



Alachua County Stormwater Treatment Manual Presentation

PROVIDED TO: The City of Alachua
BY: CHW
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Question: To save your planet's drinking water, you have to make improvements that remove Nitrogen from the water. Which improvement do you choose?

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- a. Remove 77,000 lbs TN / yr at a cost of \$292 / lb removed
- b. Remove 964,000 lbs TN / yr at a cost of \$1 / lb removed
- c. Remove 9.32 lbs TN / yr at a cost of \$4,989 / lb removed
- d. Remove 363.7 lbs TN / yr at a cost of \$6,391 / lb removed

- Basis
- Why?
- What?
- How?
- Case Studies
- Costs
- Summary

Presentation based upon CHW's review / experience with:

- Alachua County Stormwater Treatment Manual White Paper, April, 2016
- Draft Alachua County Stormwater Treatment Manual, April, 2016 (released May, 2016)
- Multiple stormwater manual presentations by Alachua County Staff
- Multiple meetings with Alachua County Staff
- Direct correspondence with Alachua County's technical consultants

Why is the County proposing new stormwater requirements?

Studies have shown that current stormwater treatment requirements (best management practices, or BMPs), are not doing enough to protect groundwater.

- *2007 FDEP Report – “Evaluation of Current Stormwater Design Criteria within the State of Florida” (Harper and Baker)*
- *2011 Report – “Nitrogen Transport and Transformation Beneath Stormwater Retention Basins in Karst Areas and Effectiveness of Stormwater BMPs for Reducing Nitrate Leaching to Ground Water” Marion County, FL (Wanielista et. al)*

Evidence? Increased nitrates in springs, groundwater, and surface water

Consequently, Alachua County is proposing new BMPs and performance standards to ensure adequate protection of our water resources.

Why stormwater regulations? Alachua County has jurisdiction over new development / redevelopment standards, but does not have jurisdiction over other land uses like wastewater and agricultural activities.

Why these particular regulations? Following Pinellas County's lead? (Same technical consultants, similar requirements / manual)

Why?



In 2008, Alachua County tasked AMEC Environment & Infrastructure, Inc. with developing a GIS application that would . .

.

“Support and facilitate Alachua County’s decision-making regarding potential changes to the Alachua County Comprehensive Plan and related land development regulations as they pertain to springs protection, allowing evaluation by modification of selected inputs that may represent management actions, such as the implementation of Best Management Practices (BMPs).”

“Sources of Nitrate and Estimated Groundwater Travel Times to Springs of the Santa Fe River Basin” (2013 Revised Report)

Nitrogen and Phosphorus

- Both occur naturally and are necessary for the proper function of an ecosystem.
- An excess of one or the other causes an imbalance and often leads to overgrowth of algae.
- Although there are other pollutants, these two have the most impact on water quality.
- Phosphorus tends to be a lesser problem.

What?

Nitrogen is the bigger problem.

Specifically – nitrates – because they migrate through the aquifer system and cause water quality problems when they reach springs/surface waters

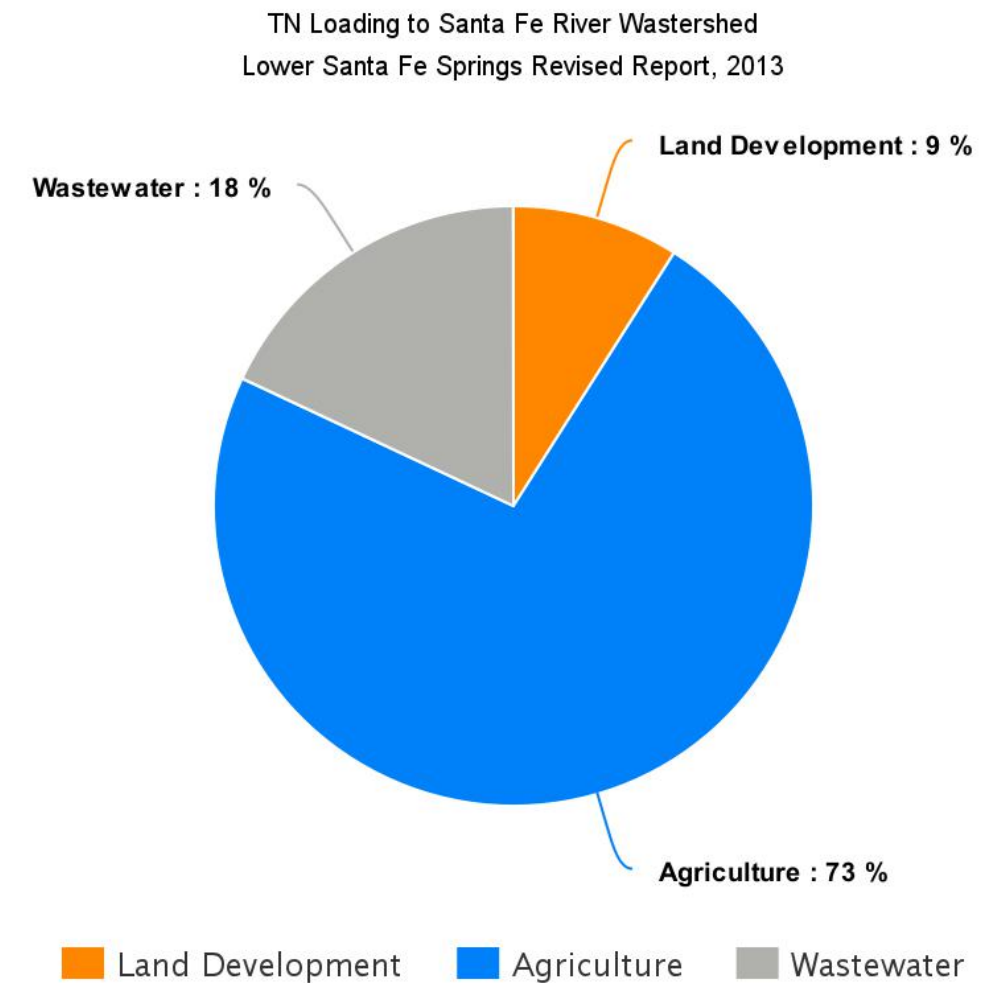
FDEP Water Quality Standards for Total Nitrogen

- Drinking water: 10 mg/L
- Springs: 0.35 mg/L

Goal: Remove nitrogen / nitrates from our water or modify them to a different form that is less problematic.

