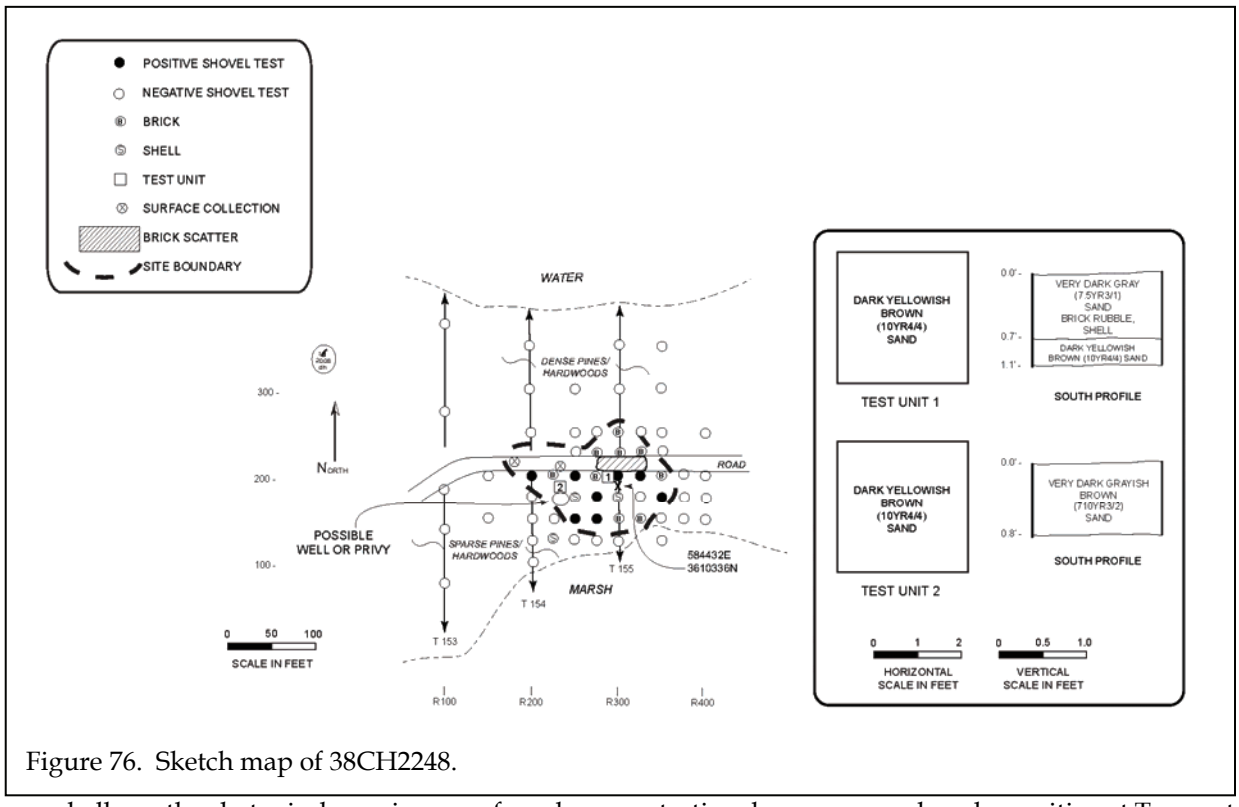


Figure 76. Sketch map of 38CH2248.

The testing yielded 617 historic artifacts (Table 48). Table 49 shows the resulting artifact pattern in comparison with several other typical patterns. The collection does not clearly match any of the previously defined patterns. When decorative motifs are examined, we find that the collection is too small to be of much assistance – while porcelains are present, so too is annular ware.


Figure 77. View of brick in the dirt road at 38CH2248.

Turning to the architectural remains, the collection is dominated by machine cut nails. These became popular in the first quarter of the nineteenth century (Howard 1989:55) and the size of nails can be used to obtain some general indication of the nature of the structure. For example, 2d to 4d nails were commonly used to fasten small timber (such as lathe) and shingles, while 6d to 8d nails were used to attach sheathing or siding. At 38CH2248, these two sizes are found in equal proportions and together account for 83% of the nails (n=136). Nails used for framing (9d to 12d) were the third most common accounting for an additional 28 specimens (17%). This suggests that we have a frame dwelling with wood shingles. Interior finish likely included plaster – verified by the recovery of plaster debris in the excavation units. Thus, while the ceramics are ambiguous, the architectural remains suggest a moderately high status dwelling – certainly not a slave dwelling.

An 1816 plat of the lands of Benjamin Roper's Oaks Plantation, shows a structure at the location of these remains (Figure 79). The proximity of the structure to salt water suggests that 38CH2248 may represent a planter's summer house, predating the formation of Legareville. As discussed earlier, we have no good archaeological data for summer house assemblages, but we anticipate that they generally reflect the Revised Carolina Artifact Pattern. The results from this site may be anomalous because of the location of the two test pits and their focus on recognizable architectural remains. Excavation units in the immediate vicinity of structure walls routinely distort the prevalence of architectural materials such as nails and window glass.

One of the shovel tests was placed within a depression that may represent a well or similar feature. Excavation failed to identify the base of the feature. A unit placed outside the posited feature did not identify the edge of the feature and its function remains uncertain.


Figure 78. View of Test Unit 1 at 38CH2248.

Site 38CH2248 has produced a range of

Table 48.
Artifacts from 38CH2248

	200 R200	150 R250	200 R250	150 R275	175 R275	200 R300	200 R325	175 R350	Test Unit #1	Test Unit #2	**Subtotal**	**Total**
Kitchen Group												**264**
Canton Porcelain, blue HP									2		**2**	
English Porcelain, blue HP									1		**1**	
Rockingham										1	**1**	
Slipware, lead glazed	1										**1**	
Pearlware, undec.		1									**1**	
Whiteware, annular, mended			2							2	**4**	
Whiteware, undec.	1				1				3		**5**	
Glass, melted							1	1	246		**248**	
Glass, fulgurite									1		**1**	
Architecture Group												**358**
Window glass	1			1						2	**4**	
Cut nails						17			148		**165**	
Cut nail fragments						13			160		**173**	
Nail, fragment						8	1			1	**10**	
Plaster						3			3		**6**	
Activities Group												**1**
Metal, UID										1	**1**	
Prehistoric												**1**
Sherd, small										1	**1**	
Subtotal	**3**	**1**	**2**	**1**	**1**	**41**	**2**	**1**	**564**	**8**	**624**	
TOTAL												**624**

HP : Hand painted undec. : undecorated

data sets, including early antebellum artifacts, architectural remains indicative of a frame dwelling with plaster and glazed windows, and a possible well or other feature. Another data set includes the historic documentation, especially the 1816 plat showing a structure at this location. These data sets offer an opportunity to examine the site as a possible early antebellum summer residence, predating the organization of Legareville – and perhaps offering an opportunity to develop a context for other, similar sites. This is a topic for which there is little existing research (see, however, Brewster 1947; Helsley 2004 discusses this topic in the context of planters' migrations to the upstate of South Carolina) and we believe it represents an important topic. For example, there are anecdotal accounts of planters annually moving everything from kitchen utensils to pianos to their summer homes, suggesting that their lifeways were simply moved from one location to another. On the other hand, there is competing evidence that the summer homes were far more rustic and spartan. While one study will certainly not resolve this issue, it will begin to provide clear data to compare and contrast to the available historical accounts.

This survey suggests that 38CH2248 exhibits a high degree of integrity, with well preserved artifactual collections, including even

Table 49.
Artifact Pattern Comparison for 38CH2248

	38CH2248	Revised Carolina Artifact Pattern[1]	Georgia Slave Artifact Pattern[2]	Carolina Slave Artifact Pattern[1]
Kitchen Group	42.8	51.8 - 65.0	20.0 - 25.8	70.9 - 84.2
Architectural Group	57.0	25.2 - 31.4	67.9 - 73.2	11.8 - 24.8
Furniture Group	0.0	0.2 - 0.6	0.0 - 0.1	0.1
Arms Group	0.0	0.1 - 0.3	0.0 - 0.2	0.1 - 0.3
Tobacco Group	0.0	1.9 - 13.9	0.3 - 9.7	2.4 - 5.4
Clothing Group	0.0	0.6 - 5.4	0.3 - 1.7	0.3 - 0.8
Personal Group	0.0	0.2 - 0.5	0.1 - 0.2	0.1
Activities Group	0.2	0.9 - 1.7	0.2 - 0.4	0.2 - 0.9

[1] Garrow 1982
[2] Singleton 1980

fragile architectural materials such as plaster, as well as the preservation of possible features.

As a result, we recommend 38CH2248 eligible for inclusion on the National Register of Historic Places. No additional activities at the site

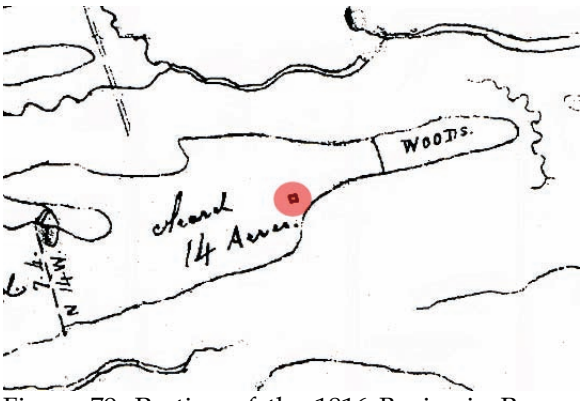


Figure 79. Portion of the 1816 Benjamin Roper plat showing the structure at 38CH2248.

are recommended pending the review and concurrence by the State Historic Preservation Office.

38CH2249

Site 38CH2249 (Figure 80) is a prehistoric scatter of artifacts located on a ridge side slope at an elevation of about 8 feet AMSL. The site is located in an area of planted pines and has a UTM coordinate of 582899E 3610344N (NAD27 datum).

The site was identified through routine shovel testing at 100-foot intervals when Transect 270, Shovel Test 10 was positive, producing a small sherd. Additional close-interval testing was performed at 50-foot intervals along the cardinal directions until two consecutive negative tests were encountered. A total of 70 shovel tests were excavated in the site vicinity with 20 positive (29%).

Shovel testing produced soils representative of Wando loamy fine sand. This Series has an Ap horizon of dark brown (10YR4/3) loamy fine sand to 0.7 foot in depth over a brown (7.5YR5/4) loamy fine sand to a depth of 2.7 feet.

A total of 27 artifacts were recovered with 25 of the specimens representing small sherds. One chert flake and one unidentifiable nail fragment were also found. None of the sherds were identifiable as to type (all were under 1-inch in size) and all the artifacts were found in the upper 1.0 foot of soil – no intact subsurface remains were found.

The site, defined by the positive shovel tests, encompasses an area of about 500 feet east-west by 200 feet north-south. Site integrity has been damaged through logging and cultivation (as shown by the modern topographic map). With no bone, shell, or ethnobotanical remains, it is unlikely that this site is able to address significant research questions.

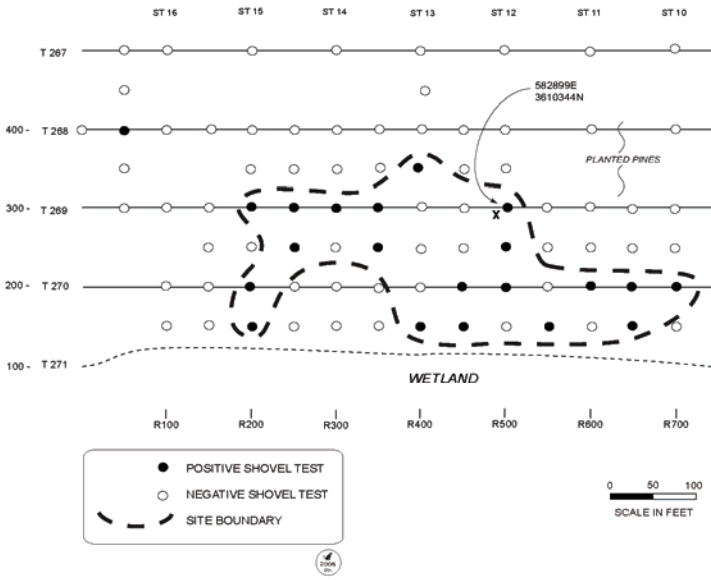


Figure 80. Sketch map of 38CH2249.

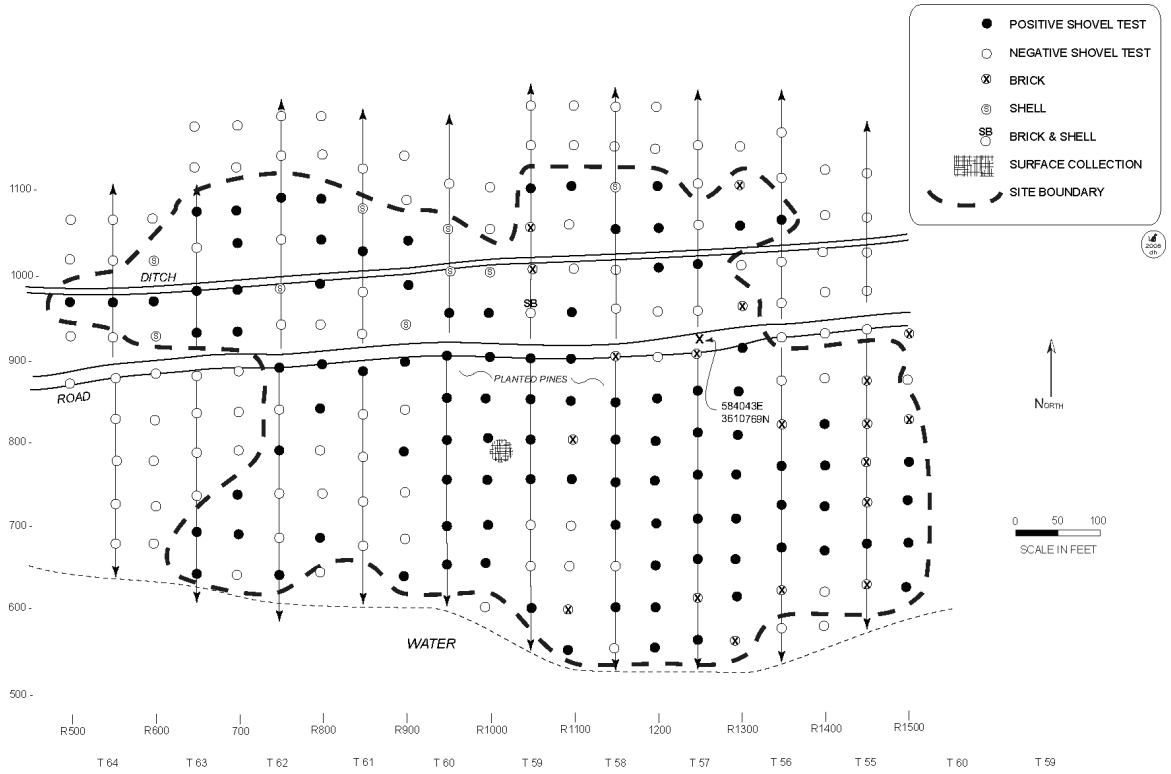


Figure 81. Sketch map of 38CH2250.

Site 38CH2249 is recommended not eligible for the National Register of Historic Places. No additional management activity is recommended pending the review and concurrence by the State Historic Preservation Office.

38CH2250

Site 38CH2250 (Figure 81) is a prehistoric and eighteenth century scatter, which is located on a ridge and side slope at elevations ranging from 5 to 10 feet AMSL. The site is situated in an area currently in planted pines. A UTM coordinate, taken toward the eastern edge of the site is 584043E 3610769N (NAD27 datum).

The site was encountered during shovel testing at 100-foot intervals when Transect 64, Shovel Test 1 North (970R550) was positive, producing two small prehistoric sherds. Investigation was continued at 50-foot intervals until two consecutive negative tests were encountered in the cardinal directions. A total of 232 shovel tests were excavated with 91 positive tests (39%).

Soils in the area resemble the Seabrook Series, which has an Ap horizon of very dark grayish brown (10YR3/2) loamy fine sand to a depth of 0.8 foot over a dark brown (10YR4/3) or dark yellowish brown (10YR4/4) loamy fine sand to a depth of 1.7 feet. All of the artifacts were found in the upper Ap horizon, which sometimes extended up to 1.3 feet in depth – indicative of subsoiling.

The site, which encompassed an area of about 1,000 feet east-west by 550 feet north-south, produced both prehistoric and historic artifacts (Table 50). The prehistoric component was found primarily in the western portion of the site (although it covered almost the entire site area),

Table 50.
Artifacts from 38CH2250

	970 R500	970 R550	970 R600	630 R650	680 R650	930 R650	980 R650	1080 R650	670 R700	730 R700	930 R700	980 R700	1030 R700	1080 R700	640 R750	790 R750	890 R750	1090 R750	690 R800	840 R800	890 R800	990 R800	1040 R800	1090 R800	880 R850	1030 R850	640 R900	790 R900	890 R900	990 R900	1040 R900	650 R950	700 R950	750 R950	800 R950	850 R950	900 R950	950 R950
Kitchen Group																																					
Agateware																																					
Stoneware, grey SG																																					
Earthenware																																					
Delftware, undec.																																					
Colonoware																																	1	3	2		
Glass, melted																																					
Glass, green																																					
Glass, black																																					
Architecture Group																																					
Nail, fragment																																					
Tobacco Group																																					
Tobacco, pipe bowl, Kaolin																																					
Activities Group																																					
Faunal, bone																																					
Prehistoric Group																																					
Sherd, small	1	2	2	1	1	1	1	1	1	1	3	1	2	1	1	1	1	1	1		2	3	1	1	1	3	1	1	1	2	4	3	1		1		2	2
UID lithic																				1																		
Chert, fragment																																					
Subtotal	**1**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**3**	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**3**	**1**	**1**	**1**	**3**	**1**	**1**	**1**	**2**	**4**	**3**	**1**	**1**	**4**	**2**	**2**	**2**
TOTAL																																					

SG : Salt glazed

	650 R1000	700 R1000	750 R1000	800 R1000	850 R1000	900 R1000	950 R1000	600 R1050	750 R1050	800 R1050	850 R1050	900 R1050	1100 R1050	550 R1100	750 R1100	850 R1100	900 R1100	950 R1100	1100 R1100	600 R1150	700 R1150	750 R1150	800 R1150	850 R1150	1050 R1150	550 R1200	600 R1200	650 R1200	700 R1200	750 R1200	800 R1200	850 R1200	1000 R1200	1050 R1200	1100 R1200	560 R1250	660 R1250	710 R1250
Kitchen Group																																					
Agateware																																					
Stoneware, grey SG																																			1		
Earthenware																							1														
Delftware, undec.																1																					
Colonoware			1	2	1				1	1													2						1						2	1	4
Glass, melted																																					
Glass, green																																					
Glass, black																							1						1	1							
Architecture Group																																					
Nail, fragment																																					1
Tobacco Group																																					
Tobacco, pipe bowl, Kaolin																																			1		
Activities Group																																					
Faunal, bone																																	1			1	3
Prehistoric Group																																					
Sherd, small	1	1		1	1	2	1	1			1	2	2	1	1		1	2	2	2	3	1		2	1	1	1	5			1	1	1	2			2
UID lithic																																					
Chert, fragment																																					1
Subtotal	**1**	**1**	**1**	**3**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**3**	**1**	**3**	**1**	**2**	**1**	**1**	**1**	**5**	**2**	**1**	**1**	**1**	**2**	**2**	**3**	**3**	**11**
TOTAL																																					

	760 R1250	810 R1250	860 R1250	1010 R1250	610 R1300	660 R1300	710 R1300	760 R1300	810 R1300	860 R1300	910 R1300	1060 R1300	670 R1350	720 R1350	770 R1350	1070 R1350	670 R1400	720 R1400	770 R1400	820 R1400	730 R1450	630 R1500	680 R1500	730 R1500	780 R1500	**Subtotal**	**Total**
Kitchen Group																											**62**
Agateware														1												**1**	
Stoneware, grey SG													1													**2**	
Earthenware	1				1				1																	**4**	
Delftware, undec.																										**1**	
Colonoware	2	5				4	9	2		2								1			1					**48**	
Glass, melted	1																									**1**	
Glass, green																			1							**1**	
Glass, black							1																			**4**	
Architecture Group																											**4**
Nail, fragment		1	1						1																	**4**	
Tobacco Group																											**3**
Tobacco, pipe bowl, Kaolin								1										1								**3**	
Activities Group																											**8**
Faunal, bone							2											1								**8**	
Prehistoric Group																											**117**
Sherd, small		1		1		1					1	1		4	1	1	1	2		1		1	1	1	1	**115**	
UID lithic																										**1**	
Chert, fragment																										**1**	
Subtotal	**4**	**7**	**1**	**1**	**1**	**5**	**12**	**3**	**2**	**2**	**1**	**1**	**1**	**5**	**1**	**1**	**1**	**5**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**194**	
TOTAL																											**194**

SG : Salt glaze

while the historic artifacts were only found in the southeastern portion of the site.

