Recent efforts to improve the water quality of Lower St. Johns River tributaries

Cheryl M. Wapnick

Objectives

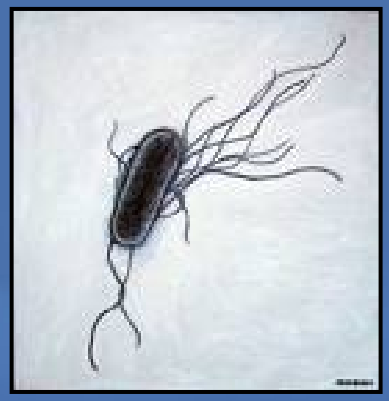
1. Use of Indicator Organisms for TMDLs

2. Current Local Source Identification Efforts
   A. GIS and Technical Reports
   B. Detailed Assessment of Fecal Coliform Sources

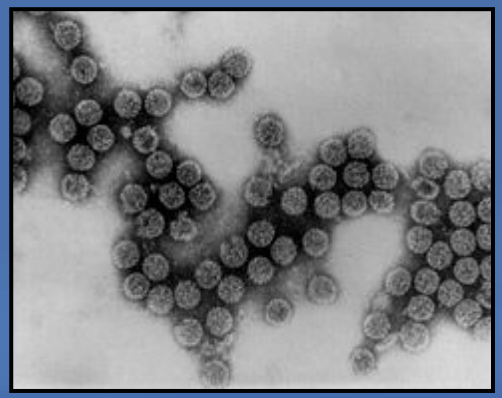
3. Science and Engineering

Indicator Organisms (IOs)

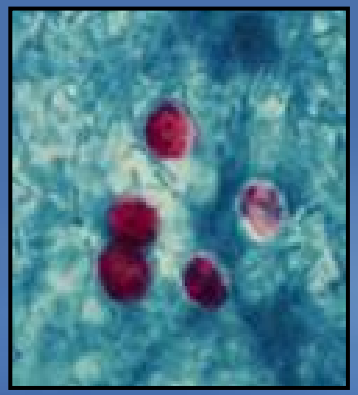
- Bacteria present in the GI tract of warm-blooded animals
- Used to identify fecal contamination
- Not pathogenic
- In theory, predictive of human pathogens



Bacterial Pathogens



Viral Pathogens

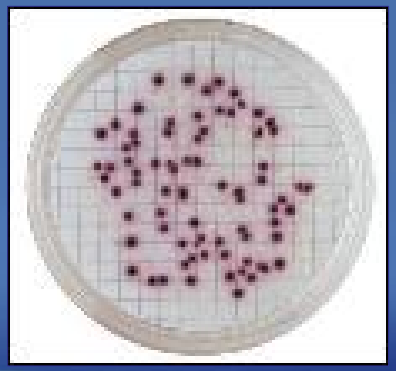


Protozoan Pathogens

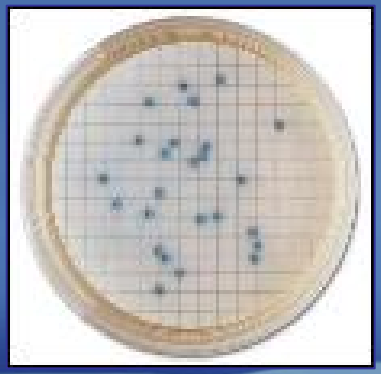
Currently Recognized IOs

- **Fecal coliforms – thermotolerant coliforms of fecal origin**
- ***Escherichia coli* – the dominant fecal coliform species**
- **Enterococci – also of fecal origin; more salt-tolerant than fecal coliforms**