What?

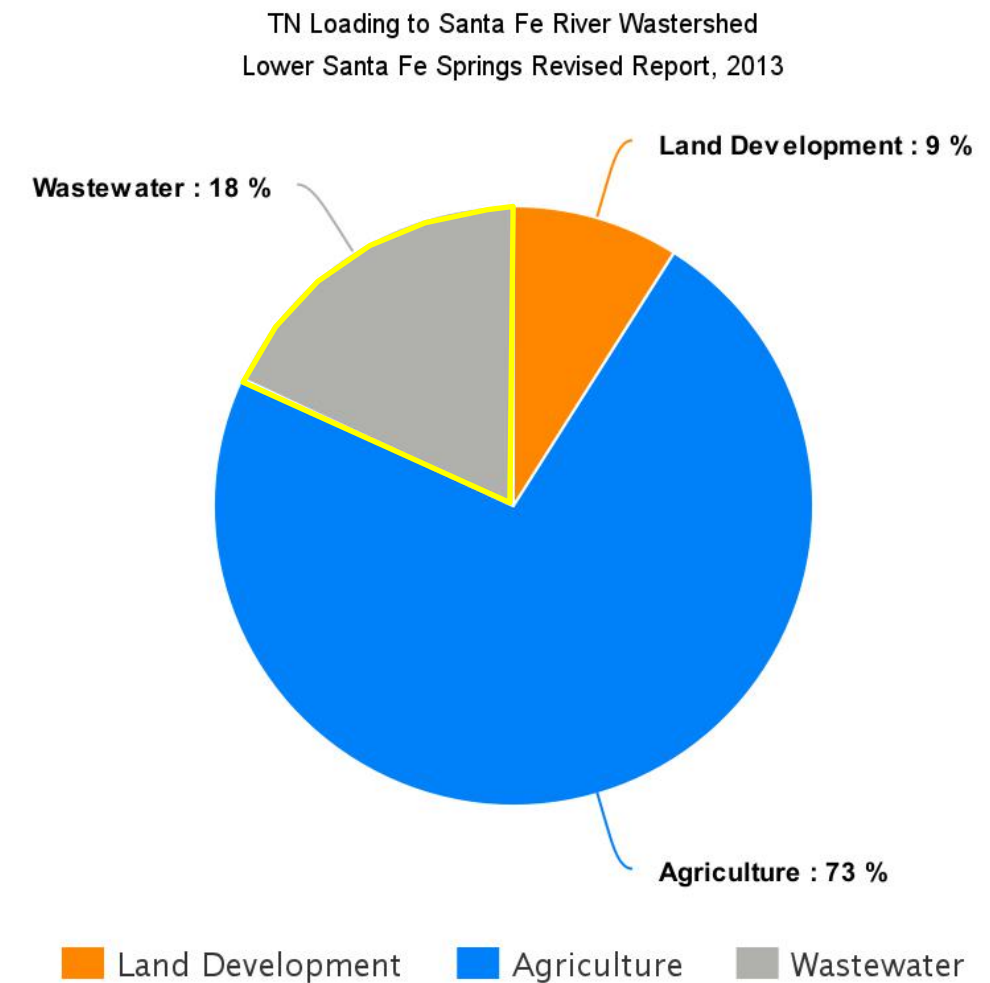
- What are the primary anthropogenic sources of Nitrogen?
 - Fertilizer
 - Human Waste
 - Animal Waste
- Often estimate Nitrogen loading based on land use
- Santa Fe River Basin Report analyzed land uses from 2004



meta-chart.com

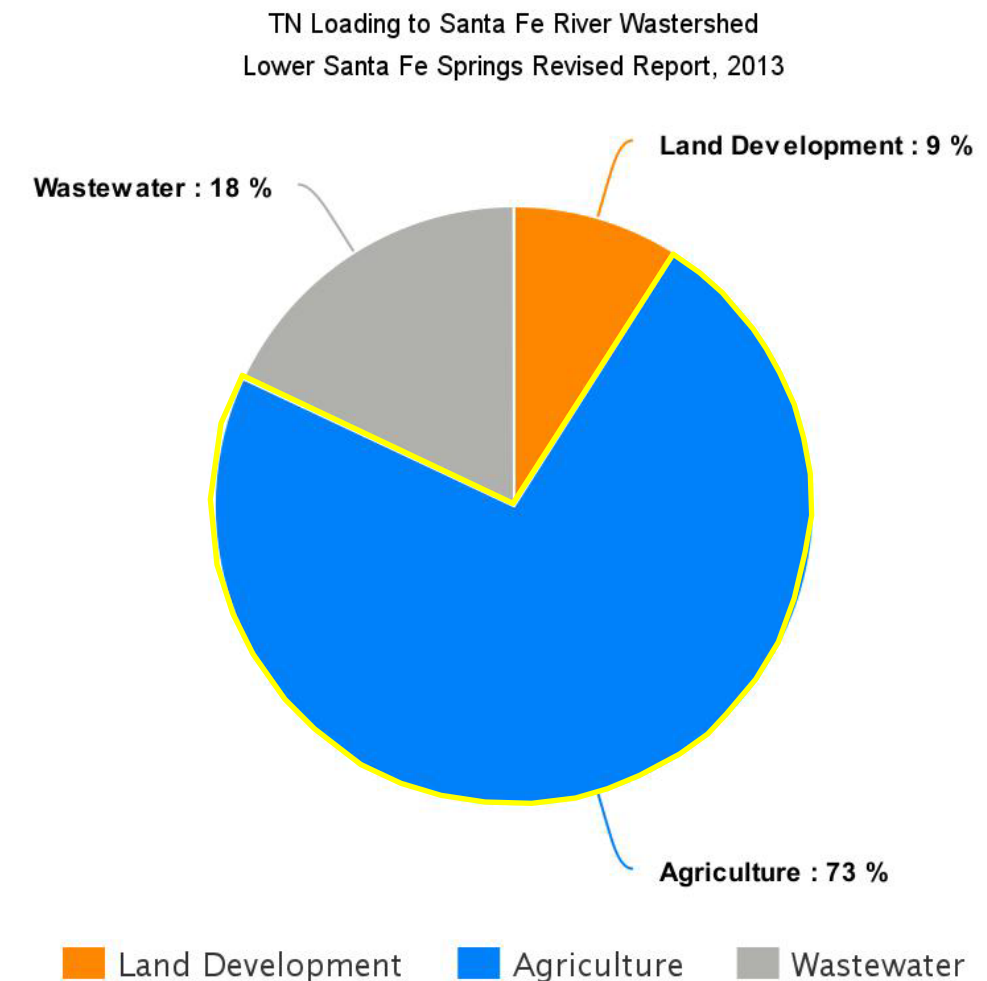
What?

