Bluffton Township Watershed Plan
User Guide & Study Summary
August 2009

Abstract

Over half of Beaufort County is covered with waterways and wetlands. This unique natural environment has enabled generations of prosperity throughout the County and has attracted many new residents over the past decades. Today, the surrounding community depends on these water systems for public health, jobs and recreation.

Recent decades of development have brought an influx of impervious surfaces, such as parking lots and roads. If these impervious surfaces cover more than 10 percent of a watershed area, it is a widely held scientific fact that the water quality within it declines. Poor water quality leads to medical illness in humans and decimates oysters, fish and other marine life.

The proposed Bluffton Township Watershed Plan accommodates development and expected increases in growth, while also protecting the health of the waterways. The goal of our plan is to arrange development in patterns and locations that keep impervious coverage at or below 10 percent, so that the quality of the water and the health of the surrounding communities are upheld.

Based on comprehensive regional sector mapping, we have developed an equation that calculates the average impervious surface assigned to both residential and non-residential development for each respective watershed in the region, then determined how to rearrange development within each to maximize the undisturbed natural landscape and minimize impervious surface. (The vested rights already granted through development agreements can be accommodated using the Town of Bluffton's Transfer of Development Rights Ordinance.) Using the equation, the Town and County can reorganize the currently planned sprawl development pattern into retrofitted traditional settlement patterns that will achieve more ideal levels of impervious surface and protect water quality.

This study and associated planning tools and maps were produced by the Coastal Conservation League in hopes of offering the Town and County a proactive approach to dealing with the complex issue of recovering regional water quality. The collateral benefit to using the workbook and planning tools will be the creation of a more sustainable, livable community that protects the fragile coastal environment and continues to make southern Beaufort County a desirable place to live and work.

Background – Bluffton Growth & Associated Issues

Beginning a decade ago, the Town of Bluffton set its course once Hilton Head Island began to reach the "build out" stage of development. Town of Bluffton officials began to recognize the amount of growth the Town would soon face. All of the land outside the original "one square mile" of the Town was in the jurisdiction of Beaufort County. Instead of ignoring growth in the area, the Town began to annex land in order to possess some local control over future development. In less than two years, Bluffton had grown from a square-mile-town to more than fifty square miles, a majority of which is located five or more miles from the heart of the town. In November 1998, Bluffton annexed Palmetto

Bluff (20,660 acres) and the Shults Tract (620 acres), in April 2000, the Buckwalter Tract (5,600 acres), and in June 2000, the Jones Tract (4,400 acres).

In recent years, the waterways of Southern Beaufort County, including the Okatie-Colleton, May and New, have become increasingly degraded, so much so that the rivers defining Bluffton Township (classified as Outstanding Resource Waters) are now listed as "impaired" by the Department of Health and Environmental Control. But how is Bluffton's exponential growth tied to river degradation?

With a few exceptions, the settlement pattern south of the Broad River has been comprised of conventional suburban sprawl: single-use, single-family detached subdivisions, strip-commercial, and auto-dominated thoroughfares which brings with it a high percentage of impervious surface. The clearing of land for sprawling suburban development is directly linked to the impaired waterways because without enough natural landcover left intact to serve its filtering function, stormwater carries sediment and pollutants across impervious surfaces and directly into the rivers. The impacts of impervious surface are exponential: a one-acre parking lot produces 16 times the volume of runoff that comes from a one-acre meadow (Schueller & Holland, 2000). Therefore, developing under a conventional suburban sprawl settlement pattern guarantees enormous stormwater volumes while amplifying its negative impacts on our waterways.

(Southern Beaufort County)

(Southern Beaufort County)

(Town of Bluffton)

(Town of Bluffton)

Sprawling suburban settlement and high percentages of impervious surface typify development in Southern Beaufort County and the Town of Bluffton

Moreover, the streams, creeks, marshes and rivers surrounded by filled and impervious watersheds are less diverse, less stable, and less productive than those in natural watersheds. (Schueller & Holland, 2000) Streams in watersheds with more than ten percent hard surfaces become physically unstable, causing erosion and sedimentation, (Booth, 1991; Booth & Reinelt, 1993) and habitat quality falls below the level necessary to sustain a broad diversity of aquatic life. (Booth, Booth &R; Shaver et al., 1995) In sum, a watershed's diversity, stability and quality become increasingly compromised as percentages of impervious surface increase. As a general rule, a ten-percent [impervious surface] threshold establishes an empirical point beyond which ecosystem function, in general, declines because of individual and cumulative stresses. (Beach, 2002) Studies specifically focusing on coastal estuaries have confirmed that general degradation begins at the ten-percent impervious threshold. (Taylor, 1993) There is an indisputable positive relationship between the traditional development pattern (compact, mixed-use, traditional neighborhood development) and its minimized impervious surface that ultimately results in greater water quality.