Fecal coliforms



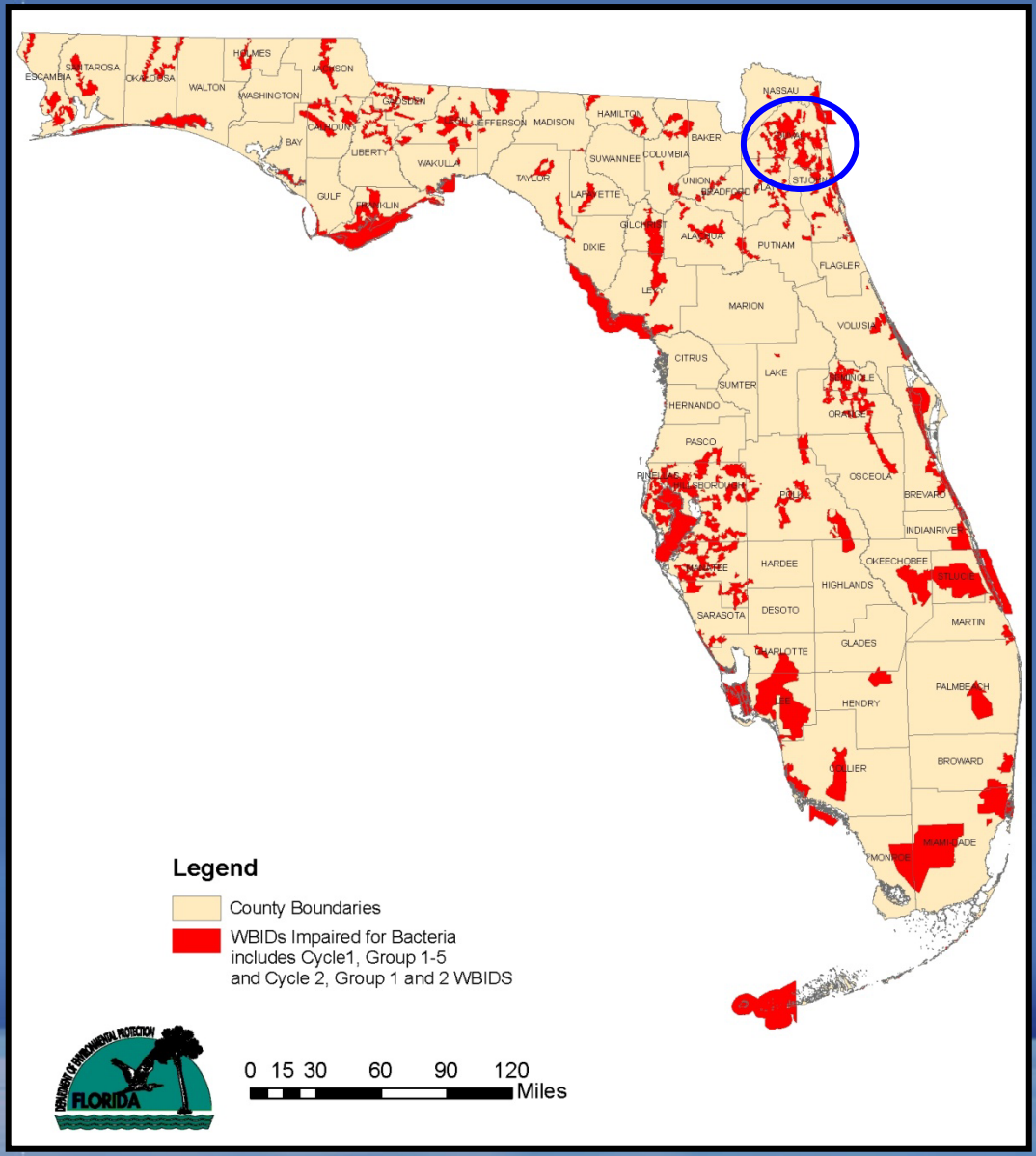
E. coli

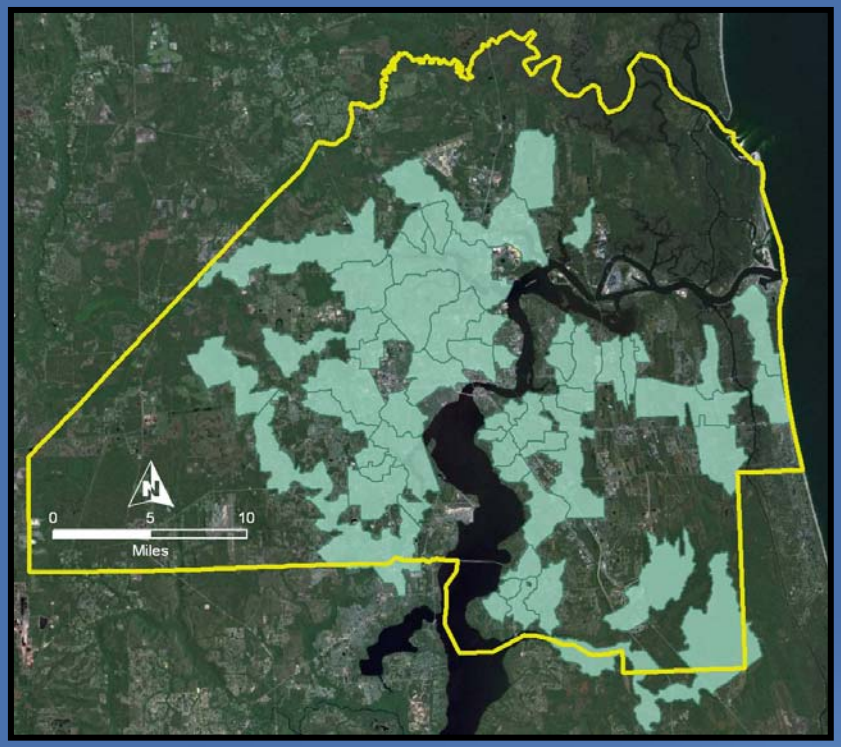


enterococci

Waterbodies Impaired for Fecal Coliforms

PBS&J





559 WBIDs impaired in Florida

75 WBIDs impaired in Jacksonville

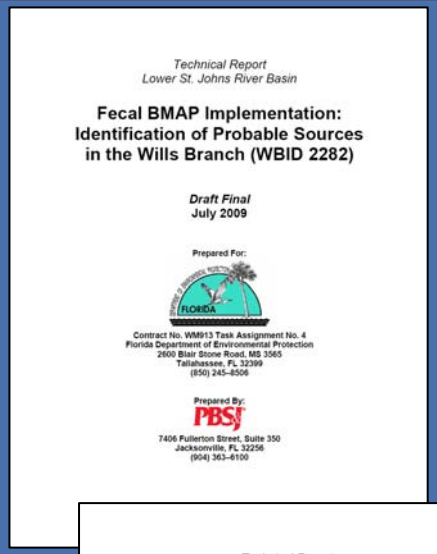
Possible Sources of IOs

- Aging sanitary sewer infrastructure
- Onsite wastewater disposal systems (septic)
- Surface runoff
- Agriculture
- Wild animals
- Soil/sediments

GIS and Technical Reports

GIS and Technical Reports

- One each for **53** impaired WBIDs
- Interprets **existing information** used to create a set of maps
- **Documents management actions** compiled by local stakeholders as of June 7, 2007
  - Includes evaluation of "sufficiency of effort"
- **Suggests additional management actions** to improve water quality and help protect human health