- Wastewater - 18%:
 - 1% WWTP
 - 17% septic tanks



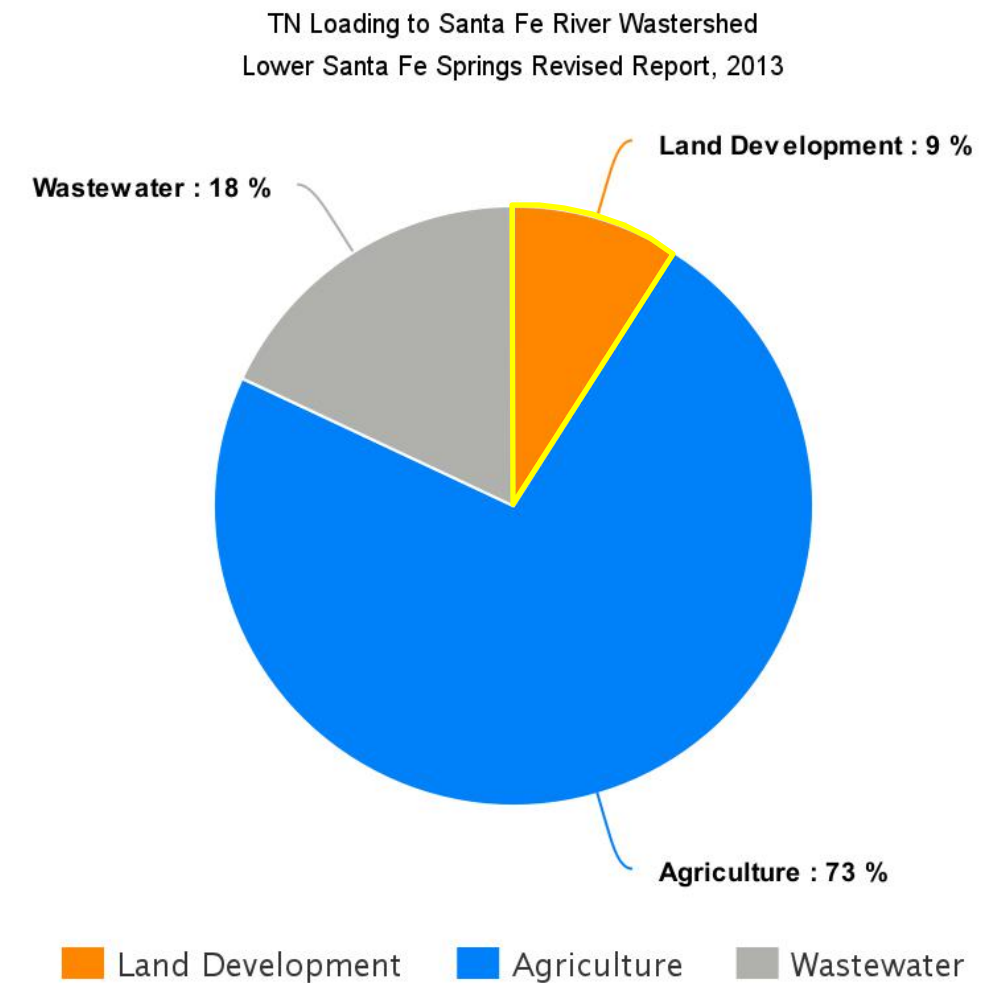
What?

- Agriculture – 73%:
- Combination of fertilizer and animal waste
 - Row crops
 - Field crops / sod
 - Orchards / nurseries
 - Tree plantations (silviculture)
 - Pasture land
 - Concentrated Animal Feeding Operations (CAFOs)



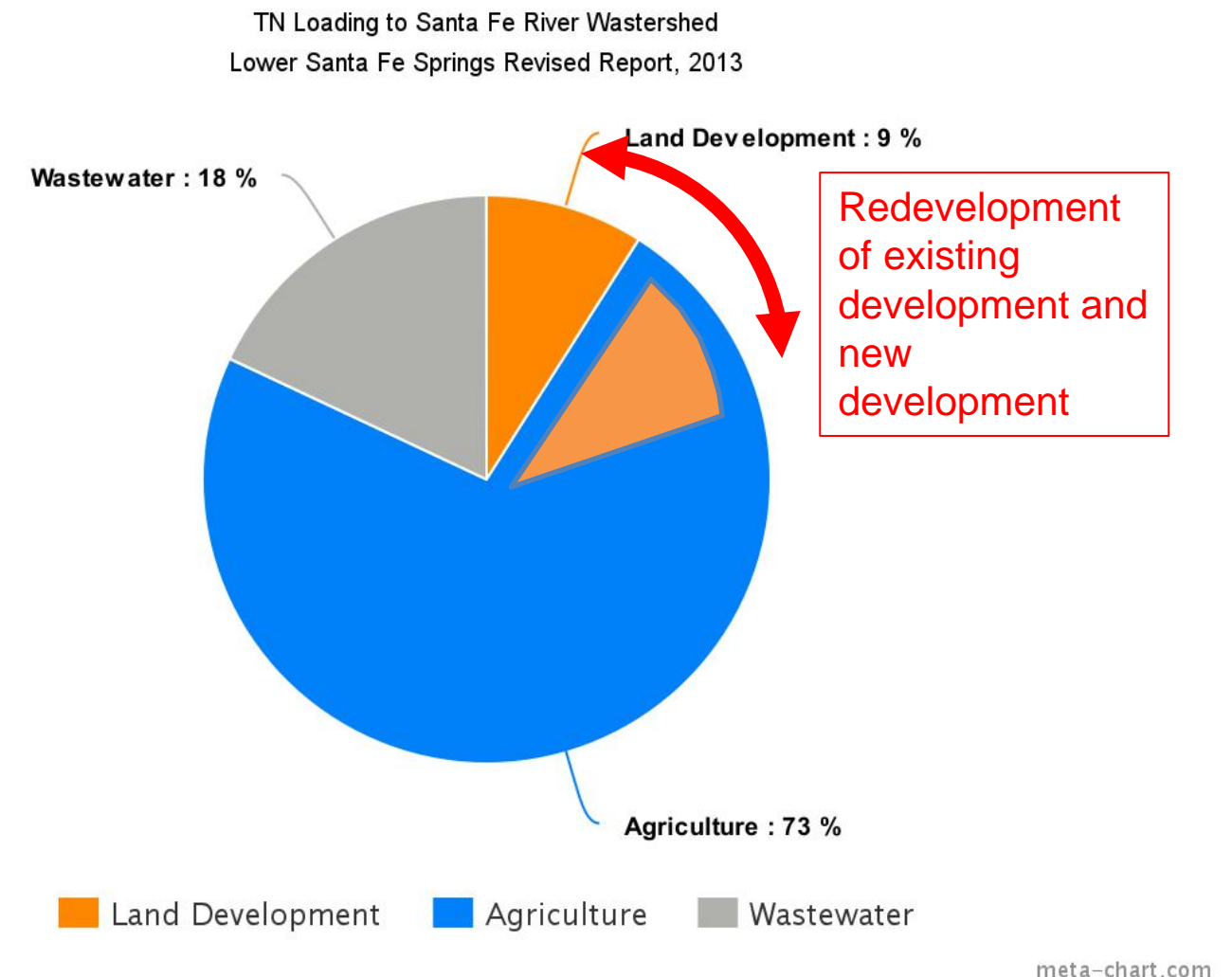
What?