Over the past decade, various stormwater management techniques have been employed in an attempt to mitigate the impacts of stormwater runoff caused by impervious surface without altering the conventional suburban settlement pattern. These techniques include, but are not limited to: stormwater management ordinances, Best Management Practices, devices at the end of outfalls, and maintenance and repair of stormwater retention ponds. However, the current inventory of on-site safeguards does not allow us to ignore the ten-percent rule. The only aquatic systems that will retain the full range of species and ecological functions will be those where less than ten percent of the watershed is impervious. (Schueller & Holland, 2000) The goal, therefore, must be to maintain as many of these watersheds as possible. This conclusion has been documented by Beaufort's Clean Water Task Force (A Blueprint for Clean Water, 1997); in the Summary of Findings of the Workshops on River Quality Overlay District Ordinance for Beaufort County (S. V. Cofer-Shabica, 2000); and in recommendations of the Beaufort County Special Area Management Plan (2002). This is not to discount the need for stormwater protection technologies that help minimize water quality impacts. Additionally, a variety of design-level techniques can be employed to achieve just such a result. The Light Imprint Handbook, produced by Duany, Plater-Zyberk and Company, offers an array of options.(see Appendix A)

While local governments grapple with the technological fix, the pattern of settlement has rarely, if ever, been discussed. The facts: lower density development, or "sprawl" scenarios, create more run-off and consume 2/3 more land than high-density, or "town" scenarios per household. Developing at a high density accommodates more growth while leaving more land undisturbed. (EPA, 2006). For the same number of households, densities greater than eight dwelling units per acre would have "significant" reduction in pollutant loads in comparison with suburban densities, and "substantial" per capita reductions in both runoff volume and pollutant load at densities of 16 – 32 dwelling units per acre (Jacob and Lopez, 2009). The Belle Hall study in Charleston, SC clearly demonstrates the stormwater and pollutant load reductions possible by employing higher density, traditional town development as the following chart illustrates.

Conventional Sprawl Development *Traditional Town Development*

	Forest	Sprawl	Town
Runoff (inches)	0.04	0.33	0.23
Sediment (tons)	1.29	17.36	4.72
Nitrogen (lbs/acre)	0.02	0.13	0.04
Phosphorus (lbs/acre)	0.01	0.06	0.02
Chemical Oxygen Demand (lbs/a	0.5	2.86	1.68

The Belle Hall Study modeled impervious surface, stormwater runoff, and pollutant load under the conventional suburban sprawl model and the traditional town development model

Abundant research over the past three decades has proven that site-level practices, in the absence of land use reforms, cannot protect aquatic ecosystems from decline (Cohn-Lee and Cameron, 1992). It is virtually certain that unless development patterns change, then next twenty years of coastal growth will precipitate severe and irreversible declines in our estuaries and near-shore waters (Beach, 2002). While the ten percent rule can be bent, it cannot be broken. Therefore, we hold the following to be true: compact settlement patterns are the truest form of water quality protection. The Coastal Conservation League undertook this study to examine existing and planned development in the three watersheds to determine whether a retrofitted settlement pattern could yield protection of the respective waterways. The goal became to obtain a maximum 10% imperviousness for each watershed.

Methodology—Sector Planning

"Sector" is a term for a geographic area. In the Smart Code, there are seven specific sectors for regional planning that establish the legal boundaries for open space and development. (SmartCode v.9.2) The Sectors utilized in this study are briefly defined as follows:

- 0-1: Preserved Open Space and 0-2: Reserved Open Space denote areas for protection of open lands (primarily open space);
- G-1: Restricted Growth Sector, G-2: Controlled Growth Sector; and
- G-3 and G-4 are for successional communities; and
- G-5: Sprawl Repair Sector.

The intent is to enable the region to retain natural infrastructure and character derived from topography, woodlands, farmlands, riparian corridors and coastlines by planning for protected land, and to encourage infill and redevelopment of new communities contiguous to existing, settled areas and integrated in the existing urban pattern.