Technical Report
Lower St. Johns River Basin

Fecal BMAP Implementation: Identification of Probable Sources in the Wills Branch (WBID 2282)

Draft Final
July 2009

Prepared For:

Contract No. WM913 Task Assignment No. 4
Florida Department of Environmental Protection
2600 Blair Stone Road, MS 3565
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Prepared By:

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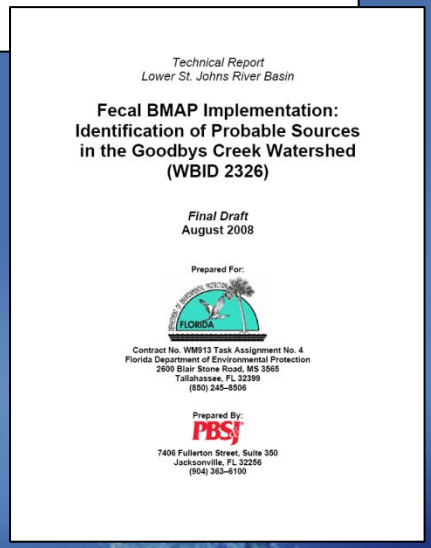

Technical Report
Lower St. Johns River Basin

Fecal BMAP Implementation: Identification of Probable Sources in the Goodbys Creek Watershed (WBID 2326)

Final Draft
August 2008

Prepared For:

Contract No. WM913 Task Assignment No. 4
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Prepared By:

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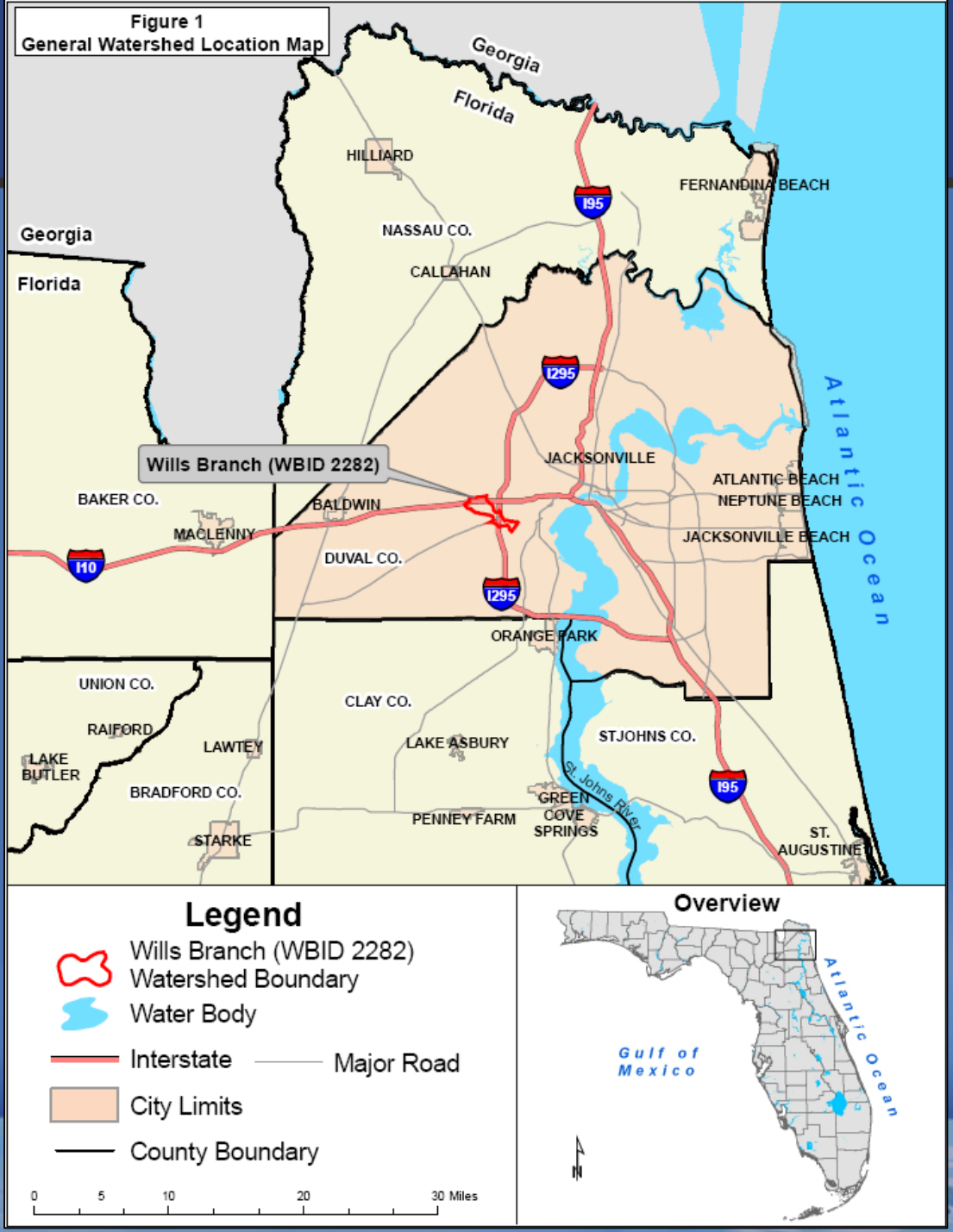
Figure 1
General Watershed Location Map