- Land Development – 9%:
- Fertilizer is the primary source
 - Residential
 - Commercial
 - Institutional
 - Recreational land uses



What?

- Changes in land use affect nitrogen loading
- The proposed Alachua County stormwater manual will only have an impact on new development or redevelopment of existing sites
- Does not reduce nitrogen loading from existing developments



Alachua County Stormwater Quality Treatment Manual

Context

- Intended for the local hydrology, geology, and water resources of Alachua County
- Delineates Sensitive Karst Areas (SKA) and Aquifer Vulnerability Zones
 - Areas more susceptible to stormwater pollutants
 - Most of Alachua is within the “High Vulnerability” Karst Area and is subject to additional stormwater requirements for retention systems
 - Some of Alachua is in the “Vulnerable” Karst Area, also subject to additional stormwater requirements for retention systems

Alachua County Stormwater Quality Treatment Manual

Context

- Identifies key surface waters and Impaired Water Bodies
 - City of Alachua lies within a watershed that has impaired water bodies: Mill Creek Sink, Hague Branch, Turkey Creek, and Blues Creek
 - San Felasco Preserve is an Outstanding Florida Water

Alachua County Stormwater Quality Treatment Manual

Relation to Municipal Requirements

- The current draft manual is intended for use in unincorporated portions of Alachua County
- A new manual for municipalities will be created
- Flood control (water quantity) will be based each municipality's code
- Water quality requirements will be established by the County manual

Alachua County Stormwater Quality Treatment Manual

- **Fundamental Basis of the Manual – Groundwater Quality**

- New Performance Standards (Continued):**

- 4. Projects within SKA (e.g. **Alachua**) must reduce nitrate loading into groundwater by 70%
 - **Applicable to stormwater that infiltrates within a retention basin**
 - **Pollutant load reduction is quantified by the amount of nutrient that is retained and does not percolate into the aquifer**
 - Retention basins in SKA require a min. depth of 2 feet of Bio-Sorption Activated Media (BAM) over the bottom and side banks of the basin

Alachua County Stormwater Quality Treatment Manual

Best Management Practices (BMPs)

- BMPs are tools used to reduce pollutant loading to ground and surface waters
- Two types of BMPs: Structural and Non-Structural

Structural

- Wet ponds, dry ponds, swales, rain gardens, etc.
- Design requirements and principles for system components
- Following the guidelines results in an presumed reduction in pollutant load

Non-structural (Site planning & Source Control)

- Low impact design (LID) – reduce impervious area, DCIA, treatment train approach
- Florida Friendly Landscaping and fertilizer applications
- Following these practices yields load reduction credits to meet the performance standards

What is BAM? Bio-Sorption Activated Media

- BAM is a BMP that helps with the removal of the primary pollutants as identified by Alachua County: Total Phosphorus (**TP**), Total Nitrogen (**TN**), and Total Suspended Solids (**TSS**) from storm water.
- TP removal has a limited life expectancy, TN removal does not
 - TP is removed by filtration and chemical means.
 - BAM will need to be maintained **every 20 years**
- TSS is removed through **filtration**, which is considered **indefinite**

