Beaufort County Stormwater Management Utility Board (SWMU Board)
Meeting Minutes

June 4, 2014 at 2:00 p.m. in Beaufort Industrial Village Building #2 Conference Room

Board Members	
Present	**Absent**
Don Smith	Allyn Schneider
Patrick Mitchell	
James Fargher	
William Bruggeman	

Ex-Officio Members	
Present	**Absent**
Andy Kinghorn	Van Willis
Scott Liggett	
Kimberly Jones	

Beaufort County Staff
Bryn Hill
Eric Larson
Allison Coppage
Eddie Bellamy
Danny Polk
Alan Eisenman

Visitors
Lamar Taylor, City of Beaufort
Dr. Bud Badr, Southern Water Resources
Paul Moore, Ward Edwards
Reed Armstrong, Coastal Conservation League
Alan Warren, USCB

1. Meeting called to order – Don Smith
- **A.** Agenda – Approved.
- **B.** April 2, 2014 Minutes – Approved.
  May 7, 2014 Minutes – Approved.

2. Introductions – Completed.

3. Executive Session – Board members went into Executive Session. The board returned to regular session. Action: The board recommended the utility share in the cost to purchase the Forby tract (10-acre tract) for no more than $125K with one opposing vote from Mr. Don Smith.

4. Public Comment(s) – None.

5. Reports – (Mr. Larson submitted his written report in advance. Please see attachment.)
- **A. Special Presentation** – The Water Budget Study is complete and Dr. Bud Badr provided a presentation on the results (please see attachment).
- **B. Utility Update –** Eric Larson
  DHEC and MS4 Update – The County will be submitting for MS4 permit coverage independently of the other MS4s. The county has notified DHEC of their intent to become permitted effective January 1, 2015. As the permit is implemented, the county plan's to find opportunities to partner with the Town of Hilton Head Island and the Town of Bluffton to decrease cost and provide uniformity in the separate programs.
- **C. Monitoring Update** – Mr. Eric Larson
  USCB Lab – Mr. Larson and the lab personnel have drafted a schedule with a full implementation date of the lab for county monitoring services to be in the spring of 2015.
- **D. Stormwater Implementation Committee Report –** Eric Larson

May 15th, 2014 SWIC Meeting - The topic was Data Management. Members have demoed (3) data management software.

E. Stormwater Related Projects – Eric Larson
Brewer Memorial Park – See "New Business".

F. Upcoming Professional Contracts Report – Eric Larson
US 278 retrofit ponds – Bid due date is June 5, 2014.
County Administration Complex Retrofit Project – Soliciting proposals from interested contractors.
RFP for a stormwater consultant to assist with the setup of the MS4 Program - The RFP will be advertised soon for services to begin in FY2015.
SC 170/Okatie West - Developing a concept plan to enhance the project design to address the project runoff as well as the west branch of the Okatie headwaters. He will report more in the future as concepts are developed.

G. Regional Coordination - Eric Larson
Battery Creek Pond – Mr. Paul Moore said the survey is on-going and should be completed by early next week.
Stoney Creek – Ms. Kimberly Jones corrected Mr. Larson's report and said this project is not funded by an EPA grant. The second EPA grant is for funding the Pineridge pond retrofit project. The Town of Bluffton will be releasing an IFB for the Pineridge stormwater reuse for irrigation. Stoney Creek is part of the May River Watershed Action Plan. Contract has been awarded. Site visit is schedule ahead of surveying services.
Salinity Study - On going. Previously the scope had been modified and expanded with receiving some federal money. First year of the study is complete and successful. DNR will be reporting on this project at the SESWA annual conference in October.
Sea Level Rise and future planning – On going research project by DNR. The committee group met on May 15th and they are working on prioritizing the proposed action steps to mitigate sea level rise. They will have an action report by August.

H. Financial Report and Incorporating the Capital Improvement Fund – Alan Eisenman
Mr. Eisenman presented the un-audited April interim financial statements for the Stormwater Utility (please see attachment). Financials are a little different since the Capital Improvement Fund has been implemented. Following are the highlights from his presentation:

- Actual April FY14 revenues are $86K more than Actual April FY13 revenues.
- Actual April FY14 expenses are at 68% of budget for FY13.
- Unrestricted Fund Balance from Balance Sheet combined with the Capital Improvement Fund increased by $166K since last FY at this time.
  Cash from Balance Sheet combined with the Capital Improvement Fund increased by $169K since last FY at this time.

I. FY 2015 Revised Proposed Budget including Capital Projects – Eric Larson
The proposed budget has been revised to be more realistic (please see attachment). Revenue is consistently declining slightly and he believes it's from annexing. Both the revenue projection and the proposed expenditures have been decreased.
Mr. Larson has compiled a list and staff has created project sheets for all the projects he has identified that are proposed to be constructed and programmed them out over 10 years (please see attachment).

J. Maintenance Projects Report – Mr. Eddie Bellamy reported on (2) major projects, Clydesdale Circle and Holly Hall Road. *Because of time, he forwent the presentation on the (19) minor and/or routine maintenance projects.*

6. Unfinished Business – Eric Larson

A. *Public Education Branding* – The SWIC has recommended the shared use of the Town Of Bluffton's "Neighbors for Clean Water" slogan for all public education efforts county wide. Our County Administration concurs. The Board supports the Public Education Branding concept.

7. New Business – Eric Larson

A. *Brewer Memorial Park Project* – Eric Larson

This proposed project is located near the Factory Creek fishing pier. The Open Land Trust has asked the utility to consider a detention basin project to retrofit an existing pond. If the utility modify the pond then the Open Land trust will build the boardwalk. The board members recommend the utility pursue this demonstration project.

8. Public Comment –

Ms. Jones reminded the board members that the Okatie 319 composting unveiling party is scheduled for that evening.

Mr. Reed Armstrong suggested the next time the board has an executive session that they allow the guest speaker to present before the executive session.

9. Next Meeting Agenda – Approved.

10. Meeting Adjourned.

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June 4, 2014

Stormwater Manager's report for the Stormwater Utility Board Meeting

Utility Update

1. DHEC and MS4 update – After much discussion with the County Administration and our counterparts in the Towns of Hilton Head and Bluffton, we have concluded that the County will need to submit for MS4 permit coverage independently of the other MS4s. As the permit is implemented, we plan to find opportunities to partner with them to decrease cost and provide uniformity in the separate programs. We have notified DHEC of our intent to become permitted effective January 1, 2015. We are awaiting the notification letter from DHEC setting these timeframe.
2. Budget for FY15 –The County Administrator's office has reviewed a series of proposed changes to our budget and has verbally agreed that the budget is acceptable. A summary of the revisions is included in the June board packet and will be explained during the meeting.
3. Larson, E. Miller, D. Polk, and Charles Bush attended the Charleston Area Pond Conference on May 22, 2014. It had very good content on pond design, maintenance, water quality benefits, problems often associated with use (including hazard material disposal of dredged sediment), and concluded the day with a keynote address from David Wilson, Chief of the DHEC Bureau of Water.
4. Eric Larson's summary report on the APA Conference in April is attached.
5. Josh Gruber will provide an update on various topics in an Executive Session during the meeting.

Monitoring Update

1. USCB Lab – Other monitoring activities are on-going. The lab and our office have set a full implementation date of the lab for county monitoring services to be in the spring of 2015. See attached draft schedule which is subject to revision.

Stormwater Implementation Committee (SWIC) report

1. The SWIC met on May 15, 2014. The topic was Data Management. (See attached draft minutes)
2. ACTION REQUESTED = Public Education Branding – The SWIC has recommended the shared use of the Town Of Bluffton's "Neighbors for Clean Water" slogan for all public education efforts county wide. Our County Administration concurs. I recommend the Board's support of the joint branding effort.

Stormwater related Projects

1. Proposed Carolina Jellyball processing facility in Lobeco and unloading facility on Golden Dock Road in St. Helena Island – Nothing new to report since last month.
2. Drainage issue on H.E. McCracken Circle in Bluffton – Nothing new to report since last month.
3. US 278 at Kitty's Crossing Overtopping issue – Nothing new to report since last month.
4. Infrastructure crew performed on-going maintenance needs. Nothing significant to report.
5. ACTION REQUESTED = Brewer Memorial Park – Possible Stormwater project – The Open Land Trust has asked us to consider a detention basin project to retrofit an existing pond. See attached draft letter proposal. I recommend the Board's endorsement of the project.

Professional Contracts Report

1. US 278 retrofit ponds – Bid due date is June 5, 2014.
2. County Admin. Complex Retrofit Project – We are soliciting proposals from interested contractors.
3. Consultant procurement for the Carolina Jellyball application for the Lebeco site is still on hold pending a submittal from the applicant.
4. A RFP for a stormwater consultant to assist with the setup of the MS4 program will be advertised soon for services to begin in FY2015.
5. Water Budget Study – Dr. Badr will be presenting the findings to the Board during the June Board meeting. A copy of the report was sent to the Board earlier this past month.
6. Okatie East BMP monitoring – Ongoing. Nothing new to report since last month.
7. Trask Parkway Overtopping study – The project is on hold pending review of available modeling data.
8. SC 170 widening and stormwater – Due to some concerns raised by an adjacent property owner, Mr. Kubic asked me to review the stormwater design for the project. I am developing a concept plan to enhance the project design to address the project runoff as well as the west branch of the Okatie headwaters. I will report more in the future as concepts are developed.

Regional Coordination

1. Battery Creek Pond funded by an EPA 319 grant – Still in design phase. (Lamar Taylor may report)
2. Stoney Creek watershed plan funded by an EPA 319 grant – Proposals from consultants are currently being reviewed. (Kim Jones may report)
3. Salinity Study - On going. Nothing new to report.
4. Sea Level Rise and future planning – On going. The committee met on May 15th and discussed the sea level rise model and brainstormed planning and development issues that need to be addressed concerning this topic.

Beaufort County Public Works
Stormwater Utility

Preliminary Budget Comparison

Revised Date: May 19, 2014

Unaudited Projected Revenue

	FY2014 Requested Board Budget	FY2015 Requested Board Budget	FY2015 Revised Budget
Revenue			
Admin SWU Fees	312,064	313,460	313,460
Utility Activities SWU Fees	3,162,936	2,814,138	2,766,881
Revenue from SWU Fees	3,475,000	3,127,598	3,080,341
Reimbursable Projects	2,500	2,500	2,500
Interest	6,923	2,955	2,955
Cost-Share for Joint Efforts	57,522	41,689	41,689
Reserve Utilization			
Del Webb Agreement Fund	-	-	
Stormwater Utility	-	413,581	351,091
	3,541,945	3,588,323	3,478,576

Efforts (Expenditures)

	FY2014 Requested Board Budget	FY2015 Requested Board Budget	FY2015 Revised Budget
Admin	312,064	323,941	313,460
Utility Activities			
UA/Control Reg	73,147	257,274	216,956
UA/WQ Monitoring	160,000	120,000	120,000
UA/WQ Controls	200,000	-	-
UA/Annual Maintenance	2,679,069	2,783,108	2,736,160
UA/Public Information/Outreach	67,665	50,000	50,000
UA/Drainage Enhancement	25,000	19,000	7,000
UA/Additional Studies	25,000	35,000	35,000
Utility Activities Subtotal	3,229,881	3,264,382	3,165,116
***Reserve Utilization**			
Reserve Utilization Subtotal	-	-	-
Efforts Total	3,541,945	3,588,323	3,478,576

*Efforts funded by utilizing the reserve are spread among all utility activities.

Change in Capital Assets On Balance Sheet

	FY2014 Requested Board Budget	FY2015 Requested Board Budget	FY2015 Revised Budget
Capital Assets Additions	455,991	340,604	166,561
Depreciation	(242,119)	(192,181)	(182,523)
	213,872	148,423	(15,962)

SUMMARY

	FY2014 Requested Board Budget	FY2015 Requested Board Budget	FY2015 Revised Budget
Cash Balance	-	-	1,611,101
Revenue	-	-	3,127,485
Revenue - SFU Rate Increase	-	-	
Expenditures (Includes Depreciation)	-	-	(3,478,576)
Capital Purchases	-	-	(166,561)
Reserve Policy	-	-	-
Capital Projects	-	-	(845,999)
	-	-	247,450
Operating Income (Loss) (15.1% of SWI Personnel Budget)	-	-	278,366
Reserve	-	-	525,816

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I N T E R O F F I C E M E M O R A N D U M

TO: **Rob McFee, Director of Engineering and Infrastructure**

FROM: **Eric W. Larson, Stormwater Manager**

SUBJECT: **Re-Cap of the APA National Conference in Atlanta, GA on April 26-30, 2014**

DATE: **May 9, 2014**

I attended the American Planning Association national annual conference in Atlanta, GA on April 26 to April 30, 2014. Even though it was a Planning conference and I do not actively work in Planning, there was a full agenda of stormwater related topics that I was able to attend.

There is a large focus on sustainability related to climate change and sea level rise. Many presentations I attended focused on planning development in coastal areas to minimize future damages by storm surge and sea level rise, as well as recovery plans. I sat in on discussions on the Georgia Coast, Florida Gulf Coast, and New Orleans area. All three had common themes: modeling sea level rise, planning for critical infrastructure (roads and buildings) within these areas, strategies to improve them, and policies to re-build them if damaged by a storm event or eventual inundation by higher water levels.

Another trend in topics was legal issues related to "takings". Ironically, many of the recent cases that APA is educating its members on are related to takings due to stormwater related restrictions on properties, such as buffers and building restrictions for water elevation freeboard. Most cases were in favor of the defendant, or property owner / developer. The key argument seems to be on whether or not the property owner has been denied all economic use of the property. Buffer restrictions that don't allow any use or disturbance would be an example of a total taking while a buffer that allows viewshed clearing, passive parks, or similar feature provides a value and not considered a total taking. Rob Merchant in our Planning Department told me our regulations are careful to allow economic use of the property in buffers to avoid such legal challenges.

A third category was based on economic development through green infrastructure. Several presentations tied urban blight and redevelopment efforts to sustainable development that created pedestrian friendly, new urbanism type improvements. Most, if not all, of these ideas use green infrastructure practices such as bioswales and pervious pavements to improve the aesthetics of the area without the need for traditional stormwater infrastructure. I was particularly interested in this topic since it is in line with the discussion our administration has been having concerning redevelopment of the Buckingham Plantation / Anolyn Ct. area.

Of course, the reason I attended the conference was my participation as moderator and presenter on a panel discussion of green infrastructure and barriers often encountered trying to implement the same. I presented as a case study the proposed Form Based Code along with past green infrastructure projects developed at the University of Kentucky during my tenure. The session was well attended with standing room only.

April 23, 2014

Draft timeline for USCB Lab "Next Steps" Strategic Plan

Developed by Eric Larson and Dr. Alan Warren

1. Complete equipment purchase - April 2014
2. Training on new equipment - April 2014
3. Field training on County monitoring stations and equipment - Feb. 2014 to June 2014
4. Begin duplicate sampling with County (to establish certification data) - June 2014
5. Town of Bluffton renewed contract with USCB Lab - July 2014
6. Lab offers services to property management entities within the County (eg. Palmetto Bluff, Sea Pines, Palmetto Dunes, others) for routine water quality monitoring - ongoing
7. Lab submits certification applications to DHEC for all certifiable methods per County's monitoring needs - January 2015
8. Discontinue use of GEL Engineering services for the County - ongoing as individuals assays are approved beginning January 2015 through April 2015 (subject to DHEC schedule)
9. County begins re-assessment of monitoring needs, with USCB lab support, to develop a MS4 compliant program. Begin additional certifications as needed - January 2015.
10. USCB Lab and County to begin discussions with Town of Hilton Head Island to join the County's collaborative effort to utilize the lab of stormwater monitoring. (The Town of Hilton Head renewed a contract with GEL Engineering in the spring of 2014) - January 2015.
11. USCB Lab reassesses workload and capabilities to expand services beyond local government and current clients - Spring 2015
12. USCB Lab and County to begin discussions with military installations to join the County's collaborative effort to utilize the lab of stormwater monitoring - Fall 2015.
13. USCB Lab and County to begin discussions with private industries to join the County's collaborative effort to utilize the lab of stormwater monitoring - 2016.
14. USCB and County begin to discuss development of a water quality curriculum to support sampling and testing workload, develop professional for internships and degrees in the field, and provide public education and outreach efforts for the community - 2016.

DRAFT Minutes - SWIC Meeting May 15, 2014 - BJWSA Community Room 1:30 pm - 3pm

1. Introductions
    a. Attendees: Kim Jones, Carl Norris, Bryan McIlwee, Bates Rambow, Lamar Taylor, Eric Larson, Seth Stanbery
    b. Not present - Tony Maglione
2. Minutes from April 3, 2014 - approved by common consent.
3. MS4 data management / Asset Management Software(s)
    a. Product(s)
        i. EnerGov - City of Charleston and County of Charleston going to it. Bryan says Tyler Technologies is working on a MS4 module. The software is customizable but requires Tyler to do the changes. Seth says Horry County has been using it for years. They recommended against it. Horry Co. is using it for initial building permitting, and const. inspections, plan review, and code enforcement. GIS is tied to tax map number, not GIS coordinate, so subdividing losses history of records.
        ii. Cityworks - Horry County also used this in the past and present. It has a good mapping component. Citizen complaint / Work order request module, IDDE, Post Const. inspections, reporting, and mobile based. Seth says it appears that Cityworks and EnerGov are the two softwares that most SC communities are using.
        iii. Permit Tracker and Gilware - Old softwares developed by Woolpert and formerly used by Charleston County.
        iv. Geosync Go - Eric noted it is cheap and web based. Does asset management.
        v. MS4web - Carl and Eric noted this software. Eric has used it. Good software but lacked GIS interface with ERSI. Carl noted with a sales flyer that they are now advertising that it does. Also very cheap license. Web based.
        vi. Iworq - Eric mentioned it but didn't recommend it.
    b. Existing tool(s)
        i. ToB uses Munis for Finance. EnerGov for building permits, stormwater for EPSC inspections, Certificates of Compliance and CO. Migrating to enterprise version. Bill is looking into what modules are needed to make it work for MS4 reporting.
        ii. ToHHI uses Munis for Finance. EnerGov for building permits, stormwater for EPSC inspections, Certificates of Compliance and CO. Just went live using it last week.
        iii. BC does not have anything but looks as if will need to use Munis for inspections.
        iv. CoB doesn't have anything that they use as of now. Use hard copy files and scanned files. No software.
        v. ToPR not present but it was assumed they do not use anything software at this time.
        vi. Issues with EnerGov are that it does not work well with Esri GIS then though it is marketed that way.
        vii. ArcGIS -Bates says it works well for inventory. Keeps inspections but can't do scheduling of future inspections. Asset management can be done if the fields are set up properly. Scheduling it probably possible using a Microsoft product but it would require someone to custom program the module(s). Bates presented the example of Gwinnett County, GA and how they do analysis of asset based on scoring.

c. Software Needs
    i. MCM 1 and 2.
        1. Pub Ed. Tracking.
        2. Citizen Complaints.
    ii. MCM 3
        1. Citizen Complaints.
        2. Complaint response.
        3. Mapping / Inventory.
        4. Routine Inspections of outfalls. - local gov. add in for water systems from Esri works well, according to Bates.
        5. Enforcement.
        6. Training.
    iii. MCM 4
        1. Plan review.
        2. Inspections.
        3. Enforcement.
        4. Training - staff and public.
    iv. MCM 5
        1. Plan review.
        2. Inspection post-construction.
        3. Enforcement.
        4. Training - staff, public for maintenance.
    v. MCM 6
        1. Inventory of facilities and structural controls.
        2. Routine inspections.
        3. Training.
    vi. MCM 7 - Monitoring
        1. Field sampling events.
        2. Data analysis.
    vii. Non-NPDES tasks
        1. Work orders for O&M.

4. Action Items
    a. Do demo of MS4web. Seth and Eric will set up.
    b. Do demo of Geosync Go. Seth and Eric will set up.
    c. Research ESRI GIS for asset management. Seth, Bates, and Carl to continue to review.
    d. Permit tracking - Everyone will be doing own thing but it appears will be using similar softwares so user group sharing of ideas may be possible..
    e. Tara and Bill with ToB to discuss how EnerGov can be used for stormwater reporting.
5. Procurement
    a. See #6.
    b. EnerGov and Munis is already owned by all so likely not an issue.
6. Cost Sharing and Collaboration
    a. County willing to pay for MS4 software if less than $20,000 (corrected). This is the budgeted amount currently proposed in the SWU Management fee.
7. Other issues
    a. None noted.

8. Next Meeting - July 9, 2014. June meeting to be canceled due to schedule conflicts. Topic: MCM6- Good Housekeeping. Ask Tony M. to run the meeting due to his experience with writing SC MS4 permits and in an effort to share leadership roles among the municipalities in the SWIC.
9. Adjourned approx. 3:00 p.m.

BEAUFORT COUNTY STORMWATER UTILITY
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May 28, 2014

Mr. Josh Bell
Land Protection Coordinator
Beaufort Open Land Trust
1001 Bay Street
Beaufort, SC 29901

RE: Brewer Memorial Park – Proposed Stormwater Demonstration Project

Dear Mr. Bell,

In review of the plan to create this park, you and I recently discussed a potential conversion of an existing and abandoned fish bait pond on the site into a stormwater detention facility. Given the high profile site, I believe this project to be an excellent opportunity to create a demonstration project featuring a stormwater best management practice (BMP) to capture, retain, and treat runoff before it is discharged into the adjacent Factory Creek.

I have recommended that the Beaufort County Stormwater Utility support the development of the demonstration site through a series of phases, the first being a feasibility study by an engineering consultant. This study will investigate the existing hydrology and hydraulics of the area to determine if the pond can be built and provide a benefit. Should this study prove viable, the next phases would be design and construction. These phases would be funded by the Utility with the understanding that the Beaufort Open Land Trust and its partners would fund site amenities such as a boardwalk, landscaping, and viewing access to allow visitors to enjoy this feature and learn more about water quality through the use of this BMP.

Budget would be as follows:
Feasibility Study = $9,500
Design Phase = $20,000
Construction Phase = $50,000
Site Amenities = TBD

On June 4, 2014, the Beaufort County Stormwater Utility Board reviewed and endorsed this project. This letter serves as a proposal to the Beaufort Open Land Trust Board for consideration.

If you have any questions, please contact me at (843) 255-2805 or elarson@bcgov.net.

Sincerely,

Eric W. Larson, PE, CPSWQ, AICP, CFM
Stormwater Engineer
Beaufort County Stormwater Utility

QUANTIFYING WATER BUDGETS IN BEAUFORT COUNTY, SC

BY

SOUTHERN WATER RESOURCES

A.W. BADR, PH.D.