Using sector-based planning is advantageous for managing regional change because it incorporates both scale (sector and community) and context (rural, sub-urban, urban center). Sector planning recognizes that natural systems function at scales larger than an individual unit or development. Additionally, sectors are regionally calibrated and can be updated easily. (SmartCode v.9.2) The following are the sector descriptions for the Plan, calibrated for conditions present in the Bluffton Township:

O-1 PRESERVED OPEN SECTOR: The Preserved Open Sector shall consist of Open Space that is protected from development in perpetuity. The Preserved Open Sector includes areas under environmental protection by law or regulation, as well as land acquired for conservation through purchase, by easement, or by past Transfer of Development Rights.

- -- Surface Waterbodies
- -- Wetlands (Freshwater or Saltwater)
- -- Marsh
- -- Land under Conservation Easements
- -- Land protected under Federal, State, County, or Municipal Law
- -- Land Trust
- -- Clustered Land Development Open Space

O-2 RESERVED OPEN SECTOR: The Reserved Open Sector shall consist of Open Space that should be, but is not yet, protected from development as existing condition is necessary to protect certain species, water quality, etc.

- -- Low-Lying Areas/High Flood Risk Areas to Be Acquired
- -- Lands Adjacent to the Headwaters of Rivers to Be Acquired
- -- Riparian Corridors to Be Acquired
- -- Waterway Buffers to Be Acquired
- -- Legacy Woodland
- -- Legacy Farmland
- -- Legacy Viewsheds
- -- Lands Composed of Incompatible Soils for Human Settlement to Be Acquired
- -- The Reserved Open Sector is a Transfer of Development Rights (TDR) sending area, for the gradual sale of rights for development in the Controlled Growth Sector and the Intended Growth Sector and the Sprawl Repair Sector. An owner who has purchased such development rights may exceed the allocated Densities of New Communities in the aforementioned sectors. Areas from where development rights have been transferred shall be designated Preserved Open Sector. The Planning Office shall maintain a record of such transfers, updating the regional map accordingly.

G1 RESTRICTED GROWTH SECTOR: The Restricted Growth Sector shall be assigned to areas that have value as Open Space but nevertheless are subject to development, either because the zoning has already been granted or because there is no legally defensible reason, in the long term, to deny it.

- -- Those portions of Planned Unit Developments (PUDs) with vested rights that have not developed either horizontally or vertically and are in areas unsuitable for immediate human settlement
- -- May be Future Phases of a Community that have not been constructed that are not suitable for human settlement
- -- Lands that are appropriate for Sustainable Agriculture supporting the Local Food System
- -- Lands that could support Low-Impact Renewable Energy Projects
- -- The Restricted Growth Sector is a Transfer of Development Rights (TDR) sending area, for the gradual sale of rights for development in the Controlled Growth Sector and the Intended Growth Sector and the Sprawl Repair Sector. An owner who has purchased such development rights may exceed the allocated Densities of New Communities in the aforementioned sectors. Areas from where development rights have been transferred shall be designated Reserved Open Sector. The Planning Office shall maintain a record of such transfers, updating the regional map accordingly.

G2 CONTROLLED GROWTH SECTOR: The Controlled Growth Sector shall be assigned to those locations that can support Mixed Use by virtue of proximity to an existing or planned Thoroughfare. This Growth Sector will require retrofitting existing stormwater treatment systems to more effectively handle existing runoff at the site, as well as that from the increased density received under the Town of Bluffton TDR Program. Retrofit should incorporate stormwater principles set forth under Light Imprint Design and Traditional Neighborhood Development, see below. Retrofitted stormwater systems should emulate natural biological systems as closely as possible and employ principles of biomimicry.

-- Communities that have begun early phases of horizontal and/or vertical infrastructure but are not settling in a traditional urban pattern
-- Communities that have Future Phases of settlement that necessitate retrofitting in order to assume a more compact design (Traditional Neighborhood Development)
-- Potential for First Phase Retrofit of the Community May Exist
-- Appropriate Settlement Area for Secondary Growth for the Town of Bluffton

G3 INTENDED GROWTH SECTOR: The Intended Growth Sector shall be assigned to those locations that can support substantial Mixed Use by virtue of proximity to an existing or planned regional Thoroughfare and/or transit. This Growth Sector will require retrofitting existing stormwater treatment systems to more effectively handle existing runoff at the site, as well as that from the increased density received under the Town of Bluffton TDR Program. Retrofit should incorporate stormwater principles set forth under Light Imprint Design and Traditional Neighborhood Development, see below. Retrofitted stormwater systems should emulate natural biological systems as closely as possible and employ principles of biomimicry.