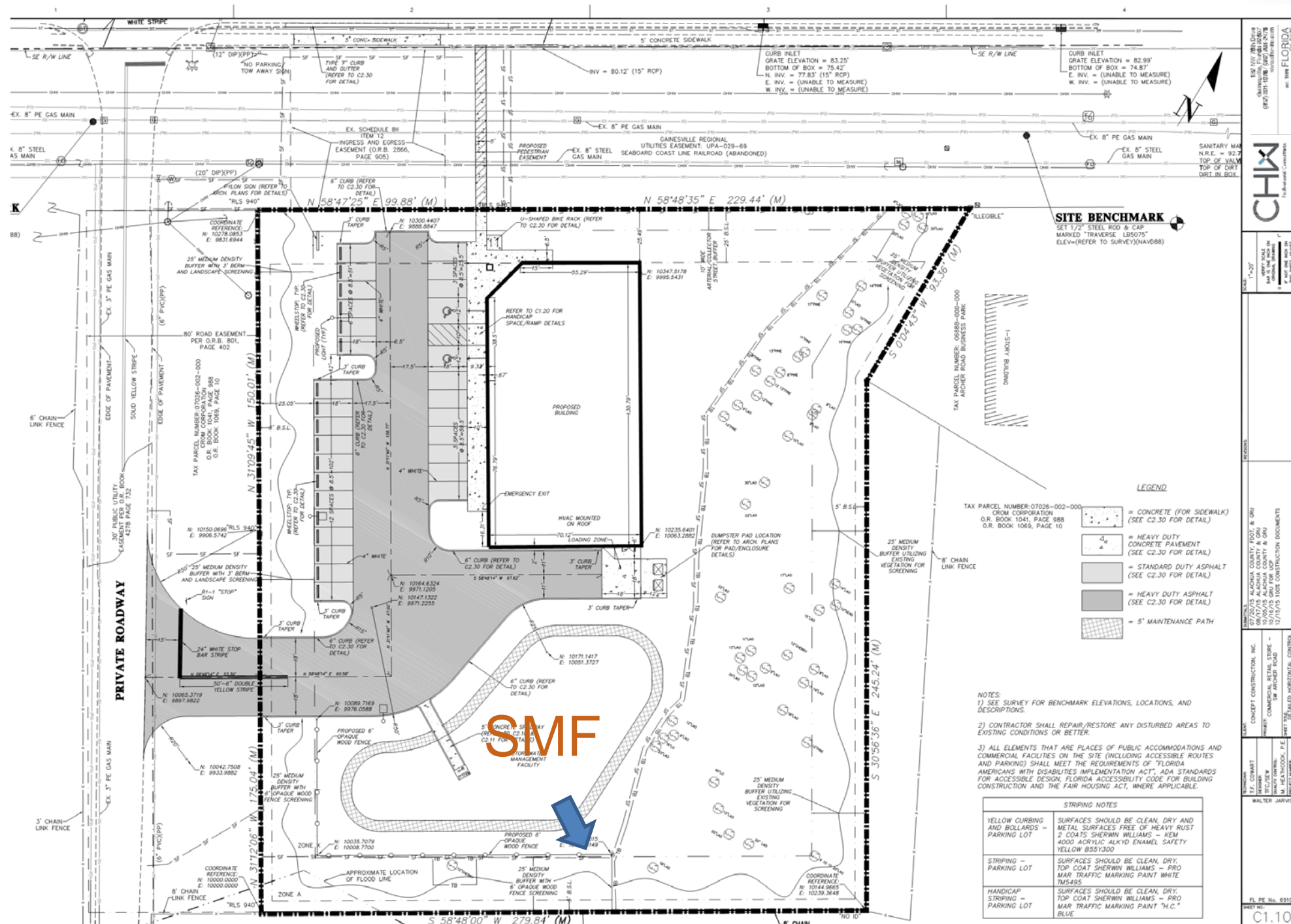
What is BAM? Bio-Sorption Activated Media

- Example of BAM: “Bold and Gold” is an approved material that can meet the requirements of the Draft Alachua County Storm Water Manual
 - Alternative media includes granulated ferric oxides, activated carbon, zeolites, or combinations of sand with ferric oxides and carbon sources
- The cost of “Bold and Gold” is estimated to be **\$200 / CY** (currently defined as 2 feet thick over entire basin bottom) or **\$645,000 / acre**

BAM Details

- Specifications for BAM have not yet been developed
- BAM is the **only** BMP recognized for use in SKA
 - Other measures do not receive credit (i.e., reduction in fertilization, Florida Friendly Landscape, Low Impact Development, BMPs)
- BAM placement and quantity is yet to be finalized
 - Placed over entire pond bottom or only Water Quality Treatment area?
- Sensitive Karst Area (SKA) is being treated as **100% uniform soil profile of 'A' soils (sandy)**
 - Some areas have **clayey soils** with slower infiltration and characteristics, hence additional treatment for Nitrogen removal
 - Site testing studies proposed
 - General application area versus site specific site conditions application

Case Study: Dollar General Archer Road



- ±2.14 acre site
- 9,100 sf commercial building
- Retention pond with outfall
- SJRWMD/ Alachua County
- Sensitive Karst Area (SKA) "Vulnerable"

New Design Criteria per Draft Manual

1. Required nutrient removal: 70% for TN, 80% for TP
2. Site is located within Hogtown Creek HUC12 watershed (impaired for TP and Fecal Coliform), so required to make a 10% net improvement from pre-development loading (Required TN removal increases to 74%). Even though the site is ± 3 miles away from Hogtown Creek and has no way to drain there.
3. (Not applicable – no direct discharge to OFW)
4. SKA “Vulnerable” requires minimum 2 ft. of BAM over the pond bottom and sides.

Case Study: Dollar General Archer Road



Design Analysis: Surface Water Quality Treatment

Evaluation Criteria	Nitrogen (TN)	Phosphorus (TP)
1. Required Minimum Nutrient Removal	70%	80%
2. Impaired Water Bodies Nutrient Removal	73.8%	74.1%
<i>Nutrient Removal Efficiency Provided by Existing Design</i>	<i>98.9%</i>	<i>98.9%</i>
Performance Criteria Met by Existing Design	YES	YES

- Pollutant removal for surface water discharge is provided by retaining 3.89" over the drainage area
- No design change is required to meet new surface water quality discharge standards

Case Study: Dollar General Archer Road



Design Analysis: Ground Water Quality Treatment

- Required performance standard: reduce post-development nitrate loading into the ground water by at least 70%
- 2' of BAM is the only BMP solution allowed