VIA

CLEMSON UNIVERSITY

AGREEMENT WITH

BEAUFORT COUNTY ENGINEERING DIVISION

2014

INTRODUCTION

Water budgets are needed primarily to determine the volume of fresh water that is being discharged into local tidal creeks and to determine how development is affecting components of the water budget. Areas of interest include the upper reaches of the Okatie River, which is part of a watershed that is fully developed and includes the retirement community of Sun City.

To address this issue, Southern Water Resources proposed to Beaufort County a network of surface- and ground-water monitoring stations strategically located within the watershed that will quantify precipitation, runoff, and changes in ground-water and surface-water storage. This network was installed in 2011 and 2012. Evapotranspiration was also estimated using a temperature-based approach. Data collected from the monitoring network was used as the basis for developing a water budget for a watershed within the Sun City development. Southern Water Resources also assisted the Beaufort County in the analysis and interpretation of this data.

Water Budgets

In its simplest terms, a water budget is an accounting of the volume of water entering a watershed (inputs), the volume of water leaving a watershed (outputs), and changes in the volume of water that is stored in the watershed (storage), over a fixed time interval. It is generally expressed by the equation:

$$Q_{in} - Q_{out} = \Delta S \text{ - - - - - - - - - - (1)}$$

where Q_{in} is the volume of water coming into the system (watershed) per unit of time, Q_{out} is the volume of water leaving the system per unit of time, and ΔS is the change in the volume of water in storage per unit of time. Three to four week time steps were used in the water budget analysis for this study.

Water enters a watershed primarily in the form of rainfall where it runs off to surface water bodies, evaporates and/or transpires from plants, or seeps into the ground. In this case, the water-budget equation above can be more accurately expressed as:

$$R - (Q_O + ET) = \Delta S \text{ - - - - - - - - (2)}$$

where P is precipitation, Q_O is runoff, and ET is evapotranspiration.

The above equation can be customized depending on the objectives and scale of a project, and depending on the complexity of the system that is being studied. Other inputs, for example, may include

water that is transferred from other watersheds or pumped from confined aquifers and used for irrigation in the watershed (Q_{ir}). The water budget equation would then be expressed as:

$$(R + Q_{ir}) - (Q_O + ET) = \Delta S \text{ - - - - - - - - - - - } (3)$$

Once calculated, a water budget is a valuable management tool that can be used to assess the availability and sustainability of water supplies within a watershed. Long-term (10 years or more) monitoring of the various components of a water budget can be used to assess the impacts that climate change and land-use modifications have on the water resources of an area.

OBJECTIVES

Watersheds commonly have different water budgets, reflecting differences in land cover, land use, soil characteristics, precipitation, geology, topography, and drainage patterns. Development can also alter the natural flow and distribution of water in a watershed and can change a water budget. Comparisons of water budgets between undeveloped and developed watersheds can be used to draw conclusions regarding the natural effects that soil characteristics, geology, or vegetation have on the water resources of the watershed. Comparisons of water budgets from undeveloped and developed watersheds can lend insights into the effects that human activities have on the water resources of the watershed.

The purpose of this project was to develop a water budget for the Sun City community in the Okatie River area, which is located in a part of a watershed that is fully developed. Runoff coefficients, or the ratio of runoff (Q_O) to rainfall (R), were also computed and compared to regional runoff coefficients determined from stream gaging stations monitored by the United States Geological Survey (USGS).

Specific objectives of this study were to:

1) quantify the amount of rainfall falling on the watershed (R),

2) quantify the amount of water imported into the watershed for irrigation purposes for both residences and golf courses (Q_{ir}),

3) quantify the amount of water discharging into the Okatie River as surface-water runoff (Q_O),

4) quantify the change in storage of the shallow water-table aquifer (ΔS_{wt}),

5) quantify the change in storage of the storm water ponds (ΔS_{rp}),

6) estimate the amount of water lost to the atmosphere by evapotranspiration (ET),

7) and compare runoff coefficients for the watershed with regional runoff coefficients.

The general water budget described above can be expressed in more detail for this study as:

$$(R + Q_{ir}) - (Q_O + ET) = \Delta S_{wt} + \Delta S_{rp}. \text{ - - - - - - - - - - (4)}$$

Scope of Work

Southern Water Resources was responsible for:

1) developing a plan to monitor the watershed with recommendations on which water budget components to monitor,
2) providing technical assistance on the siting of monitoring stations and the selection of appropriate equipment,
3) and evaluating data and developing a water budget for the watershed.

Beaufort County was responsible for:

1) purchasing the monitoring equipment,
2) installing the equipment,
3) maintaining the equipment,
4) installing monitoring wells,
5) collecting data from the monitoring stations,
6) collecting water use data for imported water and groundwater pumped from confined aquifers,
7) surveying elevations of monitoring wells and recorders in detention ponds,
8) and quality control.

Southern Water Resources' first responsibility was to develop a monitoring plan for the watershed that would focus on the principal objective of quantifying the water budget. Fiscal budget constraints, however, limited the number of sites that could be monitored and the number of wells that could be drilled. Site visits were necessary to evaluate the outfall areas, to determine where weather stations could be installed without obstructions and where monitoring wells could be drilled without interfering with other construction projects in the study area. Details of the number and locations of monitoring stations including stream gages, weather stations, pond gages, and monitoring wells are

presented in the Methods section. Monitoring wells were sited in each of the major hydrologic soil types that are represented in the watershed.

Southern Water Resources' second responsibility was to analyze the data that was collected from the various monitoring stations in order to generate the water budget for the study area. The water budget was computed for 3 to 4 week intervals and periods of analysis were limited by physical constraints at the weir outlet (see below).

METHODS

Water budget components for the study watershed located at Sun City are discussed below. Inputs to the watershed include rainfall (R) and the reuse of wastewater for irrigation purposes (Q_{ir}). Outputs from the watershed include surface water runoff (Q_O) and evapotranspiration (ET). Potential Evapotranspiration (PET) was computed to estimate the maximum amount of ET that could occur for the study watershed. Time periods for the water budget analysis were limited by periods when reliable surface runoff estimates were available (see below).

Rainfall (R)

Rainfall was measured by a manual rain gage located on the Palmetto Bluff watershed. Rainfall was typically recorded on a daily basis from Monday through Friday while rainfall totals during weekends were recorded on Monday mornings. To estimate daily rainfall on the weekends, totals recorded on Monday mornings were divided equally over Friday, Saturday and Sunday. Rainfall amounts were summed over the same 3 and 4-week periods for which flow was estimated as described below and presented in units of inches. Rainfall amounts for the selected time periods are presented in Table 1.

Water imported to watershed for irrigation (Q_{ir})

Wastewater from Sun City is reused for irrigation purposes within the study watershed, and thus, is treated as an additional inflow to the watershed. Wastewater reuse was estimated by prorating Sun City's total water use based on the percentage of houses located in the study watershed and assuming that this prorated amount is entirely returned to the watershed via irrigation. Water use data, in millions of gallons per month (MGM) were obtained from the applicable BJWSA treatment facility. Eighty percent of the water from this facility is used by Sun City. Average daily water use was estimated from the monthly water use data, and then total water use was summed over the time periods discussed below for the water budget based on the daily average values. The total water use for the selected time periods was then divided by the area of the watershed to determine the water use per unit area and converted to inches.

These values, included in Table 1, represent the amount of additional water added to the watershed from the reuse of wastewater for irrigation.

Runoff (Q_O)

Runoff or surface water outflow was estimated from a contracted rectangular weir located at the watershed outlet using the Francis equation (Gils, 1962). The form of the equation used computes outflow in cubic feet per second. The location of the weir is presented in Figure 1. The head or stage above the weir crest was measured with a pressure transducer at 5-minute intervals. Specifications for the weir allowed for outflow to be measured only when heads were equal to or less than 0.625 feet. During higher flow events, heads exceeded the 0.625 ft threshold at which the Francis equation is no longer valid for this weir. As a result of this limitation, outflow for high flow events could not be determined.

Figure 1. Groundwater and surface water monitoring sites on the study watershed.

Two periods of low to moderate flows were selected for analysis. The first period was from June 17, 2012 through August 4, 2012, and the second period was from September 16, 2012 through January 26, 2013. The second period included two flow events where heads above the weir crest briefly exceeded the 0.625 threshold limit and for each of these events the flow computed represents a minimum flow for

the event. Flow volumes were determined by taking the average head over each 5-minute interval and computing the resulting flow rate over the 5-minute interval using the Francis equation. Flow volumes were computed for each 5 minute interval, normalized to the drainage area of the watershed (1000 acres) to compute outflows in units of feet and then converted to inches. Outflows were then summed over 4-week intervals for the time periods described above (each of the two time periods discussed above included one 3-week interval as well). Outflows for the selected periods are presented in Table 1.

Runoff-rainfall coefficients, the ratio of outflow to rainfall (Qo/R), was also computed and presented in Table 1. These coefficients were compared to regional basin coefficients determined for the Salkehatchie and Coosawhatchie basins (see below) by computing percent differences in the coefficients. Ratios of runoff to the sum of rainfall and wastewater reuse ($Q_O/(R+Q_{ir})$ were also computed and presented in Table 1.

Potential Evapotranspiration (PET)

Potential Evapotranspiration (PET) for the study watershed was estimated using the Hamon method (Hamon, 1963). The Hamon method utilizes average daily temperature and daylight length, which is determined from the latitude of the study site. Temperature data was taken from the Beaufort MCAS station (ID NBC), which was approximately 19 miles from the study watershed. Daily PET in inches was computed from the average daily temperature and daylight length and then summed over appropriate time periods (the same 4-week periods for which outflows were estimated) for inclusion in the water budget. PET estimates for the selected time periods are presented in Table 1. PET is the maximum amount of evapotranspiration (ET) that can occur if soil moisture conditions are not limited. During drier periods, actual ET will be less than the PET.

Pond Stages

Surface-water levels were measured at two ponds on the study watershed. The ponds are labeled SCW-1 and SCW-5 (the largest onsite pond) in Figure 1. Levels were measured on an hourly basis with an unvented pressure transducer. The unvented transducer measured total pressure in feet of water and the hourly readings were compensated by using an onsite barometric sensor to remove the effects of barometric pressure. After compensation, water levels were converted to elevations in feet above sea level.

Groundwater Levels

Groundwater levels were measured at three sites on the study watershed. These sites are labeled as SCW-2, SCW-3 and SCW-4 in Figure 1. Levels were measured on an hourly basis with a vented pressure transducer. The unvented transducer measured total pressure in feet of water and the hourly readings were compensated by using an onsite barometric sensor to remove the effects of barometric pressure. After compensation, groundwater levels were converted to elevations in feet above sea level.

Each monitoring station in the study was surveyed to determine its latitude and longitude coordinates using the North American Datum of 1983 (NAD83) as the horizontal control datum, and leveled to determine its elevation above mean sea level using the North American Vertical Datum of 1988 (NAVD88) as the vertical control datum. All of the measurements made during the course of the study were referenced to a common datum allowing for computations of horizontal and vertical hydraulic gradients and other parameters.

Runoff coefficients for regional, unregulated watershed

The undeveloped, Palmetto Bluff watershed was originally included in the scope of this project. The runoff from that watershed was to be used for a comparison against the developed, Sun City watershed. The data collected from the Palmetto Bluff watershed shows that infiltrating rainfall moves downward into the deep sand layers of the watershed, and very little, if any, moves out of the watershed as runoff. The South Carolina Department of Natural Resources (DNR) recently made a geologic map of the Pritchardville quadrangle in Beaufort and Jasper counties. This geologic map shows an abundance of sand deposits and silted streams in the area of the Palmetto Bluff watershed. All collected data from the Palmetto Bluff watershed are given in Appendix B.

Two alternative watersheds were used for the comparison against the Sun City watershed. The selected watersheds are similar to the Okatie watershed where they are subject to tides and weather patterns (Figure 2). USGS data from the Coosawhatchie River near Hampton (02176500) gage was selected because the flow is unregulated and the hydrologic unit is the same as the Okatie River unit near Bluffton (03050208). Flow data has been collected at this site since 1951. The drainage area at this station is 203 square miles and has an average annual runoff of 10.6 in. The second selected site of unregulated flow is the Salkehatchie River near Miley (02175500) gage where the flow has been measured since 1951. The drainage area of this site is 341 square miles and has an average annual runoff of 12.8 in. The hydrologic unit of this site is 03050207 and is adjacent to the 03050208 hydrological unit. Average rainfall in the Salkehatchie and Coosawhatchie basins is approximately 48 in based on the review of several rainfall gaging stations located in these basins. Average runoff coefficients for the

Coosawhatchie and Salkehatchie basins for the period 1951 – 2012 are 0.22 and 0.26, respectively. The coefficient that was used in this study was an average of the two watersheds (0.24).

The state average runoff-rainfall coefficient was established from the State water budget (Figure 3) discussed in the State Water Plan. The state average coefficient is:

$$(21 \text{ in} - 8 \text{ in})/48 \text{ in} = 0.27.$$

The average is higher in the Upstate and Piedmont region because of the bedrocks and lack of coastal, shallow soil aquifers. The average is lower in the Coastal area because of the presence of the shallow soil aquifer system and the high storage ability in the soil profile.

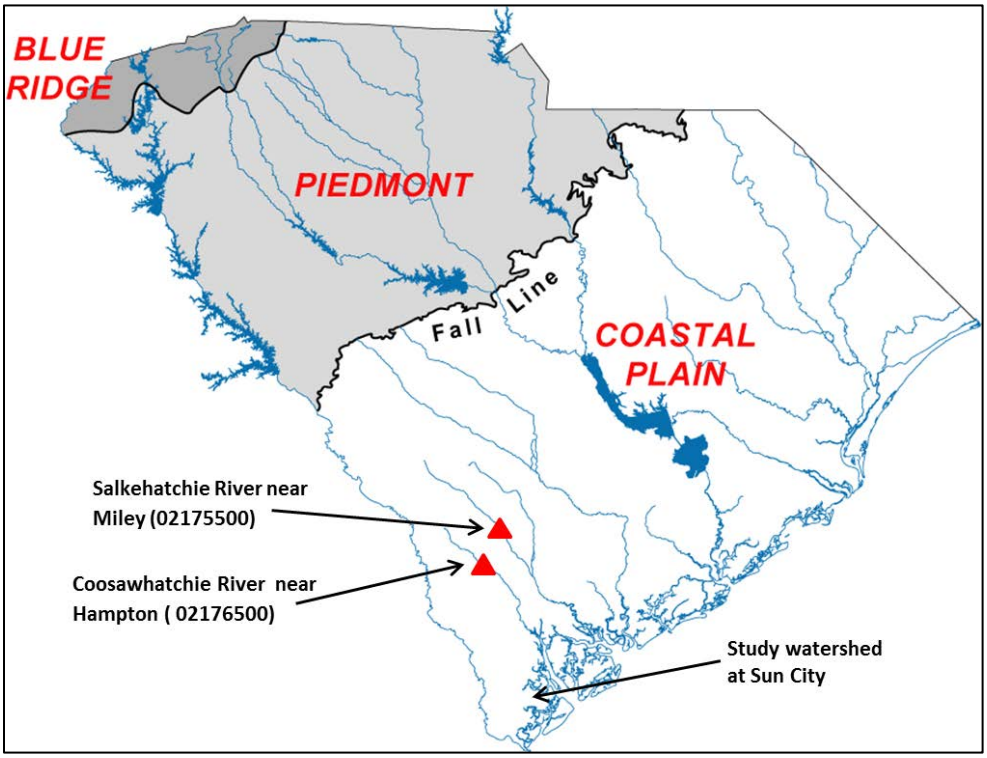


Figure 2. Location of unregulated gaging sites used to compute regional runoff-rainfall coefficients.

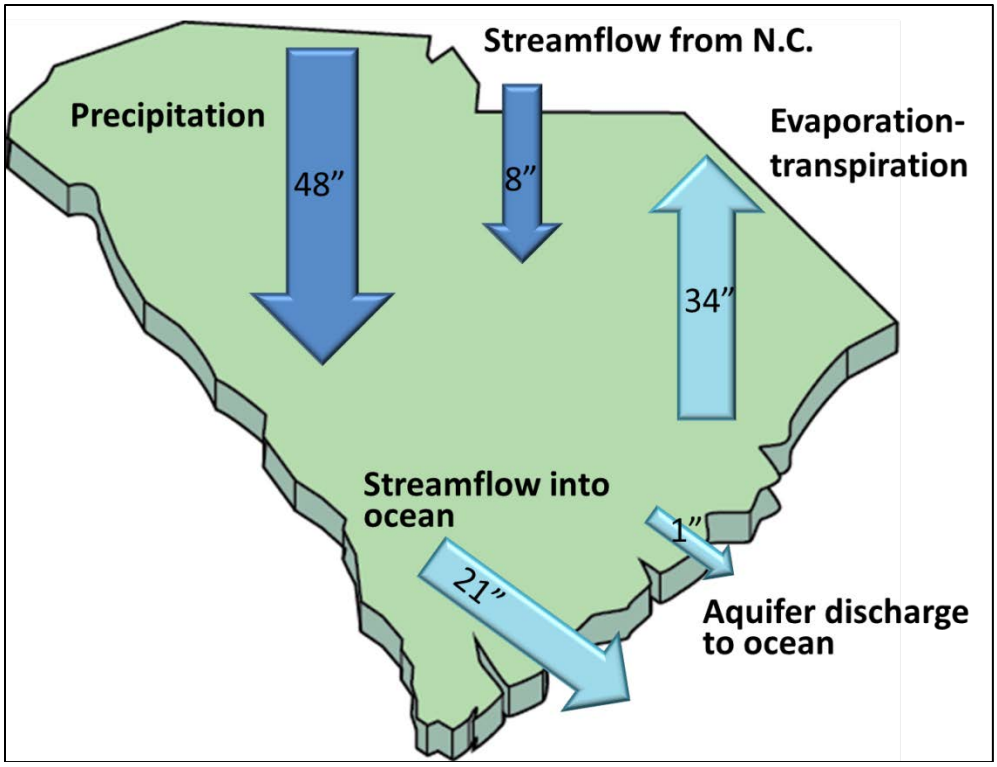


Figure 3. South Carolina’s water budget.

DISCUSSION

Water Budget Results

Precipitation and runoff are major components of the water budget in the study area. Therefore, it is critical that these two parameters be measured as accurately as possible using the best instrumentation available. Evapotranspiration is also a significant component of the water budget. Actual evapotranspiration will vary depending upon temperature and other meteorological variables. If an evaporation pan can be properly maintained or if an automated evaporation pan can be installed, it would greatly benefit any future studies on the watershed. For this study, potential evapotranspiration (PET) was used as a surrogate for actual evapotranspiration (ET).

Pond 5(SCW-5) is the largest pond in the Sun City development. While groundwater levels fluctuate due to rainfall and location, it is assumed that the groundwater levels in the watershed and SCW-5’s surface water elevations are trying to reach equilibrium at all times. Therefore, SCW-5 water levels were used to approximate the change in storage on the watershed.

Equation (3) was used to calculate the change of storage for each time unit in Table 1. For example, the total change in storage for the second period was:

$$(P + Q_{ir}) - (Q_O + ET) = (5.17 + 1.02) - (2.28 + 10.92) = -7.0 \text{ in.}$$

The measured change in storage was -7.7 in. Therefore, the percent error is:

$$[(7.7 - 7.0) / 7.7] \times 100\% = 9.2\%$$

The water budget results for the period from September 2012 through January 2013 in Table 1 gives a calculated change in storage within 10% of the observed changes in storage at pond SCW-5. However, measurement errors of runoff can be up to ± 15% for USGS streamflow gaging stations and compounded errors in the water budget can rise up to ± 45% according to the USGS.

The runoff-rainfall coefficients were calculated and included in Table 1 for each period. A coefficient was also calculated by dividing the runoff by the sum of the rainfall and additional water added to the system. The totals for the second period of analysis shows a significant increase in runoff where the coefficient measured in the Sun City watershed was more than 50% greater than the average annual runoff coefficient determined from the Coosawhatchie and Salkehatchie river basins.

Groundwater Well Data and Pond Stage Data Review

The observed water levels in groundwater wells and ponds are given the Figures 4 – 8 along with daily rainfall measured for the study period. Overall, water levels in the ponds and the wells were at their highest during August of 2012 when total monthly rainfall exceeded 13 inches and in February 2013, when monthly rainfall totals were approximately 9.5 inches. Levels were generally at their lowest during July 2012 owing to lack of rainfall and increased ET rates; however, SCW-3, SCW-4 and SCW-5 also experienced low level conditions in the fall of 2012.

Surface water levels in pond SCW-1 responded rapidly to rainfall events and increased as much as 2.5 ft during a large event in August 2012 (Figure 4). Levels in the pond also returned rapidly to pre - event levels. Levels in the pond typically showed little to no variation between rainfall events.

Table 1. Water budget results for the Sun City watershed for select periods.

[illegible] (in)	Q_{ir} (in)	[1] ΔS_{obs} (in)	ΔS_{calc} (in)	[2] % Diff. for ΔS	Q_0/R
				69.1	0.23
				71.4	0.04
				67.4	0.07
[illegible]	[illegible].28	-3.28	-2.40	26.7	0.47
[illegible]	0.26	-6.91	-1.92	72.3	0.17
[illegible]	0.22	-0.77	-1.39	-80.7	0.45
[illegible]	0.16	4.96	0.25	94.9	0.34
[illegible]	0.10	-1.70	-1.55	9.3	9.26
[illegible]	1.02	-7.70	-7.00	9.2	0.44

[1] ΔS is the change in storage observed at SCW-5.
[2] Percent difference between the observed and calculated ΔSC5 values.
[3] Average annual Q/R for the Salkehatchie and Coosewhatchie basins.
[4] Percent difference between the study watershed's runoff coefficients and the average annual runoff coefficient for the Salkehatchie and Coosewhatchie basins.

Groundwater levels at SCW-2 also respon… …, but levels at the site also experienced drawdowns on the order of several fee… …mmer of 2012 (Figure 5). In the fall of 2012 and winter of 2012-2013, water … …, owing to lack of significant rainfall, until two large rainfall events i… …ceable increases in water levels. Groundwater levels observed at SCW-3 res… …all events, but also receded very rapidly. Significant drawdowns are observed i… …f the fall and early winter of 2012.

Groundwater levels at SCW-4 also respon… …infall events and receded to baseline, conditions after 3 to 4 weeks (Figure 7). Levels ex… …e variation between large storm events and never receded much below 10 ft, amsl, which … …e for the influence of the large pond (SCW-5), which held water from 11 to 12 ft, amsl … study period. Levels in the pond rarely dipped below 11 ft, amsl. SCW-5 (Figure 8) also r… …ly to rainfall events, increasing above 13 ft, amsl on several occasions, but also receded a… …han observed at SCW-1.