-- Lands typically located adjacent to existing traditional urbanism and compact TND growth
-- No Retrofit of Community Design Needed but should be supervised to ensure sustainable settlement patterns
-- The Intended Growth Sector is a Transfer of Development Rights (TDR) receiving area from the Preserved Open Sector and Restricted Growth Sector. An owner who has purchased such development rights may exceed the allocated Densities of New Communities in the aforfementioned sectors. The Planning Office shall maintain a record of such transfers, updating the regional map accordingly.

G4 INFILL GROWTH SECTOR: The Infill Growth Sector shall be assigned to areas already developed, having the potential to be modified, confirmed or completed in the pattern of Infill TNDs or Infill RCDs. This Growth Sector will require retrofitting existing stormwater treatment systems to more effectively handle existing runoff at the site, as well as that from the increased density received under the Town of Bluffton TDR Program. Retrofit should incorporate stormwater principles set forth under Light Imprint Design and Traditional Neighborhood Development, see below. Retrofitted stormwater systems should emulate natural biological systems as closely as possible and employ principles of biomimicry.

-- Areas possess existing, sustainable infrastructure network
-- The Infill Growth Sector is a Transfer of Development Rights (TDR) receiving area from the Preserved Open Sector and Restricted Growth Sector. An owner who has purchased such development rights may exceed the allocated Densities of New Communities in the aforfementioned sectors. The Planning Office shall maintain a record of such transfers, updating the regional map accordingly.

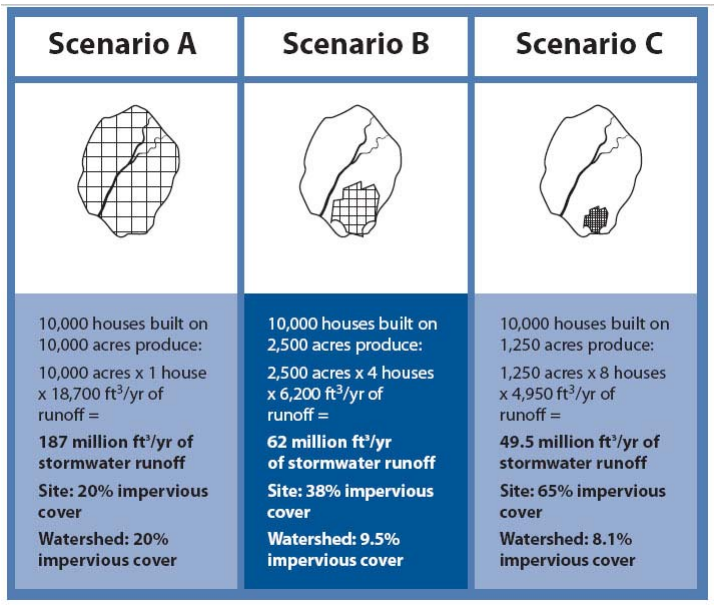
G5 SPRAWL REPAIR SECTOR: The Sprawl Repair Sector shall be assigned to areas that are currently single-use, disconnected conventional development patterns but that have the potential to be completed or redeveloped in the pattern of CLD, Infill TND or Infill RCD. This Growth Sector will require retrofitting existing stormwater treatment systems to more effectively handle existing runoff at the site, as well as that from the increased density received under the Town of Bluffton TDR Program. Retrofit should incorporate stormwater principles set forth under Light Imprint Design and Traditional Neighborhood Development, see below. Retrofitted stormwater systems should emulate natural biological systems as closely as possible and employ principles of biomimicry.

-- Underutilized Developed Lands
-- Rural Subdivisions
-- Single-family Subdivisions
-- Multi-family Subdivisions
-- Shopping Centers and Strips
-- Business Parks and Suburban Campuses
-- Malls
-- Edge Cities
-- Sprawl Type Thoroughfares
-- Sprawl Type Open Space
-- The Sprawl Repair Sector is a Transfer of Development Rights (TDR) receiving area from the Preserved Open Sector and Restricted Growth Sector. An owner who has purchased such development rights may exceed the allocated Densities of New Communities in the aforementioned sectors. The Planning Office shall maintain a record of such transfers, updating the regional map accordingly.