Construction cost for the existing code-compliant pond: \$18,000

Construction cost for new manual compliant pond: \$64,500

Additional cost due to new manual requirements: \$46,500

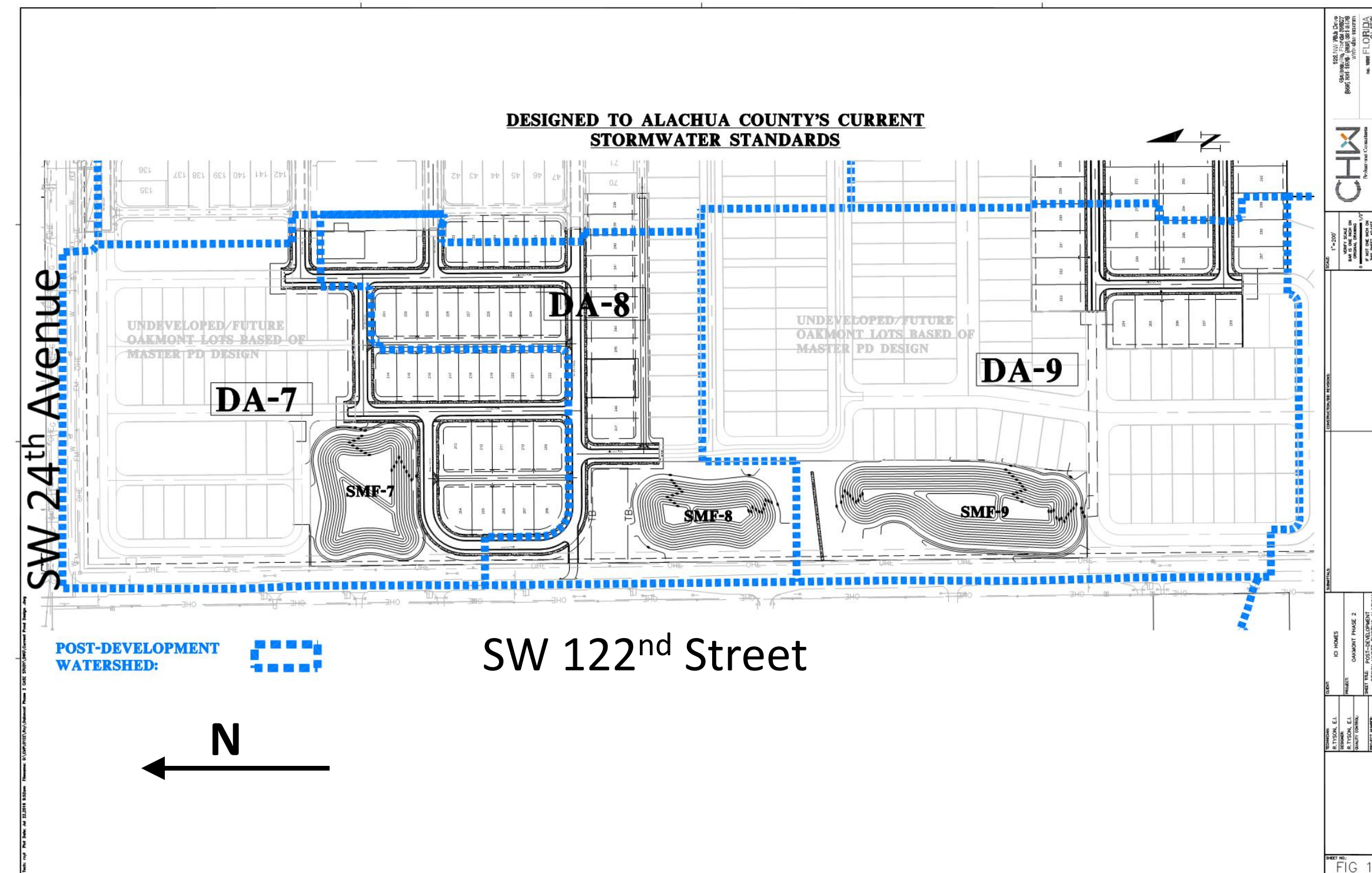
Estimated Post-Development Nitrogen Loading: 13.31 lbs/year

Presumed 70% Nitrogen loading reduction: 9.32 lbs/year

Summary and Conclusions

- Original retention design exceeds the proposed pollutant removal criteria for surface water discharge.
- Reduced infiltration rates of BAM cause increase in pond volume to meet freeboard requirements
 - Make pond bottom 0.5 ft. deeper or
 - Expand the pond laterally by 1 ft.
- Net effect on Developable Area: No change
- Cost of Stormwater Pond: Increased \$46,500 (+361%)
- Net Improvement to Water Quality: 9.32 lbs TN/ year