The weekly change in water levels for all … and ponds are found in Appendix A (Figures 9 – 13).

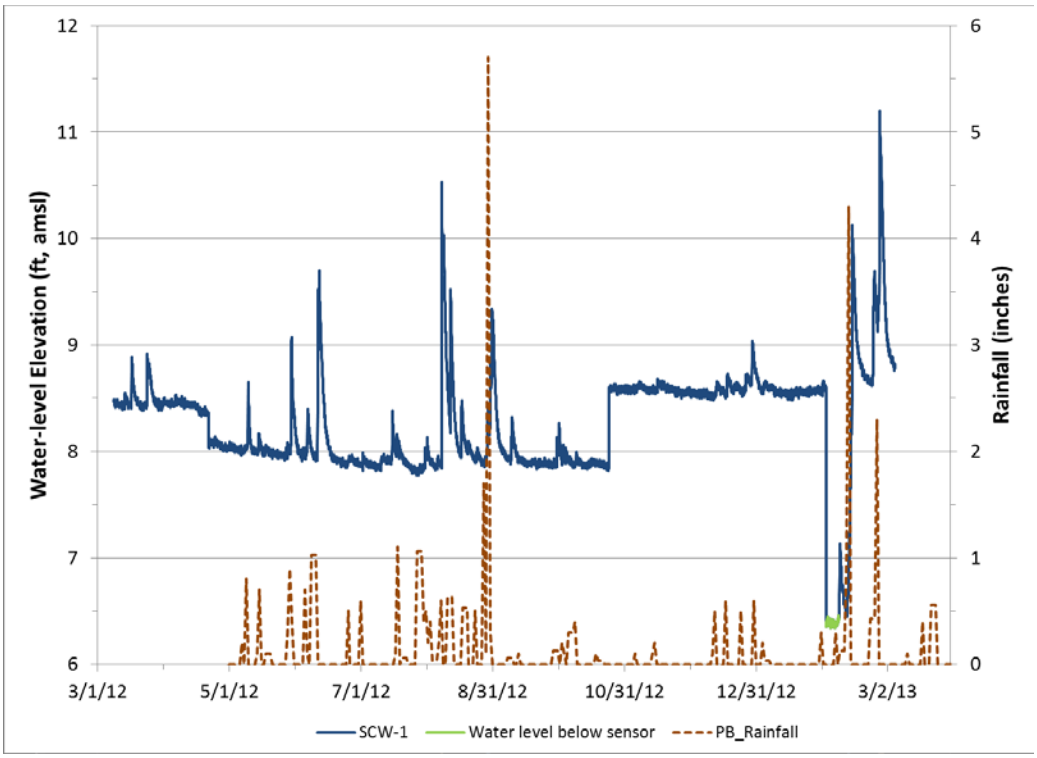


Figure 4. Water-level elevations for Pond 1 (SCW-1).

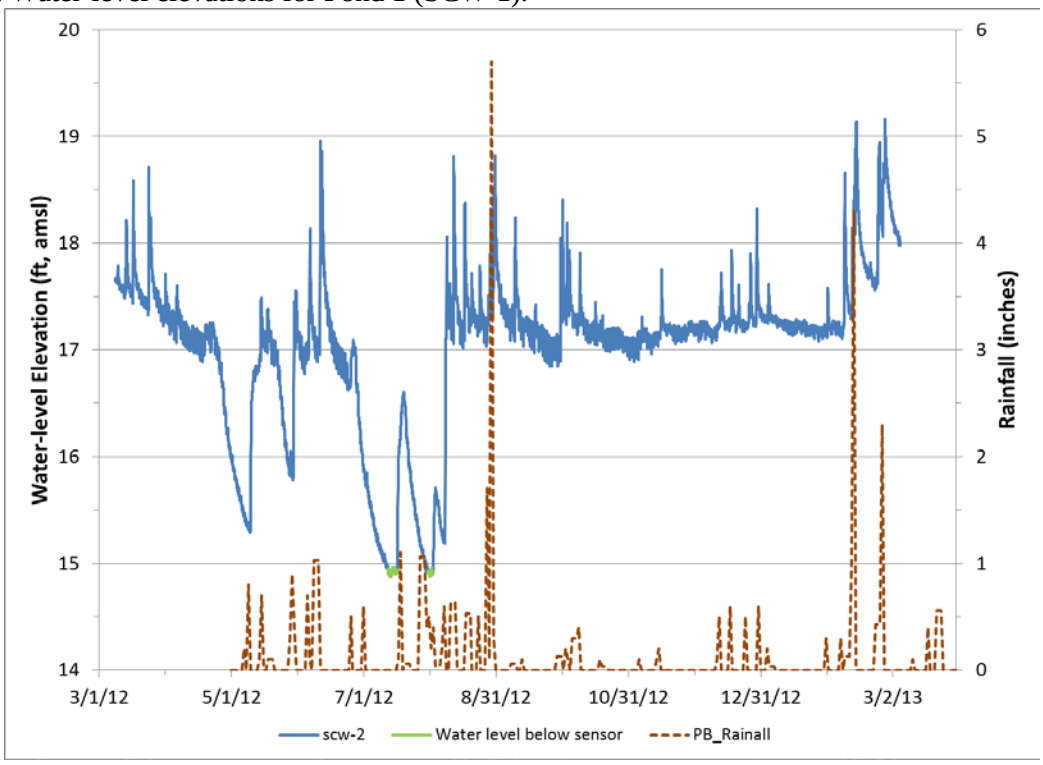


Figure 5. Groundwater-level elevations for SCW-2.

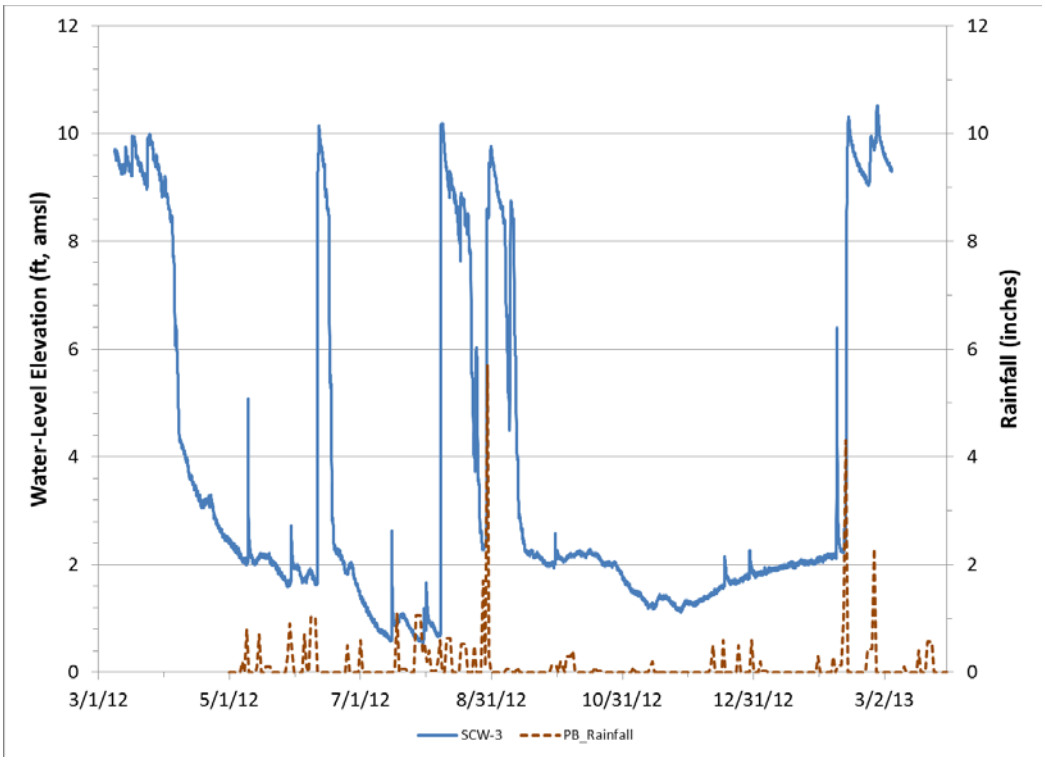


Figure 6. Groundwater-level elevations for SCW-3.

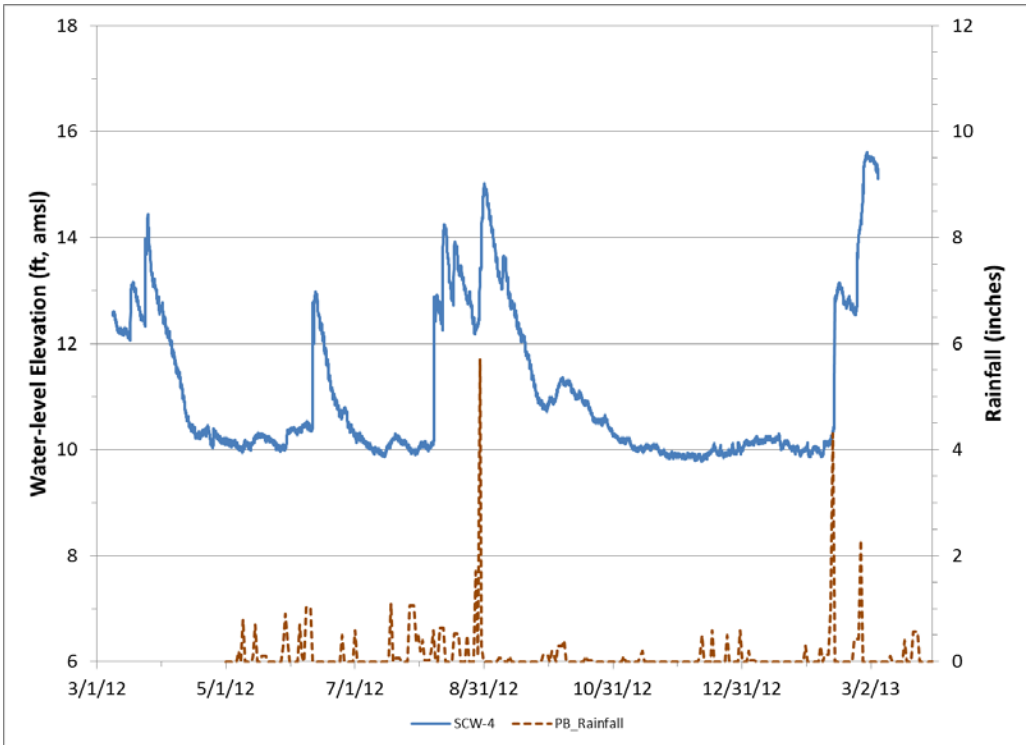


Figure 7. Groundwater-level elevations for SCW-4.

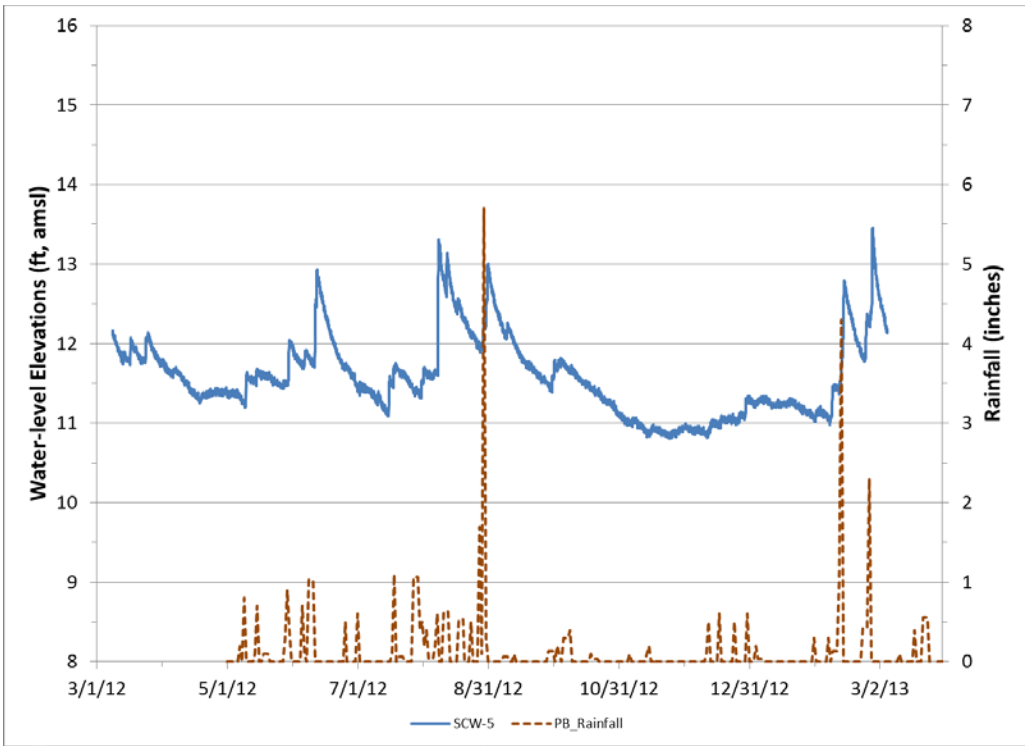


Figure 8. Water-level elevations for Pond 5 (SCW-5).

RECOMMENDATIONS

Data analysis on the Sun City watershed and the Coosawatchie and Salkewhatchie basins indicates an increase of more than 50 percent in the volume of water entering the headwaters of the May River as a result of land development.

Irrigated water added to the watershed was more than 20% of the natural rainfall during the monitoring period. The amount of available storage in the soil matrix was reduced due to the rising of the water table and the higher pond levels. Both the additional water and the higher water tables have increased the volumes and peak flows of runoff.

Surface runoff was not measured during high to very high rainfall events due to the physical limitation of the weir. Such volumes should be measured in future studies to quantify flows into the headwaters of the May River during these events.

Longer monitoring periods as well as additional monitoring stations are needed to measure more accurate runoff and rainfall during flood and drought events.

There was little to no stress on water availability in the developed area during the study period. During drier periods, the runoff was significantly less and the evapotranspiration was high, but stored water in the ponds was used to supplement the available effluent for golf course irrigation. Groundwater was available via two groundwater wells in the developed area; however, groundwater was not used during this monitoring period for irrigation.

To control the developed watershed's runoff and mimic the natural runoff, the following can be applied:

Aquifer Storage and recovery (ASR)

Aquifer storage and recovery (ASR) systems involve the injection and storage of potable water into an aquifer and the recovery of this water at a later time, usually to supplement water supplies. Most ASR projects in South Carolina are employed in coastal areas to meet high seasonal demands and to provide emergency supplies as needed. Treated surface water is injected into an aquifer during the off-peak season when demands are low and later recovered by pumping the treated water out of the aquifer to meet peak seasonal demands. Water injected into the aquifer must meet state and federal water-quality standards and ASR wells must be permitted by the S.C. Department of Health and Environmental Control (DHEC) in accordance with the S.C. Underground Injection Control Regulation (R. 61-87).

Currently four water suppliers operate ASR systems in the State: Grand Stand Water and Sewer Authority in Horry County; Mount Pleasant Waterworks in Charleston County; Kiawah Island Utility, Inc. in Charleston County; and Beaufort-Jasper Water and Sewer Authority in Beaufort and Jasper Counties.

The Orangeburg Department of Public Utilities, which uses the North Fork Edisto River as its drinking-water source, is in the process of installing two ASR wells, one in the Black Creek aquifer and the other in the Middendorf aquifer. The primary reason for developing this ASR system is not to have additional capacity during droughts when stream flows are low, but to improve the efficiency of their water treatment operations. During periods of low stream flow, when treatment of water from the North Fork Edisto is least expensive, treated water will be injected into the aquifers; during periods of high stream flow, when treatment of surface water is more expensive, the already-treated water stored underground will be recovered and made available for use with minimal additional treatment.

This suggested application of ASR is very unique in that extra runoff during normal and high flow periods will be harvested, treated and injected in a deep aquifer at the development site. The injection well will be used to supplement water supply demands during water shortages and drought

periods. Adding water to the deep aquifers in the Coastal area can significantly help control salt water intrusion into the State's aquifers. State environmental agencies like DNR and DHEC as well as local governments should have a special interest in this application.

Normal Storm Water Management

Storm water ponds should be kept drained at all times to receive the extra runoff during normal and high flow periods. The stored water should be released slowly as non-flood flows downstream. This application controls the peak of the flow downstream and does not reduce the volume of extra runoff.

REFERENCES

Badr, A.W., Wachob A., and Gellici, J.A., 2004, South Carolina Water Plan - Second Edition.

Gils, Ranald V., 1962 *Fluid Mechanics and Hydraulics*, Schaum McGraw-Hill, page 135.

Hamon, W.R., 1963. Computation of Direct Runoff Amounts From Storm Rainfall. Int. Assoc. Sci. Hydrol. Pub. 63:52-62.

APPENDIX A

Weekly Change in Water Levels for

Groundwater Wells and Ponds in the Sun City Watershed

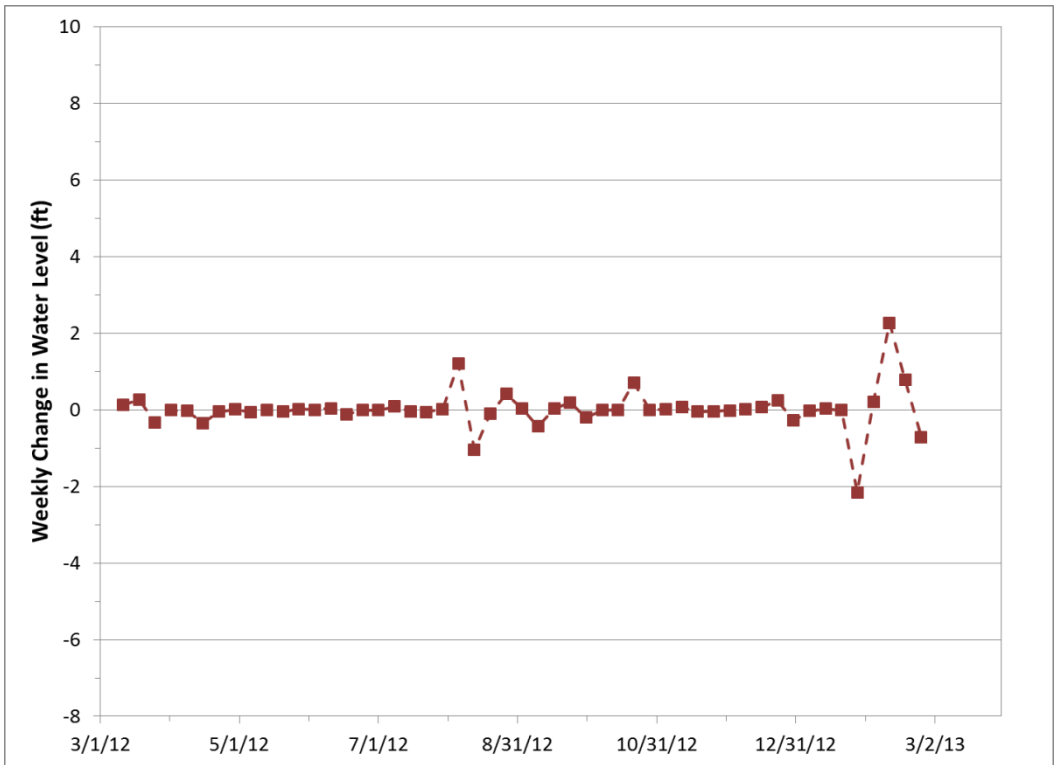


Figure 9. Weekly changes in water level at SCW-1.

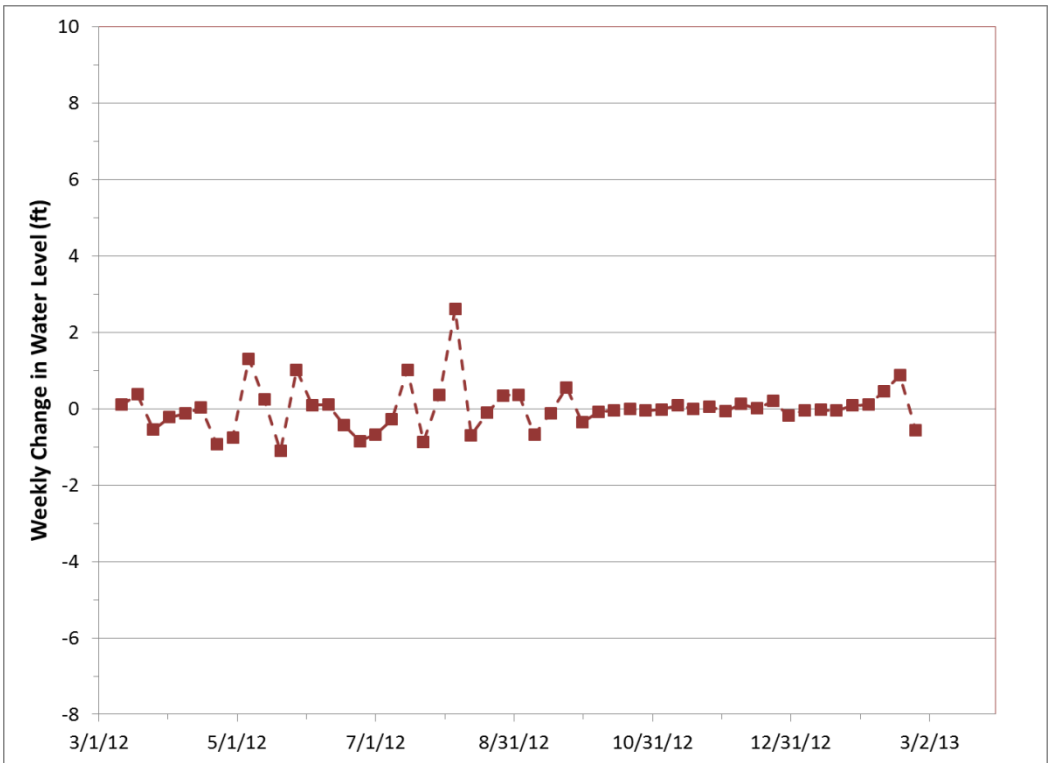


Figure 10. Weekly changes in water level at SCW-2.