None of the 114 prehistoric sherds were identifiable by type – all were under 1-inch in size. Two lithics, both flakes, were identified that may be associated with the prehistoric assemblage.

The historic assemblage contained only one datable ceramic – a single piece of plain Delft, which has a MCD of 1720. In addition, 45 sherds of Colono ware were identified that are generally associated with eighteenth century slave sites.

Of the historic assemblage, three artifact groups are represented including Kitchen (96%), Architecture (7%), and Tobacco (4%). While only a few groups are found, the historic component is fairly well isolated in the southeastern portion of the site. Even with logging in the area, the historic portion does appear to contain an isolated locus around 710R1250-1300. Ten or more artifacts were found in two shovel tests in this area.

We recommend the historic component at 38CH2250 potentially eligible for inclusion on the National Register (the prehistoric component is a non-contributing resource). If green spacing is not possible, we recommend additional testing, consisting of very close interval (15-20 feet) augering followed by the excavation of 1-2 10-foot units. This strategy will provide very detailed aerial coverage, allowing more refined identification of artifact concentrations. The use of several large test units will permit better identification of features, while at the same time assisting with the recovery of a collection better able to identify site function. No work should be conducted in the site area until plans for either green spacing have been approved by the State Historic Preservation Office or additional site assessment and evaluation have been completed.

No work should take place in the area

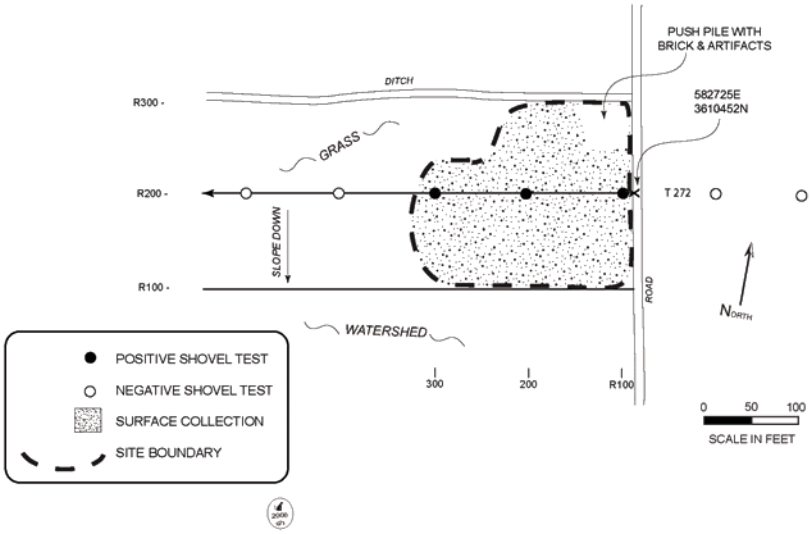


Figure 82. Sketch map of 38CH2251.

until the site has been properly studied and site function and integrity have been determined.

38CH2251

Site 38CH2251 (Figure 82) is a twentieth century trash dump that is situated on a side slope at an elevation of about 10 feet AMSL. It is located in an old field that is now growing up in grass. A UTM for the site, taken on the road at the southern end is 582725E 3610452N (NAD27 datum).

The site was identified through the large amounts of surface trash located in the old field, along with a push pile located at the southeast portion of the site (Figure 83). A single row of shovel tests was excavated west along the site at 100-foot intervals.

Three shovel tests were positive, producing items such as milk glass, mass produced porcelain, and a utensil handle with "U.S.N." on the handle (Table 51**)**. Although large pieces of artifacts were found on the surface, no collection was made.

The previous owner, Sidi Limehouse (personal communication 2008), said that his grandfather contracted with the Navy during World War II to get the trash from the Charleston mess hall in order to create swill for the pigs on his property. The remaining trash was dumped along the water's edge, just to the west of the site. In fact, other dump areas are said to be located in the area. The utensils and dishes are what was accidentally thrown away (or purposely thrown away if they were broken) at the mess hall.

With this information, no additional testing was performed in the area. The site is superficial, only deposited into the subsurface by cultivation, which has spread the site to an area of approximately 200 feet square.

While an interesting anecdote to the property, there is nothing else that we can learn

Figure 83. View of the push pile (at right) at 38CH2252.

from this site pertaining to Mullet Hall. Site 38CH2251 is recommended not eligible for the National Register of Historic Places. No additional management activity is recommended pending the review and concurrence by the State Historic Preservation Office.

Table 51.
Artifacts from 38CH2251

	120 R200	220 R200	320 R200	Subtotal	Total
Kitchen Group					**17**
Whiteware, undec.	1			**1**	
Porcelain, stripe	2			**2**	
Glass, clear	3	1	1	**5**	
Glass, black			1	**1**	
Glass, milk	1	3	2	**6**	
Glass, aqua		1		**1**	
Utensil Handle, stainless steel	1			**1**	
Architecture Group					**1**
Nail, fragment		1		**1**	
Clothing Group					**1**
Leather	1			**1**	
Activities Group					**1**
Metal, UID			1	**1**	
Prehistoric					**1**
Sherd, small			1	**1**	
Subtotal	**9**	**6**	**6**	**21**	
TOTAL					**21**

38CH2252

Site 38CH2252 (Figure 84) is an eighteenth to twentieth century and prehistoric scatter located in the interior plain at an elevation of about 5 feet AMSL. A GPS UTM, taken toward the eastern edge, is 580916E 3610414N (NAD27 datum).

The site was first encountered when Transect 283, Shovel Test 0 (720R900) was positive, producing lead glaze slipware and an unidentifiable fragment of iron. Close interval testing was performed at 50-foot intervals in the cardinal directions until two consecutive negative tests were encountered. A total of 50 shovel tests were excavated with 29 positive (58%). The site dimensions are 450 feet east-west by 250 feet north-south.

Soils resemble the poorly drained Yonges Series, which has an Ap horizon of dark grayish brown (10YR4/2) loamy fine sand to 0.8 foot over a light brownish gray (10YR6/2) loamy fine sand to 1.2 feet in depth. The site was in an old field that has grown into pines. The artifacts were found in the Ap horizon, although this layer sometimes extended to 1.5 feet in depth.

The prehistoric component, which accounts for 19% of the total artifact assemblage, produced sherds (Table 52). Only one sherd was diagnostic – a Pee Dee complicated stamped, dating to the Mississippian.

In contrast to the prehistoric remains, the historic collection reveals considerable diversity, with a modest collection of domestic refuse identified from the site. As revealed by Table 53 the assemblage includes Kitchen Group (62%), Architecture Group (22%), Tobacco (2%), Clothing (2%), and Activities Group artifacts (13%). These remains closely resemble the eighteenth century overseer pattern identified at 38BK1900. The Activities Group is anomalous, but we suspect this is related to the small sample and abundance of unidentifiable metal fragments that are recovered in shovel testing. With a larger collection this issue would likely be resolved.

Within the Kitchen Group, ceramics and glass are represented almost equally. The ceramics, which include small quantities of a wide range of materials, produce a mean ceramic date of 1806.5 (Table 54). The glass, however, does include at least one specimen – a fragment of a South Carolina Dispensary bottle – that takes the assemblage into at least the late nineteenth century (the dispensary system operated from 1893 to 1907, see Huggins 1971:v).

Although the assemblage does contain single specimens of Chinese and English porcelain, the bulk of the collection appears far more modest, including annular and plain

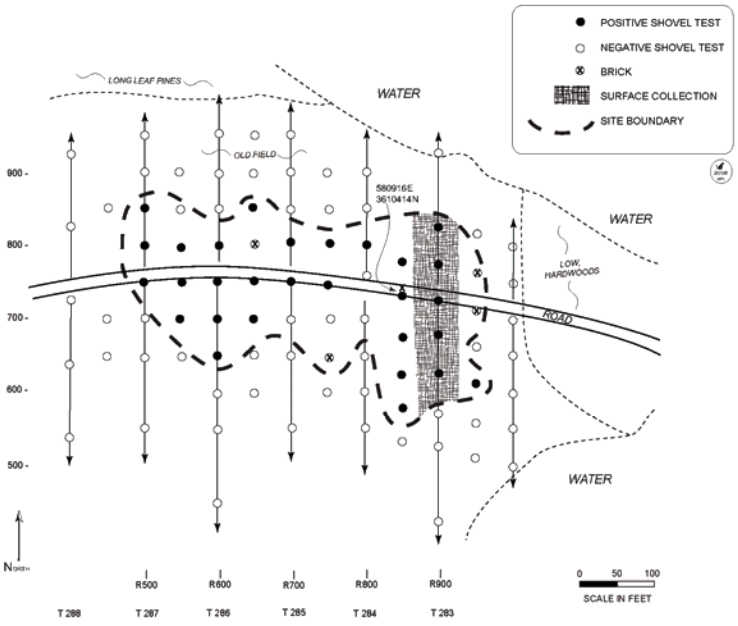


Figure 84. Sketch map of 38CH2252.

ceramics, as well as Colono and slipware. These are the ceramics we would anticipate from an overseer in the late eighteenth or early nineteenth century.

We have some information on the late assemblage, since the site is shown as two structures on the 1919 Wadmalaw topographic map. Unfortunately, the site is situated at the far western edge of the tract, in an area where we have very little historic data. The Mullet plat does not include this area, suggesting that Legare acquired this edge through another purchase.

Assessment of this site is difficult, since it does appear sparse. However, when the density of this site is compared to other eighteenth century overseer sites identified by Chicora research (Trinkley et al. 2003, Trinkley et al. 2005), it appears easily within the anticipated range. Likewise, agricultural activities here – as elsewhere on the tract – have been intensive. Nevertheless, we do not believe the site should be dismissed without a more intensive effort to define intact deposits.

Consequently, we recommend the historic component at 38CH2252 potentially eligible for

Table 52.
Artifacts from 38CH2252

	750 R500	800 R500	850 R500	700 R550	750 R550	800 R550	650 R600	700 R600	750 R600	800 R600	700 R650	750 R650	850 R650	750 R700	800 R700	750 R750	800 R750	800 R800	580 R850	630 R850	680 R850	730 R850	780 R850	620 R900	670 R900	720 R900	770 R900	820 R900	620 R950	Surface Collection	Subtotal	Total
Kitchen Group																																**37**
Chinese Porcelain, blue HP																														1	**1**	
English Porelain, undec.	1																														**1**	
Stoneware, brown																														1	**1**	
Stoneware, brown SG																							1								**1**	
Slipware, lead glazed																										1					**1**	
Creamware, undec.													1																	4	**5**	
Pearlware, annular																														1	**1**	
Pearlware, undec.																											1				**1**	
Whiteware, undec.			1	1				1											1									1			**5**	
Colonoware																								1							**1**	
Glass, manganese					1	1			1					1																	**4**	
Glass, green																	1														**1**	
Glass, brown											1																				**1**	
Glass, clear		1		1		1	1	1		3		1		1																	**10**	
Glass, black								1				1																		1	**3**	
Architecture Group																																**14**
Window glass															1																**1**	
Nail, fragment					1	2			1	1						2	1					1	1				1		1		**12**	
Nut				1																											**1**	
Tobacco Group																																**1**
Tobacco, pipe bowl, Kaolin											1																				**1**	
Clothing Group																																**1**
Button																				1											**1**	
Activities Group																																**10**
Iron, UID		1		1	2																		1			1					**6**	
Brass fragment					2																										**2**	
Slate				1																											**1**	
Faunal								1																							**1**	
Prehistoric Group																																**15**
Pee Dee, complicated stamp		1																													**1**	
Sherd, small		2						2				1			1	1		1		1	1		2		1		1				**14**	
Subtotal	**1**	**5**	**1**	**5**	**6**	**4**	**1**	**6**	**2**	**4**	**2**	**3**	**1**	**2**	**2**	**3**	**2**	**1**	**1**	**2**	**1**	**1**	**5**	**1**	**1**	**2**	**3**	**1**	**1**	**8**	**78**	
TOTAL																																**78**

HP : Hand painted SG : Salt glazed undec. : undecorated

inclusion on the National Register (the prehistoric component is a non-contributing resource). If green spacing is not possible, we recommend additional testing, consisting of very close interval (15-20 feet) augering followed by the excavation of 2-3 10-foot units. This strategy will provide very detailed aerial coverage, allowing identification of artifact concentrations. The use of several large test units will permit better identification of features, while at the same time assisting with the recovery of a collection better able to identify site function. No work should be conducted in the site area until plans for either green spacing have been approved by the State Historic Preservation Office or additional site assessment and evaluation have been completed.

Table 53.
Artifact Pattern Analysis for 38CH2252

	38CH2252	Revised Carolina Artifct Pattern[1]	38BK1900 Area B 18th Cen. Overseer[2]	38CH1278 18th Cen. Overseer[3]
Kitchen	62.0	51.8-65.0	65.2	78.1
Architecture	22.0	25.2-31.4	21.2	8.9
Furniture	0.0	02-0.6	0	0.1
Arms	0.0	0.1-0.3	0.3	0.2
Tobacco	2.0	1.9-13.9	10.2	11.4
Clothing	2.0	0.6-5.4	0.1	0.2
Personal	0.0	0.2-0.5	0.1	0.2
Activities	13.0	0.9-1.7	2.9	1.1

[1]Garrow 1982
[2]Trinkley et al. 2003
[3]Trinkley et al. 2005

38CH2253

Site 38CH2253 (Figure 85) is a prehistoric and nineteenth century scatter located on an interior plain at an elevation of 10 feet AMSL. A GPS UTM, taken at the southwest corner of the site, is 582646E 3610622N (NAD27 datum).

The site was identified during shovel testing when Transect 370, Shovel Test 2 (600R750) was positive, producing a piece of pearlware and three fragments of clear glass. Close interval testing was resumed at 50-foot intervals until two consecutive negative tests were encountered along the cardinal directions. A total of 95 shovel tests were excavated in the site area with 25 being positive (26%).

Soils in the area resemble the Seabrook Series, which has an Ap horizon of very dark grayish brown (10YR3/2) loamy fine sand to a depth of 0.8 foot over a dark brown (10YR4/3) or dark yellowish brown (10YR4/4) loamy fine sand to a depth of 1.7 feet. All of the artifacts were found in the upper Ap horizon.

The prehistoric loci, which was found predominately in the western portion of the site, consisted entirely of small sherds (n=11). None of the sherds were diagnostic. The historic loci produced a total of 42 artifacts, consisting of Kitchen (83%), Architecture (12%), and Activities (5%) groups (Table 55).

In the Kitchen Group, glass makes up 77% of the total, however, only clear and milk glass are represented. Of the ceramics, only a single piece of pearlware, which has a MCD of 1805, was diagnostic.

Table 54.
Mean ceramic date of 38CH2252

Ceramic	Date Range	Mean Date (xi)	(fi)	fi x xi
Underglazed blue porc	1660-1800	1730	1	1730
English porc	1745-1795	1770	1	1770
Lead glazed slipware	1670-1795	1733	1	1733
Creamware, undecorated	1762-1820	1791	5	8955
Pearlware, annular/cable	1790-1820	1805	1	1805
Pearlware, undecorated	1780-1830	1805	1	1805
Whiteware, undecorated	1813-1900	1860	5	9300
Total			15	27098
Mean Ceramic Date	1806.5			

For the Architecture Group, only unidentifiable nail fragments were found. In the Activities Group, the only artifacts were unidentifiable iron. The site area measures approximately 550 east-west by 350 feet north-south.