The attached spreadsheets (see Appendix B) analyze each development in the Township and calculate the impervious surface cover as they are planned now and after suggested transfer of development rights and/or retrofit. This numerically demonstrates a solution for the current pattern by describing what developments can transfer development rights or retrofit future phases to accommodate growth at a higher density and retain open space.

Further supporting the improvements that can be achieved, the 2006 EPA Report “Protecting Water Resources through Higher Density Development,” (see Appendix C) models build-out and impervious surface cover in a traditional town development model versus conventional suburban sprawl.

Traditional town development, or 8 units per acre, was 25% more efficient than conventional suburban sprawl of 4 units per acre, saving nearly 15,000 cubic ft/yr of stormwater runoff per acre (EPA 2006).



The conventional sprawl model produces twenty (20%) percent impervious cover across a ten-thousand (10,000) acre watershed, whereas a traditional town model only produces about eight (8%) percent.

The Belle Hall Study in Charleston, SC demonstrated thirty (30%) percent great efficiencies under a traditional town model versus a conventional sprawl model. (Dover, Kohl & Partners, 1996) Habersham in Northern Beaufort County includes a traditional town model for non-residential development, in which the approximate impervious coverage averages only thirty-five (35%) percent, compared to conventional sprawl commercial impervious averages of sixty to seventy (60%-70%) percent, or greater.

To calculate the equations for residential and commercial development, we used three data points. The graphs are displayed below. For residential development, the x axis represents net density and the y-axis shows impervious surface cover. For commercial development, the x-axis represents site footprint and the y-axis shows impervious surface. In sum:

- The residential equation cover reads as follows: $Y = 0.45 (x^2) – 5.75(x) + 25.3$
- The equation for non-residential development is $Y = 0.0202 (x^2) – 1.625 (x) + 40.2$

Transfer of Development and Retrofit Potential

In 2007, the Town of Bluffton passed a Transfer of Development Rights (TDR) Ordinance (see Appendix D). Under the TDR Ordinance, a developer can sell density, defined as residential units or square footage of non-residential development, to the TDR Bank. Another developer can then purchase density and “apply” it to another development. The TDR Bank was established and funded by bond referendum.

Residential units selected for retrofit were those communities that have not yet completed some/all of their development phases. Here, "retrofit" refers to either sending units to a more appropriate location or redesigning a planned development or phase of development under a traditional town model to accommodate greater density. These developments are located within the G-2 and G-3 sectors and the developer did not sell lots separately from homes. Shell Hall, for example, has two future phases to be built and a nice vegetative buffer between each phase allowing the existing construction (in Phase 1) to exist well, physically and visually, with new construction following the town development style (higher density) in the second and third phases.

Our priority sending areas are those areas at the headwaters of each respective watershed. Protecting the headwaters through buffer zones and undeveloped land is essential to achieving our water quality goals. When possible, all new construction should be transferred away from these areas. Priority receiving areas are those areas with current horizontal infrastructure in place, areas of urban infill and areas of non-residential development that can accommodate additional growth vertically. Typically these were G3, G4, G5 sectors. Densities were transferred across watersheds only when necessary.

Involving Beaufort County is a crucial step in assuring the success of this or any other planning effort. Having Beaufort County land interspersed throughout the Town of Bluffton necessitates the County and Town come to a formal agreement on how to resolve growth and stormwater issues. This study operates under the assumption that such an agreement will be reached, as property under County jurisdiction was utilized in each watershed's density transfer scenario.

The Town and County can further facilitate this study's suggestions through the adoption of a calibrated Form-based code with a sprawl retrofit module. This will allow some development's existing densities to be retrofitted (when indicated as appropriate in matrix) as opposed to being transferred. A calibrated Form-based code and retrofit module will also promote the retrofit of strip-commercial corridors in order to accommodate mixed-uses, such as residential, civic and park space