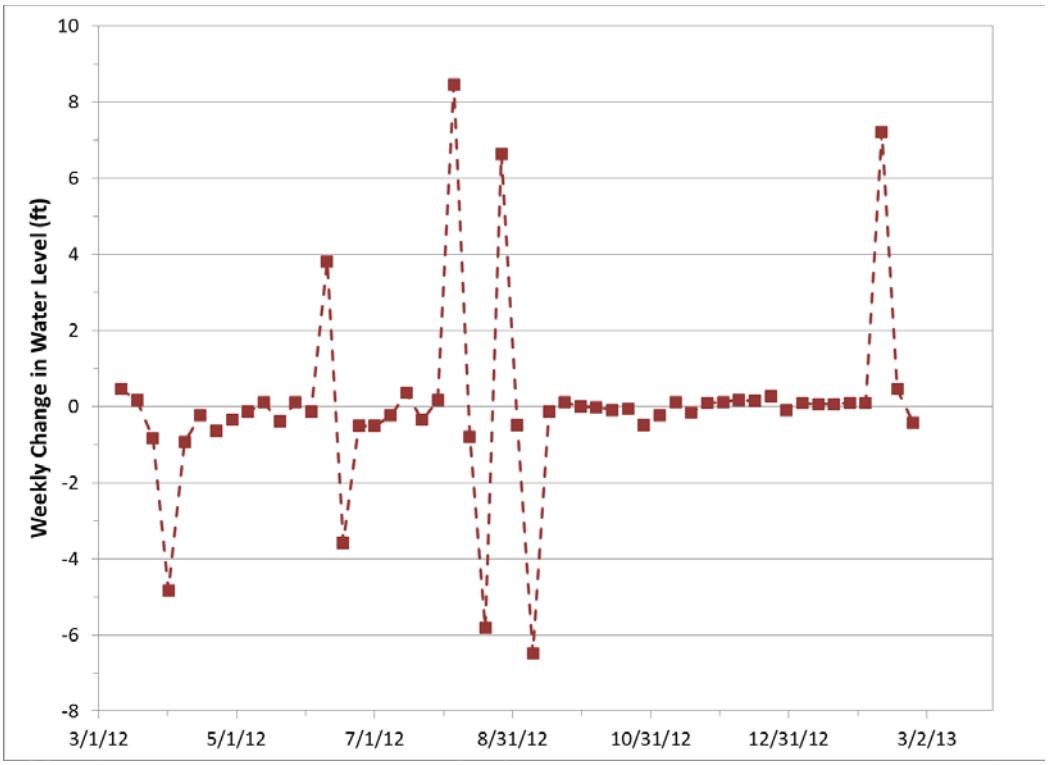


Figure 11. Weekly changes in water level at SCW-3.

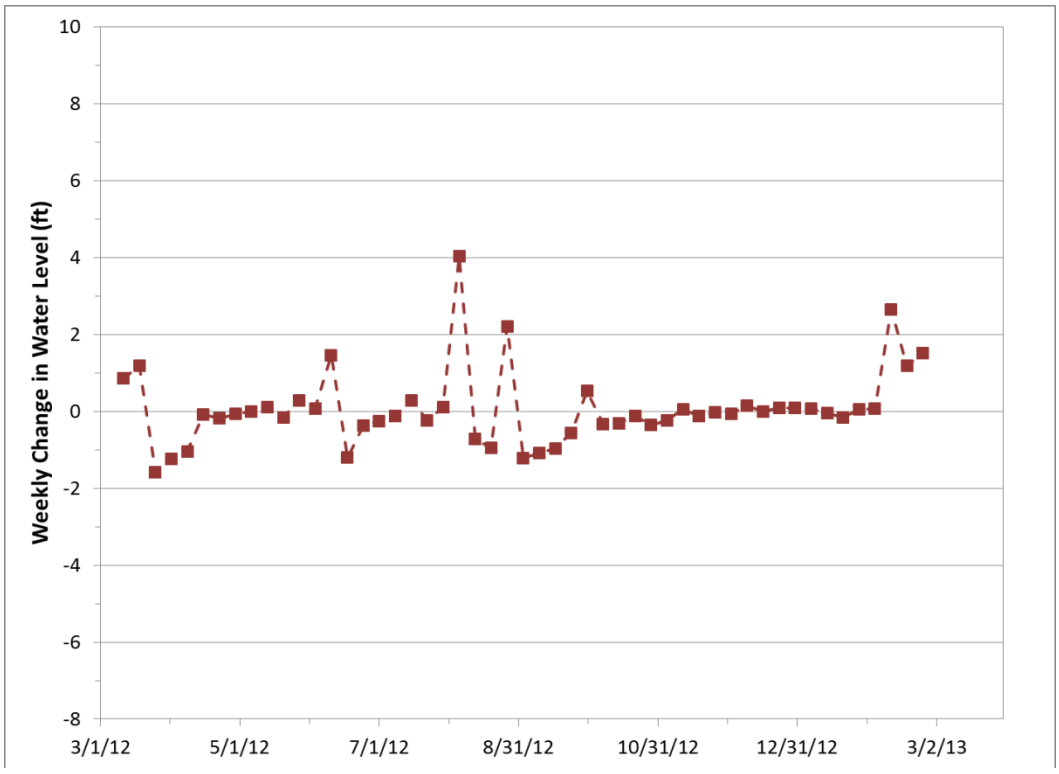


Figure 12. Weekly changes in water level at SCW-4.

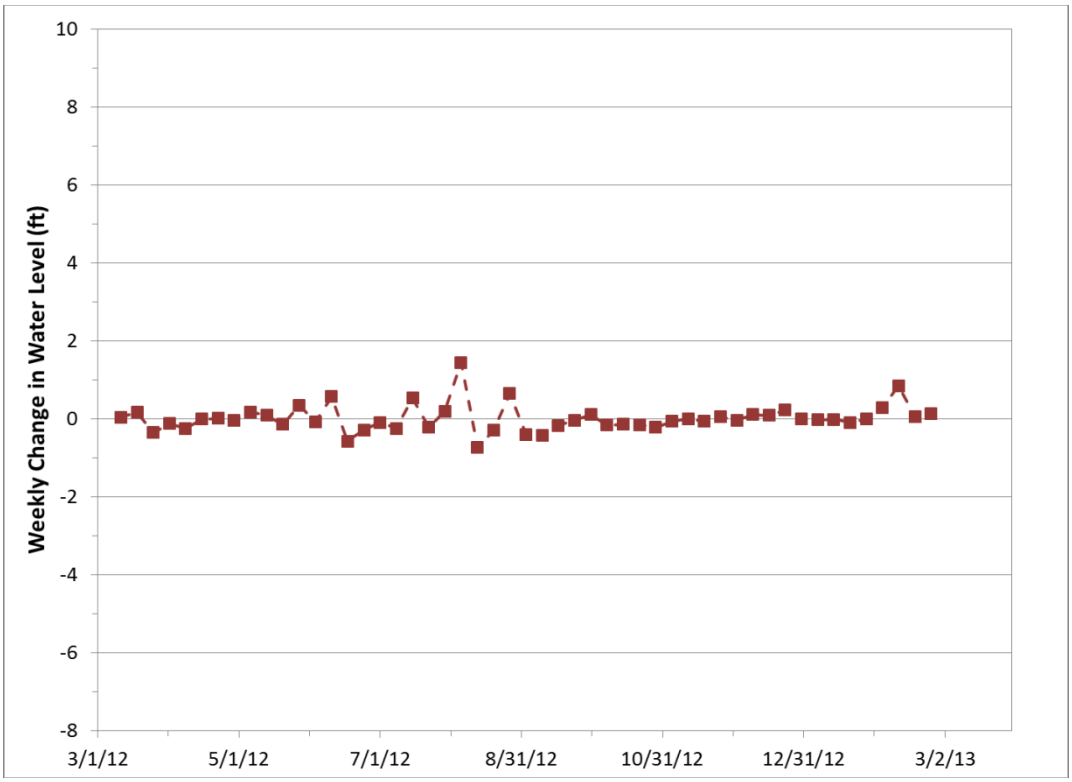


Figure 13. Weekly changes in water level at SCW-5.

APPENDIX B

Outlet Stage and Groundwater-level Elevations

in the Palmetto Bluff Watershed

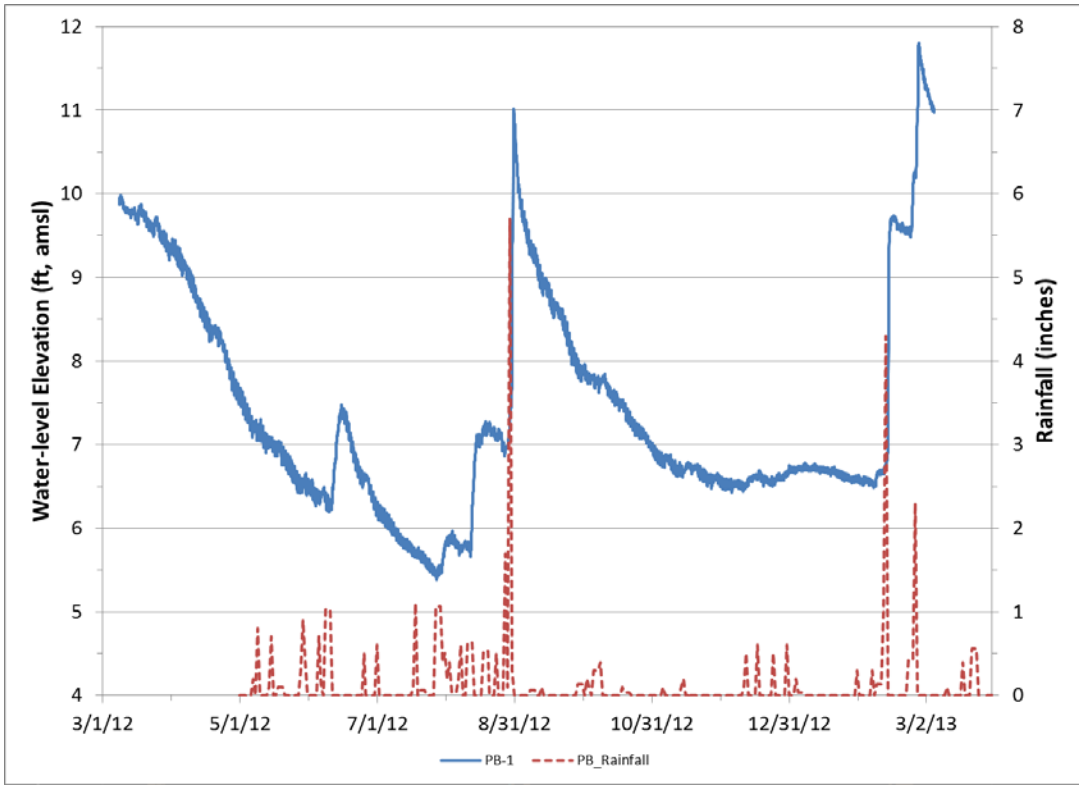


Figure 14. Groundwater-level elevations at PB-1.

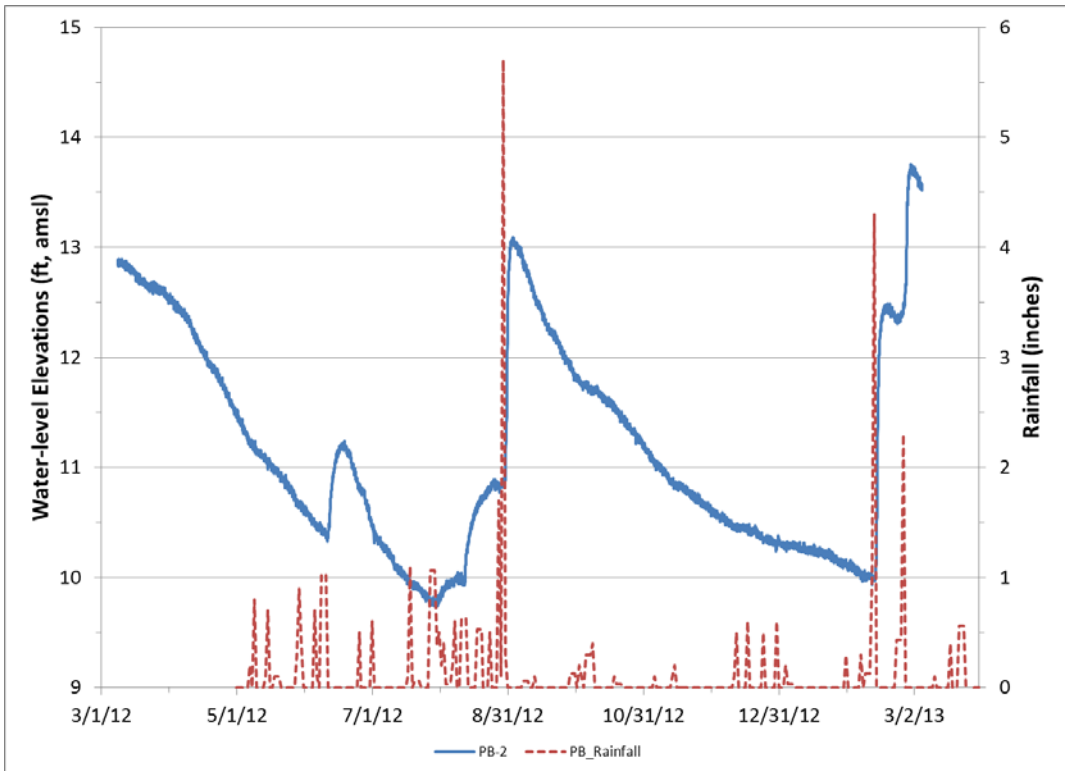


Figure 15. Groundwater-level elevations at PB-2.

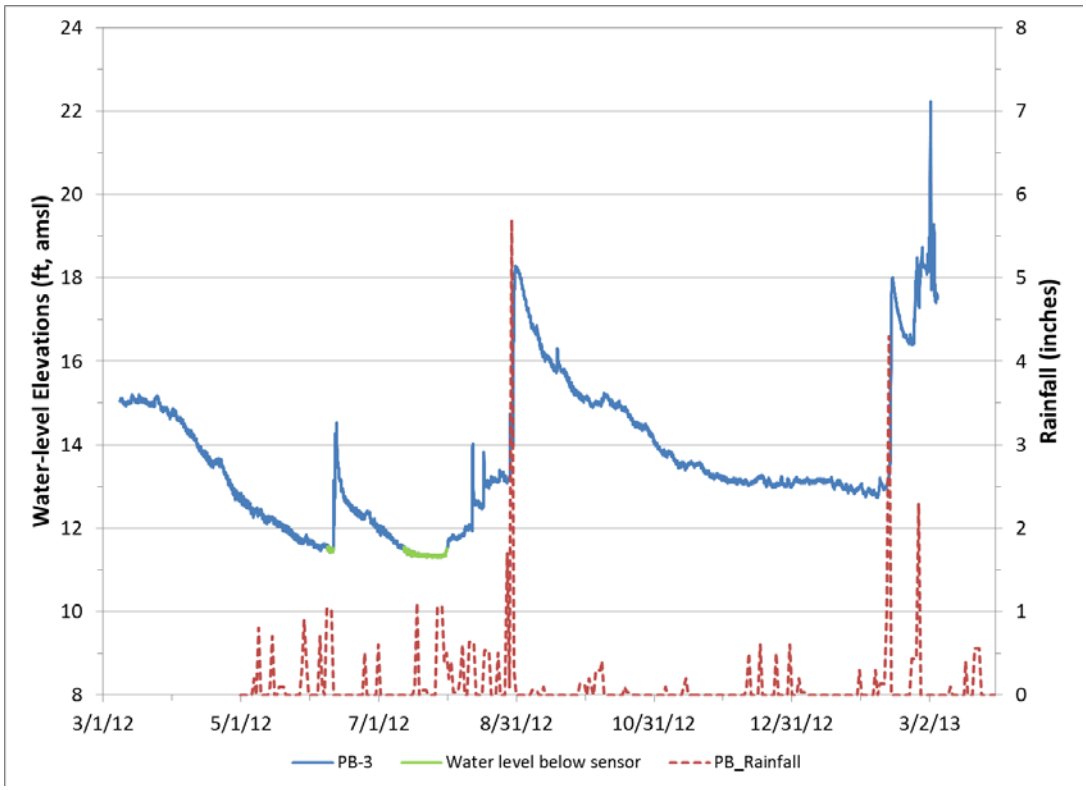


Figure 16. Groundwater-level elevations at PB-3.

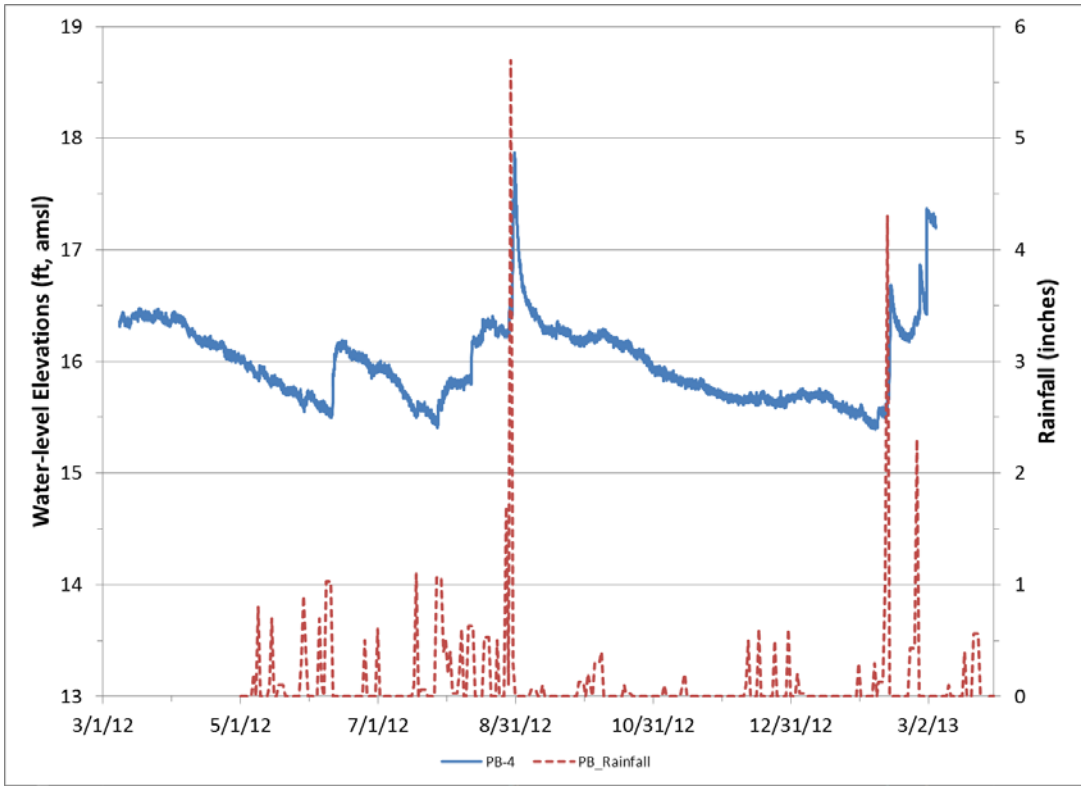


Figure 17. Groundwater-level elevations at PB-4.

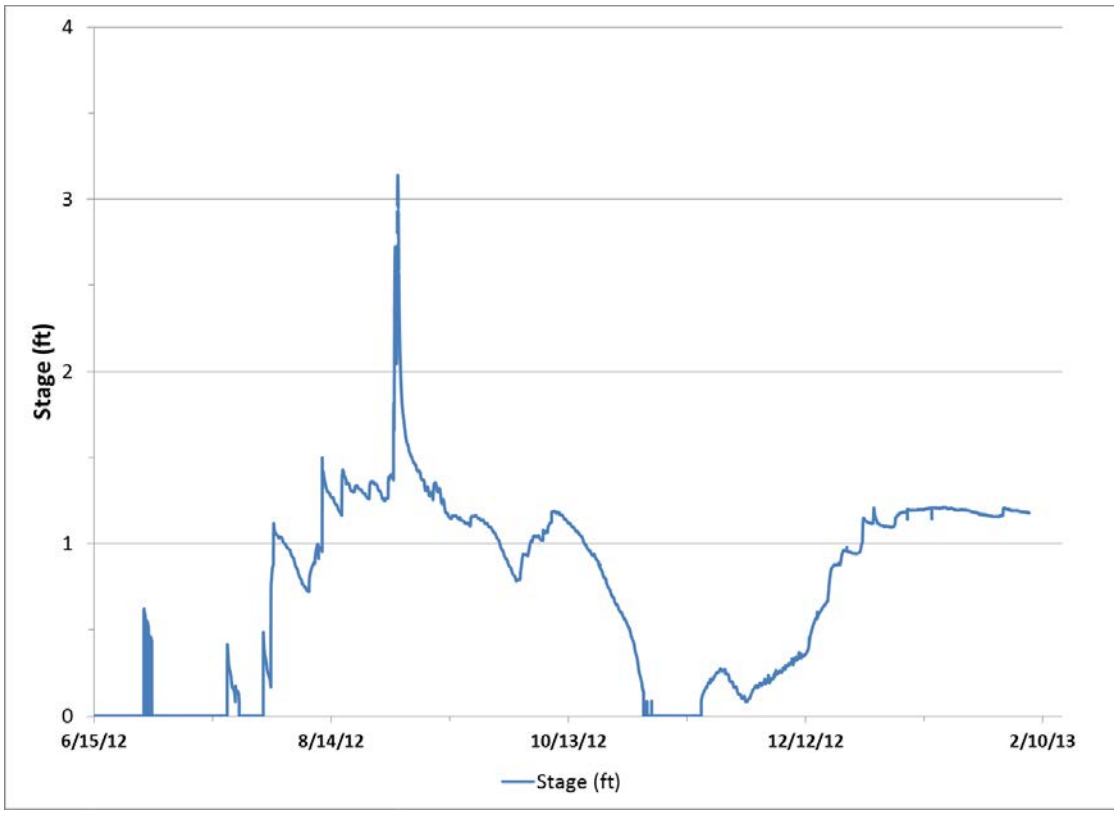


Figure 18. Outlet stage at the Palmetto Bluff watershed.