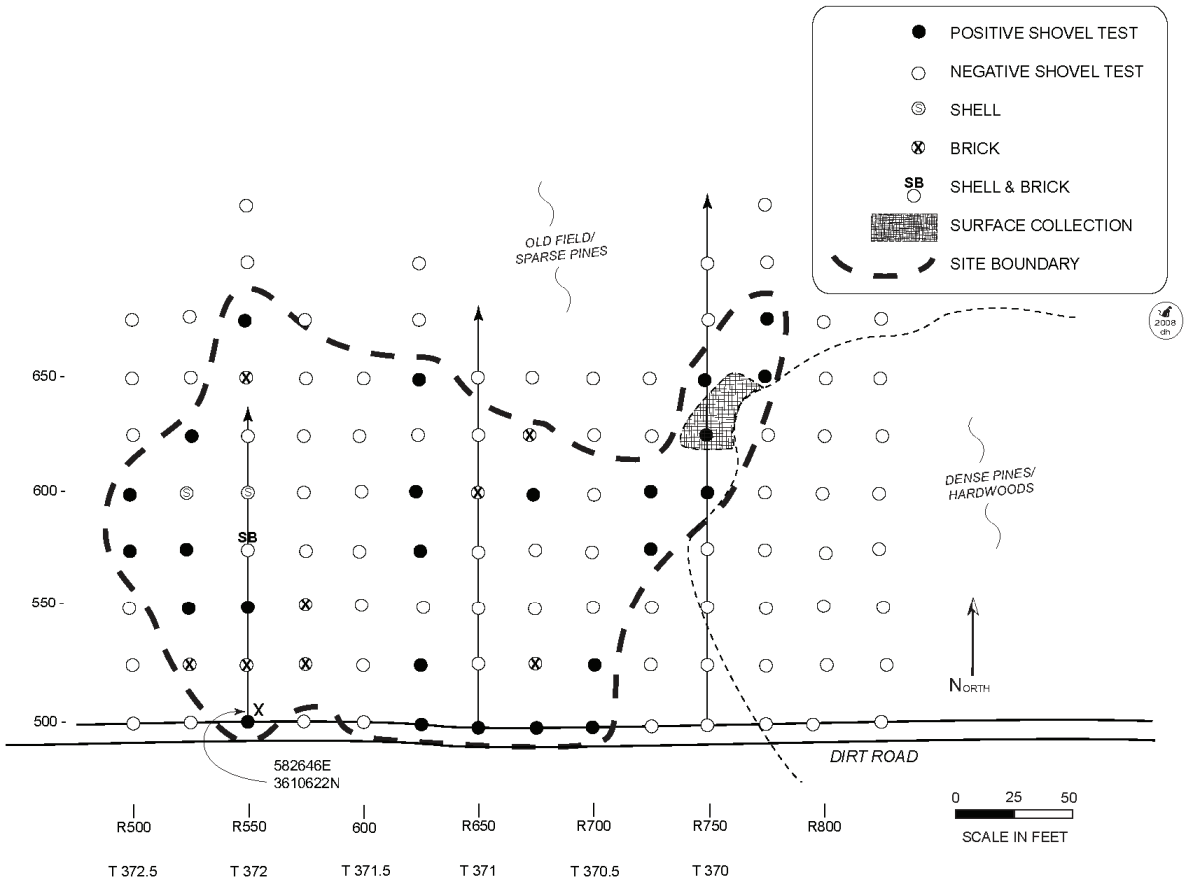


Figure 85. Sketch map of 38CH2253.

The examination of an 1879 plat for Sol. Legare shows three structures in the vicinity. While there is a record of when these structures existed, the remains do not reflect the quality needed to be able to address significant questions. The area has also been heavily cultivated, with extensive subsoiling. A second growth of pines is now covering the fallow field.

Site 38CH2253 is recommended not eligible for the National Register of Historic Places. No additional management activity is recommended pending the review and concurrence by the State Historic Preservation Office.

38CH2254

Site 38CH2254 (Figure 86) is a sparse nineteenth to twentieth century scatter located on the interior plain of Johns Island at an elevation of about 10 feet AMSL. A central GPS UTM is 580916E 3611205N (NAD27 datum).

The site was found during shovel testing when Transect 369, Shovel Test 13 was positive producing a piece of clear glass and an unidentifiable nail fragment. Limited close interval testing was performed at 50-foot intervals with 20 shovel tests excavated in the site area. Of those tests, four were positive (20%).

Soils in the area resemble Wando loamy

Table 55.
Artifacts from 38CH2253

	574 R500	600 R500	500 R525	575 R525	625 R525	500 R550	550 R550	675 R550	500 R625	525 R625	575 R625	600 R625	650 R625	500 R650	500 R675	600 R675	500 R700	525 R700	575 R725	600 R725	600 R750	625 R750	650 R750	650 R775	675 R775	Surface Collection	Subtotal	Total
Kitchen Group																												**33**
White porcelain, stripe																										2	**2**	
White porelain, undec.																										5	**5**	
Pearlware, undec.																					1						**1**	
Glass, milk																						1	1			5	**7**	
Glass, clear					1					1			1	1			1	1	1	1	3			1	2	4	**18**	
Architecture Group																												**6**
Window glass																1											**1**	
Nail, fragment						1			4																		**5**	
Activities Group																												**2**
Iron, UID								1							1												**2**	
Prehistoric Group																												**11**
Sherd, small	1	1	1	4			1					1	1			1											**11**	
Subtotal	**1**	**1**	**1**	**4**	**1**	**1**	**1**	**1**	**4**	**1**	**0**	**1**	**2**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**4**	**1**	**1**	**1**	**2**	**16**	**52**	
TOTAL																												**52**

undec. : undecorated

fine sand. This Series has an Ap horizon of dark brown (10YR4/3) loamy fine sand to 0.7 foot in depth over a brown (7.5YR5/4) loamy fine sand.

The site produced a total of seven artifacts: three clear glass, one brown glass, one wire nail, one unidentifiable nail, and one piece of asbestos siding. Wire nails were common after c. 1880 (Howard 1989:55). Asbestos was first used in the late nineteenth century in houses, although it was used into the 1970s. The glass is not diagnostic. An 1884 plat shows two structures in the vicinity. The site area covers about 100 feet north-south by 200 feet east-west.

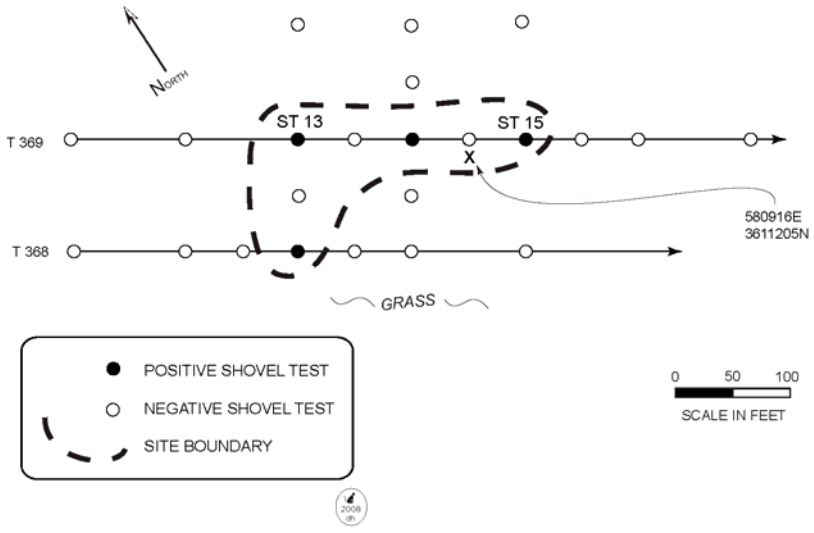


Figure 86. Sketch map of 38CH2254.

The site area, although grassed at the time of the survey, has been heavily cultivated for years. Very few remains were found and no diagnostic artifacts, such as ceramics, were recovered. It is unlikely that remains would be able to address significant research questions about turn-of-the-century tenancy in the Low Country.

Site 38CH2254 is recommended not eligible for the National Register of Historic Places. No additional management activity is recommended pending the review and concurrence of the State Historic Preservation Office.

Architectural and Other Historic Resources

The previously identified historic structures were revisited and reevaluated by the current survey. The structures originally determined not eligible through by Fick and her colleagues (1989, 1992) are still thought to be not eligible. The project development tract may be visible from the Lee Glover House (1471), but this structure has been found not eligible by the State Historic Preservation Office.

The Bass Pond archaeological site on Kiawah has been subjected to data recovery and is no longer an issue of consideration. In addition, the Mullet Hall tract will have a vegetative barrier along the river, reducing or eliminating visual intrusion. The remaining eligible structure, 1468,

Mt. Hebron Presbyterian Church, is situated at such a distance that the development tract will not be visible. In addition, construction in this area of Johns Island has been ongoing since the historic surveys and there has already been a significant change in the visual integrity surrounding these structures. We do not believe that the Mullet Hall tract will have any significant affect on the property.

One structure is situated on the Mullet Hall tract (Figure 87) built by Julian S. Limehouse ca. 1940. Since that time it has been extensively mofidied (ca. 1960 and 1980). Neither the interior nor exterior retain any integrity and this structure is recommended not eligible for inclusion on the National Register.

Figure 87. View of the structure located on the Mullet Hall property.

CONCLUSIONS

Resource Management

This study involved the examination of a tract of approximately 1,427 acres on Johns Island in Charleston County to be used for single family homes. This work, conducted for Mr. Kevin O'Neill of Kiawah River Plantation, LP examined archaeological sites and cultural resources found in the proposed project area and is intended to assist the company in complying with their historic preservation responsibilities.

Table 56.
Sites Identified on the Mullet Hall Property

Site Number	Description	Size (in feet)	Central UTM[1] Easting	Central UTM[1] Northing	Soil	Eligibility
38CH487	18th-19th c. scatter	900 x 600	582408	3610894	Seabrook	E
38CH1539	19th c. scatter	50 x 10	582480	3609560	Kiawah	NE
38CH1540	18th-19th c. plantation complex	2,400 x 950	583972	3610963	Seabrook	E
38CH1541	18th-20th c. domestic	700 x 900	581720	3610682	Seabrook	E
38CH1542	19th-20th c. settlement	1,200 x 500	581841	3610310	Seabrook	E
38CH1543	18th-19th c. scatter	300 x 300	581842	3610534	Seabrook	PE
38CH1545	prehistoric/20th c. scatter	350 X 200	582743	3609623	Kiawah	PE
38CH1546	prehistoric/18th-19th c. scatter	200 x 250	582671	3609837	Seabrook	NE
38CH1547	prehistoric/18th-19th c. scatter	650 x 450	582686	3610045	Kiawah	PE
38CH1548	19th-20th c. cemetery	200 x 200[2]	581509	3610818	Kiawah	PE
38CH1549	cemetery	250 x 250[2]	582734	3610249	Wando	PE
38CH2240	prehistoric scatter	150 x 200	584231	3610883	Seabrook	NE
38CH2241	19th-20th c. scatter	150 x 200	582369	3609721	Kiawah	NE
38CH2242	prehistoric/18th c. settlement	400 x 300	582376	3610096	Wando	PE
38CH2243	prehistoric/18th-19th c. scatter	1,850 x 400	583003	3609935	Seabrook	NE
38CH2244	prehistoric/18th-20th c. scatter	500 x 250	582663	3610209	Wando	PE
38CH2245	19th-20th c. scatter	150 x 150	583345	3610070	Seabrook	NE
38CH2246	prehistoric scatter	150 x 50	583482	3610108	Seabrook	NE
38CH2247	Middle Woodland scatter	50 x 50	583702	3610141	Seabrook	NE
38CH2248	Early 19th c. scatter	150 x 100	584432	3610336	Seabrook	E
38CH2249	prehistoric scatter	500 x 200	582899	3610344	Wando	NE
38CH2250	prehistoric/18th c. scatter	1,000 x 550	583944	3610691	Seabrook	PE
38CH2251	20th c. trash dump	200 x 200	582704	3610444	Wando	NE
38CH2252	18th-20th c. possible overseer	450 x 250	580877	3610417	Yonges	PE
38CH2253	prehistoric/19th c. scatter	550 x 350	582682	3610696	Seabrook	NE
38CH2254	19th-20th c. scatter	100 x 200	580916	3611205	Wando	NE

[1] Zone 17, NAD27 datum

[2] Includes buffer as discussed

As a result of this investigation, 26 sites were assessed on the property (Table 56). A total of five sites (38CH487, 38CH1540, 38CH1541, 38CH1542, and 38CH2248) are recommended eligible for the National Register. Fourteen sites (38CH1539, 38CH1546, 38CH2240-2241, 38CH2243, 38CH2245-2247, 38CH2249, 38CH2251, 38CH2253-2254) are recommended not eligible.

Additional testing should be performed at 38CH1543, 38CH1545, 38CH1547-1549, 38CH2242, 38CH2244, 38CH2250, and 38CH2252) to determine eligibility for the National Register of Historic Places. The two cemeteries, 38CH1548 and 38CH1549, will not be developed, but are nevertheless recommended potentially eligible for the National Register. For 38CH1548 we recommend the SHPO minimum buffer of 25 feet, while for the less well defined 38CH1549 we recommend expanding that buffer to 50 feet. Both sites should have construction fences erected for their protection during all phases of construction activity. The third cemetery is part of site 38CH1540, which is recommended eligible for its historic resources. The boundary for the cemetery at this site should be established based on the woods line as observed in the 1948 aerial photograph with a 50 foot buffer.

Kiawah River Plantation, LP may wish to improve the appearance of these cemeteries, helping to make them more attractive amenities. This can be accomplished *by hand removal* of all trees 5-inches and less in diameter (dbh) (we understand that Charleston County's tree ordinance identifies protected trees as 8-inches or greater dbh and grand trees as 24-inches or greater dbh except for pines). The remaining trees should be pruned for crown cleaning and overall restoration. We

recommend a tree inspection by an ISA certified arborist, who may recommend further thinning for the overall health of the cemetery tract. Brush and scrub may also be removed once evaluated for evidence of intentional plantings.

Upon review and concurrence by the State Historic Preservation Office, eligible and potentially eligible archaeological resources may be either green spaced (preserved in place) or subjected to additional investigation (data recovery in the case of eligible sites or additional testing in the case of potentially eligible sites). With additional testing the potentially eligible sites may be assessed as either eligible or not eligible. For the potentially eligible sites we have generally recommended the level of additional investigation we feel is likely to resolve the issue of site significance and integrity.

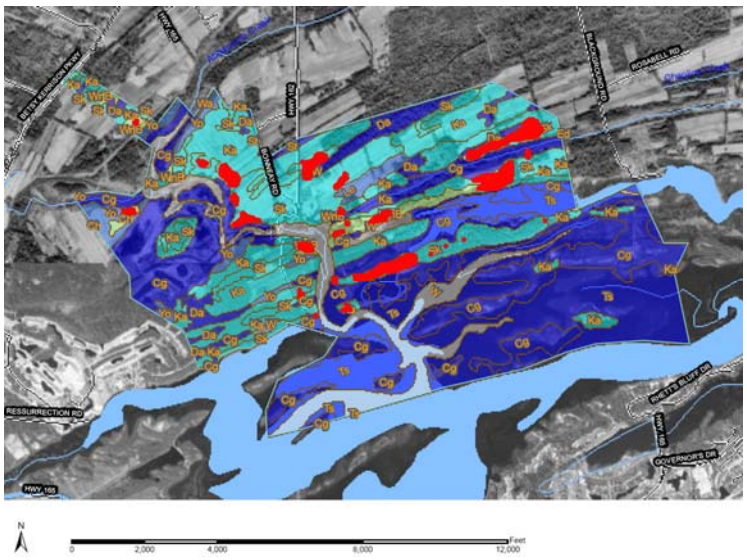


Figure 88. Identification of site locations on the Mullet Hall soil drainage map.

A survey of public roads within 0.5 mile Confirmed the findings of the 1992 county-wide survey (Fick 1992) and the 1989 James and Johns islands survey (Fick et al. 1989). No structures were found in the project area. The eligible structures and NRHP site cannot be seen from the current project area.

It is possible that archaeological remains may be encountered during construction activities. As always, contractors should be advised to report any discoveries of concentrations of artifacts (such as bottles, ceramics, or projectile points) or brick rubble to the project engineer, who should in turn report the material to the State Historic Preservation Office, or Chicora Foundation (the process of dealing with late discoveries is discussed in 36CFR800.13(b)(3)). No further land altering activities should take place in the vicinity of these discoveries until they have been examined by an archaeologist and, if necessary, have been processed according to 36CFR800.13(b)(3).

Site Locations

Table 56 provides information on the soils associated with each of the identified Mullet Hall sites. The reader may recall that the study tract consisted of 11 soil series (see Figure 6), although sites have been found in only four of these series. In fact, 14 of the 26 sites (54%) are found on Seakbrook soils. This series accounts for only 16% of the study area. An additional six sites (23%) are found on Wando soils – and this series accounts for just over 2% of the tract's soils. The Kiawah soils – which comprise 16% of the Mullet Hall soils – have five sites (19%). Thus 96% of the sites are found on 34.3% of the soils.

The Kiawah and Seabrook series – accounting for 32.1% of the soils – are both classified as somewhat poorly drained. In fact, to make them productive these soils today are typically drained. In spite of this, 19 of the sites (73%) are found on these soils.

Poorly or very poorly drained soils – such as Stono, Leon, and Dawhoo-Rutlege – did not produce sites.

These findings are not entirely startling. The most recent effort at modeling site locations

(Cable and Reed 1996) correlates site density with well-drained soils in close proximity to streams or other hydrologic features (such as interior swamps or salt marsh) or to areas of increased soil patch diversity. This is, of course, a simple refinement of the long-held understanding that sites will be found close to water sources. Unfortunately, the model provides little assistance in a setting such as Johns Island since the ridge and trough topography provides numerous areas meeting these criteria. Even a cursory examination of Figure 88 reveals that there are many more areas where sites might be found than there are actual soil locations. More significantly, the model does not actually eliminate any of the tracts nearly 1,500 acres. Thus, while the model is certainly accurate, it would provide a very large number of false positives – that is, it would predict that a number of areas have a high probability for site locations when no sites are present.

In addition, the Mullet Hall study reveals a surprising range in site density on Johns Island. This particular survey yields a density of one site every 57 acres. Three surrounding surveys yield extremely variable densities – one site every 55 acres for the Orange Hill tract, one site for every 64 acres at the Briars Creek tract, and one site every 417 acres for the Anchorage Plantation tract. Whether these data reflect actual variations in density or variations in the thoroughness or effectiveness of survey effort is not certain.

Historic Research

If site modeling is thus far not particularly useful in a setting such as Johns Island, certainly detailed historical research may be (although we acknowledge that it can only provide information on historic settlement). For Mullet Hall, detailed examination of maps and plats produced 19 separate potential site locations. Using Figure 38, each will be briefly discussed, starting in the northwest corner of the tract with "Bldgs. 1884" and moving clockwise.

Bldgs. 1884

Two structures are shown on a February 1884 plat of Rose Bank, which belonged to F.Y. Legare. These structures were identified in the field and given the site number 38CH2254.

Commissary

There were no maps identifying the commissary – its location is based on oral history. Early business directories (e.g., 1890 and 1905) list the F.Y. Legare general store on Mullet Hall. The site is found within 38CH487.

Tenants 1919

The 1919 Wadmalaw 15' topographic map shows a series of eight tenant structures along the north side of a road, running approximately northeast. This area was recorded as 38CH487, although this tenant assemblage blurs with other materials.

Slave Row ca. 1850-1865

Two maps, ca. 1850-1865, show a series of eight structures running approximately northeast from Mullet Hall Road. They have been identified as 38CH487. It seems likely that these structures survived the Civil War and continued to be used by tenants in the postbellum.