housing pod

before retrofit

after retrofit

townhouse pod

before retrofit ***after retrofit***

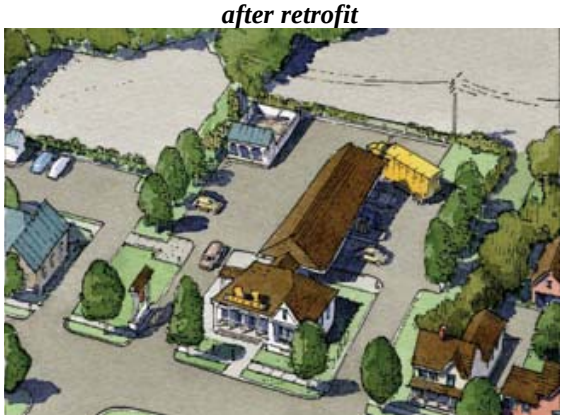
retail development

before retrofit ***after retrofit***

April 02, 2008

service station

before retrofit ***after retrofit***



April 02, 2008

Findings

Using quantitative and qualitative analyses, it was determined that Bluffton Township could achieve substantially decreased impervious surface and reduce stormwater runoff in both existing and planned developments, and improve water quality, all while creating an enhanced and sustainable public realm. Utilizing the Town's Transfer of Development Rights Ordinance as a model, retrofitted net density increases produced decreased impervious surface percentages, and total impervious surface coverage within each respective watershed can be realized.

We believe this study demonstrates the necessary next steps that must be taken in order to protect the watersheds and respective waterways in perpetuity, and simultaneously create more sustainable, interconnected and attractive neighborhoods.

1. Most importantly, the Town and County ***must*** devise and implement a plan to reduce and maintain impervious surfaces at or below 10% across each watershed.
2. To accomplish this goal, the Town and County should first adopt this sector plan into its Comprehensive Plan, and then move aggressively toward Form-based code adoption while amending development agreement development standards.
3. The Town and County should then begin promoting the sale of density to developers to utilize in accordance with the sector plan.
4. The Town and County should utilize the Light Imprint Development tool box, as well as continuing to use and enforce stormwater management technologies.
5. The Town and County should enter into an intergovernmental agreement for the formation of a Regional Planning Commission to oversee the implementation of this plan as well as other multi-jurisdictional planning efforts.

We hope this study and its recommendations provide the Town and County with a workable solution for its current water quality and growth management issues. If implemented comprehensively, we believe it will allow the Town and County to remedy its current crisis and set the stage for a more sustainable future. In closing, we must emphasize timing. Any plan must be vetted and applied as quickly as possible in order to achieve maximum impact for our waterways and communities. Time is of the essence. The Coastal Conservation League appreciates the opportunity to study this issue and will continue to support the Town of Bluffton and Beaufort County in its efforts to protect the fragile coastal environment and make Southern Beaufort County a desirable place to live and work.

Definitions:

Watershed - area of land within which all water drains to the same place; a bounded hydrologic system. Developments within the scope of the Bluffton Watershed Plan have been sorted according to the watershed(s) in which each is located.

Jurisdiction - the governmental entity each development is represented and regulated by for the purpose of our study, we included developments from the Town of Bluffton and Beaufort County. Developments in Jasper County and Town of Hardeeville were not included but do have an impact on area water quality.

Sector - method of characterizing and categorizing the appropriate and assigned growth for each development. See Sector Map for sector descriptions.

Development - an individual proposal for residential and/or commercial construction as defined by development agreement or by right. Include all phases of a multi-phased proposal

Acres – total acreage of a proposed or existing development

Vested Units – number of individual residential units approved to be constructed under a development agreement or by right.

Constructed Units– number of residential units physically constructed across all phases of a development, also includes number of lots purchased by new owners for home construction

Reassigned Units – number of Units Approved sent to another development using the Town of Bluffton's Transfer of Development Rights Ordinance

Net Density – the number of dwelling units per net acre of land developed or used for residential purposes

Planned Impervious – total percentage of impervious surface coverage across an entire development based on average impervious surface coverage per Unit Approved

Retrofitted Impervious – recalculated total percentage of impervious surface coverage across an entire development after sending Units Approved and retrofitting remaining development

Percent Buildout – to date, percentage of total Units Approved in a development that have been purchased or physically constructed

Unit Change – adjusted number of Units Approved after either sending or receiving Units Approved to or from another development under the Town of Bluffton's Transfer of Development Rights Ordinance

'Transfer or Retrofit' for 10% goal – number of Units Approved from a development that must be sent under the Town of Bluffton's Transfer of Development Rights Ordinance, within a respective watershed, in order to achieve 10% goal for impervious cover, recognized as the threshold for maintaining fully functioning and healthy biological systems.

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Appendices:
Please go to coastalconservationleague.org
to access supporting documents for the Bluffton Township Watershed Plan
(under Regions, South Coast and then Bluffton Watershed Plan) including:

Appendix A: Light Imprint Tool Box Matrix
Appendix B: Spreadsheets for all calculations
Appendix C: Town of Bluffton TDR Ordinance
Pew Report, Coastal Sprawl
EPA Report(s)
DPZ Retrofit Boards