



# Wastewater research and alternatives

Jay W. Brown  
Captiva Community Panel  
Wastewater Committee  
Public Meeting  
Jan. 28, 2020



# AGENDA

- Septic System Primer
- Review of Dr. Tomasko's Research
- Central Sewer System Alternatives



# SEPTIC SYSTEM PRIMER

- What Pollutants Concern Us?
- How Does A Septic System (OSTDS) Operate?
  - How Can Septic Systems Be A Problem?
    - Properly Used, Septic Systems Can Be Very Effective!



# POLLUTANTS

## Health Hazards

- Pathogens That Harm Human Health

## Nutrients

- Promote Growth Of Undesirable Organisms Such As Algae
  - Nitrogen, Phosphorous

# SEPTIC SYSTEM PROCESS

- Septic System Discharges Tank Effluent Via Drainfield Into Soil
- Septic Tank Effluent Is Processed “Naturally” In Soil
- Below the Topsoil is Groundwater (Saturated Soil)
  - Effluent Should Be Processed Before Reaching Groundwater
  - Otherwise, Groundwater Spreads Untreated Effluent



# SEPTIC SYSTEM ISSUE

- Amount of Drainfield/Groundwater Separation is Very Important
  - Generally, 24 Inches is Standard Minimum Separation
  - Often, More Separation is Recommended or Required
- FDOH: Septic Systems Generally Remove 30% of Tank Nutrients

(Source – TKW 2018)



# CAPTIVA WASTEWATER RESEARCH

**David Tomasko, Ph.D.**

Ph.D. in Biology – University of South Florida

30 Years' Experience on Water Quality Projects

Manager, SWF Water Management District, Environmental Section

## **Environmental Science Associates**

Employee-Owned Environmental Consulting firm

500+ Scientists, Planners, Engineers

Local Governments 90% of Client Base

Recommendation & Assistance From Sanibel & SCCF



# RESEARCH OBJECTIVES

- What Are the Environmental and Health Impacts of Captiva's Septic Systems?
  - Present Day and Long Term?
- Importance Vs. Other Threat Sources?
  - How Quantifiable?
- Present Factual Findings to Aid Community Decision-Making
  - No Bias and No Advocacy



# METHODOLOGY

- Reviewed 2011 SCCF Captiva Water Quality Research
- Reviewed Wastewater Treatment Data in 2018 TKW Study
- Detailed Examination of Permits/Other Info for 60+ Captiva OSTDS
- Determined Actual Drain Field/Groundwater Separation at 40+ Sites
  - Lab Analyzed Pathogen Presence in Stormwater Samples
- Reviewed Related Scientific Literature and Regulatory Guidance
  - Constructed Models to Quantify Pollutant Impacts
    - Final Report Presented November 2019



# MAJOR CONCLUSIONS

- Widespread Lack of Compliance With FDOH Guidance for Septic Use  
(Lot Size, Coastal Water Setback, Drain Field/ Water Table Separation)
- Insignificant Present-Day Health and Water Quality Impacts
- Significant Long-Term Risk Due to Sea Level Rise
  - Storm Water Runoff Should Be Major Present-Day Concern

# FLORIDA DEPT. OF HEALTH

- **Half-Acre Minimum Lot Size**

Most Lots in Village Less Than ½ Acre

- **Minimum 75' Coastal Water Setback**

Many Setbacks Less Than 75' in Tween Waters And Roosevelt Channel Areas

- **Minimum 24" Drainfield/Groundwater Separation**

Many Systems (Roosevelt Channel & Village) Have Less than 24" Separation

(Note: 24" Separation Mandatory For Permits)

# WATER QUALITY IMPACTS

- 2011 SCCF Research Collected Groundwater Samples Across Captiva
  - Samples Were Collected From Both Septic and Non-Septic Areas
    - Samples Were Analyzed for Presence of “Nutrients” That Promote Pollutant Growth
  - Nutrients in Septic Area Samples Were Far Below Septic Tank Nutrient Content
    - Nutrients in Septic Tanks Are Not Reaching Groundwater In Significant Quantities
      - Probable Explanation is Processes of Nitrification and Denitrification
  - Tomasko’s Nitrogen-loading Model Indicates Minimal Nutrient Load to Coastal Waters



# WATER QUALITY IMPACTS

## CONCLUSION:

Captiva Septic Systems Are Not Significantly  
Impacting Coastal Water Quality Today

(Note: SCCF Samples Collected 2008)



# HEALTH IMPACTS

- If Septic Tanks Were Leaking Pathogens, Evidence Should Be Found in Storm Drains
- Water Samples Collected from Storm Drain Areas April 15, 2019, and June 25, 2019
- Samples Lab Analyzed for Presence of Pathogen Indicators
  - Human Source Pathogen Indicators Were Not Present in Samples
- SCCF 2008 Water Samples Show Higher Presence of Fecal Indicator Bacteria in Nearshore Waters Than in Septic System Groundwater Areas



# HEALTH IMPACTS

## CONCLUSION

Septic Systems Not Likely Creating  
Human Health Risks Today

Note: High Levels of Non-Human Source  
Pathogen Indicators in Drain Samples!