Sol. Legare Settlement ca 1850-1865

Two maps, ca. 1850-1865, show the location of Solomon Legare's antebellum settlement, situated in the vicinity of the junction of four roads in the center of the Mullet Hall property. It is our assessment that this site is slightly misplaced on the historic maps and should be further north, part of 38CH487.

Oaks 1816, 1850-1865

The Oaks main house, which belonged to Roper, is shown in the approximate location of 38CH1540.

Tenants 1919

Plotting of these five structures places them north of 38CH1540. Our survey efforts, however, suggest the tenant occupation is actually included within 38CH1540, suggesting some inaccuracy in the topographic map.

Slave Row 1850-1865

The slave row is part of the Oaks Plantation and was identified as the eastern end of 38CH1540.

Bldg. 1816

This structure is shown on an 1816 plat of Benjamin Roper's lands and was identified in this location as 38CH2248.

Graveyard 1933

A cemetery was identified by USGS surveyors placed the Mullet Hall control datum. Their location is identical to the cemetery identified as 38CH1549. Perhaps the most interesting aspect of this discovery is that few archaeologists take advantage of the USGS Horizontal Control Notes, which provide excellent data dating into the first quarter of the twentieth century.

Cotton Hs. 1850-1865

Solomon Legare's cotton house was apparently used as a back sight for survey work preparing the antebellum maps. It appears to be at the site identified as 38CH1547.

Bldg. 1919

Two structures are shown on the 1919 Wadmalaw topographic map. They were identified as 38CH2241, although cultivation has blurred the remains and two distinct loci cannot be identified based on survey work.

Bldg. 1879

A series of three structures are shown on an 1879 plat of Solomon Legare's tract. We mislocated the site based on overlays, but once in the field the road network is still extant and the site was identified as 38CH2253.

Bldg. 1860

This building was one of the only structures not identified in the field. The location of the structure according to an 1860 map is on the southern portion of the property, adjacent to the marshes of Haulover Creek and Kiawah River. Shovel testing failed to produce any remains in this area. We believe the structure has been destroyed by the creation of a pond in this area.

Slave Rows 1850-1865

These structures were found and recorded as 38CH1542.

James Legare Settlement ca. 1850-1865

This settlement was found and recorded as 38CH1541, although the location appears to be slightly further north than projected.

Bldgs. 1919

The two buildings identified on the 1919 Wadmalaw topographic map were identified as 38CH2252.

Mullet ca. 1794

The 1794 Mullet plat shows a single settlement symbol at the location identified as 38CH1543.

All but one of the 18 projected historic sites were identified in the field investigations – reflecting 95% accuracy. The failure to identify the one structure is likely associated with its destruction by a modern pond. Granted, we did find inaccuracies of up to 1,000 feet – and this may

be either a map error or a failure on the part of our location efforts – although most locations were very accurate.

Thus, for the identification of historic sites, we believe the use of historic research is far more likely to yield accurate predictive modeling than anything else readily available. There is considerable value in the time and effort placed in historic research. Conversely, when little effort is expended on historic research, we believe that it becomes not only far more difficult to identify properties that should be present, but to also accurately and effectively assess their significance.

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Archaeological Investigations

Historical Research

Preservation

Education

Interpretation

Heritage Marketing

Museum Support Programs

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MEMORANDUM OF AGREEMENT
Among
South Carolina Department of Health and Environmental Control,
South Carolina State Historic Preservation Office,
Kiawah River Plantation LP
For
38CH487, 1539-1549, 2240-2254
Charleston County, South Carolina

Whereas, the South Carolina Department of Health and Environmental Control's Office of Ocean and Coastal Resource Management ("Department") has the responsibility to certify that all projects requiring State or Federal permits in the Coastal Zone of South Carolina are consistent with the Coastal Zone Management Program; and

Whereas, the State Historic Preservation Officer ("SHPO"), as the State official with recognized expertise in historical and archaeological matters, assists the Department in determining potential impacts on sites which are potentially eligible for, eligible for, or currently listed in the National Register of Historic Places (NRHP) ("historic properties"); and

Whereas, such sites are defined as Geographic Areas of Particular Concern ("GAPCs") by the Coastal Zone Management Program and must be given special consideration; and

Whereas, Kiawah River Plantation, LP is the owner of real property in Charleston County, S.C. ("Owner") and proposes to develop the tract with single family homes and associated infrastructure at and on the project site as further described in the Coastal Zone Consistency Certification associated with Department NPDES General Permit for Stormwater Discharges from Large and Small Construction Activities (NPDES CGP) Coverage No. 2003-1N-043-P; and

Whereas, upon consultation with the SHPO, the Department has determined that the Development will adversely affect the historic properties/GAPCs designated as 38CH487, 1539-1549, 2240-2254 and whose defining qualities are described in Exhibit A. The site locations are shown on the attached map (Exhibit B);

Now, therefore, the Owner of the project area associated with Department NPDES CGP Coverage No. 2003-1N-043-P, SHPO, and the Department under the direction of the Department's Coastal Zone Management Program, agree that the proposed project, if constructed, shall be

undertaken in accordance with the following provisions in order to minimize and mitigate adverse effects of the proposed development on the GAPCs.

Applicability

1. This Memorandum of Agreement (MOA) shall become void if Department NPDES CGP Coverage No. 2003-1N-043-P is not issued or if Department NPDES CGP Coverage No. 2003-1N-043-P expires and no work is initiated prior to the expiration.

2. The Department will incorporate the requirements of this MOA as conditions of the certification of the project under the Coastal Zone Management Program and will monitor the progress of the stipulated tasks. Failure to comply may result in the Department referring the noncompliance to appropriate enforcement staff.

General Management of Development

1. The Owner shall allow representatives from the SHPO and the Department to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of this MOA.

2. Prior to any construction activities the Developer shall ensure that:

    a. Each GAPC, including a buffer of 50 feet, is cordoned off in the field with orange tree-save fencing, or a similar highly visible barrier;
    b. A licensed surveyor has surveyed all GAPCs and identified buffers of 50 feet; and
    c. All surveyed GAPCs are marked on construction and maintenance plans with treatment notes and this MOA referenced.

3. All GAPCs within the Development will be evaluated, mitigated, and/or preserved as described herein.

4. Prior to Owner initiating work under Department NPDES CGP Coverage No. 2003-1N-043-P, if authorized, Owner must record a restrictive covenant for protection of the GAPCs, which will remain in effect until such time as the individual GAPC or portion of a GAPC may be released after testing or data recovery. Exhibit C shall be used as a template for the restrictive covenants, which will reference this MOA and grant enforcement rights to the Department. The term Owner shall include Kiawah River Plantation LP and all successors, heirs, and assigns associated with this permit or the property subject to this permit. The Department and SHPO shall review and approve of the restrictive covenant prior to Owner recording it. Owner shall provide a copy of the recorded restrictive covenant to the Department and SHPO prior to initiating work.

Evaluation

1. Known GAPCs may need further investigation to determine NRHP eligibility as described below. Late-discovered sites may similarly be investigated to determine NRHP eligibility status.

2. If additional investigations result in a determination by the SHPO and the Department that one or more of the GAPCs are not eligible for the NRHP, those sites will no longer be considered GAPCs and the permit and restrictive covenants conditions as to those specific GAPCs can be modified to remove those sites from protection. Covenant modification will be done in consultation with Department and SHPO.

3. If Phase II archaeological testing investigations indicate that significant deposits are present, indicating NRHP eligibility, the GAPC will be preserved or mitigated through data recovery as described herein.

Mitigation

Archaeological

1. If a resource is determined to be eligible for the NRHP by the SHPO, the significant sections of the resource (as determined through testing) that will be impacted by development will be mitigated through data recovery and a public information component. The Owner's archaeological consultant will submit research designs and data recovery plans to the SHPO and the Department for review. The Department and SHPO will make a reasonable effort to review and comment on the plans no later than thirty (30) calendar days after their receipt. Following approval of the plans, data recovery investigations will be initiated.

2. For each GAPC mitigated through data recovery, a detailed Management Summary and draft public information plan will be prepared by the Owner's archaeological consultant and submitted to the SHPO and the Department for review and approval within thirty (30) calendar days of the last day of fieldwork. The Management Summary will include a discussion of the research methods, field investigations, and data recovery results consistent with the requirements of *South Carolina Standards and Guidelines for Archaeological Investigations* (2005). Upon review and approval of the Management Summary by the SHPO and the Department, the Owner may proceed with its development plans.

3. A minimum of one copy of the draft technical report of data recovery investigations and final public information plans will be prepared by the Owner's archaeological consultant and submitted to the SHPO for review and approval within one (1) year from the last day of fieldwork. The SHPO reserves the right to submit the draft technical report to qualified

professional archaeologists for the purpose of peer review. If the SHPO elects to utilize this option, the Owner's archaeological consultant will be advised and additional report copies may be requested. If revisions of the draft report are recommended, the Owner is responsible for ensuring that these are addressed.

4. Within three (3) months of draft report approval, the Owner shall provide, or have his consultant provide, one bound copy and one compact disk containing a Portable Document Format (PDF) file of the final technical report for the SHPO, and two bound copies, one unbound copy, and one PDF copy of the final technical report for the South Carolina Institute of Archaeology and Anthropology, all submitted to SHPO. Additionally, please provide to the SHPO a separate digital Abstract document in Word or html format (not PDF). This Abstract file can be included on the same CD as the PDF file.

5. The public information component also will be completed by the time the final report is submitted unless a completion date is otherwise negotiated at the time of draft report submittal. The Owner will provide, at a minimum, one PDF or HTML copy of the public information component to the SHPO, as appropriate. The PDF shall be the smallest appropriate size for on-line viewing and distribution over the Internet. It will be downloadable and printable and may be used for posting on the SHPO website, or another agreed-upon website. To facilitate posting and to comply with Section 508 of the Americans with Disabilities Act, please apply the guidance for "Creating Accessible PDF Documents with Adobe Acrobat" at the following link: http://www.adobe.com/accessibility/index.html. The accessible PDF should include an alternative text description for all figures.

6. The Owner shall ensure that all artifacts recovered during archaeological investigations are stabilized and processed for curation at a repository meeting professional curation standards as established in 36 CFR Part 79. Copies of all records, including but not limited to field notes, maps, catalogue sheets, and representative photographs and negatives shall be submitted for curation with the artifacts. The Owner by approval of this MOA releases to the curatorial facility any claim of ownership of all collections and field records. Documentation that the repository has received and accepted these materials will be supplied to the SHPO and the Department.

Document Guidelines and Standards

All plans and reports developed for the evaluation or mitigation of a GAPC shall incorporate guidance provided by the Secretary of Interior's *Standards and Guidelines for Archeological Documentation* (48 FR 44734-37), the President's Advisory Council on Historic Preservation publication *Treatment of Archeological Properties* (ACHP 1980), and the Secretary of the Interior's *Standards and Guidelines for Historical Documentation* and the *Standards for Architectural and Engineering Documentation*. In addition, these plans and reports will be consistent with the *South Carolina Standards and Guidelines for Archaeological Investigations* (2005). Plans may be implemented only after approval by the SHPO and the Department.

Preservation

1. For archaeological sites being preserved, unless otherwise indicated under Treatment of Specific GAPCs, no construction, alteration, demolition, disturbance of the ground surface, or other action shall be undertaken or permitted to be undertaken that would materially affect the integrity or appearance of the attributes of the archaeological site without the prior written permission of the SHPO and Department.

2. Portions of an archaeological site may be thinned by hand. Extensive clearing is prohibited unless specified in individual site treatment plans. If timber maintenance activities (such as burning, removal or trimming of dead, diseased, or damaged trees, and the plowing of existing firebreaks) are needed, they will be conducted by hand or with the use of rubber tired machinery IN DRY CONDITIONS ONLY. Stumps may be ground or shredded level with the existing ground surface but not extracted. In all instances, equipment operators will be advised by the Owner of the need to prevent disturbances to buried deposits within the site.

3. Within the GAPC boundaries, the removal of stumps, alteration of the ground surface, installation of utility lines, and the planting of trees and shrubs are prohibited without the prior written permission of the SHPO and Department.

Late Discoveries

If unanticipated cultural materials (*e.g.*, large, intact artifacts or animal bones; large clusters of artifacts or animal bones; large soil stains or patterns of soil stains; buried brick or stone structures; clusters of brick or stone) or human skeletal remains are discovered on the Development site prior to or during land altering or construction activities, then the Owner will temporarily halt any activities and immediately notify the Department and the SHPO of the late discoveries.

A minimum 50-foot buffer shall be immediately established around the cultural materials by the construction project manager. The buffer will be flagged by appropriate personnel. All project personnel will be notified by the Owner that no land altering activities will be allowed within this buffer zone until the course of action hereinafter described has been established. The halt will afford the Department and the SHPO the opportunity to assess the situation and recommend a course of action within two (2) business days of such notification.

If unanticipated cultural materials or human skeletal remains are discovered within a GAPC during data recovery investigations, the Owner or the Owner's archaeological consultant will consult with the SHPO and the Department to determine whether additional excavations or investigations are needed.

If human remains are found or suspected, they should be left in place and protected until appropriate consultation is completed. The Owner is responsible for notifying the SHPO, the Department, the local coroner or medical examiner, and interested parties, such as Native American tribes, of the find to initiate consultation. Please note that human remains and burial grounds are subject to South Carolina law that addresses abandoned cemeteries and burials, including but not limited to S.C. Code Ann. §§ 27-43-10 to -30; 16-16-600; and 61-19-28 to -29.

Dispute Resolution

As between the Department and SHPO, they shall attempt informal resolution of any disagreement arising from the implementation of this MOA for a period of sixty days. However, this does not constrain any enforcement action that may be appropriate against Owner.

Amendment and Modification

Any party to this MOA may request that it be amended or modified at any time, whereupon the parties will consult with each other to consider such amendment or modification. Amendment is exclusively based on the concurrence of SHPO and the Department, which shall be discretionary determinations. Amendment of this MOA may require a concurrent request to amend applicable permits and easements or restrictive covenants.

Final Project Approval

Owner shall notify the Department when Owner believes all of the above stipulations are complete. The Department and SHPO will review Owner's performance and provide written notification to Owner if the terms of this MOA are deemed complete.

Execution of MOA

This MOA may be executed in counterparts. A copy with all original executed signature pages affixed shall constitute the original MOA. The date of execution shall be the date of the signature of the last party to sign.

IN WITNESS WHEREOF, the parties hereto have caused this MOA to be executed by their duly authorized representatives as of the last date signed.

South Carolina Department of Health and Environmental Control
Office of Ocean and Coastal Resource Management

By:_____ _____, 2008

_____(Name)

_____(Title)

South Carolina State Historic Preservation Office

By:_____ _____, 2008

_____(Name)

_____(Title)

Kiawah River Plantation, LP

By:_____ _____, 2007

_____(Name)

_____(Title)

EXHIBIT A

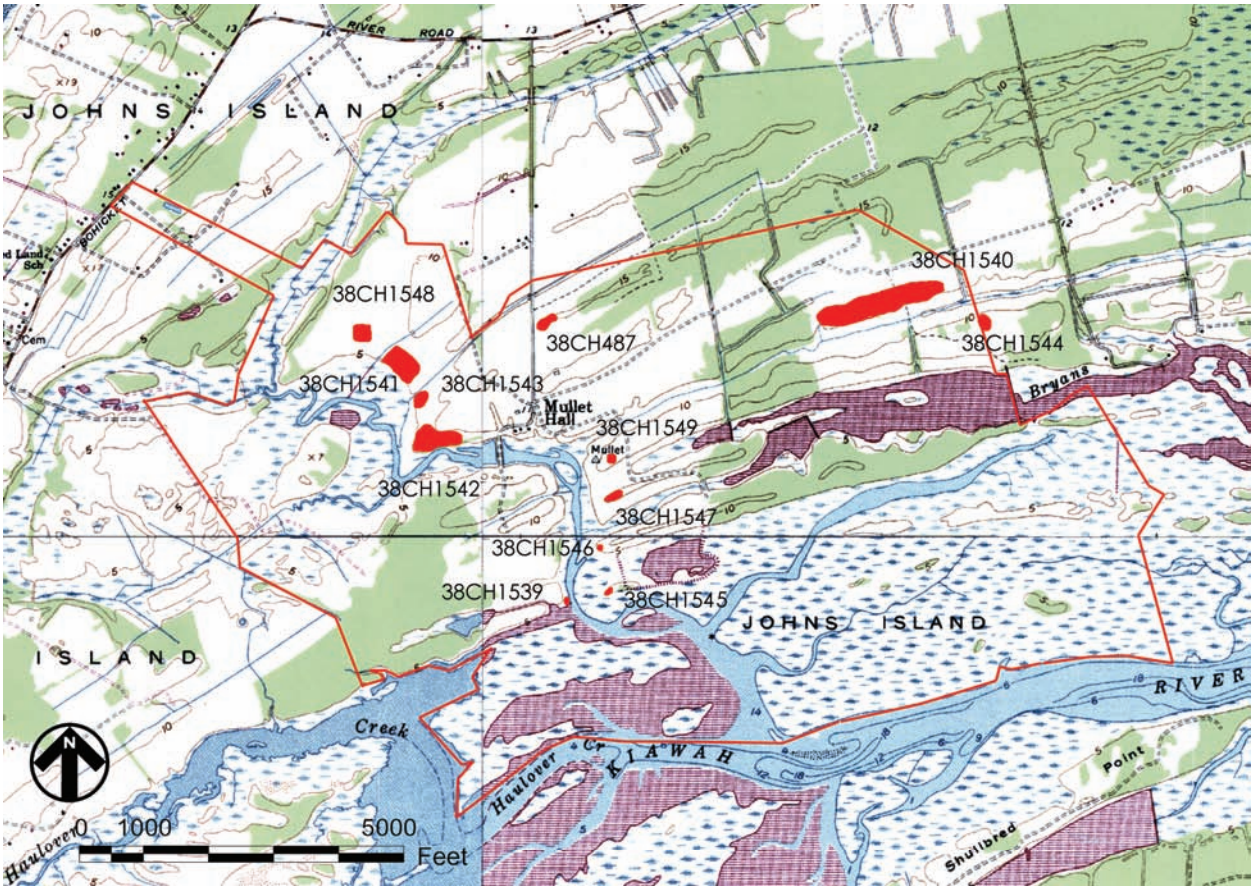
Table 56.
Sites Identified on the Mullet Hall Property

Site Number	Description	Size (in feet)	Central UTM[1] Easting	Central UTM[1] Northing	Soil	Eligibility
38CH487	18th-19th c. scatter	900 x 600	582408	3610894	Seabrook	E
38CH1539	19th c. scatter	50 x 10	582480	3609560	Kiawah	NE
38CH1540	18th-19th c. plantation complex	2,400 x 950	583972	3610963	Seabrook	E
38CH1541	18th-20th c. domestic	700 x 900	581720	3610682	Seabrook	E
38CH1542	19th-20th c. settlement	1,200 x 500	581841	3610310	Seabrook	E
38CH1543	18th-19th c. scatter	300 x 300	581842	3610534	Seabrook	PE
38CH1545	prehistoric/20th c. scatter	350 X 200	582743	3609623	Kiawah	PE
38CH1546	prehistoric/18th-19th c. scatter	200 x 250	582671	3609837	Seabrook	NE
38CH1547	prehistoric/18th-19th c. scatter	650 x 450	582686	3610045	Kiawah	PE
38CH1548	19th-20th c. cemetery	200 x 200[2]	581509	3610818	Kiawah	PE
38CH1549	cemetery	250 x 250[2]	582734	3610249	Wando	PE
38CH2240	prehistoric scatter	150 x 200	584231	3610883	Seabrook	NE
38CH2241	19th-20th c. scatter	150 x 200	582369	3609721	Kiawah	NE
38CH2242	prehistoric/18th c. settlement	400 x 300	582376	3610096	Wando	PE
38CH2243	prehistoric/18th-19th c. scatter	1,850 x 400	583003	3609935	Seabrook	NE
38CH2244	prehistoric/18th-20th c. scatter	500 x 250	582663	3610209	Wando	PE
38CH2245	19th-20th c. scatter	150 x 150	583345	3610070	Seabrook	NE
38CH2246	prehistoric scatter	150 x 50	583482	3610108	Seabrook	NE
38CH2247	Middle Woodland scatter	50 x 50	583702	3610141	Seabrook	NE
38CH2248	Early 19th c. scatter	150 x 100	584432	3610336	Seabrook	E
38CH2249	prehistoric scatter	500 x 200	582899	3610344	Wando	NE
38CH2250	prehistoric/18th c. scatter	1,000 x 550	583944	3610691	Seabrook	PE
38CH2251	20th c. trash dump	200 x 200	582704	3610444	Wando	NE
38CH2252	18th-20th c. possible overseer	450 x 250	580877	3610417	Yonges	PE
38CH2253	prehistoric/19th c. scatter	550 x 350	582682	3610696	Seabrook	NE
38CH2254	19th-20th c. scatter	100 x 200	580916	3611205	Wando	NE

[1] Zone 17, NAD27 datum

[2] Includes buffer as discussed

EXHIBIT B



IDENTIFIED ARCHAEOLOGICAL SITES

EXHIBIT C

STATE OF SOUTH CAROLINA)
)
COUNTY OF _____)

DECLARATION OF COVENANTS AND RESTRICTIONS

THIS DECLARATION OF COVENANTS AND RESTRICTIONS is made and entered into this _____ day of _____ 20___, by Kiawah River Plantation, LP ("Declarant").