QUANTIFYING WATER BUDGETS IN BEAUFORT COUNTY, SC

BY: A.W. BADR, PH.D
SOUTHERN WATER RESOURCES, LLC

INTRODUCTION

- Why?
- Objectives
- Scope of Work
- Results
- Conclusions

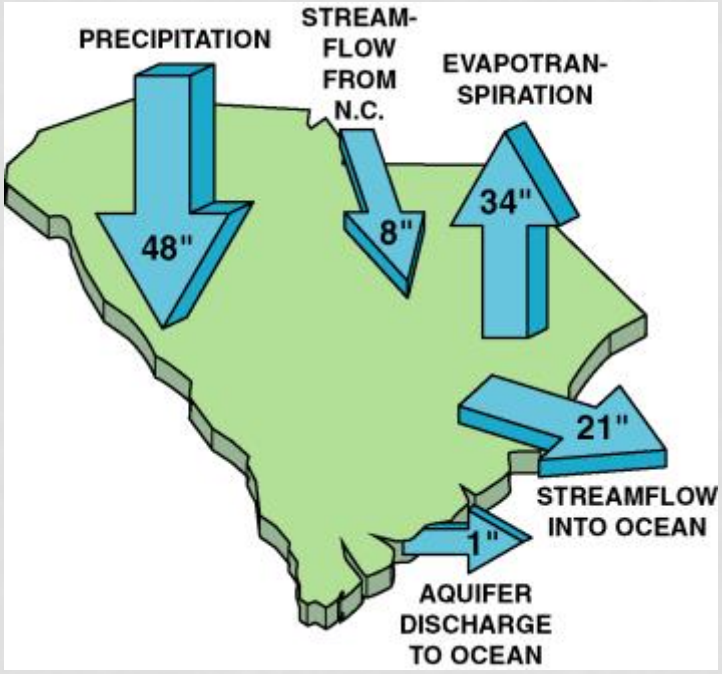
OBJECTIVES

- Quantify the amount of rainfall falling on the watershed.
- Quantify the amount of water imported into the watershed for irrigation purposes for both residences and golf courses.
- Quantify the amount of water discharging into the Okatie River as surface-water runoff.
- Quantify the change in storage of the shallow water-table aquifer.

OBJECTIVES (CONT.)

- Quantify the change in storage of the storm water ponds.
- Estimate the amount of water lost to the atmosphere by evapotranspiration.
- Compare runoff coefficients for the watershed with regional runoff coefficients.

SOUTH CAROLINA'S WATER BUDGET

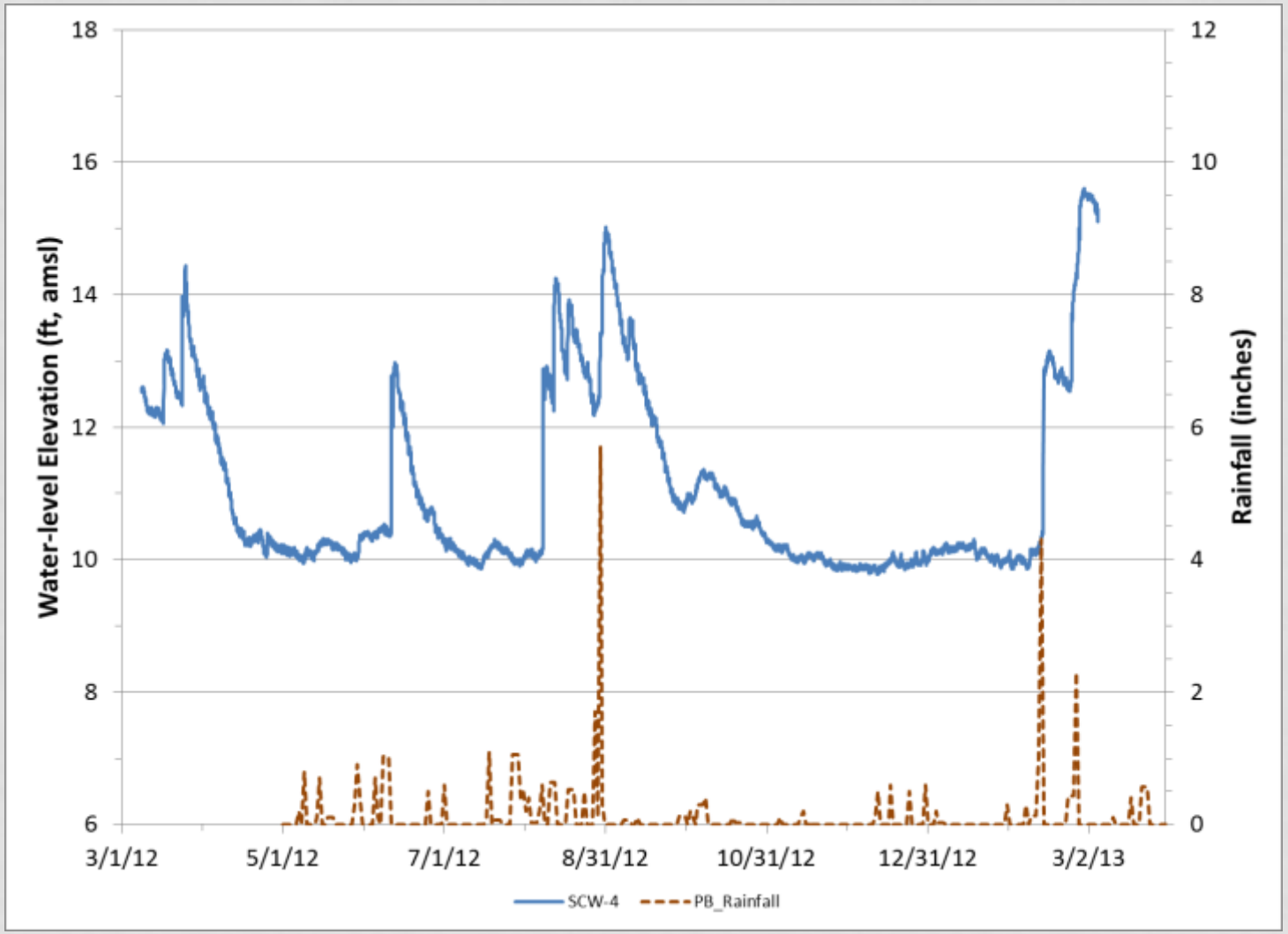


SCOPE OF WORK

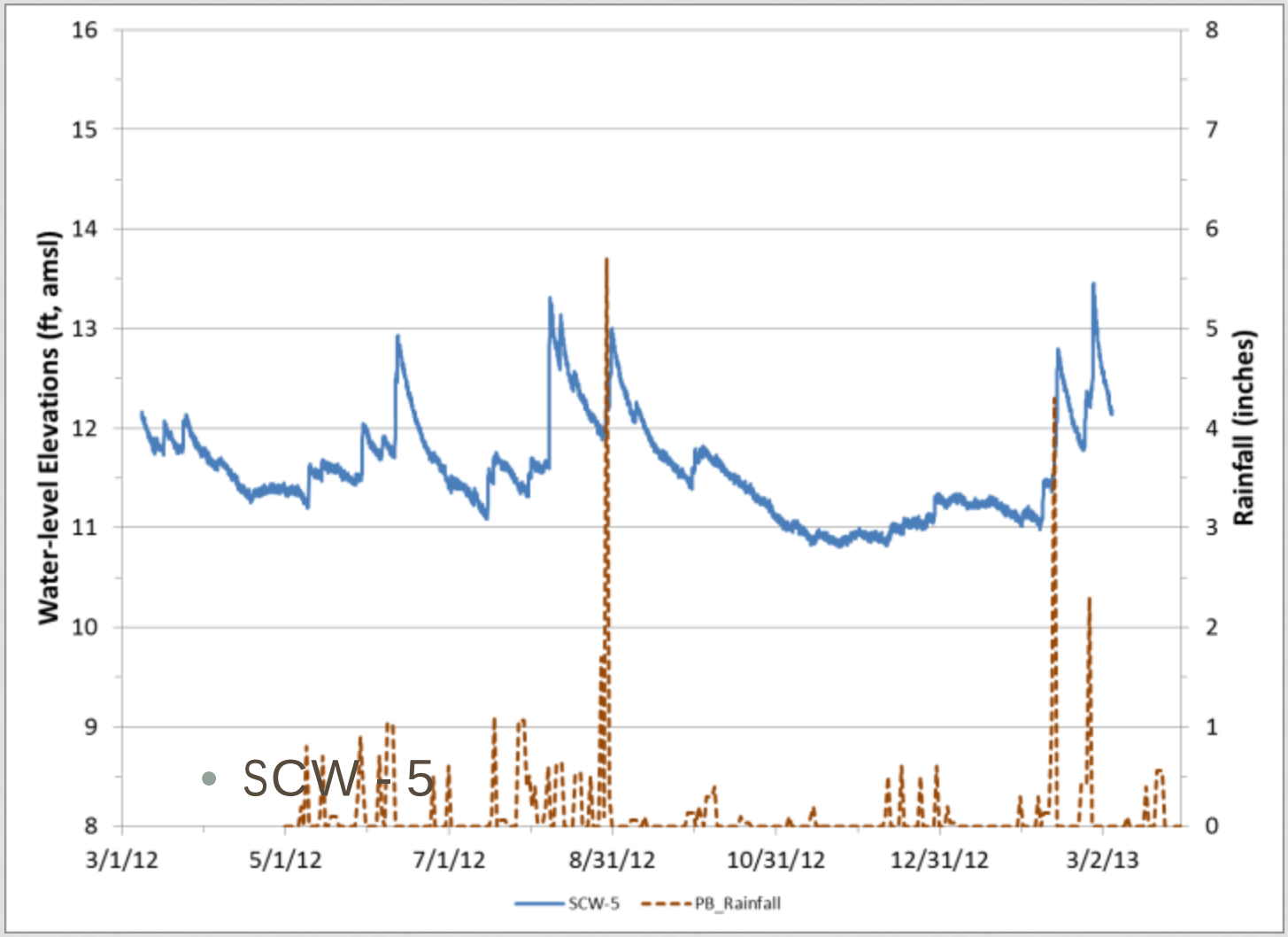
- Developing a plan to monitor the watershed with recommendations on which water budget components to monitor.
- Providing technical assistance on the siting of monitoring stations and the selection of appropriate equipment.
- Evaluating data and developing a water budget for the watershed.

GROUNDWATER & SURFACE WATER MONITORING SITES ON THE STUDY WATERSHED.

GROUNDWATER-LEVEL ELEVATIONS FOR SCW-4

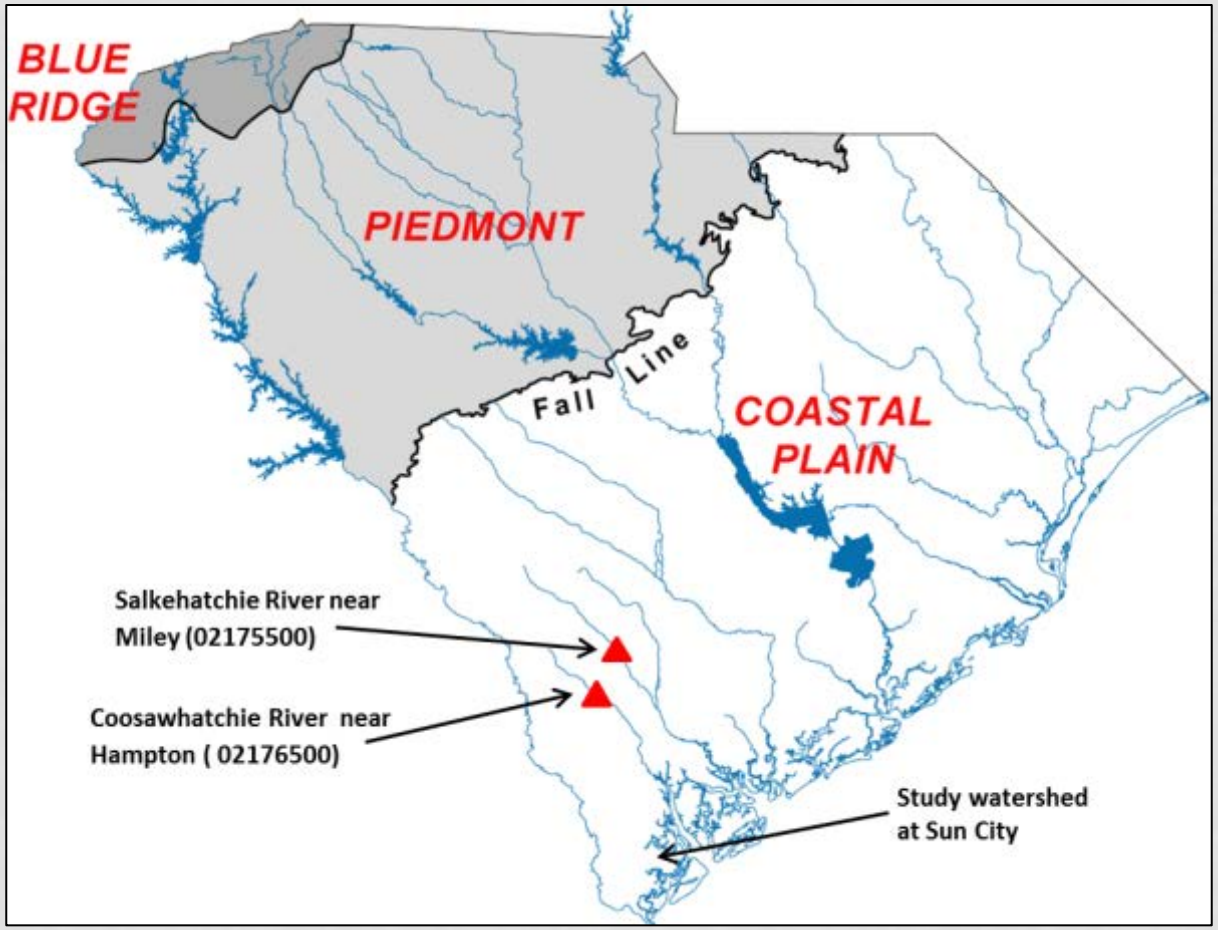


WATER-LEVEL ELEVATIONS FOR POND 5 (SCW-5)

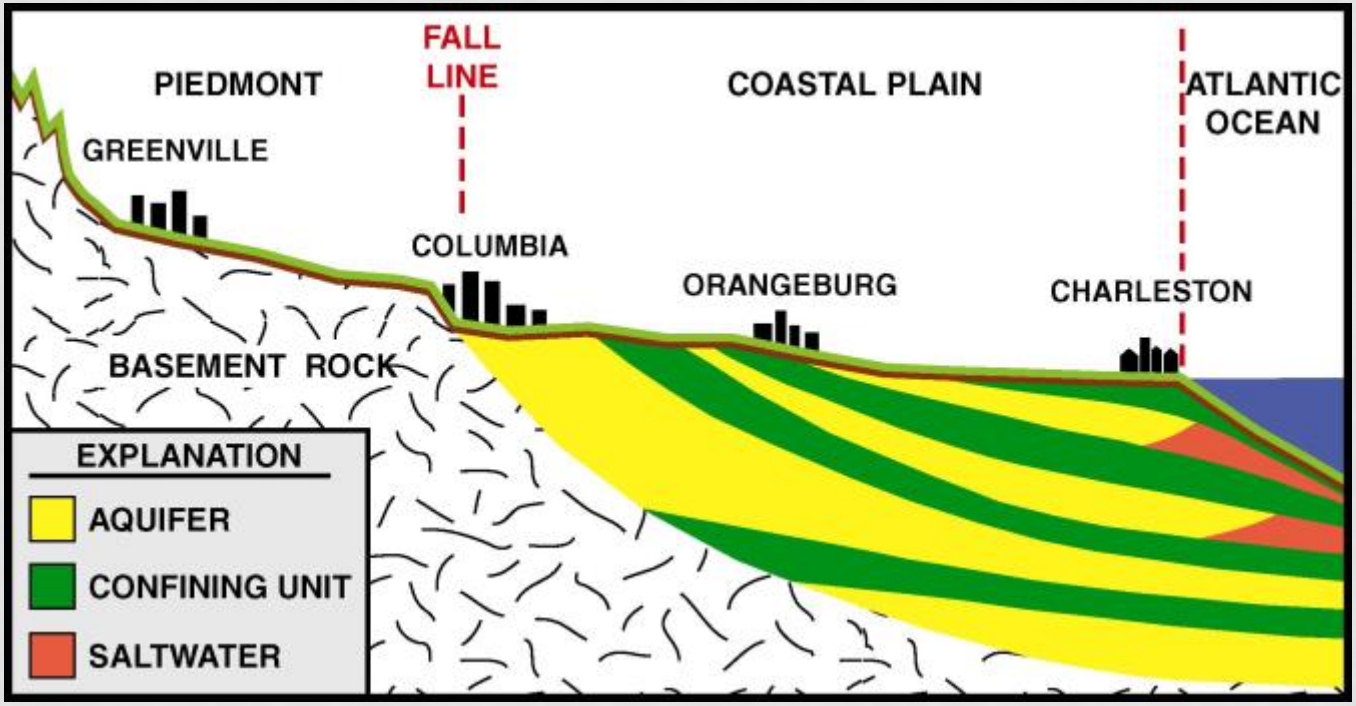


- SCW-5

LOCATION OF UNREGULATED GAGING SITES USED TO COMPUTE REGIONAL RUNOFF-RAINFALL COEFFICIENTS.



THE STATE'S AQUIFER SYSTEM



THANK YOU

QUESTIONS?

UNAUDITED AND PRELIMINARY

BEAUFORT COUNTY, SOUTH CAROLINA
STATEMENT OF NET ASSETS
Stormwater Utility and Capital Improvement Funds
April 30, 2014 & April 30, 2013

	Stormwater Utility Fund April 30, 2014	Capital Improvement Fund April 30, 2014	Stormwater Utility Fund April 30, 2013
ASSETS			
Current Assets			
Cash and Investments with Trustee	$ 2,395,506	811,313	$ 3,037,509
Receivables, Net	109,334	-	2,334
Inventories	92,511	-	102,941
Total Current Assets	2,597,351	811,313	3,157,077
Capital Assets	2,976,411	-	2,841,893
Accumulated Depreciation	(2,142,794)	-	(2,068,828)
	833,617	-	773,065
Total Assets	$ 3,430,968	811,313	$ 3,930,142
LIABILITIES			
Liabilities			
Account Payable	225,680	-	57,400
Accrued Payroll	46,883	-	69,791
Accrued Compensated Absences	6,247	-	4,470
Total Current Liabilities	278,810	-	131,661
Long Term Liabilities			
Accrued Compensated Absences	55,379	-	64,937
Net Other Postemployment Benefits Obligation	831,027	-	690,547
Total Long Term Liabilities	886,406	-	755,484
Total Liabilities	1,165,216	-	887,145
NET ASSETS			
Invested in Capital Assets, Net of Related Debt	833,617	-	773,065
Reserved for Encumbrances	130,455	-	323,002
Reserved for Capital Improvement	-	811,313	-
Unrestricted	1,301,680	-	1,946,930
Total Net Assets	$ 2,265,752	$ 811,313	$ 3,042,997

Unaudited and Preliminary

BEAUFORT COUNTY, SOUTH CAROLINA
STATEMENT OF REVENUES, EXPENSES AND CHANGES IN NET ASSETS
Stormwater Utility Fund
For the Period Ended April 30, 2014

	Budget FY 2014	April 30, 2014	Budget to Actual	Percent of Budget
Operating Revenues				
Stormwater Utility Fees	$ 3,475,000	$ 2,928,439	(546,561)	84%
Stormwater Utility Project Billings	60,023	110,272	50,249	184%
Total Operating Revenues	3,535,023	3,038,711	(496,312)	86%
Operating Expenses				
Personnel	2,160,475	1,586,099	(574,376)	73%
Purchased Services	961,864	476,399	(485,465)	50%
Supplies	381,446	260,533	(120,913)	68%
Depreciation	242,119	201,770	(40,349)	83%
Total Operating Expenses	3,745,904	2,524,801	(1,221,103)	67%
Operating Income (Loss)	(210,881)	513,910	724,791	-244%
Non-Operating Revenues (Expenses)				
Gain (Loss) on Sale of Capital Assets	-	(31,113)	(31,113)	-100%
Interest Earned	6,922	-	(6,922)	0%
Total Non-Operating Revenues (Expenses)	6,922	(31,113)	(38,035)	0%
Transfers Out To Capital Improvement Fund	-	859,705	859,705	100%
Change in Net Assets	(203,959)	(376,908)	(172,949)	185%
Net Assets, Beginning	2,642,660	2,642,660		
Net Assets, Ending	$ 2,438,701	$ 2,265,752	(172,949)	93%

Unaudited and Preliminary

BEAUFORT COUNTY, SOUTH CAROLINA
STATEMENT OF REVENUES, EXPENSES AND CHANGES IN NET ASSETS
Stormwater Capital Improvement Fund
For the Period Ended April 30, 2014

	Budget FY 2014	April 30, 2014	Budget to Actual	Percent of Budget
Transfers In from Stormwater Utility Fund				
Administration Complex Parking Lot Retrofit	$ -	$ 329,650	329,650	100%
Okatie East Retrofit	-	60,237	60,237	100%
Highway 278 Retrofit	-	222,600	222,600	100%
Okatie West Land Purchase	-	100,000	100,000	100%
Upper Battery Creek Retrofit	-	147,218	147,218	100%
Total Transfers In	-	859,705	859,705	100%
Capital Improvement Expenses				
Administration Complex Parking Lot Retrofit	-	981	981	100%
Okatie East Retrofit	-	17,925	17,925	100%
Highway 278 Retrofit	-	14,878	14,878	100%
Okatie West Land Purchase	-	-	-	0%
Upper Battery Creek Retrofit	-	14,608	14,608	100%
Total Operating Expenses	-	48,392	48,392	#DIV/0!
Change in Net Assets by Project				
Administration Complex Parking Lot Retrofit	-	328,669	328,669	100%
Okatie East Retrofit	-	42,312	42,312	100%
Highway 278 Retrofit	-	207,722	207,722	100%
Okatie West Land Purchase	-	100,000	100,000	100%
Upper Battery Creek Retrofit	-	132,610	132,610	100%
Total Change in Net Assets by Project	-	811,313	811,313	100%
Net Assets, Beginning	-	-		
Net Assets, Ending	$ -	$ 811,313	811,313	100%

Unaudited and Preliminary

BEAUFORT COUNTY, SOUTH CAROLINA
STATEMENT OF REVENUES, EXPENSES AND CHANGES IN NET ASSETS
Stormwater Utility Fund
For the Period Ended April 30, 2013

	Budget FY 2013	April 30, 2013	Budget to Actual	Percent of Budget
Operating Revenues				
Stormwater Utility Fees	$ 3,469,180	$ 2,932,407	(536,773)	85%
Stormwater Utility Project Billings	370,664	20,299	(350,365)	5%
Total Operating Revenues	3,839,844	2,952,706	(887,138)	77%
Operating Expenses				
Personnel	2,014,323	1,515,782	(498,541)	75%
Purchased Services	1,296,188	660,589	(635,599)	51%
Supplies	426,597	239,024	(187,573)	56%
Depreciation	273,545	227,960	(45,585)	83%
Total Operating Expenses	4,010,653	2,643,355	(1,367,298)	66%
Operating Income (Loss)	(170,809)	309,351	480,160	-181%
Non-Operating Revenues (Expenses)				
Interest Earned	11,389	-	(11,389)	0%
Total Non-Operating Revenues (Expenses)	11,389	-	(11,389)	100%
Change in Net Assets	(159,420)	309,351	468,771	-194%
Net Assets, Beginning	2,733,646	2,733,646		
Net Assets, Ending	$ 2,574,226	$ 3,042,997	468,771	118%

BEAUFORT COUNTY STORMWATER UTILITY
120 Shanklin Road
Beaufort, South Carolina 29906
Voice (843) 255-2801 Facsimile (843) 255-9478

February 5, 2013

TO: Bryan Hill, Deputy Administrator

VIA: David Starkey, Chief Financial Officer
Robert Klink, County Engineer
Dave Thomas, Purchasing Director
Monica Spells, Compliance Officer

FROM: Robert McFee, P.E., Stormwater Manager
Alan Eisenman, Finance Supervisor ARE

SUBJ: **Capital Improvement Budget Transfer for the Stormwater Utility**

BACKGROUND. On July 19, 2012 a Balance Utilization Plan was developed based on a July 13, 2012 request to develop a plan to where the Stormwater Utility cash balance in the month of November/December would be near zero. This plan focused on funding retrofit projects to implement the 5-year watershed restoration plan that was approved by the County Council in January 2012. This plan identified eight restoration activities ranging in cost from $107,000 to $4,095,000 for an estimated total cost of $9,279,000. Since the lowest cash balance in fiscal year 2011 was $847,658, there will be issues with trying to fund the larger retrofit projects when they are ready.