# LONG TERM IMPACTS

- NOAA Projects Local Area 1.3' Sea Level Rise For 2050  
(Intermediate High Scenario)
- Groundwater Will Rise in Tandem With Sea Level Rise
- Few Captiva Septic Systems Will Have Adequate 24" Clearance  
(None In Village)
  - Many Septic Drain Fields Will Be IN Groundwater
    - Drain Fields Will Not Operate Properly
    - Septic Tank Backups/Plumbing Failures
      - Significant Pollution Risk Increase



# CAN SEPTICS COPE WITH SLR?

- Increase Drain Field Mounds – How Feasible in Dense Village Area?
  - Convert to Performance Systems that Process Waste in Tank
    - Cost/Feasibility of Performance-Based Processing Will Vary by Property
    - May Be Possible to Retrofit Some Conventional Systems
- New Performance System = **\$30,000** + Existing System Removal
  - Overall Coping Challenge Will Vary Property by Property
    - Failures Can Be “Sudden” -- Adaptations May Have “Lead Times”



# CAN SEPTICS COPE WITH SLR?

## **KEY ISSUE**

Can Property-by-Property Adaptations  
Result In Community-wide Success?

# OTHER POLLUTION SOURCES

- Lake O/River Releases, FGUA Plant, On-Island Package Plants, Stormwater Runoff
- Nutrient-loading Models Developed to Estimate Impacts
  - Nutrient Load from River Has Greatest Impact
    - Local Source Pollutants Can Exacerbate Nearshore River Impacts
      - Storm Water Runoff Today Has Biggest Local Source Impact by Far



# STORM WATER RUNOFF

- Tomasko Models Show Stormwater Runoff Is Greatest Source of Nearshore Pollution
  - Similar Conclusion Reached in 2011 SCCF Water Quality Study
  - High Presence of Non-Human Source Bacteria in Drains Confirms Importance
    - Captiva Has No Storm Water Management Plan
      - That Should Be a Priority!



# CONCLUSION

**Comments by Dr. Tomasko**

Discussion/Q&A



# CAPTIVA COMMUNITY PANEL

- Investigate Wastewater Alternatives
  - Present Facts Without Advocacy
- Community Decides Strategy Democratically
- Possible Creation of Municipal Services Taxing District
- Majority Approval of Service Area Property Owners
  - Notarized Approval... 50% + 1



# TONIGHT'S MEETING PRESENT CENTRAL SEWER ALTERNATIVES AND COSTS

What Has Been Learned  
Since Last Winter's Meeting



# WASTEWATER PROCESSING

Total Parcels – 1,020

**WWTP Parcels – 642**

(South Seas, Tween Waters, Captiva Shores, Sunset Captiva)

**OSTDS Parcels – 378**

Estimated Residential vs.  
Commercial Usage – 71%/29%

(Village – 83%/17%)

(Source: TKW 2018)





# SEPTIC SYSTEMS (OSTDS)

Conventional – **224**

Not Permitted (Assumed Conventional) – **73**

Advanced – **81**

**Total – 378**

Conventional Systems Rely on Soil to Process Pollutants

Advanced Systems Process  
Pollutants In Tank Before Discharge

(Source: TKW 2018)



# RESIDENTIAL PARCELS

**993** TOTAL PARCELS

South Seas – **546** Parcels, all WWTP

Village – **288** Parcels (200 OSTDS, 88 WWTP)

Tween Waters Stretch – **47** Parcels, all OSTDS

Estates – **112** Parcels, all OSTDS

(Source: TKW 2018)



# CENTRAL SEWER COMPONENTS

## **COLLECTION SYSTEM**

Main Sewer Line + Lift Stations

## **PROCESSING FACILITY**

Effluent Treatment + Disposal



# PROCESSING ALTERNATIVES

## **SANIBEL'S DONAX FACILITY**

Excess Capacity Exists for All Captiva

AWT Treatment Standard

OR

## **EXPAND FGUA SOUTH SEAS FACILITY**

**\$9 Million** for Village +  
**\$0.6 Million** for All Captiva

Improves Treatment Standard to AWT

(Sources: City of Sanibel, FGUA)



# COLLECTION ALTERNATIVES

Establish Sewer Line South Seas to Blind Pass

(Could Connect to Either FGUA or Donax)

**\$16 Million**

OR

Establish Sewer Line for Village Only

(Could Connect Only to FGUA)

**\$4 Million**

(Source: TKW 2018 Estimates)



# INDIVIDUAL PROPERTY COSTS

ACCESS FEE: Fee Charged by Processor to Use Capacity

(Sanibel = \$5,000, FGUA = \$1,300)