RECITALS

WHEREAS, Declarant is the owner of certain real property in Charleston County, South Carolina, more particularly described in Exhibit A {**legal description and/or plat or reference to recorded plat}** attached hereto and incorporated herein by reference ("Property"); and

WHEREAS, the Property is also currently identified by tax map parcel number _____; and

WHEREAS, Declarant desires to obtain from or enjoy the benefit of a {**permit/authorization type}** which requires the South Carolina Department of Health and Environmental Control's Office of Ocean and Coastal Resource Management, including any successor agency, (Department) to determine whether the proposed activity is consistent with the Coastal Zone Management Program; and

WHEREAS, the State Historic Preservation Officer ("SHPO"), as the State official with recognized expertise in historical and archaeological matters, assists the Department in determining potential impacts on sites which are eligible for, potentially eligible for, or currently listed in the National Register of Historic Places; and

WHEREAS, such sites are defined as Geographic Areas of Particular Concern ("GAPCs") by the Coastal Zone Management Program and must be given special consideration; and

WHEREAS, upon consultation with the SHPO, the Department has determined that activities proposed for the Property will adversely affect significant historical and cultural resources present on the Property, as expressed more fully in the attached Memorandum of Agreement (Exhibit B), which was executed between the SHPO, the Department, and Declarant on **{MOA date of execution}** and is incorporated herein by reference; and

WHEREAS, the Department requires as a condition to the consistency determination associated with **{permit number} - {applicant / project name}**, authorizing **{brief project description}**, that Declarant properly record this Declaration of Covenants and Restrictions for the Property.

NOW, THEREFORE, IT IS AGREED, that Declarant hereby declares and covenants that the Property described in Exhibit A shall be held, mortgaged, transferred, sold, conveyed, leased, occupied, and used subject to the following restrictions, which shall touch and concern and run with the title to the Property and be binding on all heirs, successors, assigns, lessees, or other occupiers and users (all included in the term Declarant below).

1. **Restrictions**. Declarant shall hold and manage the Property as explained in the attached MOA. Accordingly, no construction, alteration, demolition, or disturbance, or other actions shall be taken or permitted on the Property that would materially and negatively affect the integrity of the designated GAPCs (including any buffer, if designated) without prior written authorization from the Department.

2. **Amendment**. After recording, these restrictive covenants may only be amended by a recorded document signed by the Department and Declarant. Any request by Declarant to amend these restrictive covenants shall be submitted in writing to the Department. Amendment of these restrictive covenants shall be at the discretion of the Department.

3. **Notice**. Declarant shall include the following notice on all deeds, mortgages, plats, or any other legal instruments used to convey any interest in the Property (failure to comply with this paragraph does not impair the validity or enforceability of these covenants):

   NOTICE: This Property Subject to Declaration of Covenants and Restrictions, and any subsequent amendments, Recorded in Book _____, at Page _____, in _____ County on _____.

4. **Department's Authority**. This Declaration only applies to the Property expressly identified in Exhibit A and does not impair the Department's general authorities with respect to the Property.

5. **Severability**. Should any separable part of these restrictive covenants be held contrary to law, the remainder shall continue in full force and effect.

6. **Inspection**. Declarant will allow the Department and SHPO or their respective designees, at all reasonable times and upon reasonable advance notice to Declarant, to inspect the GAPCs and buffers in order to ascertain whether Declarant is complying with the conditions of this preservation covenant.

7. **Enforcement.** Declarant grants to the Department a discretionary right to enforce these restrictive covenants in a judicial action against any person or entity violating or attempting to violate these restrictive covenants; provided, however that no violation of these restrictive covenants shall result in a forfeiture or reversion of title. In any enforcement action, the Department shall be entitled to complete restoration for any violation, as well as any other judicial remedy such as civil penalties. Failure of the Department to exercise any right or remedy granted under these restrictive covenants shall not have the effect of waiving or limiting the exercise by the Department of any other right or remedy at any other time. Nothing herein shall limit the right of the Department to act according to its regulatory authority.

IT IS FURTHER AGREED, that Declarant, by signing below, authorize the recording of this Declaration and will promptly and properly file this Declaration of Covenants and Restrictions in the _____ County Office of Register of Deeds. Afterwards, a copy of the recorded Declaration of Covenants and Restrictions shall be provided to the Department and accompanied by an opinion of an attorney, licensed to practice in South Carolina, certifying that the Declaration of Covenants and Restrictions has been properly recorded and indexed.

IN WITNESS WHEREOF, Kiawah River Plantation LP has caused this Declaration of Covenants and Restrictions to be executed as of the date first above written.

WITNESSES: Kiawah River Plantation, LP

_____ By:_____

_____ _____
(Name and Title)

STATE OF _____)
) ACKNOWLEDGEMENT
COUNTY OF _____)

I, _____ (Notary Public), do hereby certify that, _____, an authorized representative of the Kiawah River Plantation, LP, personally appeared before me this day and acknowledged the due execution of the foregoing instrument, on behalf of the Limited Partnership.

Witness my hand and official seal this _____ day of _____, 20__.

_____

Notary Public for _____

My Commission Expires: _____

IN WITNESS WHEREOF, Kiawah River Plantation, LP has caused this Declaration of Covenants and Restrictions to be executed as of the date first above written.

WITNESSES:

_____ _____

_____

STATE OF _____)
) ACKNOWLEDGEMENT
COUNTY OF _____)

I, _____ (Notary Public), do hereby certify that, _____, personally appeared before me this day and acknowledged the due execution of the foregoing instrument.

Witness my hand and official seal this _____ day of _____, 20__.

_____

Notary Public for _____

My Commission Expires: _____

[FOR AMENDMENTS ONLY]

IN WITNESS WHEREOF, the Department has caused this _[First, Second, etc.]_ Amendment to Declaration of Covenants and Restrictions to be executed as of the date first above written.

WITNESSES:

South Carolina Department of Health
and Environmental Control

By:

_____

Carolyn R. Boltin, Deputy Commissioner
South Carolina Department of
Health and Environmental Control

_____

_____

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON)

ACKNOWLEDGEMENT

I, _____ (Notary Public), do hereby certify that Carolyn R. Boltin, Deputy Commissioner of the South Carolina Department of Health and Environmental Control, personally appeared before me this day and acknowledged the due execution of the foregoing instrument.

Witness my hand and official seal this _____ day of _____, 20__.

_____
Notary Public for South Carolina
My Commission Expires: _____

NEWKIRK
ENVIRONMENTAL, INC
CHARLESTON, SC • BLUFFTON, SC

21 May 2009

Mr. Kevin O'Neill, Vice President
Beach Development
211 King Street, Suite 300
Charleston, SC 29401

RE: Update to Threatened and Endangered Species Assessment
For Kiawah River Plantation
Charleston County, South Carolina

Dear Mr. O'Neill,

In May of 2008, Newkirk Environmental, Inc. (NEI) prepared a report of findings for comprehensive surveys and assessments of Kiawah River Plantation with regards to federally threatened and endangered species. The conclusion of the report stipulates that should significant time (i.e. the passing of annual breeding or migratory seasons) lapse between issuance of the report and development of the property or any other type of legal reliance, it is recommended that an update of the report be completed. In order to satisfy this stipulation, NEI has revisited the site, interviewed the current land manager, solicited comments from SCDNR, and searched the South Carolina Heritage Trust Database.

A site visit was performed by NEI on 15 May 2009. During the visit, it was discovered that there had been no significant change to the habitat types on site. Also, it was observed that work approved by an OCRM permit issued in 2008 had been completed in the on site impoundments. With regards to the on-site eagles, this work was completed in accordance with suggestions made by agents of SCDNR, USFWS and in accordance with the current Habitat Management Guidelines for the Bald Eagle in the Southeast Region.

A telephone interview with the current land manager, Mr. Jeff Snyder, was also performed on 15 May 2009. During this interview Mr. Snyder informed NEI of the active status of the two bald eagle nests on site. Mr. Snyder stated that the two nests are active and bald eagles were observed at both sites during the most recent nesting period. Mr. Snyder also stated that he has supplied this information to SCDNR and has encouraged further coordination with SCDNR and USFWS as those agencies see necessary.

During a telephone conversation with Ms. Charlotte Hope of SCDNR on 19 May 2009, Ms. Hope verified the active status of the two nest sites at Kiawah River Plantation. Ms. Hope also said that additional nest sites were not discovered during SCDNR's most recent aerial survey of the area. Ms. Hope had no further recommendations or suggestions in addition to the recommendations or comments made during coordination of the initial report in May 2008.

Post Office Box 746, Mt. Pleasant, South Carolina 29465-0746 • 1887 Clements Ferry Road, Charleston, South Carolina 29492
Telephone: (843) 388-6585 • Facsimile: (843) 388-6580

E-Mail: general@newkirkenv.com
www.newkirkenvironmental.com

Existing data from the South Carolina Heritage Trust Database was reviewed to locate recorded occurrences of threatened and/or endangered species within or near Kiawah River Plantation since the issuance of the May 2008 report. This review did not indicate any new occurrences. In addition, during the aforementioned phone conversation with Ms. Hope, Ms. Hope stated that she was not aware of any other federally listed threatened and/or endangered species that had been discovered on or near the site that had not yet been entered into the South Carolina Heritage Trust Database.

As a result of the most recent coordination detailed in this letter regarding potential threatened and/or endangered species, it is the opinion of NEI that there has been no significant change to the onsite habitat types nor is there any new information that would void the original conclusion of the May 2008 report and warrant further surveys or coordination. Therefore, NEI reaffirms its conclusions of May 2008.

Should significant time (i.e. the passing of annual breeding or migratory seasons) lapse between the issuance of this letter and development of the property or any other type of legal reliance, it is strongly recommended that an update be completed. Also, any potential findings at a later date should be fully investigated.

Please do not hesitate to contact me with any questions you may have regarding this project. At your request, a copy of this update has been sent to agents of USFWS and SCDNR.

Sincerely,

Ryan Clarey
Newkirk Environmental, Inc.
Charleston Office

Cc: Charlotte Hope, SCDNR
Melissa Bimbi, USFWS

Threatened and Endangered Species Assessment
For Kiawah River Plantation
Charleston County, South Carolina

May 2008

Prepared by:

Newkirk Environmental, Inc.
P.O. Box 746
Mt. Pleasant, SC 29465

Threatened and Endangered Species Assessment
Kiawah River Plantation
Charleston County, South Carolina
May 2008

1.0 INTRODUCTION:

The following report details methodology and an assessment of survey results for a threatened and endangered species survey completed in April of 2008 at Kiawah River Plantation located on Johns Island adjacent to the Kiawah River at the terminus of Mullet Hall Road in Charleston County, South Carolina (See Figure 1). While the date of this report reflects a completion date of April 2008, the data and evaluations represented herein were collected and completed over the last several months beginning in the winter of 2007. Conclusions are based upon all of the collected data including assessments and coordination completed within the last 30 days. This endangered species survey was conducted to determine the occurrence of, or potential for, animal and plant species federally listed as endangered or threatened to exist within the referenced site. Completion of this survey was directed by and complies with current state and federal regulations including the Federal Endangered Species Act (16 U.S.C. 1531-1543), the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c), the Migratory Bird Treaty Act (16 U.S.C. 703-712) and the South Carolina Non-Game and Endangered Species Conservation Act (58-2384).

2.0 METHODOLOGY:

The US Fish & Wildlife Service lists the following threatened and endangered species as occurring in or potentially occurring in Charleston County, South Carolina:

Common Name	Scientific Name	Federal Status
West Indian manatee*	*Trichechus manatus*	Federally Endangered
Bachman's warbler †*	*Vermivora bachmanii*	Federally Endangered
Wood stork	*Mycteria americana*	Federally Endangered
Red-cockaded woodpecker	*Picoides borealis*	Federally Endangered
Piping plover*	*Charadrius melodus*	Federally Threatened
Kemp's ridley sea turtle*	*Lepidochelys kimpii*	Federally Endangered
Leatherback sea turtle*	*Cermochelys coriacea*	Federally Endangered
Loggerhead sea turtle*	*Caretta caretta*	Federally Threatened
Green sea turtle*	*Chelonia mydas*	Federally Threatened
Flatwoods salamander	*Ambystoma cingulatum*	Federally Threatened

NEWKIRK ENVIRONMENTAL, INC

Kiawah River Plantation
Charleston County, South Carolina

Figure 1:
Location Map

Project #: 01-2535c
Date: 5/2007
Scale: NTS

NEWKIRK
ENVIRONMENTAL, INC

Kiawah River Plantation
Charleston County, South Carolina

Figure 2:
Nest Locations

Project #: 01-2535c
Date: 5/2007
Scale: NTS

Shortnose sturgeon*	*Acipenser brevirostrum*	Federally Endangered
Sea-beach amaranth *	*Amaranthus pumilus*	Federally Threatened
Canby's dropwort	*Oxypolis canbyi*	Federally Endangered
Pondberry	*Lindera melissifolia*	Federally Endangered
American chaffseed	*Schwalbea Americana*	Federally Endangered
Bald Eagle **	*Haliaeetus leucocephalus*	Protected

† Last recorded occurrence in 1988. Believed to be extinct.
** Protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c) and the Migratory Bird Treaty Act (16 U.S.C. 703-712).

Existing data from the South Carolina Department of Natural Resources (DNR) was reviewed to locate recorded occurrences of threatened and endangered species within or near the subject site. Some of the species listed as potentially occurring in Charleston County were eliminated from the survey based upon broad habitat requirements; these species has been indicated with an asterisk. The remaining species were included in the assessment.

At the time of this report, SCDNR has documented the location of a bald eagle nest near the project boundary of the referenced site. This recorded occurrence was assigned number 10 of the Legareville Quad and appeared to be close to the project boundary based on the maps of DNR's Heritage Trust Database. However, during further coordination with Charlotte Hope of DNR through March 2008 and April 2008, Mrs. Hope confirmed that the recorded bald eagle number 10 is no longer considered an active bald eagle nest. Therefore, further coordination regarding this site was deemed unnecessary.

Two additional eagle nests that have been observed and are known to exist within the boundary of the site were documented during this survey (Figure 2). Both of these nests have been located using sub meter GPS and, at the request of the landowner, the coordinates were provided to both the USFWS and DNR in March 2008. Since that time, both DNR and USFWS have been on site to confirm the existence of the two eagle nests and to make recommendations in regards to any future plans for the property.

No other listed species are recorded within or near the site according to the Heritage Trust Database. However, as noted by DNR, their records are not assumed to be complete and they should not be assumed comprehensive; therefore, field surveys are necessary for more thorough evaluations. This report outlines the methodology and results of a preliminary survey for the listed species and further assessment of the occurrences of bald eagle nests within the project boundary of the site.

Field surveys to identify suitable habitat were initially conducted in the winter of 2007. Subsequent assessments have been conducted during coordination with the USFWS and DNR in regards to bald eagle locations. The most recent assessments have been completed within 30 days of this report. During the field surveys, plant communities and habitats were observed and noted to determine if they match habitat types where the listed species have the potential to occur. If potential habitat was identified on site, all species observed were, at a minimum, identified to the genus taxonomic level.

A survey for Red-Cockaded Woodpecker was conducted using the "Guidelines for the Preparation of Biological Assessments and Evaluation for the Red-Cockaded Woodpecker", V. Gary Henry. These guidelines include methods for identifying areas to survey as well as actual survey methods for determining the presence of the Red-Cockaded Woodpecker. The guidelines state that timber stands exhibiting any of the following criteria should be surveyed when making a determination for the occurrence of Red-Cockaded Woodpeckers. The criteria are:

* mixed pine hardwood stands over 60 years of age

* mixed pine and hardwood stands under 60 years of age that contain clumps of pine trees over 60 years of age

* stands containing pine saw timber, including stands thought to be less than 60 years of age but containing scattered or clumped trees over 60 years of age

* hardwood-pine over 60 years of age adjacent to pine and pine-hardwood over 30 years in age

3.0 HABITAT CLASSIFICATIONS:

The following is a description and classification of major habitat/community types identified within the site. Also noted is an assessment of suitability for federally listed threatened and endangered species.