Case Study: Oakmont Phase 2



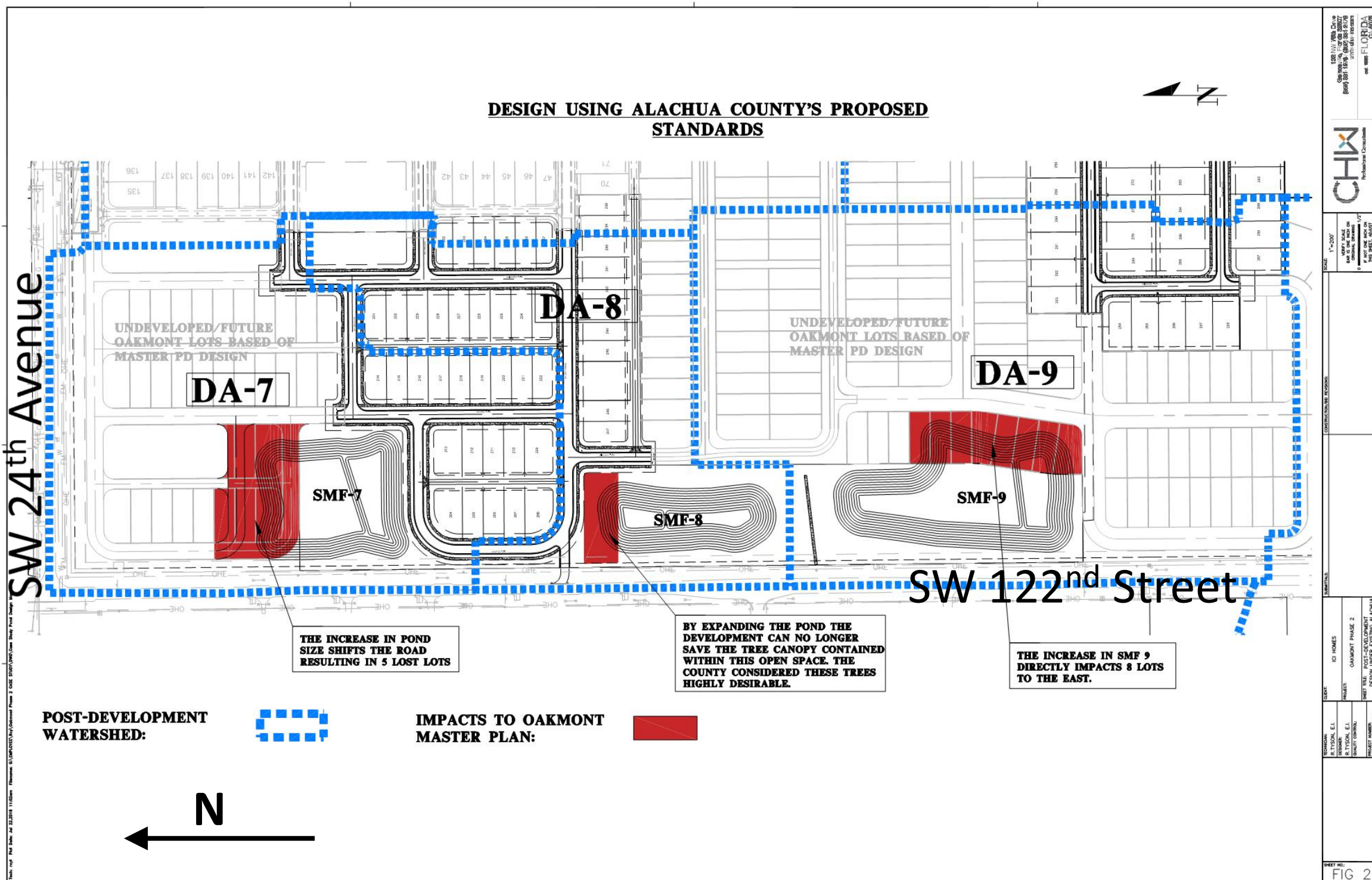
Details

- Phase 2 will include 3 new master stormwater systems expecting to handle:
 - Proposed (59 lots)
 - Future development (140 lots).
- Proposed SMF's are full retention.

Developable Value

- Only considering lots being treated by SMF-7, SMF-8, or SMF-9.
- Estimated Total Lot Sale Value:
 - \$11,338,000
- Number of lots:
 - 199 lots
- Average Cost Per Lot:
 - \$56,974 / lot

Case Study: Oakmont Phase 2



Details

- Due to being in a Karst Sensitive Area BAM material is required.
 - 2 ft of depth under pond bottom
 - 2 ft depth under side slopes to the WQTV elevation.
- Infiltration rates decreased
 - 10 ft/day to 2 ft/day
- Total Impact
 - Basin expansion required
 - Loss of a minimum of 13 lots
 - *Impact to quality trees and canopy retention*

Case Study: Oakmont Phase 2



Increased Stormwater Facility Costs

BAM Material:

- BAM Material Used: Bold & Gold
- Cost of Procurement and installation: \$200 / CY
 - **Total Cost: \$2,114,058**

Earthwork Costs:

- Excavation and disposal of waste material: \$8 / CY
 - **Total Cost: \$210,067**

Impact on Lot Value:

- Total lot sales value = \$11,338,000 (for 186 lots)
- Increased costs = \$2,114,000 + \$210,067 = \$2,324,067 for **new stormwater requirements**
- Increased cost represents 20% of the original sale value, builder must either:
 - Increase the lot sale value to cover the additional cost – lots become less affordable to the buyer
 - Make less money – due to increased cost
 - Choose not to build and make no money – if the margins decrease to the point that it isn't worthwhile to build
- **Average Cost = \$73,452 / lot**

Case Study: Oakmont Phase 2



Summary and Conclusion:

Impact on Lot Value:

- Total lot sales value = \$11,338,000 (for 186 lots)
- Increased costs = \$2,114,000 + \$210,067 = \$2,324,067 for **new stormwater requirements**
- Increased cost represents 20% of the original sale value, builder must either:
 - Increase the lot sale value to cover the additional cost – lots become less affordable to the buyer
 - Make less money – due to increased cost
 - Choose not to build and make no money – if the margins decrease to the point that it isn't worthwhile to build
- Original Cost per lot: **\$56,974 / lot**
- Under new Alachua County Design Standards: **\$73,452 / lot**
- Increase in lot cost: **~\$16,500 / lot**
- Loss of a minimum of **2.99 AC** of developable area
- Future maintenance

Summary and Conclusion:

What about maintenance?

- Not yet well defined
- Expectation is that BAM will need to be periodically replaced; replacement frequency may be based on limitations of component materials
- Informal data from technical consultant indicates BAM may need to be replaced every 20 years
- For Oakmont, if BAM must be replaced in 20 years, then residents (via the HOA) will have to bear the cost of replacing the BAM in the basins at a cost of \$2.1 million (2016 dollars), increased for inflation
- Other alternatives may be developed before the BAM must be replaced

Santa Fe River BMAP: BMPs



- Lower Santa Fe River is an impaired water body for Dissolved Oxygen and Nutrients
- Santa Fe River BMAP (Basin Management Action Plan) was adopted in 2012
- TMDL (Total Maximum Daily Load) target 0.35 mg/L for Nitrate (vs. 10 mg/L groundwater drinking water standards)
- Nitrate loads from non-point sources needs to be reduced by 35% to meet target
- BMP (Best Management Practice) based
 - “BMPs are individual or combined management and/or structural practices determined through research, field testing, and expert review to be the most effective and practicable means for improving water quality, taking into account economic and technological considerations.”*
- **BMPs must be cost-effective**

Are the BMPs proposed in the draft manual cost-effective?