This issue was discussed at the November 7, 2012 Stormwater Utility Board and they made a suggestion of considering a capital improvement fund to direct funds to these watershed restoration projects. Staff discussed their suggestion, but rather recommends making a budget transfer from unrestricted net assets to capital project expense accounts to fund these projects. This offers a method of meeting our cash balance goal and having adequate funds to complete the restoration projects as they proceed during the 5-year watershed restoration period. Projects to utilize the funds will be identified separately in the 5-year budget for the Utility.

DISCUSSION. It is proposed to request a capital improvement budget transfer that will be restricted to fund large Watershed Restoration Projects that cannot be supported with funds available in a single fiscal year budget. The initial capital improvement budget transfer will be for the projects expected to be funded in the next year. These will be:

			Less FY 13 Exp		FY14 Transfer
SW1-11	Administration Complex Parking Lot Retrofit	$330,000	− 350	=	329,650
SW2-12	Okatie East Retrofit	$107,000	− 46,762.66	=	60,237.34
SW3-13	Highway 278 Retrofit (SWU portion)	$231,000	− 8,400	=	222,600
SW4-14	Okatie West Land Purchase	$100,000	− 0	=	100,000
	Total	$768,000	55,512.66		712,487.34

In the future, as additional unrestricted net asset balances become available Stormwater Utility will request a capital improvement budget transfer to fund future watershed retrofit projects.

RECOMMENDATION: A Stormwater Utility Capital Improvement Budget Transfer made for $768,000 to fund Watershed Restoration Projects necessary to restore designated water uses and comply with Total Maximum Daily Load (TMDL) requirements.

Beaufort County Public Works
Stormwater Utility

Budget Comparison

Revised Date: December 31, 2013

Revenue/Reserve Utilization

	Board Budget	FY2013 Unaudited Actuals	Variance	FY 2014 Approved Budget
Revenue				
Admin SWU Fees	$ 309,117	$ 311,086	$ (1,969)	$ 312,064
Utility Activities SWU Fees	3,160,063	2,759,703	400,360	3,162,936
Total Revenue from SWU Fees	3,469,180	3,070,789	398,391	3,475,000
Reimbursable Projects	63,000	33,808	29,192	2,500
Interest	11,389	2,955	8,434	6,923
Other Charges	-	(2,920)	2,920	-
Cost-Share for Joint Efforts	307,664	50,403	257,261	57,522
Reserve Utilization				
Del Webb Agreement Fund	-	-	-	-
Stormwater Utility	159,420	90,986	68,434	-
	$ 4,010,653	$ 3,246,022	$ 764,631	$ 3,541,945

Efforts (Expenditures)

		FY2013		FY2014
Admin	$ 309,117	$ 244,053	$ 65,064	$ 312,064
Utility Activities				
UA/Control Reg	113,560	78,147	35,413	73,147
UA/WQ Monitoring	148,200	174,766	(26,566)	160,000
UA/WQ Controls	440,580	60,248	380,332	200,000
UA/Annual Maintenance	2,364,776	2,376,048	(11,272)	2,679,069
UA/Public Information/Outreach	75,000	67,665	7,335	67,665
UA/Drainage Enhancement	25,000	2,700	22,300	25,000
UA/Additional Studies	375,000	242,394	132,606	25,000
Utility Activities Subtotal	3,542,116	3,001,968	540,148	3,229,881
***Reserve Utilization**				
UA/WQ Controls	159,420	-	159,420	-
Reserve Utilization Subtotal	159,420	-	159,420	-
Efforts Total	$ 4,010,653	$ 3,246,022	$ 764,631	$ 3,541,945

carolynw:
$350 - BC Admin Bldg
$4,735.10 - Shanklin Rd WQ Retrofit (includes Ward Edwards Invoices)
$8,400 - Hwy 278
$46,762.66 - Okatie East

*Efforts funded by utilizing the reserve are spread among all utility activities.

Change in Capital Assets On Balance Sheet

		FY2013		FY2014
Capital Assets Additions	$ 126,367	$ 146,212	$ (19,845)	$ 455,991
Depreciation	(273,545)	(248,463)	(25,082)	(242,119)
	$ (147,178)	$ (102,250)	$ (44,928)	$ 213,872

Hickman, Maggie

From: Thomas East [teast@cityofbeaufort.org]
Sent: Wednesday, July 03, 2013 10:13 AM
To: McFee, Robert
Cc: Hickman, Maggie; Scott Dadson; Isiah Smalls; Lamar Taylor
Subject: Letter of Commitment
Attachments: DOC011.pdf; 319 County Grant Commitment.doc

Rob,

Good morning. We are approaching the 319 Grant deadline of July 15th and need Mr. Gary Kubic's letter of commitment. This is the only grant application document requiring his signature as well as Scott Dadson's signature.

Attached is a copy of the letter signed by Scott and the Word document for preparing Mr. Kubic's letter for signature. You will need to add these words to a County letterhead then print for his signature.

The 319 Grant pays up to 60% requiring a local match of 40%. The 40% local match will be split evenly between the City and the County. Ward Edwards estimates the total cost to be $736,088 requiring the City and County to provide a local match of $147,217.60 each.

Once Mr. Kubic signs this on County letterhead, please scan and email it to me.

Thanks,

Thomas East, Accountant
City of Beaufort
1911 Boundary Street
Beaufort, SC 29902
Ph: 843-525-7071
Fax: 843-986-5606
www.cityofbeaufort.org

STATE OF SOUTH CAROLINA)
) INTERGOVERNMENTAL AGREEMENT
COUNTY OF BEAUFORT)

This Intergovernmental Agreement ("Agreement") was developed February xx, 2013 between the City of Beaufort (hereinafter referred to as the "City") and Beaufort County, South Carolina (hereinafter referred to as the "County") and together with the City, ("Parties", each a "Party") to define and implement environmental initiatives related to the protection of Upper Battery Creek Watershed.

WHEREAS, the City and County realize that the protection of this watershed and other outstanding natural water resources are of utmost importance to our community; and

WHEREAS, drainage to Upper Battery Creek are located in both City and unincorporated County boundaries; and

WHEREAS, the City and County understand that the development of a partnership for safeguarding of the watersheds and other outstanding natural water resources is of the utmost importance; and

WHEREAS, the City and County understand that water quality monitoring indicates that the drainage from the Cross Creek area is contributing the highest known levels of bacteria loads to the Upper Battery Creek;

NOW, THEREFORE, for and in consideration of mutual promises, undertakings, and covenants set forth herein, the receipt and sufficiency of which is acknowledged and affirmed by the City and the County, the Parties hereto agree to this amendment as follows:

1. **Establish a cost sharing mechanism on the initial Cross Creek area (Burton Hill) retrofit project.** It is the intent of the Parties that cost sharing should be on an equal basis with each party contributing 50% of the local cost. This includes the cost of preparing the watershed base plan and the 319 grant application by Ward Edwards, estimated to be $13,200. Should the City and County be awarded the grant, the remaining cost will be split on an even basis with each party contributing 50% of the remaining cost after applying the grant funds.

2. **Implementation of Burton Hill retrofit project**

    a. Through a competitive RFQ process, the City has selected an engineering firm for an Indefinite Delivery Contract. The selected engineer, Ward Edwards, Inc., will be responsible for the design of the project. Design shall be broken into two parts, the first of which will be preliminary

engineering and surveying to determine the feasibility and performance of the proposed retrofit described as Burton Hill M2. If this initial work demonstrates the likely benefit to water quality, final design will commence and encompass all work required successfully complete necessary project designs and drawings.

b. The City will take lead in the project and be the decision maker throughout the project. Should the City and County be awarded the 319 Federal Grant, the City will be the named Grantee. The City will be responsible for paying all invoices related to the project. The City will request reimbursement from the Grantor on a quarterly basis. The City will submit an invoice to the County for their share on a quarterly basis. The County must reimburse the City within 30 days of the invoice date.
c. Parties will proceed with construction as budgets allow.

3. **Term.** This agreement shall remain in force until the completion of Cross Creek retrofit known also as the Burton Hill M2 retrofit. Additional retrofit projects, if needed, will be addressed in separate agreements.

IN WITNESS WHEREOF, the Parties hereto have affixed their signatures hereto the date first written hereinabove.

Dated this 30th day of August 2013

BEAUFORT COUNTY

By _____

Date 9/25/2013

Address:
P.O. Drawer 1228
Beaufort, SC 29901-1228

CITY OF BEAUFORT

By _____

Date 9/25/2013

Address:
1911 Boundary Street
Beaufort, SC 29902

Beaufort County Public Works
Stormwater Utility

Preliminary Budget Comparison

Revised Date: May 19, 2014

Unaudited Projected Revenue

	FY2014 Requested Board Budget	FY2015 Requested Board Budget	FY2015 Revised Budget
Revenue			
Admin SWU Fees	312,064	313,460	313,460
Utility Activities SWU Fees	3,162,936	2,814,138	2,766,881
Revenue from SWU Fees	3,475,000	3,127,598	3,080,341
Reimbursable Projects	2,500	2,500	2,500
Interest	6,923	2,955	2,955
Cost-Share for Joint Efforts	57,522	41,689	41,689
Reserve Utilization			
Del Webb Agreement Fund	-	-	
Stormwater Utility	-	413,581	351,091
	3,541,945	3,588,323	3,478,576

Efforts (Expenditures)

	FY2014 Requested Board Budget	FY2015 Requested Board Budget	FY2015 Revised Budget
Admin	312,064	323,941	313,460
Utility Activities			
UA/Control Reg	73,147	257,274	216,956
UA/WQ Monitoring	160,000	120,000	120,000
UA/WQ Controls	200,000	-	-
UA/Annual Maintenance	2,679,069	2,783,108	2,736,160
UA/Public Information/Outreach	67,665	50,000	50,000
UA/Drainage Enhancement	25,000	19,000	7,000
UA/Additional Studies	25,000	35,000	35,000
Utility Activities Subtotal	3,229,881	3,264,382	3,165,116
***Reserve Utilization**			
Reserve Utilization Subtotal	-	-	-
Efforts Total	3,541,945	3,588,323	3,478,576

*Efforts funded by utilizing the reserve are spread among all utility activities.

Change in Capital Assets On Balance Sheet

	FY2014 Requested Board Budget	FY2015 Requested Board Budget	FY2015 Revised Budget
Capital Assets Additions	455,991	340,604	166,561
Depreciation	(242,119)	(192,181)	(182,523)
	213,872	148,423	(15,962)

SUMMARY

	FY2014 Requested Board Budget	FY2015 Requested Board Budget	FY2015 Revised Budget
Cash Balance	-	-	1,611,101
Revenue	-	-	3,127,485
Revenue - SFU Rate Increase	-	-	
Expenditures (Includes Depreciation)	-	-	(3,478,576)
Capital Purchases	-	-	(166,561)
Reserve Policy	-	-	-
Capital Projects	-	-	(845,999)
	-	-	247,450
Operating Income (Loss) (15.1% of SWI Personnel Budget)	-	-	278,366
Reserve	-	-	525,816

	Budget FY 2015	Budget FY 2016	Budget FY 2017	Budget FY 2018	Budget FY 2019	Budget FY 2020	Budget FY 2021	Budget FY 2022	Budget FY 2023	Budget FY 2024		
CAPITAL PROJECTS												
SC170/Okatie West	60,000	315,000	600,000								=	975,000
Hwy 278 Retrofit (Ttl estimate $231K)	216,122										=	216,122
Admin Bldg Parking Lot (Ttl estimate $330K)	327,768										=	327,768
Battery Creek (Revised estimate for cost-share $147K)	132,609										=	132,609
Buckingham Plantation	100,000	400,000	400,000								=	900,000
Sawmill Creek Overtopping/Forby (land $100K/design $25K/$25K Construction)		125,000	25,000								=	150,000
Brewer Memorial Park Demonstration Wet Pond Porject (Feasibility $9.5K/Design $20K/Construction $50K)	9,500	20,000		50,000							=	79,500
Salt Creek South M1 ($245K Design/$400K ROW/$1.4M Construction)				245,000	400,000	1,400,000					=	2,045,000
Shanklin Road M2 ($330K Design/ $660K ROW/$2.35K Construction)				330,000	660,000		2,350,000				=	3,340,000
Factory Creek M2($200K Design/$340K ROW/$1.2M Construction)				200,000		340,000		1,200,000			=	1,740,000
Grober Hill M2 ($225K Design/$900K ROW/$1.4M Construction)				225,000		900,000		1,400,000			=	2,525,000
Camp St. Mary M2 ($342K Design/$165K ROW/$3.25M Construction)							342,000	165,000	3,250,000		=	3,757,000
Battery Creek West M1($375K Design/$165K ROW/$3.6M Construction)								375,000	165,000	3,600,000	=	4,140,000
Paige Point Overtopping Design ($30K/$305K Construction)									30,000	305000	=	335,000
	845,999	860,000	1,025,000	1,050,000	1,060,000	2,640,000	2,692,000	3,140,000	3,445,000	3,905,000	=	20,662,999

County Retrofit Project: SC170/Okatie West
Activity: Regional/Retrofit BMP
Township: Bluffton

Project Schedule: FY 2015-2017

Project Cost: $975,000
$60,000 (2015)
$315,000 (2016)
$600,000 (2017)

Drainage

TYPE	
River	Roadside
Creek/Stream	Roadside Pipe
River/Creek/Marsh BANK	Road Pipe
Channel (fka Outfall)	Crossline Pipe
Channel Pipe	Driveway Pipe
Lateral	Access Pipe
Lateral Pipe	Bleeder Pipe

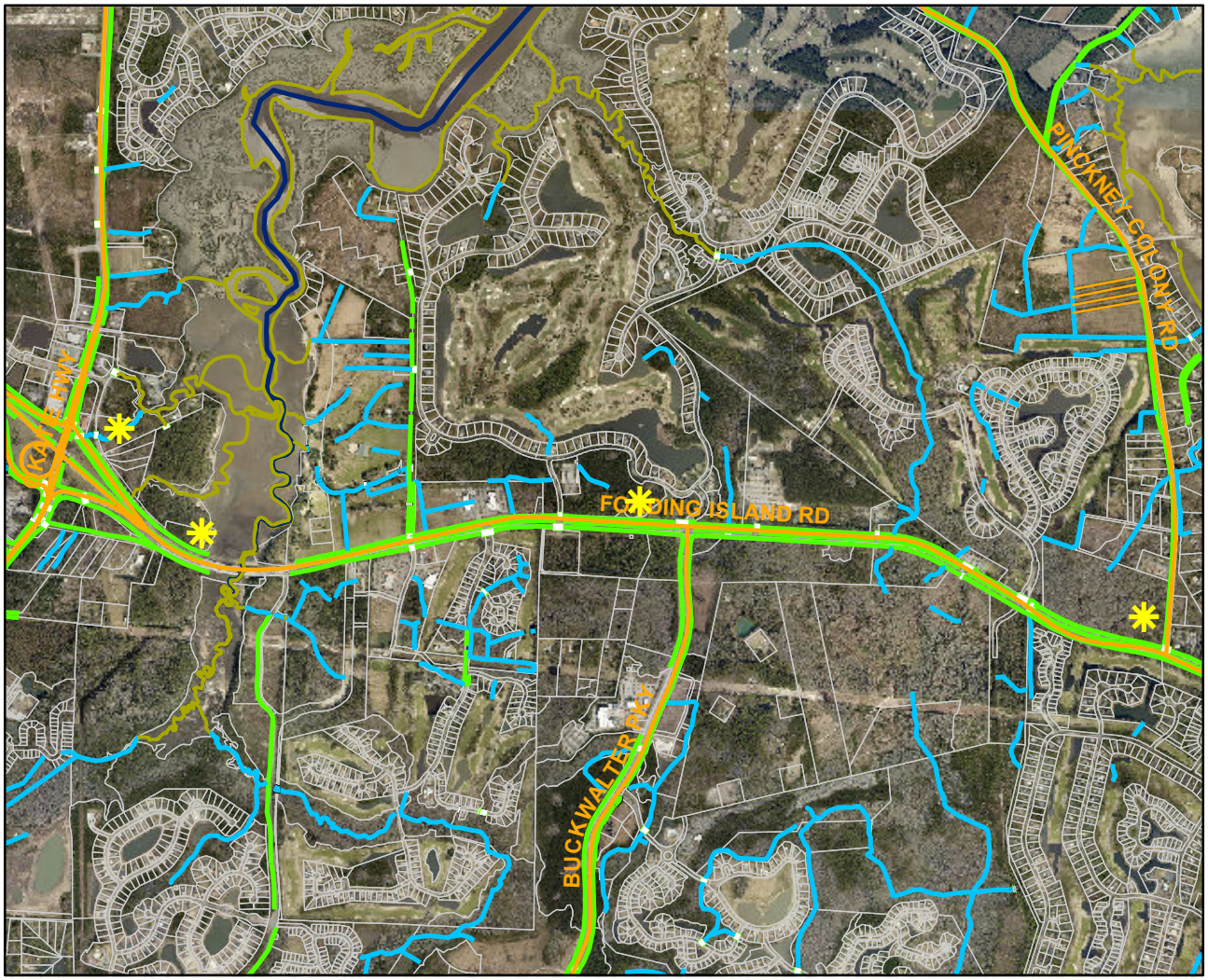
0 1,400 2,800 5,600 8,400 11,200 Feet

1 inch = 3,771 feet

Prepared By: BC Stormwater Management Utility
Date Print: 5/19/14

Description: The Okatie River watershed has been identified as a high priority watershed for water quality improvements due to bacteria contamination. The east branch of the headwaters was improved in FY2014 with a wetland enhancement project near Island West golf course and subdivision. A similar enhancement or detention basin is planned for the west branch. Increased runoff from the widening of SC170 in the west branch subwatershed basin adds to the need for a retrofit to the watershed to improve stormwater runoff water quality and reduce runoff volume. The project is a series of detention basins along SC170.

County Retrofit Project: Hwy 278 Retrofit
Activity: Retrofit BMP
Township: Bluffton



Project Schedule: FY 2015

Project Cost: $216,122

Drainage

TYPE	
River	Roadside
Creek/Stream	Roadside Pipe
River/Creek/Marsh BANK	Road Pipe
Channel (fka Outfall)	Crossline Pipe
Channel Pipe	Driveway Pipe
Lateral	Access Pipe
Lateral Pipe	Bleeder Pipe

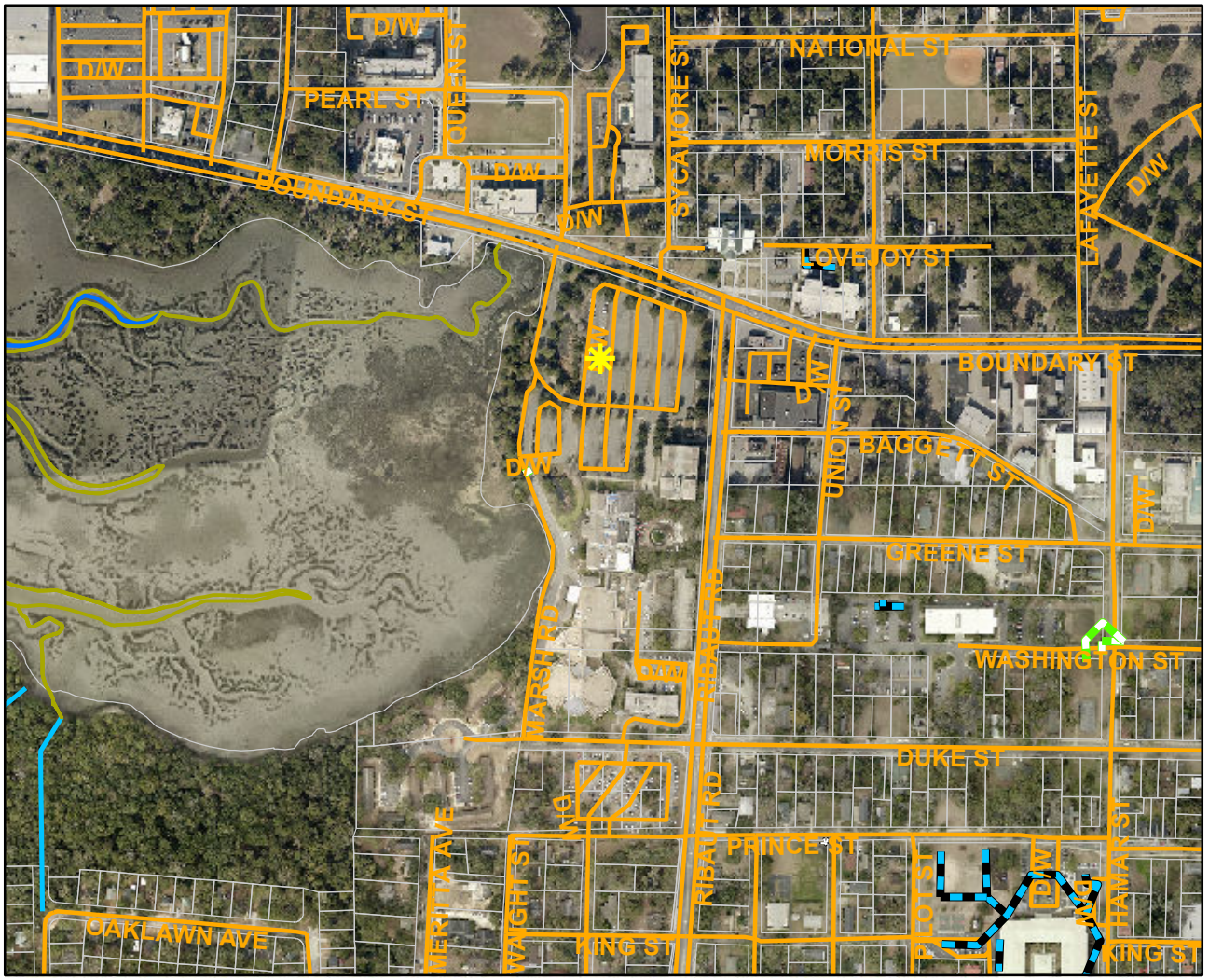
0 900 1,800 3,600 5,400 7,200 Feet

1 inch = 2,468 feet

Prepared By: BC Stormwater Management Utility
Date Print: 5/19/14

Description: Construct four detention basins along US 278 between Pickney Colony Road and SC170 to intercept stormwater runoff, provide water quality treatment, and reduce volume into the Okatie River. The Okatie is impaired by bacteria pollution, a major source being urban runoff.