3.1 Harwood Wetland Run

The central most part of the site contains both USACE jurisdictional and non-jurisdictional hardwood wetland runs. The location of these wetlands has been

documented and surveyed through a comprehensive wetland delineation and verification of the delineation is currently pending. The southern most stand of this community type was very narrow, appeared to have been clear-cut in the past 15 to 20 years and is relatively dense with a rather low canopy. The soils were inundated in the upper twelve inches and there were obvious signs of hydrology including drainage patterns and water stained leaves. The dominant flora consisted of tallow tree *(Sapium sebiferum)*, cotton wood *(Populus deltoids)*, and wax myrtle *(Myrica cerifera)*. The herbaceous stratum was a mix of patchy to dense cover consisting mostly of wetland grasses. To the north, are two stands of this habitat type that had not exhibited any type of recent timber harvest and contained a high tree canopy of species such as swamp chestnut oak *(Quercus michauxii)*, black gum *(Nyssa sylvatica)*, and red maple *(Acer rubrum)*. There was little to no herbaceous species in these mature runs. This community type is not considered critical habitat for any of the federally listed species.

3.2 Maritime Forest

A large portion of the upland acreage on site can be characterized as a maritime forest dominated by live oak *(Quercus virginiana),* palmetto trees *(Sabal palmetto)*, loblolly pine *(Pinus taeda)*, and red cedar *(Juniperus virginana)*. In some areas the midstory was relatively dense with saplings of the tree stratum as well as wax myrtle *(Myrica cerifera*) and groundsel tree *(Baccharis glomeruliflora)*. Other areas of the on site maritime forest exhibited an open subcanopy with little to no herbaceous or shrub layer. This area is not considered critical habitat for any of the federally listed species.

The two known locations of bald eagle nests occur within large mature loblolly pines present within this habitat type near the transition from upland maritime forest to salt marsh flat. However, the presence of the nests are not directly attributed to the classification or condition of the habitat type, rather, they are ascribed to the presence of suitable trees near suitable foraging habitat.

3.3 Salt Marsh/Salt Flats

The site is bordered to the south by the Kiawah River and its associated marshes and tidal creeks. This community is dominated by cord grass (*Spartina alterniflora*). The adjacent salt marsh does provide suitable foraging habitat for the bald eagles on-site and bald eagles have been observed foraging over the marshes during site assessments. In addition, this habitat type could also be utilized as foraging habitat for wood storks, although no wood storks were observed during the on-site field surveys. Due to the nature of protection afforded to saltwater habitats in the coastal counties of South

Carolina, it is the opinion of NEI that development of the tract will unlikely alter or negatively affect the use or potential use of this habitat by bald eagles or wood storks. This area is not considered critical habitat for any of the other federally listed species.

3.4 Fresh/Brackish Water Impoundments

Historically, one of the main uses for the property was hunting waterfowl. As such, a large acreage of fresh and brackish water impoundments and associated dikes in the western portion of the property has been maintained and managed throughout the years for duck hunting. Like all duck impoundments, the amount of water in these areas is lowered and raised as needed by a series of water control structures including risers and traditional rice trunks. Most of the impoundments can be described as shallow, open water habitats with the occasional patches of soft rush *(Juncus effusus)* and needlegrass rush *(Juncus roemeranus)* in the shallower areas and around the edges of the dike system. The impoundments are potential foraging habitat for both bald eagles and woodstorks; however, this area is not considered critical habitat for these species and is no different than thousands of acres spread throughout the coasts of South Carolina and Georgia that could provide habitat. This area is not considered critical habitat for any of the other federally listed species.

3.5 Saltwater Impoundments

There are a series of impoundments on the southeastern portion of the tract that are distinguishably separate from the fresh/brackish water impoundments due to a much higher salinity caused by significant saltwater intrusion into the system. These impoundments are also utilized for duck hunting and are for the most part open water habitats interspersed with patches of needlegrass rush in the shallower portions of the impoundments. Like the other impoundments, this area is not considered critical habitat for any of the listed species, however this area could be used as foraging habitat for both bald eagles and woodstorks.

3.6 Loblolly Pine Plantation

Besides the aforementioned maritime forest, the remainder of the wooded portions of the tract are planted loblolly pine. These areas are managed for timber harvest and are subject to normal sivilcultural practices including bedding, mechanical land clearing, and burning. The average age of the pine trees in this community is 15 to 25 years. The understory of this habitat is relatively dense and therefore it is the opinion of NEI that this habitat type does not offer suitable foraging or nesting habitat for the Red-Cockaded Woodpecker. This area is not considered critical habitat for any of the other federally

listed species.

3.7 Agricultural Fields

Several active agricultural fields are located throughout Kiawah River Plantation. These fields are seasonally planted with crops attractive to game animals such as turkey, deer, and dove. These areas are not considered critical habitat for any of the federally listed species.

4.0 LISTED SPECIES AND ACKNOWLEDGED HABITATS:

The following is a brief description of each listed species included in the survey, its recognized habitat and comments regarding survey results for that species.

4.1 The **Bald Eagle** is a very large raptor with a wingspread of nearly seven (7) feet. After being nearly extinct, the bald eagle has recovered to occupy territories in all of the lower 48 states except Vermont. The bald eagle is normally associated with coasts, rivers and lakes with adjacent suitable nesting habitat and is known to forage over the adjacent rivers and marshes. Nest sites include mature old-growth trees, snags, cliffs, and increasingly on human-made structures (USFWS).

DNR and USFWS have recently been made aware of two bald eagle nests within the project boundaries of Kiawah River Plantation. The surrounding vegetative communities are characterized as a densely stocked maritime forest adjacent to salt marsh and the associated flats of the nearby Kiawah River to the south of the nests. The existing vegetative community to the north, east, and west acts as a natural screen in respect to the visibility from the nest to any potential residential development referred to in the current National Bald Eagle Management Guidelines. While the exact flight patterns of the nesting birds are unknown, it is assumed that the majority of foraging and hunting is done over the adjacent marshes to the south and the impoundments to the west and north.

As stated, NEI located the nest trees using sub meter GPS and supplied the latitude and longitude coordinates to both DNR and USFWS. Nest 1, which is the eastern most nest, is located at 32° 37'19.5" N and 80° 07' 34.6"W. The coordinates for Nest 2 are 32° 37' 33.8" N and 80° 06' 42.9" W. These coordinates have been provided to the project engineer and incorporated into preliminary development plans. As preliminary development plans have

progressed, NEI and representatives of the land owner, The Beach Company, have met several times with DNR and USFWS to coordinate and incorporate recommended setbacks to ensure that proposed development activities do not cause an adverse effect to this species. The *"National Bald Eagle Management Guidelines"* are included as (Appendix A).

4.2 The **Wood Stork** is a large wading bird characterized by its black featherless head and black and white markings. This species nests in colonies known as rookeries and roosts and feeds in flocks, often in association with other species of long-legged water birds. Wood storks utilize freshwater and estuarine wetlands for feeding, nesting and roosting. These sites are utilized for many years and are characterized by woody vegetation, primary cypress or swamp hummocks over open water (USFWS).

Only a few nesting sites (rookeries) are known in South Carolina, none of which are within or near the site. However, because this species covers vast areas during active foraging, it may occur over a broad region. Wood storks commonly feed throughout the estuarine marshes along the coast and are frequently observed in the surrounding areas during the summer months. Estuarine marshes and impoundments tend to be preferred foraging habitat, however, this species will also use open mature forested wetlands (USFWS). No wood storks were observed during field investigations and the hardwood wetland runs on site are not considered preferred habitat. It is possible that this species could utilize the adjacent tidal marshes or impoundments for foraging; however, these areas are not considered critical habitat for woodstorks and are not unlike thousands of acres of similar habitat found along the southeastern coast.

4.3 **Red-Cockaded Woodpeckers** are small birds requiring old growth pine forest for cavity excavation, foraging and nesting. The particular habitat associated with this species requires many years to develop and is fire dependant to maintain open mid-story conditions. Due to the lack of any mature pine stands near or within the tract, no suitable foraging or nesting habitat for the Red-Cockaded Woodpecker is present.

4.4 The **Flatwoods Salamander** requires open, mesic woodland of longleaf pine (*Pinus palustris*) and slash pine (*Pinus elliottii*) maintained by frequent fire. Pine flatwoods are typically flat, low-lying open woodlands that lie between the drier

sandhill community up slope and the wetlands down slope. Wiregrasses (*Aristida spp.*), especially *Aristida beyrichiana*, are often the dominate grasses in the herbaceous layer. Adult flatwoods salamanders move to their wetland breeding site during the rainy weather from October to December. The breeding sites are isolated pond cypress (*Taxodium ascendens*), swamp gum (*Nyssa biflora*), or slash pine dominated depressions that dry completely on a cyclic basis. These wetlands are generally shallow and relatively small and have a marsh-like appearance with sedges (*Carex spp.*) growing throughout; wiregrasses, panic grasses (*Panicum spp.*) and other herbaceous species concentrated in shallow water edges. A relatively open canopy is necessary to maintain the herbaceous species component that serves as cover for the flatwoods salamander larvae. The property has no freshwater wetlands that maintain the "open" conditions or adjacent pine forests necessary to support this species; therefore, there is no habitat on site that matches the acknowledged habitat for the flatwoods salamander.

4.5 **Canby's dropwort** is a medium sized shrub found in the coastal plain of South Carolina where it occupies pond savannahs, the shallow edges of cypress/pond pine sloughs and wet pine savannahs. These sites are characterized by open conditions with savannah like herbaceous layers and are almost always associated with a sandy loam or loam soil underlain with a clay layer. Additionally, these sites require that the groundwater regime remain stable and that the sites must be protected from adverse alterations such as ditching, dams, etc.

The white flower of this species is noted as occurring from May through August, although past surveys indicate blooming in this region occurs during late July-October. There are no habitats that match the acknowledged habitat for this species within the subject property.

4.6 **Pondberry** is a small fragrant shrub also found in and around small depressional wetlands and sinks with a semi-open canopy. Surveys for this species and its habitat were completed in concert with the surveys for Canby's dropwort. No occurrences of this species were noted during the surveys, and there are no habitats that match the acknowledged habitat for this species within the subject property.

4.7 **Chaffseed** is an upland herbaceous species indigenous to open fire maintained

pine forest that also typically contain blackjack oak (*Quercus marilandica*) and goat's rue (*Tephrosia virginiana*) as dominates and indicator species. No occurrences of this species or indicator species were noted during the surveys nor was longleaf pine habitat identified.

5.0 CONCLUSION

Comprehensive surveys and assessments of the project site have been completed to document and classify on-site habitat types and their suitability for listed federally threatened and endangered species. Field surveys have documented the presence of two bald eagle nests within the boundaries of the subject property. As a result, coordination with DNR and USFWS is on going in an attempt to establish guidance for activities near the active nests. Ultimately, it is anticipated that a Bald Eagle Management Plan will be developed based upon proposed plans and incorporated in forthcoming Federal wetlands permits.

The saltwater communities on site, as well as the impoundments, provide potential foraging habitat for woodstorks. However, as stated, these areas are not considered critical habitat for woodstorks and are not unlike thousands of acres of similar habitat found along the southeastern coast.

Although unlikely because of the habitat available on site, it should be noted that because of the transitory nature of some of the listed threatened and endangered plants and animals, it is possible that endangered species populations and locations may change over time. Therefore, any potential findings at a later date should be fully investigated. Should significant time lapse between the issuance of this report and development of the property or any other type of legal reliance, it is strongly recommended that an update of this report be completed. The definition of significant time is not absolute but would include passing of annual breeding or migratory seasons.

APPENDIX A

Habitat Management Guidelines for the Bald Eagle in the Southeast Region

(Current Federal Guidelines)

NATIONAL BALD EAGLE MANAGEMENT GUIDELINES

U.S. Fish and Wildlife Service

May 2007

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INTRODUCTION

The bald eagle (*Haliaeetus leucocephalus*) is protected by the Bald and Golden Eagle Protection Act (Eagle Act) and the Migratory Bird Treaty Act (MBTA). The MBTA and the Eagle Act protect bald eagles from a variety of harmful actions and impacts. The U.S. Fish and Wildlife Service (Service) developed these National Bald Eagle Management Guidelines to advise landowners, land managers, and others who share public and private lands with bald eagles when and under what circumstances the protective provisions of the Eagle Act may apply to their activities. A variety of human activities can potentially interfere with bald eagles, affecting their ability to forage, nest, roost, breed, or raise young. The Guidelines are intended to help people minimize such impacts to bald eagles, particularly where they may constitute "disturbance," which is prohibited by the Eagle Act.

The Guidelines are intended to:

(1) Publicize the provisions of the Eagle Act that continue to protect bald eagles, in order to reduce the possibility that people will violate the law,

(2) Advise landowners, land managers and the general public of the potential for various human activities to disturb bald eagles, and

(3) Encourage additional nonbinding land management practices that benefit bald eagles (see Additional Recommendations section).

While the Guidelines include general recommendations for land management practices that will benefit bald eagles, the document is intended primarily as a tool for landowners and planners who seek information and recommendations regarding how to avoid disturbing bald eagles. Many States and some tribal entities have developed state-specific management plans, regulations, and/or guidance for landowners and land managers to protect and enhance bald eagle habitat, and we encourage the continued development and use of these planning tools to benefit bald eagles.

Adherence to the Guidelines herein will benefit individuals, agencies, organizations, and companies by helping them avoid violations of the law. However, the Guidelines themselves are not law. Rather, they are recommendations based on several decades of behavioral observations, science, and conservation measures to avoid or minimize adverse impacts to bald eagles.

The U.S. Fish and Wildlife Service strongly encourages adherence to these guidelines to ensure that bald and golden eagle populations will continue to be sustained. The Service realizes there may be impacts to some birds even if all reasonable measures are taken to avoid such impacts. Although it is not possible to absolve individuals and entities from liability under the Eagle Act or the MBTA, the Service exercises enforcement discretion to focus on those individuals, companies, or agencies that take migratory birds without regard for the consequences of their actions and the law, especially when conservation measures, such as these Guidelines, are available, but have not been implemented. The Service will prioritize its enforcement efforts to focus on those individuals or entities who take bald eagles or their parts, eggs, or nests without implementing appropriate measures recommended by the Guidelines.

The Service intends to pursue the development of regulations that would authorize, under limited circumstances, the use of permits if "take" of an eagle is anticipated but unavoidable. Additionally, if the bald eagle is delisted, the Service intends to provide a regulatory mechanism to honor existing (take) authorizations under the Endangered Species Act (ESA).

During the interim period until the Service completes a rulemaking for permits under the Eagle Act, the Service does not intend to refer for prosecution the incidental "*take*" of any bald eagle under the MBTA or Eagle Act, if such take is in full compliance with the terms and conditions of an incidental take statement issued to the action agency or applicant under the authority of section 7(b)(4) of the ESA or a permit issued under the authority of section 10(a)(1)(B) of the ESA.

The Guidelines are applicable throughout the United States, including Alaska. The primary purpose of these Guidelines is to provide information that will minimize or prevent violations only of *Federal* laws governing bald eagles. In addition to Federal laws, many states and some smaller jurisdictions and tribes have additional laws and regulations protecting bald eagles. In some cases those laws and regulations may be more protective (restrictive) than these Federal guidelines. If you are planning activities that may affect bald eagles, we therefore recommend that you contact both your nearest U.S. Fish and Wildlife Service Field Office (see the contact information on p.16) and your state wildlife agency for assistance.

LEGAL PROTECTIONS FOR THE BALD EAGLE

The Bald and Golden Eagle Protection Act

The Eagle Act (16 U.S.C. 668-668c), enacted in 1940, and amended several times since then, prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. The Act provides criminal and civil penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof." The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." "Disturb" means:

> "Disturb means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior."

In addition to immediate impacts, this definition also covers impacts that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle=s return, such alterations agitate or bother an eagle to a degree that injures an eagle or substantially interferes with normal breeding, feeding, or sheltering habits and causes, or is likely to cause, a loss of productivity or nest abandonment.

A violation of the Act can result in a criminal fine of $100,000 ($200,000 for organizations), imprisonment for one year, or both, for a first offense. Penalties increase substantially for additional offenses, and a second violation of this Act is a felony.

The Migratory Bird Treaty Act
The MBTA (16 U.S.C. 703-712), prohibits the taking of any migratory bird or any part, nest, or egg, except as permitted by regulation. The MBTA was enacted in 1918; a 1972 agreement supplementing one of the bilateral treaties underlying the MBTA had the effect of expanding the scope of the Act to cover bald eagles and other raptors. Implementing regulations define "take" under the MBTA as "pursue, hunt, shoot, wound, kill, trap, capture, possess, or collect."

Copies of the Eagle Act and the MBTA are available at: http://permits.fws.gov/ltr/ltr.shtml.

State laws and regulations
Most states have their own regulations and/or guidelines for bald eagle management. Some states may continue to list the bald eagle as endangered, threatened, or of special concern. If you plan activities that may affect bald eagles, we urge you to familiarize yourself with the regulations and/or guidelines that apply to bald eagles in your state. Your adherence to the Guidelines herein does not ensure that you are in compliance with state laws and regulations because state regulations can be more specific and/or restrictive than these Guidelines.

NATURAL HISTORY OF THE BALD EAGLE

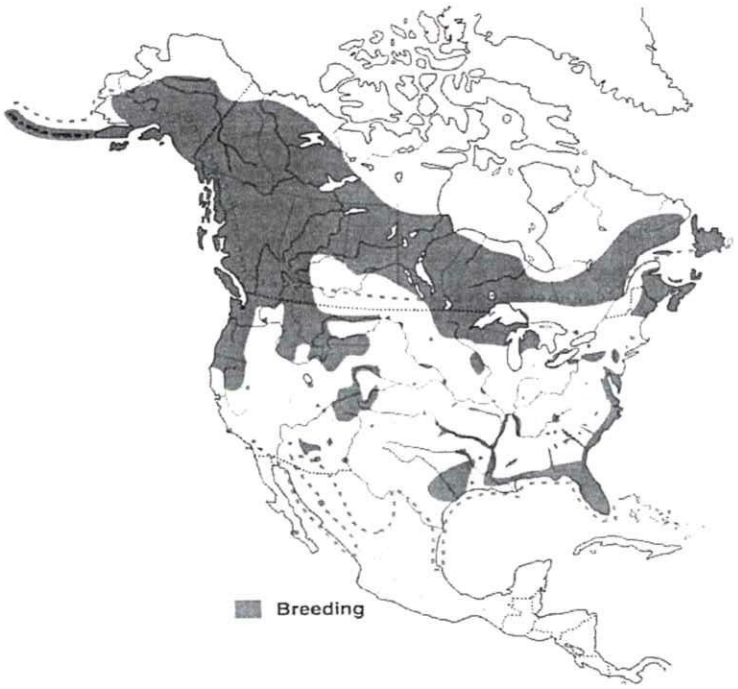
Bald eagles are a North American species that historically occurred throughout the contiguous United States and Alaska. After severely declining in the lower 48 States between the 1870s and the 1970s, bald eagles have rebounded and re-established breeding territories in each of the lower 48 states. The largest North American breeding populations are in Alaska and Canada, but there are also significant bald eagle populations in Florida, the Pacific Northwest, the Greater Yellowstone area, the Great Lakes states, and the Chesapeake Bay region. Bald eagle distribution varies seasonally. Bald eagles that nest in southern latitudes frequently move northward in late spring and early summer, often summering as far north as Canada. Most eagles that breed at northern latitudes migrate southward during winter, or to coastal areas where waters remain unfrozen. Migrants frequently concentrate in large numbers at sites where food is abundant and they often roost together communally. In some cases, concentration areas are used year-round: in summer by southern eagles and in winter by northern eagles.