Nitrogen Removal Cost Comparison



1. Lake City Wastewater Treatment Plant Upgrades*:

- $\$22.5 \text{ million} / 77,000 \text{ lbs TN/yr} = \292 per lb TN/yr

2. Agricultural BMPs (FDACS “Fertigation” projects)*:

- $\$990,000 / 964,000 \text{ lbs TN/yr} = \$1.03 \text{ per lb TN/yr}$

3. BAM (Bold & Gold) for Dollar General Archer Rd

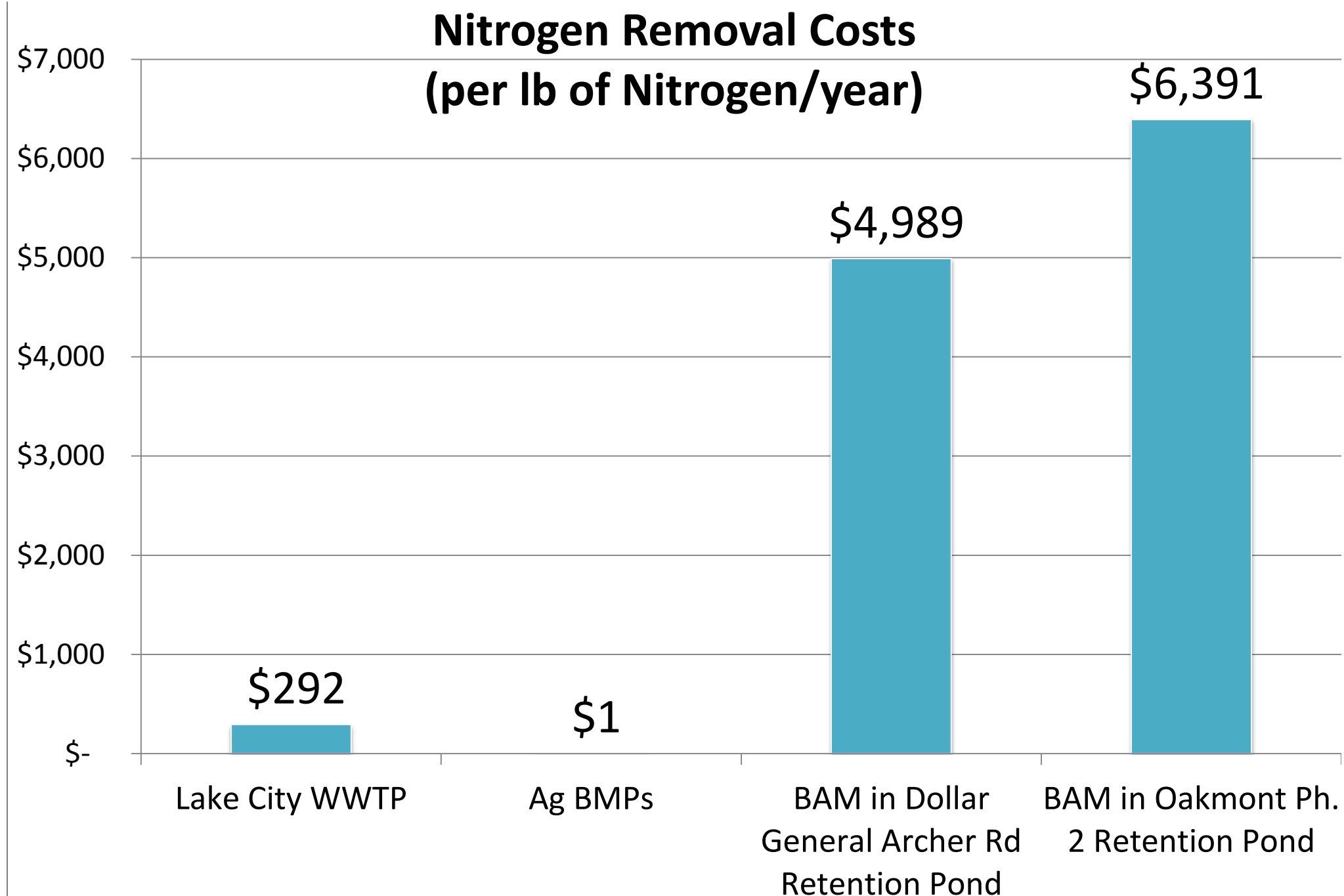
- $\$46,500 / 9.32 \text{ lbs TN/yr} = \$4,989 \text{ per lb TN/yr}$

4. BAM (Bold & Gold) for Oakmont Phase 2

- $\$2.32 \text{ million} / 363.7 \text{ lbs TN/yr} = \$6,391 \text{ per lb TN/yr}$

**Source: 2013 Progress Report for the Santa Fe River BMAP*

Nitrogen Removal Cost Comparison



- Using BAM in a retention pond is a very expensive method for Nitrogen removal
- BAM is required for all retention ponds in SKA, regardless of site soil conditions
- Costs for WWTP and Ag BMPs are partially subsidized
- No proposed subsidies for BAM

- **We all care about water quality**
- The contents of the proposed manual exhibit some inconsistencies and areas that require clarification
- The costs associated with the proposed stormwater treatment – are they acceptable? (Per Santa Fe River Basin BMAP, BMPs must be cost effective)
- Next steps?

Task Force Letter (BCC)



Dear Chair Hutchinson,

The Business Community Coalition (BCC), a partnership between the Gainesville Area Chamber of Commerce, the Builders Association of North Central Florida, and the Gainesville-Alachua County Association of Realtors, respectfully urges the Alachua County Board of County Commissioners (BoCC) to ensure that the stormwater policy formulation process is deliberative, inclusive, and thoughtfully conceived.

We recommend that the BoCC establish an Alachua County Stormwater Quality Enhancement Task Force to identify and recommend policies enhancing surface and ground water quality in Alachua County. The mission would be to balance environmental protection and affordability through policy recommendations based on science and locally derived data.

We suggest the Task Force would consist of no more than fifteen members with the BoCC, the Alachua County League of Cities, and the BCC each appointing five members. It would meet from July – December 2016 and transmit a report with policy recommendations to the BoCC no later than February 1, 2017. The Deputy County Manager would serve as Executive Director of the Task Force and provide staff support in preparing the meeting agendas and the report.

We also respectfully urge the BoCC not to revise any stormwater regulations until after the Task Force has submitted its report with policy recommendations.

Thank you for your consideration.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Dean R. Cheshire'.

Dean R. Cheshire, M.B.A.
2015/2016 Chair, Business Community Coalition

Proposal

Alachua County Commission establish a Stormwater Quality Enhancement Task Force to identify and recommend policies enhancing surface and ground water quality in Alachua County.

Mission

Balance environmental protection and affordability through policy recommendations based on science and locally derived data.

Membership

The Task Force would consist of no more than fifteen (15) members who would be selected as follows: Five (5) members appointed by the Alachua County Board of County Commissioners, and five (5) members appointed by the Alachua County League of Cities, five (5) members appointed by the Business Community Coalition.

Term and Report

The Task Force would meet from July 2016 – December 2016 and transmit a report with policy recommendations to the Alachua County Commission no later than February 1, 2017.

Executive Director

The Deputy County Manager would serve as Executive Director of the Task Force and provide staff support to the Task Force, aid in preparing and distributing meeting agendas prior to meetings, and aid in preparing the Task Force report with policy recommendations.

Operation

The Task Force would elect its own Chair and Vice Chair. The Chair would set meeting agendas.

Meetings

The Task Force would meet no less than once per month.

Subcommittees

The Task Force may create subcommittees.

Questions?



Professional Consultants