CONNECTION: **\$5,000** to Connect to Main Sewer Line

(TKW Estimated Average Cost Per OSTDS Property)

SEPTIC REMOVAL: **\$2,000**  
to Remove Septic System

(TKW Estimated Average Cost Per OSTDS Property)



# COST PRESENTATION

- Costs Presented on Individual Residential Property Basis
- Expansion/Collection System Costs Split Residential Vs. Commercial
  - Commercial Share = Commercial % of Total Waste Processed
    - Residential Share = Remainder of Project Cost
  - Individual Residential Property Owner Costs Totaled
    - All Residential Costs Totaled & Divided Evenly Among Residential Parcels
  - 30-Year Financing Assumed at 3.5% Interest Rate



# SANIBEL PARTNERSHIP

- Sanibel Serves Captiva Outside South Seas (447 Parcels)
- Sanibel Builds & Operates \$16 Million Collection System
  - Collection System Funded By New Captiva Properties Served
- Donax Plant Processes All Wastewater
- Captiva Customers = Sanibel Customers



# SANIBEL PARTNERSHIP... COSTS

- Total Cost Per Residential Property Served = **\$36,036**
  - Annual Cost Per Residential Property = **\$1,959**
    - Plus Annual Donax Utility Fee
    - Positive Support from Sanibel
    - Requires Sanibel/Lee County Interlocal Agreement



# SANIBEL SERVES ALL CAPTIVA

- FGUA Service to South Seas Replaced by Sanibel Service
  - South Seas Collection System Remains in Place
  - Sanibel Builds/Operates New Collection System South Seas to Blind Pass
- All Captiva Properties Fund New Collection System
- All Properties Outside South Seas Use New Sewer Line
  - All Captiva Waste Processing Done at Sanibel's Donax Plant

# SANIBEL @ ALL CAPTIVA... COSTS

- Total Cost Per Residential Property Served - **\$18,971**
  - Annual Cost Per Residential Property - **\$1,031**
- Requires Sanibel/Lee County Interlocal Agreement
  - FGUA Would Require Compensation For Loss of Business

# SHOULD SANIBEL REPLACE FGUA?

- Little Evidence of South Seas Dissatisfaction with FGUA Service
  - Future Issues with FGUA Plant Wetlands Location?
- FGUA Enterprise System (not SS Customers) Pays “R&R” Costs
  - Reliability of FGUA Cost Allocation Policy Long Term?
    - No Nutrient Removal Standard at FGUA (Does Not Mean No Nutrients Removed)
    - Rationale For Two Plants in Same Area?
  - Should South Seas Properties Pay Equal Share?



# EXPAND FGUA TO ALL CAPTIVA

- **\$9.6 Million** FGUA Plant Expansion
- 70%/30% New Customer/ FGUA Cost Share  
(Preliminary FGUA Estimate Subject to Cost Allocation Study)
  - FGUA Builds/Operates **\$16 million** Collection System
- New Service Area Customers Fund Collection System



# EXPAND FGUA... COSTS

Cost Per New Residential Property Served - **\$43,010**

Annual Cost Per New Residential Property - **\$2,339**

Plus FGUA Annual Utility Charge

(Further Analysis Needed of FGUA Cost-Share)



# EXPAND FGUA TO VILLAGE ONLY

- Provide Central Sewer Service to High-density Village Area Only
- **\$9 Million** FGUA Plant Expansion
- 70%/30% New Customer/FGUA Cost Share
- FGUA Builds/Operates \$4 Million Village Collection System



# EXPAND FGUA TO VILLAGE... COSTS

- New Service Area (Village) Customers Fund Collection System
- Total Cost Per New Residential Properties Served - **\$35,890**
- Annual Cost For New Residential Properties Served - **\$1,951**



# SUMMARY OF ALTERNATIVES

Sanibel (ex. South Seas) – 447 Parcels / **\$36,036** / **\$1,959**

(South Seas Maintains Status Quo)

Sanibel (with South Seas) – 993 Parcels / **\$18,971** / **\$1,031**

(Does Not Include Compensation to FGUA)

Expand FGUA to All Captiva –  
447 Parcels / **\$43,010** / **\$2,339**

(Further Analysis Of FGUA Cost Share Needed)

Expand FGUA to Village –  
288 Parcels / **\$35,890** / **\$1,951**

(Further Analysis Of FGUA Cost Share Needed)



# DECISION FACTORS

- No Present-Day Environmental Imperative
  - Community and Commercial Disruption
  - Possible Loss of Development Barrier
    - Evolving Decision Environment
      - High Investment Cost



# DECISION FACTORS

- Water Quality Community Values & Advocacy
  - OSTDS Likely Not Sustainable Long Term
- Multi Year Lead Time to Establish Central Sewer
  - Alternate Drain Field Land Uses
    - Long-term Property Values
    - Convenience & Reliability



Q&A and DISCUSSION

**THANK YOU!**

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