Juvenile bald eagles have mottled brown and white plumage, gradually acquiring their dark brown body and distinctive white head and tail as they mature. Bald eagles generally attain adult plumage by 5 years of age. Most are capable of breeding at 4 or 5 years of age, but in healthy populations they may not start breeding until much older. Bald eagles may live 15 to 25 years in the wild. Adults weigh 8 to 14 pounds (occasionally reaching 16 pounds in Alaska) and have wingspans of 5 to 8 feet. Those in the northern range are larger than those in the south, and females are larger than males.

Where do bald eagles nest?

Breeding bald eagles occupy "territories," areas they will typically defend against intrusion by other eagles. In addition to the active nest, a territory may include one or more alternate nests (nests built or maintained by the eagles but not used for nesting in a given year). The Eagle Act prohibits removal or destruction of both active and alternate bald eagle nests. Bald eagles exhibit high nest site fidelity and nesting territories are often used year after year. Some territories are known to have been used continually for over half a century.

Bald eagles generally nest near coastlines, rivers, large lakes or streams that support an adequate food supply. They often nest in mature or old-growth trees; snags (dead trees); cliffs; rock promontories; rarely on the ground; and with increasing frequency on human-made structures such as power poles and communication towers. In forested areas, bald eagles often select the tallest trees with limbs strong enough to support a nest that can weigh more than 1,000 pounds. Nest sites typically include at least one perch with a clear view of the water where the eagles usually forage. Shoreline trees or snags located in reservoirs provide the visibility and accessibility needed to locate aquatic prey. Eagle nests are constructed with large sticks, and may be lined with moss, grass, plant stalks, lichens, seaweed, or sod. Nests are usually about 4-6 feet in diameter and 3 feet deep, although larger nests exist.



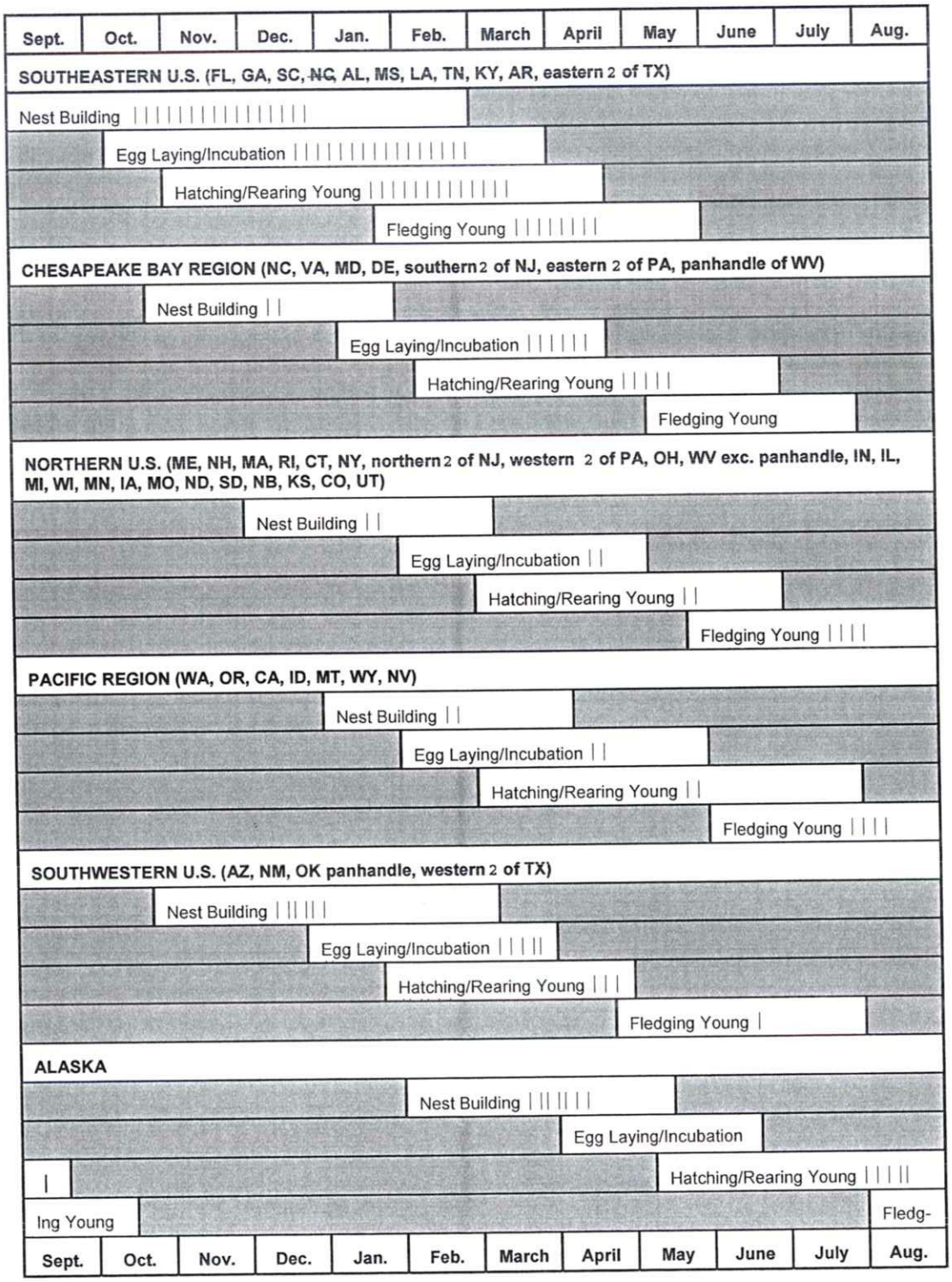
The range of breeding bald eagles in 2000 (shaded areas). This map shows only the larger concentrations of nests; eagles have continued to expand into additional nesting territories in many states. The dotted line represents the bald eagle's wintering range.

When do bald eagles nest?

Nesting activity begins several months before egg-laying. Egg-laying dates vary throughout the U.S., ranging from October in Florida, to late April or even early May in the northern United States. Incubation typically lasts 33-35 days, but can be as long as 40 days. Eaglets make their first unsteady flights about 10 to 12 weeks after hatching, and fledge (leave their nests) within a few days after that first flight. However, young birds usually remain in the vicinity of the nest for several weeks after fledging because they are almost completely dependent on their parents for food until they disperse from the nesting territory approximately 6 weeks later.

The bald eagle breeding season tends to be longer in the southern U.S., and re-nesting following an unsuccessful first nesting attempt is more common there as well. The following table shows the timing of bald eagle breeding seasons in different regions of the country. The table represents the range of time within which the majority of nesting activities occur in each region and does not apply to any specific nesting pair. Because the timing of nesting activities may vary within a given region, you should contact the nearest U.S. Fish and Wildlife Service Field Office (see page 16) and/or your state wildlife conservation agency for more specific information on nesting chronology in your area.

Chronology of typical reproductive activities of bald eagles in the United States.



How many chicks do bald eagles raise?
The number of eagle eggs laid will vary from 1-3, with 1-2 eggs being the most common. Only one eagle egg is laid per day, although not always on successive days. Hatching of young occurs on different days with the result that chicks in the same nest are sometimes of unequal size. The overall national fledging rate is approximately one chick per nest, annually, which results in a healthy expanding population.

What do bald eagles eat?
Bald eagles are opportunistic feeders. Fish comprise much of their diet, but they also eat waterfowl, shorebirds/colonial waterbirds, small mammals, turtles, and carrion. Because they are visual hunters, eagles typically locate their prey from a conspicuous perch, or soaring flight, then swoop down and strike. Wintering bald eagles often congregate in large numbers along streams to feed on spawning salmon or other fish species, and often gather in large numbers in areas below reservoirs, especially hydropower dams, where fish are abundant. Wintering eagles also take birds from rafts of ducks at reservoirs and rivers, and congregate on melting ice shelves to scavenge dead fish from the current or the soft melting ice. Bald eagles will also feed on carcasses along roads, in landfills, and at feedlots.

During the breeding season, adults carry prey to the nest to feed the young. Adults feed their chicks by tearing off pieces of food and holding them to the beaks of the eaglets. After fledging, immature eagles are slow to develop hunting skills, and must learn to locate reliable food sources and master feeding techniques. Young eagles will congregate together, often feeding upon easily acquired food such as carrion and fish found in abundance at the mouths of streams and shallow bays and at landfills.

The impact of human activity on nesting bald eagles
During the breeding season, bald eagles are sensitive to a variety of human activities. However, not all bald eagle pairs react to human activities in the same way. Some pairs nest successfully just dozens of yards from human activity, while others abandon nest sites in response to activities much farther away. This variability may be related to a number of factors, including visibility, duration, noise levels, extent of the area affected by the activity, prior experiences with humans, and tolerance of the individual nesting pair. The relative sensitivity of bald eagles during various stages of the breeding season is outlined in the following table.

Nesting Bald Eagle Sensitivity to Human Activities

Phase	Activity	Sensitivity to Human Activity	Comments
I	Courtship and Nest Building	Most sensitive period; likely to respond negatively	Most critical time period. Disturbance is manifested in nest abandonment. Bald eagles in newly established territories are more prone to abandon nest sites.
II	Egg laying	Very sensitive period	Human activity of even limited duration may cause nest desertion and abandonment of territory for the breeding season.
III	Incubation and early nestling period (up to 4 weeks)	Very sensitive period	Adults are less likely to abandon the nest near and after hatching. However, flushed adults leave eggs and young unattended; eggs are susceptible to cooling, loss of moisture, overheating, and predation; young are vulnerable to elements.
IV	Nestling period, 4 to 8 weeks	Moderately sensitive period	Likelihood of nest abandonment and vulnerability of the nestlings to elements somewhat decreases. However, nestlings may miss feedings, affecting their survival.
V	Nestlings 8 weeks through fledging	Very sensitive period	Gaining flight capability, nestlings 8 weeks and older may flush from the nest prematurely due to disruption and die.

If agitated by human activities, eagles may inadequately construct or repair their nest, may expend energy defending the nest rather than tending to their young, or may abandon the nest altogether. Activities that cause prolonged absences of adults from their nests can jeopardize eggs or young. Depending on weather conditions, eggs may overheat or cool too much and fail to hatch. Unattended eggs and nestlings are subject to predation. Young nestlings are particularly vulnerable because they rely on their parents to provide warmth or shade, without which they may die as a result of hypothermia or heat stress. If food delivery schedules are interrupted, the young may not develop healthy plumage, which can affect their survival. In addition, adults startled while incubating or brooding young may damage eggs or injure their young as they abruptly leave the nest. Older nestlings no longer require constant attention from the adults, but they may be startled by loud or intrusive human activities and prematurely jump from the nest before they are able to fly or care for themselves. Once fledged, juveniles range up to ¼ mile from the nest site, often to a site with minimal human activity. During this period, until about six weeks after departure from the nest, the juveniles still depend on the adults to feed them.

The impact of human activity on foraging and roosting bald eagles

Disruption, destruction, or obstruction of roosting and foraging areas can also negatively affect bald eagles. Disruptive activities in or near eagle foraging areas can interfere with feeding, reducing chances of survival. Interference with feeding can also result in reduced productivity (number of young successfully fledged). Migrating and wintering bald eagles often congregate at specific sites for purposes of feeding and sheltering. Bald eagles rely on established roost sites because of their proximity to sufficient food sources. Roost sites are usually in mature trees where the eagles are somewhat sheltered from the wind and weather. Human activities near or within communal roost sites may prevent eagles

from feeding or taking shelter, especially if there are not other undisturbed and productive feeding and roosting sites available. Activities that permanently alter communal roost sites and important foraging areas can altogether eliminate the elements that are essential for feeding and sheltering eagles.

Where a human activity agitates or bothers roosting or foraging bald eagles to the degree that causes injury or substantially interferes with breeding, feeding, or sheltering behavior and causes, or is likely to cause, a loss of productivity or nest abandonment, the conduct of the activity constitutes a violation of the Eagle Act's prohibition against disturbing eagles. The circumstances that might result in such an outcome are difficult to predict without detailed site-specific information. If your activities may disturb roosting or foraging bald eagles, you should contact your local Fish and Wildlife Service Field Office (see page 16) for advice and recommendations for how to avoid such disturbance.

RECOMMENDATIONS FOR AVOIDING DISTURBANCE AT NEST SITES

In developing these Guidelines, we relied on existing state and regional bald eagle guidelines, scientific literature on bald eagle disturbance, and recommendations of state and Federal biologists who monitor the impacts of human activity on eagles. Despite these resources, uncertainties remain regarding the effects of many activities on eagles and how eagles in different situations may or may not respond to certain human activities. The Service recognizes this uncertainty and views the collection of better biological data on the response of eagles to disturbance as a high priority. To the extent that resources allow, the Service will continue to collect data on responses of bald eagles to human activities conducted according to the recommendations within these Guidelines to ensure that adequate protection from disturbance is being afforded, and to identify circumstances where the Guidelines might be modified. These data will be used to make future adjustments to the Guidelines.

To avoid disturbing nesting bald eagles, we recommend (1) keeping a distance between the activity and the nest (distance buffers), (2) maintaining preferably forested (or natural) areas between the activity and around nest trees (landscape buffers), and (3) avoiding certain activities during the breeding season. The buffer areas serve to minimize visual and auditory impacts associated with human activities near nest sites. Ideally, buffers would be large enough to protect existing nest trees and provide for alternative or replacement nest trees.

The size and shape of effective buffers vary depending on the topography and other ecological characteristics surrounding the nest site. In open areas where there are little or no forested or topographical buffers, such as in many western states, distance alone must serve as the buffer. Consequently, in open areas, the distance between the activity and the nest may need to be larger than the distances recommended under Categories A and B of these guidelines (pg. 12) if no landscape buffers are present. The height of the nest above the ground may also ameliorate effects of human activities; eagles at higher nests may be less prone to disturbance.

In addition to the physical features of the landscape and nest site, the appropriate size for the distance buffer may vary according to the historical tolerances of eagles to human activities in particular localities, and may also depend on the location of the nest in relation

to feeding and roosting areas used by the eagles. Increased competition for nest sites may lead bald eagles to nest closer to human activity (and other eagles).

Seasonal restrictions can prevent the potential impacts of many shorter-term, obtrusive activities that do not entail landscape alterations (e.g. fireworks, outdoor concerts). In proximity to the nest, these kinds of activities should be conducted only outside the breeding season. For activities that entail both short-term, obtrusive characteristics and more permanent impacts (e.g., building construction), we recommend a combination of both approaches: retaining a landscape buffer *and* observing seasonal restrictions.

For assistance in determining the appropriate size and configuration of buffers or the timing of activities in the vicinity of a bald eagle nest, we encourage you to contact the nearest U.S. Fish and Wildlife Service Field Office (see page 16).

Existing Uses
Eagles are unlikely to be disturbed by routine use of roads, homes, and other facilities where such use pre-dates the eagles' successful nesting activity in a given area. Therefore, in most cases *ongoing* existing uses may proceed with the same intensity with little risk of disturbing bald eagles. However, some *intermittent, occasional, or irregular* uses that pre-date eagle nesting in an area may disturb bald eagles. For example: a pair of eagles may begin nesting in an area and subsequently be disturbed by activities associated with an annual outdoor flea market, even though the flea market has been held annually at the same location. In such situations, human activity should be adjusted or relocated to minimize potential impacts on the nesting pair.

ACTIVITY-SPECIFIC GUIDELINES

The following section provides the Service=s management recommendations for avoiding bald eagle disturbance as a result of new or intermittent activities proposed in the vicinity of bald eagle nests. Activities are separated into 8 categories (A – H) based on the nature and magnitude of impacts to bald eagles that usually result from the type of activity. Activities with similar or comparable impacts are grouped together.

In most cases, impacts will vary based on the visibility of the activity from the eagle nest and the degree to which similar activities are already occurring in proximity to the nest site. Visibility is a factor because, in general, eagles are more prone to disturbance when an activity occurs in full view. For this reason, we recommend that people locate activities farther from the nest structure in areas with open vistas, in contrast to areas where the view is shielded by rolling topography, trees, or other screening factors. The recommendations also take into account the existence of similar activities in the area because the continued presence of nesting bald eagles in the vicinity of the existing activities indicates that the eagles in that area can tolerate a greater degree of human activity than we can generally expect from eagles in areas that experience fewer human impacts. To illustrate how these factors affect the likelihood of disturbing eagles, we have incorporated the recommendations for some activities into a table (categories A and B).

First, determine which category your activity falls into (between categories A – H). If the activity you plan to undertake is not specifically addressed in these guidelines, follow the recommendations for the most similar activity represented.

If your activity is under A or B, our recommendations are in table form. The vertical axis shows the degree of visibility of the activity from the nest. The horizontal axis (header row) represents the degree to which similar activities are ongoing in the vicinity of the nest. Locate the row that best describes how visible your activity will be from the eagle nest. Then, choose the column that best describes the degree to which similar activities are ongoing in the vicinity of the eagle nest. The box where the column and row come together contains our management recommendations for how far you should locate your activity from the nest to avoid disturbing the eagles. The numerical distances shown in the tables are the closest the activity should be conducted relative to the nest. In some cases we have included additional recommendations (other than recommended *distance* from the nest) you should follow to help ensure that your activity will not disturb the eagles.

Alternate nests

For activities that entail permanent landscape alterations that may result in bald eagle disturbance, these recommendations apply to both active and alternate bald eagle nests. Disturbance becomes an issue with regard to alternate nests if eagles return for breeding purposes and react to land use changes that occurred while the nest was inactive. The likelihood that an alternate nest will again become active decreases the longer it goes unused. If you plan activities in the vicinity of an alternate bald eagle nest and have information to show that the nest has not been active during the preceding 5 breeding seasons, the recommendations provided in these guidelines for avoiding disturbance around the nest site may no longer be warranted. The nest itself remains protected by other provisions of the Eagle Act, however, and may not be destroyed.