County Retrofit Project: Beaufort County Administration Parking Lot
Activity: Demonstration BMP
Township: Port Royal Island



Project Schedule: FY 2015

Project Cost: $327,768

Drainage

TYPE	
River	Roadside
Creek/Stream	Roadside Pipe
River/Creek/Marsh BANK	Road Pipe
Channel (fka Outfall)	Crossline Pipe
Channel Pipe	Driveway Pipe
Lateral	Access Pipe
Lateral Pipe	Bleeder Pipe

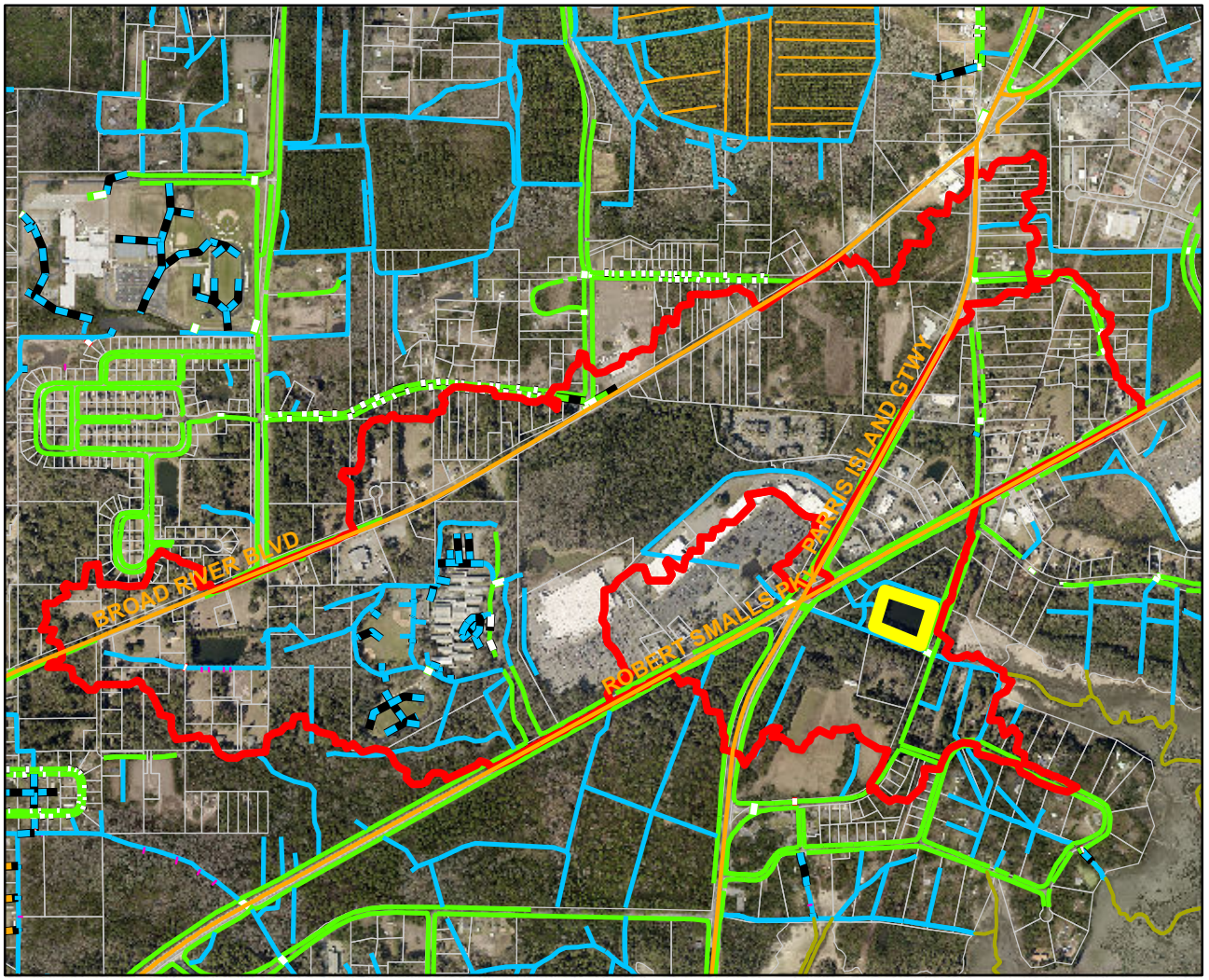
0 210 420 840 1,260 1,680 Feet

1 inch = 563 feet

Prepared By: BC Stormwater Management Utility
Date Print: 5/19/14

Description: Retrofit a portion of the parking lot at the County Administration Building on Ribaut Road with pervious pavement and bio-swales to reduce stormwater runoff volume and provide water quality treatment prior to discharge into the Battery Creek. This project is envisoned as a demonstration project due to the high profile location and provides an opportunity to educate the public on stormwater pollution and best management practices to address the same. Battery Creek is impaired by bacteria pollution, a major source being urban runoff.

County Retrofit Project: Battery Creek 319
Activity: Regional BMP
Township: Port Royal Island



Project Schedule: FY 2015

Project Cost: $132,609

Drainage

TYPE	
River	Roadside
Creek/Stream	Roadside Pipe
River/Creek/Marsh BANK	Road Pipe
Channel (fka Outfall)	Crossline Pipe
Channel Pipe	Driveway Pipe
Lateral	Access Pipe
Lateral Pipe	Bleeder Pipe

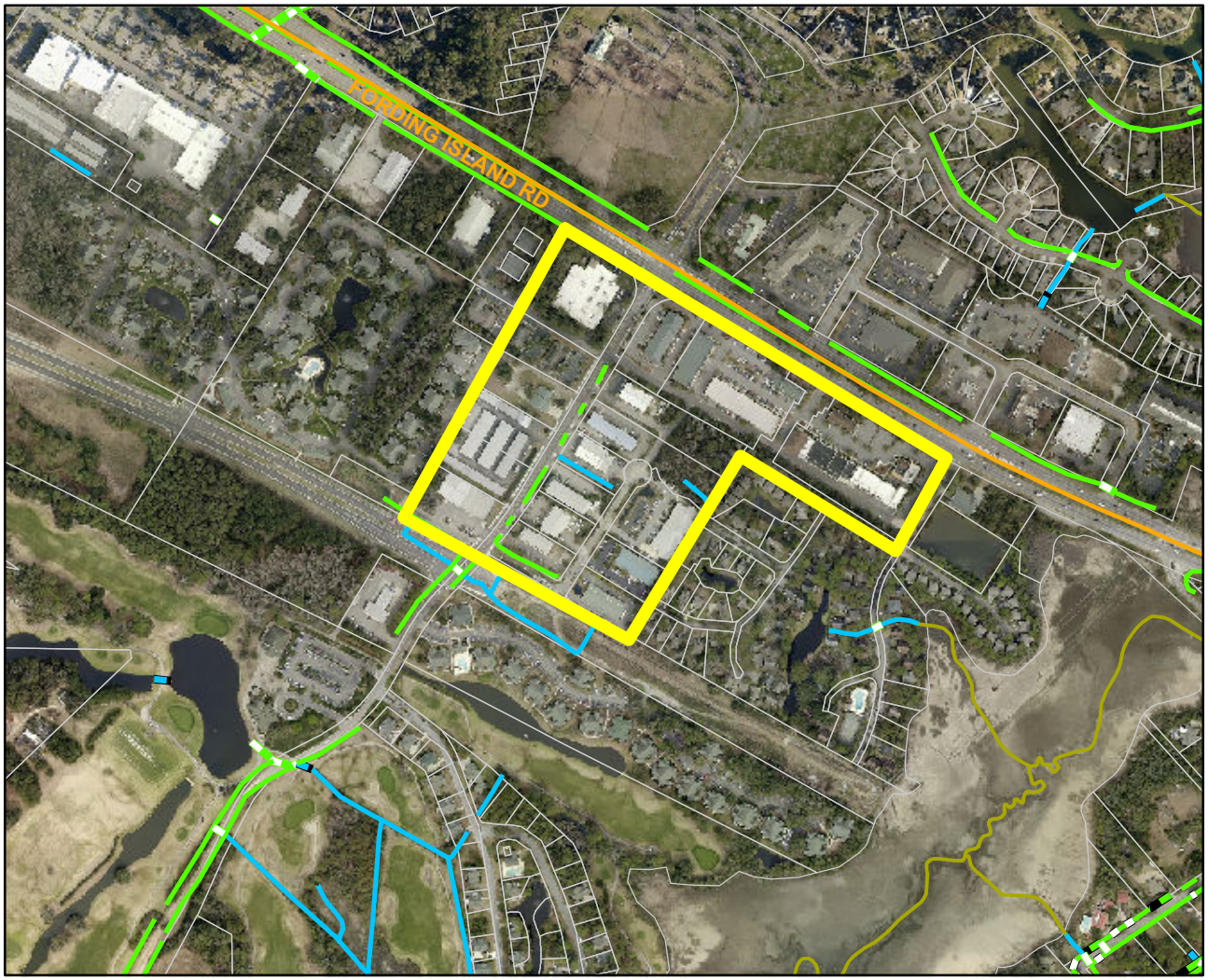
0 500 1,000 2,000 3,000 4,000 Feet

1 inch = 1,426 feet

Prepared By: BC Stormwater Management Utility
Date Print: 5/19/14

Description: Construct a detention pond to intercept stormwater runoff from an densely developed urban area of the BatteryCreek watershed near SC170 and the US 21and the Cross Creek Shopping Center. The Project is partially funded by a US EPA Section 319 grant with the match being shared by the City of Beaufort and Beaufort County. Battery Creek is impaired by bacteria pollution, a major source being urban runoff.

County Retrofit Project: Buckingham Plantation Stormwater Retrofit
Activity: Retrofit BMP
Township: Bluffton



Project Schedule: FY 2015-2017

Project Cost: $900,000
$100,000 (2015)
$400,000 (2016)
$400,000 (2017)

Drainage

TYPE	
River	Roadside
Creek/Stream	Roadside Pipe
River/Creek/Marsh BANK	Road Pipe
Channel (fka Outfall)	Crossline Pipe
Channel Pipe	Driveway Pipe
Lateral	Access Pipe
Lateral Pipe	Bleeder Pipe

0 235 470 940 1,410 1,880 Feet

1 inch = 628 feet

Prepared By: BC Stormwater Management Utility
Date Print: 5/19/14

Description: Upgrading Buckingham Plantation Drive and Anolyn Ct. with water quality best management practices to provide stormwater runoff treatment and volume reduction. This project will be in conjnuction with other area improvements designed to promote economic redevelopment of the area.

County Retrofit Project: Sawmill Creek Overtopping/Forby Land
Activity: Mitigation BMP
Township: Bluffton

Project Schedule: FY 2016-2017

Project Cost: $150,000
$125,000 (2016)
$25,000 (2017)

Drainage

TYPE	
River	Roadside
Creek/Stream	Roadside Pipe
River/Creek/Marsh BANK	Road Pipe
Channel (fka Outfall)	Crossline Pipe
Channel Pipe	Driveway Pipe
Lateral	Access Pipe
Lateral Pipe	Bleeder Pipe

0 250 500 1,000 1,500 2,000 Feet

1 inch = 667 feet

Prepared By: BC Stormwater Management Utility
Date Print: 5/19/14

Description: Overtopping of US 278 near Sawmill Creek Road during a 100 - year storm event was identified in the 2006 Stormwater Master Plan. US 278 serves as an evacution route during a hurricane. The project scope is to construct a detention pond via a wetland enhancement to slow stormwater discharge to the existing culverts under US 278 and to provide water quality treatment and runoff volume reduction. The project will be in conjunction with another project to construct a frontage road in the location providing additional interconnectivity along the south side of the highway.

County Retrofit Project: Brewer Memorial Park Demonstration Wet Pond Project Feasibility
Activity: Demonstration BMP
Township: Lady's Island

Project Schedule: FY 2015, 2016 & 2018

Project Cost: $79,500
$9,500 (2015)
$20,000 (2016)
$50,000 (2018)

Drainage

TYPE	
River	Roadside
Creek/Stream	Roadside Pipe
River/Creek/Marsh BANK	Road Pipe
Channel (fka Outfall)	Crossline Pipe
Channel Pipe	Driveway Pipe
Lateral	Access Pipe
Lateral Pipe	Bleeder Pipe

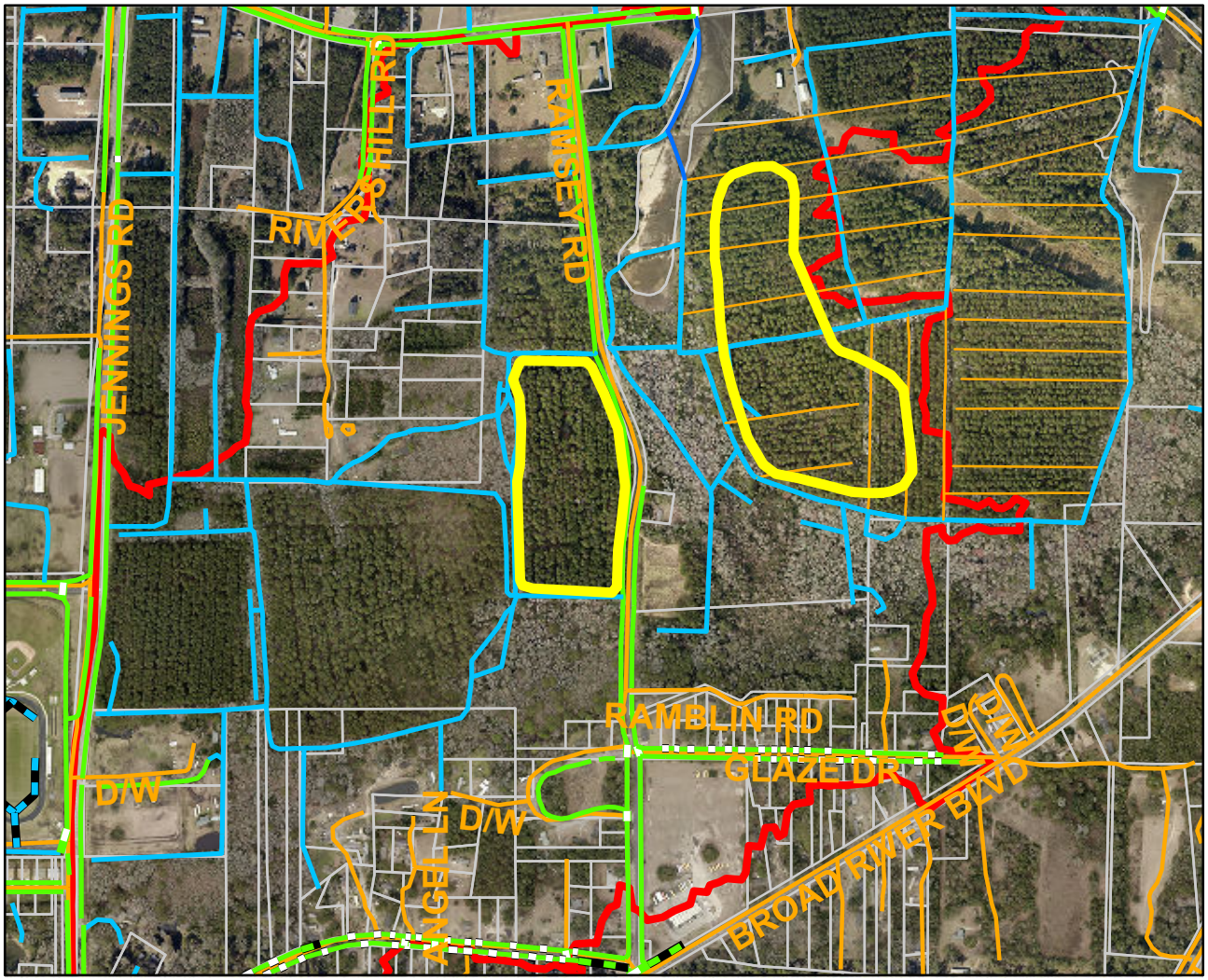
0 62.5 125 250 375 500 Feet

1 inch = 167 feet

Prepared By: BC Stormwater Management Utility
Date Print: 5/19/14

Description: Retrofit a former bait pond at the Brewer Memorial Park on Lady's Island. The site has runoff from Sea Island Parkway and adjacent properties that discharges directly to Factory Creek without water quality treatment or volume reduction. The site is envisioned as a demonstration site due to the high profile location. The park is being built with separate funding through the Beaufort Open Land Trust and will inlcude a broadwalk and landscaping around the pond, providing opportunity for viewing and public education.

County Retrofit Project: Salt Creek South M1
Activity: Regional BMP
Township: Port Royal Island



Project Schedule: FY 2018-2020

Project Cost: $2,045,000
$245,000 (2018)
$400,000 (2019)
$1,400,000 (2020)

Drainage

TYPE	
River	Roadside
Creek/Stream	Roadside Pipe
River/Creek/Marsh BANK	Road Pipe
Channel (fka Outfall)	Crossline Pipe
Channel Pipe	Driveway Pipe
Lateral	Access Pipe
Lateral Pipe	Bleeder Pipe

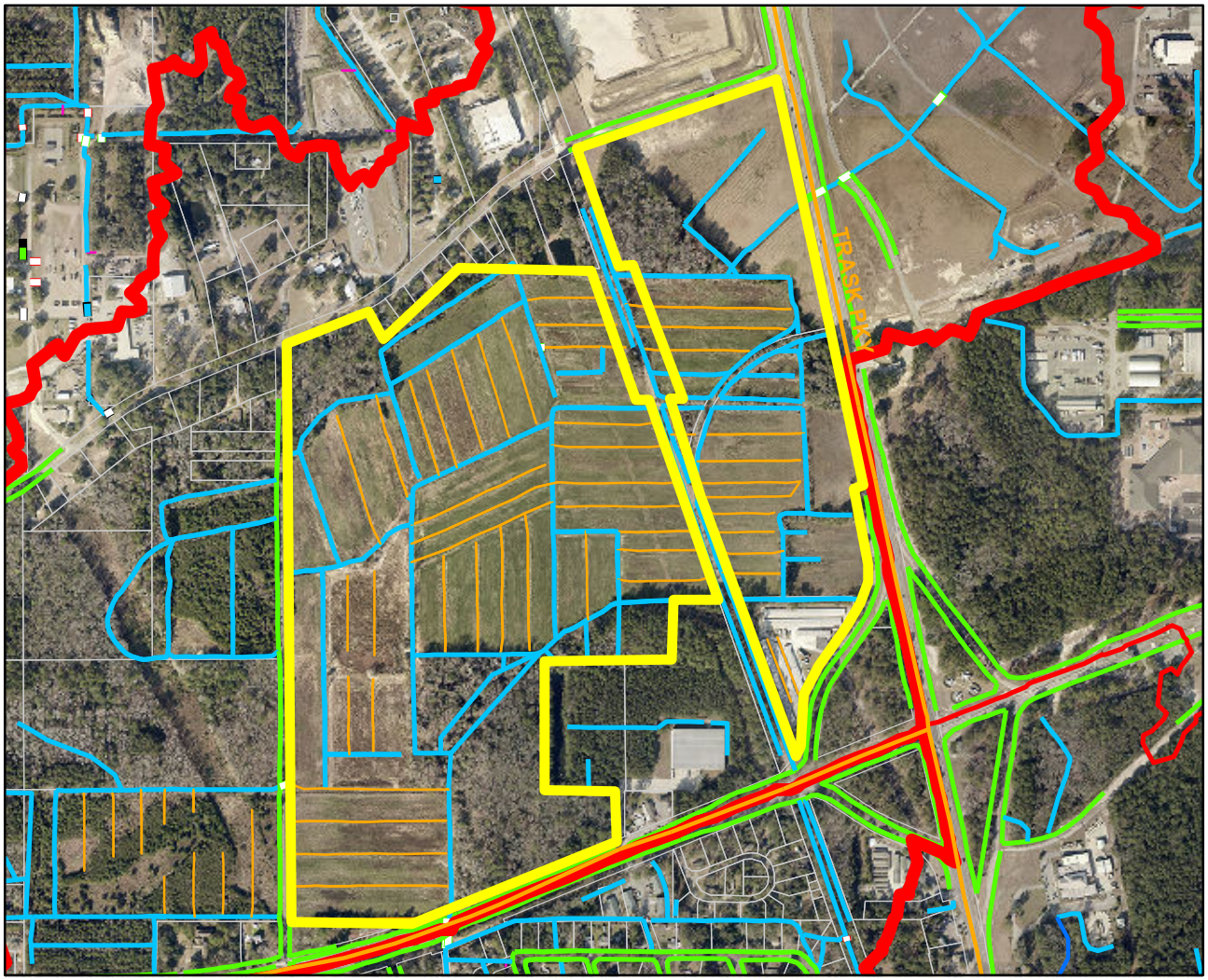
0 312.5 625 1,250 1,875 2,500 Feet

1 inch = 833 feet

Prepared By: BC Stormwater Management Utility
Date Print: 5/19/14

Description: Development in the Salt Creek South hydrologic sub-basin in the Albergotti Creek watershed inlcudes approx. 330 acres of rural and single family development built prior to stormwater regulations. There are no stormwater best management practices, such as detention facilities, in the area. The project would be to construct a regional detention facility to provide stormwater runoff water quality treatment and volume reduction. Due to the presence of multiple wetlands in the area, project design would involve delineation and avoidance of the wetlands, making construction cost a limiting factor for project implementation. Albergotti Creek is impaired by bacteria pollution, a major source being urban runoff. The Creek is being proposed for reclassification to allow shellfish harvesting, making this project a higher priority than in the past. The watershed of the site is located within Beaufort County.