If special circumstances exist that make it unlikely an inactive nest will be reused before 5 years of disuse have passed, and you believe that the probability of reuse is low enough to warrant disregarding the recommendations for avoiding disturbance, you should be prepared to provide all the reasons for your conclusion, including information regarding past use of the nest site. Without sufficient documentation, you should continue to follow these guidelines when conducting activities around the nest site. If we are able to determine that it is unlikely the nest will be reused, we may advise you that the recommendations provided in these guidelines for avoiding disturbance are no longer necessary around that nest site.

This guidance is intended to minimize disturbance, as defined by Federal regulation. In addition to Federal laws, most states and some tribes and smaller jurisdictions have additional laws and regulations protecting bald eagles. In some cases those laws and regulations may be more protective (restrictive) than these Federal guidelines.

Temporary Impacts

For activities that have temporary impacts, such as the use of loud machinery, fireworks displays, or summer boating activities, we recommend seasonal restrictions. These types of activities can generally be carried out outside of the breeding season without causing disturbance. The recommended restrictions for these types of activities can be lifted for alternate nests within a particular territory, including nests that were attended during the current breeding season but not used to raise young, after eggs laid in another nest within the territory have hatched (depending on the distance between the alternate nest and the active nest).

In general, activities should be kept as far away from nest trees as possible; loud and disruptive activities should be conducted when eagles are not nesting; and activity between the nest and the nearest foraging area should be minimized. If the activity you plan to undertake is not specifically addressed in these guidelines, follow the recommendations for the most similar activity addressed, or contact your local U.S. Fish and Wildlife Service Field Office for additional guidance.

If you believe that special circumstances apply to your situation that increase or diminish the likelihood of bald eagle disturbance, or if it is not possible to adhere to the guidelines, you should contact your local Service Field Office for further guidance.

Category A:
Building construction, 1 or 2 story, with project footprint of ½ acre or less.
Construction of roads, trails, canals, power lines, and other linear utilities.
Agriculture and aquaculture – new or expanded operations.
Alteration of shorelines or wetlands.
Installation of docks or moorings.
Water impoundment.

Category B:
Building construction, 3 or more stories.
Building construction, 1 or 2 story, with project footprint of more than ½ acre.
Installation or expansion of marinas with a capacity of 6 or more boats.
Mining and associated activities.
Oil and natural gas drilling and refining and associated activities.

	If there is no similar activity within 1 mile of the nest	***If there is similar activity closer than 1 mile from the nest***
If the activity will be visible from the nest	660 feet. Landscape buffers are recommended.	660 feet, or as close as existing tolerated activity of similar scope. Landscape buffers are recommended.
If the activity will not be visible from the nest	Category A: 330 feet. Clearing, external construction, and landscaping between 330 feet and 660 feet should be done outside breeding season. Category B: 660 feet.	330 feet, or as close as existing tolerated activity of similar scope. Clearing, external construction and landscaping within 660 feet should be done outside breeding season.

The numerical distances shown in the table are the closest the activity should be conducted relative to the nest.

Category C. Timber Operations and Forestry Practices

- Avoid clear cutting or removal of overstory trees within 330 feet of the nest at any time.

- Avoid timber harvesting operations, including road construction and chain saw and yarding operations, during the breeding season within 660 feet of the nest. The distance may be decreased to 330 feet around alternate nests within a particular territory, including nests that were attended during the current breeding season but not used to raise young, after eggs laid in another nest within the territory have hatched.

- Selective thinning and other silviculture management practices designed to conserve or enhance habitat, including prescribed burning close to the nest tree, should be undertaken outside the breeding season. Precautions such as raking leaves and woody debris from around the nest tree should be taken to prevent crown fire or fire climbing the nest tree. If it is determined that a burn during the breeding season would be beneficial, then, to ensure that no take or disturbance will occur, these activities should be conducted only when neither adult eagles nor young are present at the nest tree (i.e., at the beginning of, or end of, the breeding season, either before the particular nest is active or after the young have fledged from that nest). Appropriate Federal and state biologists should be consulted before any prescribed burning is conducted during the breeding season.

- Avoid construction of log transfer facilities and in-water log storage areas within 330 feet of the nest.

Category D. Off-road vehicle use (including snowmobiles). No buffer is necessary around nest sites outside the breeding season. During the breeding season, do not operate off-road vehicles within 330 feet of the nest. In open areas, where there is increased visibility and exposure to noise, this distance should be extended to 660 feet.

Category E. Motorized Watercraft use (including jet skis/personal watercraft). No buffer is necessary around nest sites outside the breeding season. During the breeding season, within 330 feet of the nest, (1) do not operate jet skis (personal watercraft), and (2) avoid concentrations of noisy vessels (e.g., commercial fishing boats and tour boats), except where eagles have demonstrated tolerance for such activity. Other motorized boat traffic passing within 330 feet of the nest should attempt to minimize trips and avoid stopping in the area where feasible, particularly where eagles are unaccustomed to boat traffic. Buffers for airboats should be larger than 330 feet due to the increased noise they generate, combined with their speed, maneuverability, and visibility.

Category F. Non-motorized recreation and human entry (e.g., hiking, camping, fishing, hunting, birdwatching, kayaking, canoeing). No buffer is necessary around nest sites outside the breeding season. If the activity will be visible or highly audible from the nest, maintain a 330-foot buffer during the breeding season, particularly where eagles are unaccustomed to such activity.

Category G. Helicopters and fixed-wing aircraft.
Except for authorized biologists trained in survey techniques, avoid operating aircraft within 1,000 feet of the nest during the breeding season, except where eagles have demonstrated tolerance for such activity.

Category H. Blasting and other loud, intermittent noises.
Avoid blasting and other activities that produce extremely loud noises within 1/2 mile of active nests, unless greater tolerance to the activity (or similar activity) has been demonstrated by the eagles in the nesting area. This recommendation applies to the use of fireworks classified by the Federal Department of Transportation as Class B explosives, which includes the larger fireworks that are intended for licensed public display.

RECOMMENDATIONS FOR AVOIDING DISTURBANCE AT FORAGING AREAS AND COMMUNAL ROOST SITES

1. Minimize potentially disruptive activities and development in the eagles' direct flight path between their nest and roost sites and important foraging areas.

2. Locate long-term and permanent water-dependent facilities, such as boat ramps and marinas, away from important eagle foraging areas.

3. Avoid recreational and commercial boating and fishing near critical eagle foraging areas during peak feeding times (usually early to mid-morning and late afternoon), except where eagles have demonstrated tolerance to such activity.

4. Do not use explosives within ½ mile (or within 1 mile in open areas) of communal roosts when eagles are congregating, without prior coordination with the U.S. Fish and Wildlife Service and your state wildlife agency.

5. Locate aircraft corridors no closer than 1,000 feet vertical or horizontal distance from communal roost sites.

ADDITIONAL RECOMMENDATIONS TO BENEFIT BALD EAGLES

The following are additional management practices that landowners and planners can exercise for added benefit to bald eagles.

1. Protect and preserve potential roost and nest sites by retaining mature trees and old growth stands, particularly within ½ mile from water.

2. Where nests are blown from trees during storms or are otherwise destroyed by the elements, continue to protect the site in the absence of the nest for up to three (3) complete breeding seasons. Many eagles will rebuild the nest and reoccupy the site.

3. To avoid collisions, site wind turbines, communication towers, and high voltage transmission power lines away from nests, foraging areas, and communal roost sites.

4. Employ industry-accepted best management practices to prevent birds from colliding with or being electrocuted by utility lines, towers, and poles. If possible, bury utility lines in important eagle areas.

5. Where bald eagles are likely to nest in human-made structures (e.g., cell phone towers) and such use could impede operation or maintenance of the structures or jeopardize the safety of the eagles, equip the structures with either (1) devices engineered to discourage bald eagles from building nests, or (2) nesting platforms that will safely accommodate bald eagle nests without interfering with structure performance.

6. Immediately cover carcasses of euthanized animals at landfills to protect eagles from being poisoned.

7. Do not intentionally feed bald eagles. Artificially feeding bald eagles can disrupt their essential behavioral patterns and put them at increased risk from power lines, collision with windows and cars, and other mortality factors.

8. Use pesticides, herbicides, fertilizers, and other chemicals only in accordance with Federal and state laws.

9. Monitor and minimize dispersal of contaminants associated with hazardous waste sites (legal or illegal), permitted releases, and runoff from agricultural areas, especially within watersheds where eagles have shown poor reproduction or where bioaccumulating contaminants have been documented. These factors present a risk of contamination to eagles and their food sources.

CONTACTS

The following U.S. Fish and Wildlife Service Field Offices provide technical assistance on bald eagle management:

Alabama	Daphne	(251) 441-5181
Alaska	Anchorage	(907) 271-2888
	Fairbanks	(907) 456-0203
	Juneau	(907) 780-1160
Arizona	Phoenix	(602) 242-0210
Arkansas	Conway	(501) 513-4470
California	Arcata	(707) 822-7201
	Barstow	(760) 255-8852
	Carlsbad	(760) 431-9440
	Red Bluff	(530) 527-3043
	Sacramento	(916) 414-6000
	Stockton	(209) 946-6400
	Ventura	(805) 644-1766
	Yreka	(530) 842-5763
Colorado	Lakewood	(303) 275-2370
	Grand Junction	(970) 243-2778
Connecticut	(See New Hampshire)	
Delaware	(See Maryland)	
Florida	Panama City	(850) 769-0552
	Vero Beach	(772) 562-3909
	Jacksonville	(904) 232-2580
Georgia	Athens	(706) 613-9493
	Brunswick	(912) 265-9336
	Columbus	(706) 544-6428
Idaho	Boise	(208) 378-5243
	Chubbuck	(208) 237-6975
Illinois/Iowa	Rock Island	(309) 757-5800
Indiana	Bloomington	(812) 334-4261
Kansas	Manhattan	(785) 539-3474
Kentucky	Frankfort	(502) 695-0468
Louisiana	Lafayette	(337) 291-3100
Maine	Old Town	(207) 827-5938
Maryland	Annapolis	(410) 573-4573
Massachusetts	(See New Hampshire)	
Michigan	East Lansing	(517) 351-2555
Minnesota	Bloomington	(612) 725-3548
Mississippi	Jackson	(601) 965-4900
Missouri	Columbia	(573) 234-2132
Montana	Helena	(405) 449-5225
Nebraska	Grand Island	(308) 382-6468
Nevada	Las Vegas	(702) 515-5230
	Reno	(775) 861-6300
New Hampshire	Concord	(603) 223-2541
New Jersey	Pleasantville	(609) 646-9310
New Mexico	Albuquerque	(505) 346-2525
New York	Cortland	(607) 753-9334
	Long Island	(631) 776-1401
North Carolina	Raleigh	(919) 856-4520
	Asheville	(828) 258-3939
North Dakota	Bismarck	(701) 250-4481
Ohio	Reynoldsburg	(614) 469-6923
Oklahoma	Tulsa	(918) 581-7458
Oregon	Bend	(541) 383-7146
	Klamath Falls	(541) 885-8481
	La Grande	(541) 962-8584
	Newport	(541) 867-4558
	Portland	(503) 231-6179
	Roseburg	(541) 957-3474
Pennsylvania	State College	(814) 234-4090
Rhode Island	(See New Hampshire)	
South Carolina	Charleston	(843) 727-4707
South Dakota	Pierre	(605) 224-8693
Tennessee	Cookeville	(931) 528-6481
Texas	Clear Lake	(281) 286-8282
Utah	West Valley City	(801) 975-3330
Vermont	(See New Hampshire)	
Virginia	Gloucester	(804) 693-6694
Washington	Lacey	(306) 753-9440
	Spokane	(509) 891-6839
	Wenatchee	(509) 665-3508
West Virginia	Elkins	(304) 636-6586
Wisconsin	New Franken	(920) 866-1725
Wyoming	Cheyenne	(307) 772-2374
	Cody	(307) 578-5939

National Office
U.S. Fish and Wildlife Service
Division of Migratory Bird Management
4401 North Fairfax Drive, MBSP-4107
Arlington, VA 22203-1610
(703) 358-1714
http://www.fws.gov/migratorybirds

State Agencies

To contact a state wildlife agency, visit the Association of Fish & Wildlife Agencies' website at http://www.fishwildlife.org/where_us.html

GLOSSARY

The definitions below apply to these National Bald Eagle Management Guidelines:

Communal roost sites – Areas where bald eagles gather and perch overnight – and sometimes during the day in the event of inclement weather. Communal roost sites are usually in large trees (live or dead) that are relatively sheltered from wind and are generally in close proximity to foraging areas. These roosts may also serve a social purpose for pair bond formation and communication among eagles. Many roost sites are used year after year.

Disturb – To agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.

In addition to immediate impacts, this definition also covers impacts that result from human-caused alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle=s return, such alterations agitate or bother an eagle to a degree that injures an eagle or substantially interferes with normal breeding, feeding, or sheltering habits and causes, or is likely to cause, a loss of productivity or nest abandonment.

Fledge – To leave the nest and begin flying. For bald eagles, this normally occurs at 10-12 weeks of age.

Fledgling – A juvenile bald eagle that has taken the first flight from the nest but is not yet independent.

Foraging area – An area where eagles feed, typically near open water such as rivers, lakes, reservoirs, and bays where fish and waterfowl are abundant, or in areas with little or no water (i.e., rangelands, barren land, tundra, suburban areas, etc.) where other prey species (e.g., rabbit, rodents) or carrion (such as at landfills) are abundant.

Landscape buffer – A natural or human-made landscape feature that screens eagles from human activity (e.g., strip of trees, hill, cliff, berm, sound wall).

Nest – A structure built, maintained, or used by bald eagles for the purpose of reproduction. An **active** nest is a nest that is attended (built, maintained or used) by a pair of bald eagles during a given breeding season, whether or not eggs are laid. An **alternate** nest is a nest that is not used for breeding by eagles during a given breeding season.

Nest abandonment – Nest abandonment occurs when adult eagles desert or stop attending a nest and do not subsequently return and successfully raise young in that nest for the duration of a breeding season. Nest abandonment can be caused by altering habitat near a nest, even if the alteration occurs prior to the breeding season. Whether the eagles migrate during the non-breeding season, or remain in the area throughout the non-breeding season, nest abandonment can occur at any point between the time the eagles return to the nesting site for the breeding season and the time when all progeny from the breeding season have

dispersed.

Project footprint – The area of land (and water) that will be permanently altered for a development project, including access roads.

Similar scope – In the vicinity of a bald eagle nest, an existing activity is of similar scope to a new activity where the types of impacts to bald eagles are similar in nature, and the impacts of the existing activity are of the same or greater magnitude than the impacts of the potential new activity. Examples: (1) An existing single-story home 200 feet from a nest is similar in scope to an additional single-story home 200 feet from the nest; (2) An existing multi-story, multi-family dwelling 150 feet from a nest has impacts of a greater magnitude than a potential new single-family home 200 feet from the nest; (3) One existing single-family home 200 feet from the nest has impacts of a lesser magnitude than three single-family homes 200 feet from the nest; (4) an existing single-family home 200 feet from a communal roost has impacts of a lesser magnitude than a single-family home 300 feet from the roost but 40 feet from the eagles' foraging area. The existing activities in examples (1) and (2) are of similar scope, while the existing activities in example (3) and (4) are not.

Vegetative buffer – An area surrounding a bald eagle nest that is wholly or largely covered by forest, vegetation, or other natural ecological characteristics, and separates the nest from human activities.

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NEWKIRK
ENVIRONMENTAL, INC
CHARLESTON, SC • BLUFFTON, SC

14 October 2009

Mr. Kevin O'Neill, Vice President
Beach Development
211 King Street, Suite 300
Charleston, SC 29401

RE: **Kiawah River Plantation**
Charleston County, South Carolina

Dear Mr. O'Neill,

In a standard reply from the USACE on 7 August 2008, attached to this letter, the USACE acknowledges receipt of the wetland verification request by NEI for the referenced project. The USACE has since performed a field inspection of the site and subsequently verbally verified the freshwater wetlands delineated by NEI. I am currently coordinating with the USACE to obtain a final wetland verification letter.

Until receipt of the final verification, there will be no official correspondence from the USACE. If you have any questions, please do not hesitate to contact me.

Sincerely,

Ryan Clarey
Newkirk Environmental, Inc.
Charleston Office

Enclosure

Post Office Box 746, Mt. Pleasant, South Carolina 29465-0746 • 1887 Clements Ferry Road, Charleston, South Carolina 29492
Telephone: (843) 388-6585 • Facsimile: (843) 388-6580

E-Mail: general@newkirkenv.com
www.newkirkenvironmental.com

DEPARTMENT OF THE ARMY
CHARLESTON DISTRICT, CORPS OF ENGINEERS
69A Hagood Avenue
CHARLESTON, SOUTH CAROLINA 29403-5107

REPLY TO
ATTENTION OF

AUG - 7 2008

Regulatory Division

To Whom It May Concern:

This is to acknowledge receipt of your project submittal to the Charleston District Regulatory Division for review.

SAC Number: 2008-01605-2Jy

Applicant: The Beach Company

Project: Kiawah River Plantation

Project Manager: David Chamberlain

All future inquiries regarding this matter should be directed to the Project Manager at (843) 329-8044. Additional information about the Charleston District Regulatory Program and Public Notice postings can be found at our web site located at http://www.sac.usace.army.mil/

U.S. Army Corps of Engineers
Regulatory Division
Charleston District

The Real Property is not included in an overlay or special purpose district. Therefore, Articles 5.1, 5.2, and 5.4 through 5.9 shall not apply. Article 5.3 shall apply as set forth herein.

ARTICLE 5.3 WDU, WATER-DEPENDENT USE OVERLAY DISTRICT

§5.3.1 DESCRIPTION

The WDU, Water-Dependent Use Overlay District is intended to accommodate community docks, boat ramps, marinas and commercial docks and other nonresidential uses that require locations near water bodies.

A. Private docks intended for the private use of one family shall be exempt from the requirements of this Ordinance.

B. Joint use docks intended for the private use of two to four families shall be exempt from the requirements of this Article.

§5.3.2 USES

Community docks, boat ramps, marinas and commercial docks and other uses that require locations near water bodies may be allowed in the WDU District, if approved in accordance with the procedures of this Ordinance.

§5.3.3 COMMUNITY DOCKS

A community dock(s) is any docking facility that provides access for more than four families (greater than or equal to 5 watercraft slips and less than or equal to 10 watercraft slips) and is not a marina. All community docks shall be considered a Water-Dependent Use.

Community dock(s) shall be subject to the following standards:

1. All proposed community docks shall comply with the Site Plan Review procedures contained within this Ordinance;

2. All proposed community docks shall comply with all applicable regulatory requirements of State and Federal agencies including but not limited to South Carolina Department of Health and Environmental Control (SCDHEC) and U.S. Army Corps of Engineers;

3. [redacted]

4. No leasing or other transfer of space to individuals who do not reside in the residential community or other commercial uses are allowed at community docks;