County Retrofit Project: Shanklin Road M2
Activity: Regional BMP
Township: Port Royal Island



Project Schedule: FY 2018-2019 & FY 2021

Project Cost: $3,340,000
$330,000 (2018)
$660,000 (2019)
$2,350,000 (2021)

Drainage

TYPE	
River	Roadside
Creek/Stream	Roadside Pipe
River/Creek/Marsh BANK	Road Pipe
Channel (fka Outfall)	Crossline Pipe
Channel Pipe	Driveway Pipe
Lateral	Access Pipe
Lateral Pipe	Bleeder Pipe

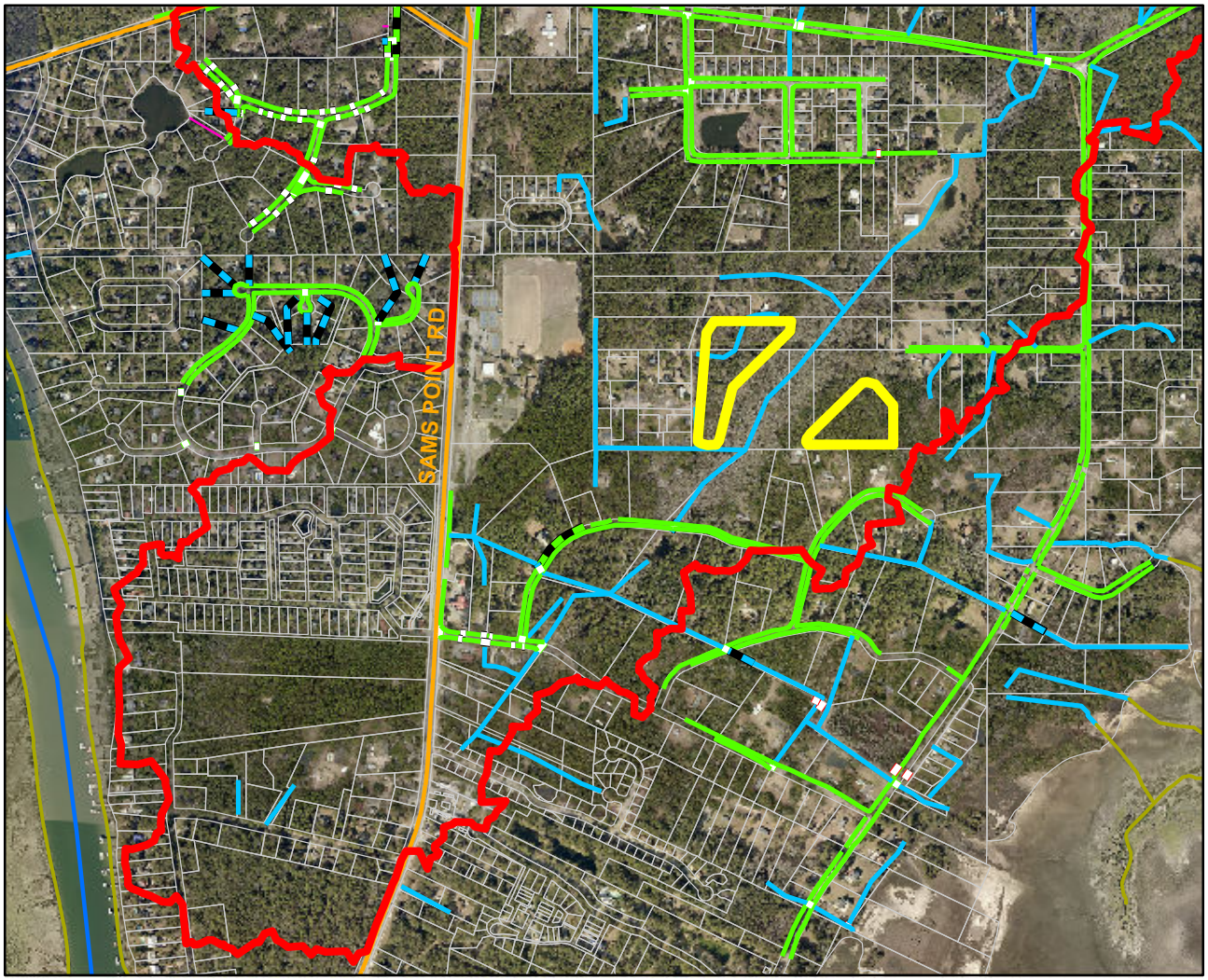
0 345 690 1,380 2,070 2,760 Feet

1 inch = 917 feet

Prepared By: BC Stormwater Management Utility
Date Print: 5/19/14

Description: Development in the Shanklin Road hydrologic sub-basin in the Albergotti Creek watershed inlcudes approx. 600 acres of rural, single family development, commercial, and industrial built prior to stormwater regulations. There are no stormwater best management practices, such as detention facilities, in the area. The project would be to construct a regional detention facility to provide stormwater runoff water quality treatment and volume reduction. Due to the presence of multiple wetlands in the area, project design would involve delineation and avoidance of the wetlands, making construction cost a limiting factor for project implementation. Albergotti Creek is impaired by bacteria pollution, a major source being urban runoff. The Creek is being proposed for reclassification to allow shellfish harvesting, making this project a higher priority than in the past. The watershed of the site is located within Beaufort County.

County Retrofit Project: Factory Creek M2
Activity: Regional BMP
Township: Lady's Island



Project Schedule: FY 2018, 2020 & 2022

Project Cost: $1,740,000
$200,000 (2018)
$340,000 (2020)
$1,200,000 (2022)

Drainage

TYPE	
River	Roadside
Creek/Stream	Roadside Pipe
River/Creek/Marsh BANK	Road Pipe
Channel (fka Outfall)	Crossline Pipe
Channel Pipe	Driveway Pipe
Lateral	Access Pipe
Lateral Pipe	Bleeder Pipe

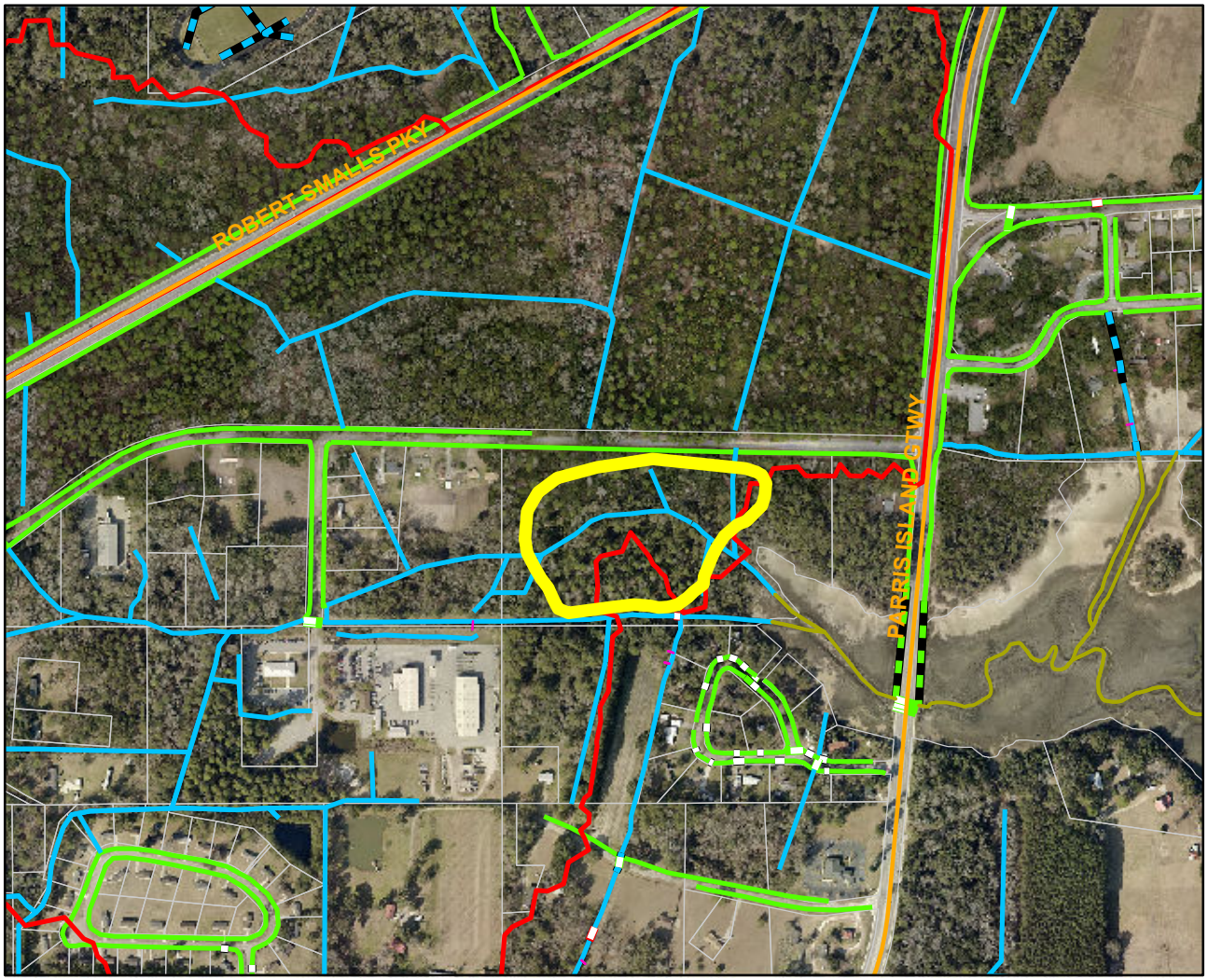
0 450 900 1,800 2,700 3,600 Feet

1 inch = 1,207 feet

Prepared By: BC Stormwater Management Utility
Date Print: 5/19/14

Description: Development in the Factory Creek hydrologic sub-basin in the Rock Springs Creek watershed inlcudes approx. 300 acres of a mix of single family development, and commercial/institutional development built prior to stormwater regulations. There are only a few stormwater best management practices, such as detention basins, in the area. The project would be to construct a regional detention facility to provide stormwater runoff water quality treatment and volume reduction. Due to the grades of the area and the "stop gap measure" to construct a ditch to drain a portion of the wetland, construction will involve a large amount of earthwork, making project cost a limiting factor for project implementation. Rock Springs Creek drains into the Morgan River, which is impaired by bacteria pollution, a major source being urban runoff. The site is located in Beaufort County on Lady's Island.

County Retrofit Project: Grober Hill M2
Activity: Regional BMP
Township: Port Royal Island



Project Schedule: FY 2018,2020 & 2022

Project Cost: $2,525,000
$225,000 (2018))
$900,000 (2020)
$1,400,000 (2022)

Drainage

TYPE	
River	Roadside
Creek/Stream	Roadside Pipe
River/Creek/Marsh BANK	Road Pipe
Channel (fka Outfall)	Crossline Pipe
Channel Pipe	Driveway Pipe
Lateral	Access Pipe
Lateral Pipe	Bleeder Pipe

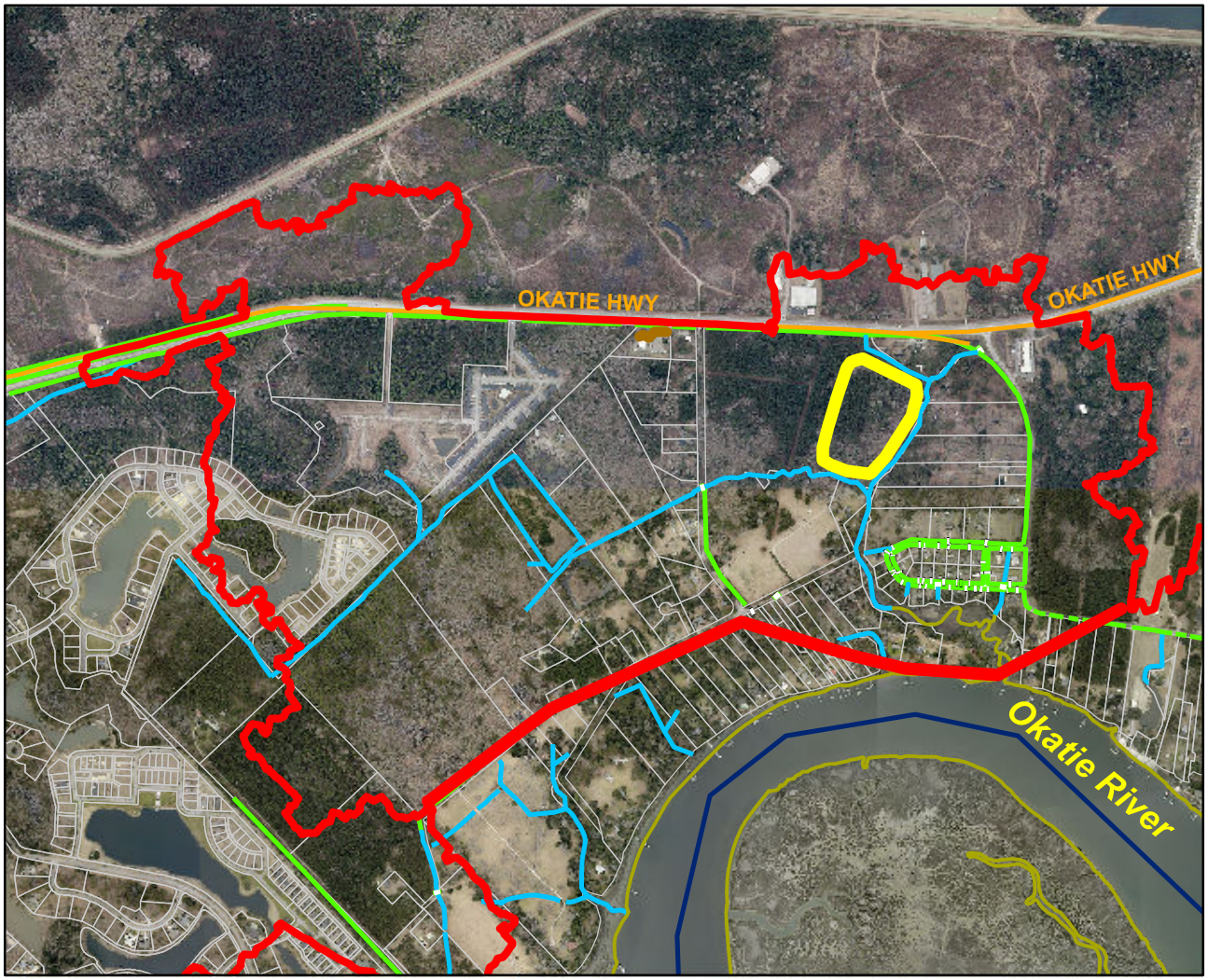
0 250 500 1,000 1,500 2,000 Feet

1 inch = 667 feet

Prepared By: BC Stormwater Management Utility
Date Print: 5/19/14

Description: Development in the Grober Hill hydrologic sub-basin in the Battery Creek watershed inlcudes approx. 130 acres of single family development built prior to stormwater regulations. There are no stormwater best management practices, such as detention facilities, in the area. The project would be to construct a regional detention facility to provide stormwater runoff water quality treatment and volume reduction. Due to the grades of the area , construction will involve a large amount of earthwork, making project cost a limiting factor for project implementation. Battery Creek is impaired by bacteria pollution, a major source being urban runoff. The site is located in the City of Beaufort.

County Retrofit Project: Camp St. Mary's M2
Activity: Regional BMP
Township: Bluffton



Project Schedule: FY 2021-2023

Project Cost: $3,757,000
$342,000 (2021)
$165,000 (2022)
$3,250,000 (2023)

Drainage

TYPE	
River	Roadside
Creek/Stream	Roadside Pipe
River/Creek/Marsh BANK	Road Pipe
Channel (fka Outfall)	Crossline Pipe
Channel Pipe	Driveway Pipe
Lateral	Access Pipe
Lateral Pipe	Bleeder Pipe

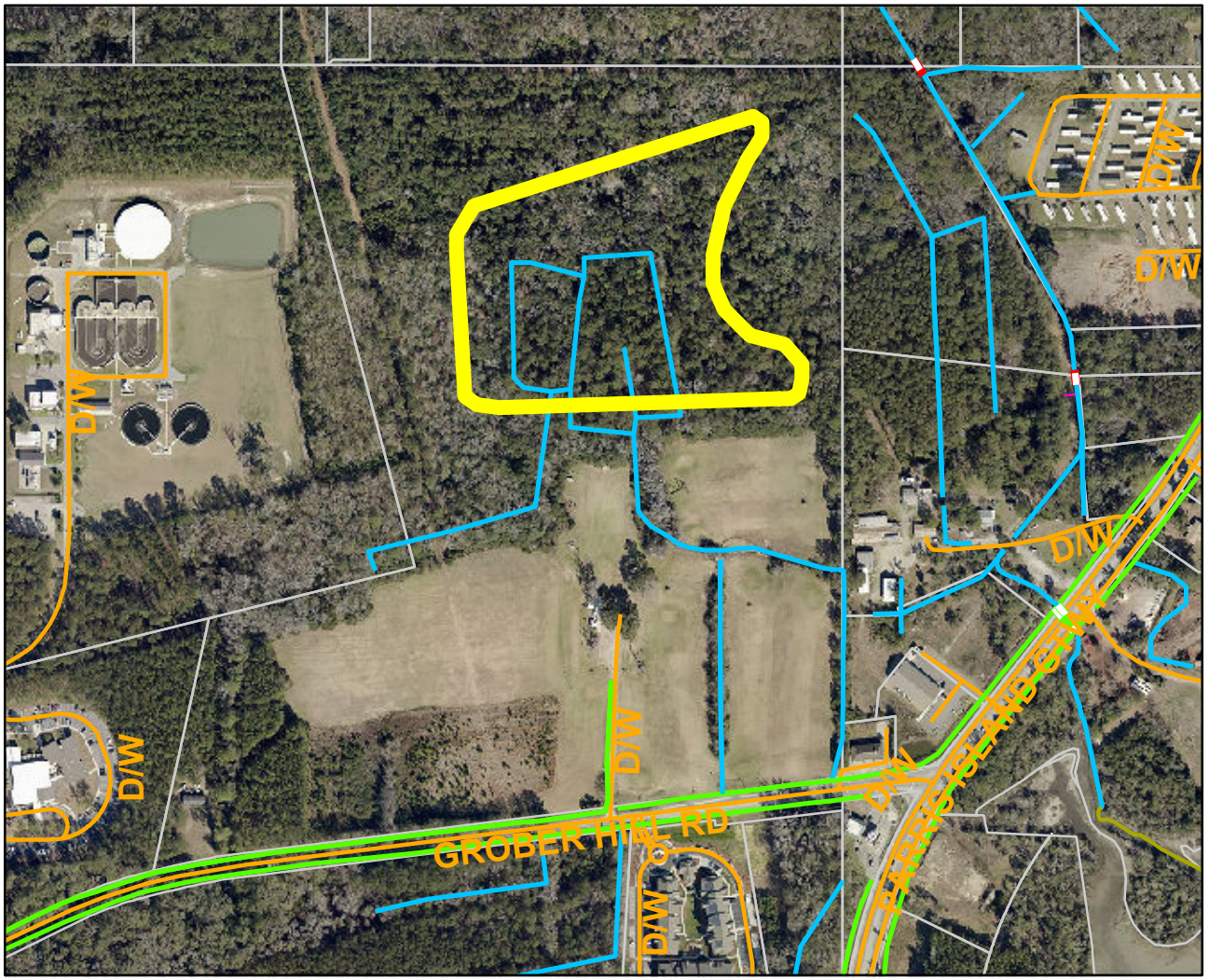
0 550 1,100 2,200 3,300 4,400 Feet

1 inch = 1,457 feet

Prepared By: BC Stormwater Management Utility
Date Print: 5/19/14

Description: Development in the Camp St. Mary hydrologic sub-basin in the Okatie River watershed inlcudes approx. 500 acres of rural and single family development built prior to stormwater regulations. There are no stormwater best management practices, such as detention facilities, in the area. The project would be to construct a regional detention facility to provide stormwater runoff water quality treatment and volume reduction. Due to the presence of multiple wetlands in the area, project design would involve delineation and avoidance of the wetlands, making construction cost a limiting factor for project implementation. Okatie River is impaired by bacteria pollution, a major source being urban runoff. The watershed of the site is located within both Beaufort and Jasper Counties.

County Retrofit Project: Battery Creek West M1
Activity: Regional BMP
Township: Port Royal Island



Project Schedule: FY 2022-2024

Project Cost: $4,140,000
$375,000 (2022)
$165,000 (2023)
$3,600,000 (2024)

Drainage

TYPE	
River	Roadside
Creek/Stream	Roadside Pipe
River/Creek/Marsh BANK	Road Pipe
Channel (fka Outfall)	Crossline Pipe
Channel Pipe	Driveway Pipe
Lateral	Access Pipe
Lateral Pipe	Bleeder Pipe

0 187.5 375 750 1,125 1,500 Feet

1 inch = 500 feet

Prepared By: BC Stormwater Management Utility
Date Print: 5/19/14

Description: Development in the Battery Creek West hydrologic sub-basin in the Battery Creek watershed inlcudes approx. 500 acres of a mix of single family development and commercial development built prior to stormwater regulations. There are only a few stormwater best management practices, such as hydrodynamic separators, in the area. The project would be to construct a regional detention facility to provide stormwater runoff water quality treatment and volume reduction. Due to the grades of the area, construction will involve a large amount of earthwork, making project cost a limiting factor for project implementation. Battery Creek is impaired by bacteria pollution, a major source being urban runoff. The site is located in the Town of Port Royal.

County Retrofit Project: Paige Point Rd Overtopping Design
Activity: Mitigationl BMP
Township: Sheldon

Project Schedule: FY 2023-2024

Project Cost: $335,000
$30,000 (2023)
$305,000 (2024)

Drainage

TYPE	
River	Roadside
Creek/Stream	Roadside Pipe
River/Creek/Marsh BANK	Road Pipe
Channel (fka Outfall)	Crossline Pipe
Channel Pipe	Driveway Pipe
Lateral	Access Pipe
Lateral Pipe	Bleeder Pipe

0 312.5 625 1,250 1,875 2,500 Feet

1 inch = 833 feet

Prepared By: BC Stormwater Management Utility
Date Print: 5/19/14

Description: Historic complaints about road overtopping support the findings of the 2006 Stormwater Master Plan, which identified this location as a flooding hazard during a 100 - year storm event. A 2013 study by the County confirmed the flooding problem and proposes raising a portion of the road and up-sizing the storm drain under the road.