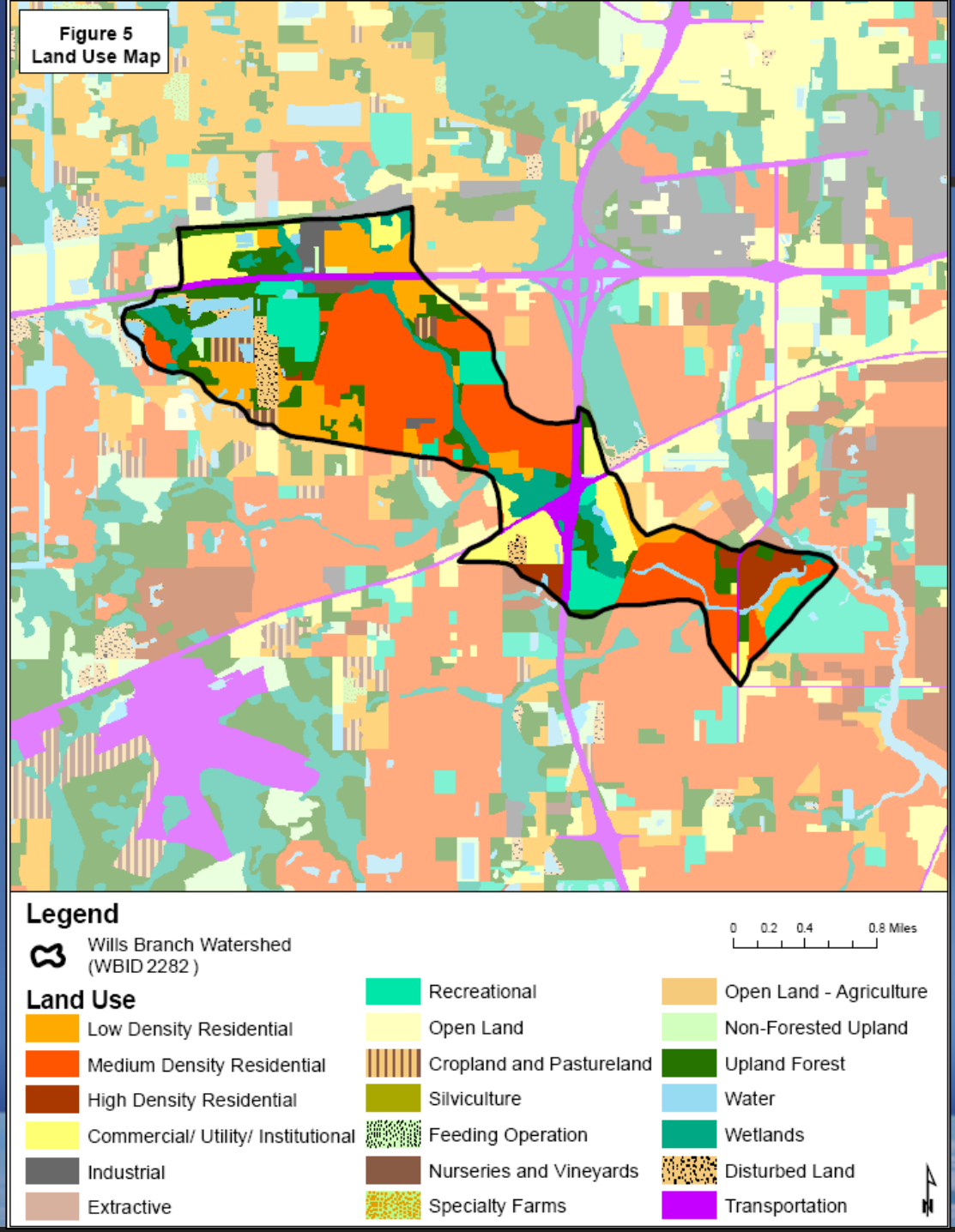


Figure 5
Land Use Map
Legend
Wills Branch Watershed
(WBID 2282)
0 0.2 0.4 0.8 Miles
Land Use
Low Density Residential
Medium Density Residential
High Density Residential
Commercial/ Utility/ Institutional
Industrial
Extractive
Recreational
Open Land
Cropland and Pastureland
Silviculture
Feeding Operation
Nurseries and Vineyards
Specialty Farms
Open Land - Agriculture
Non-Forested Upland
Upland Forest
Water
Wetlands
Disturbed Land
Transportation
N

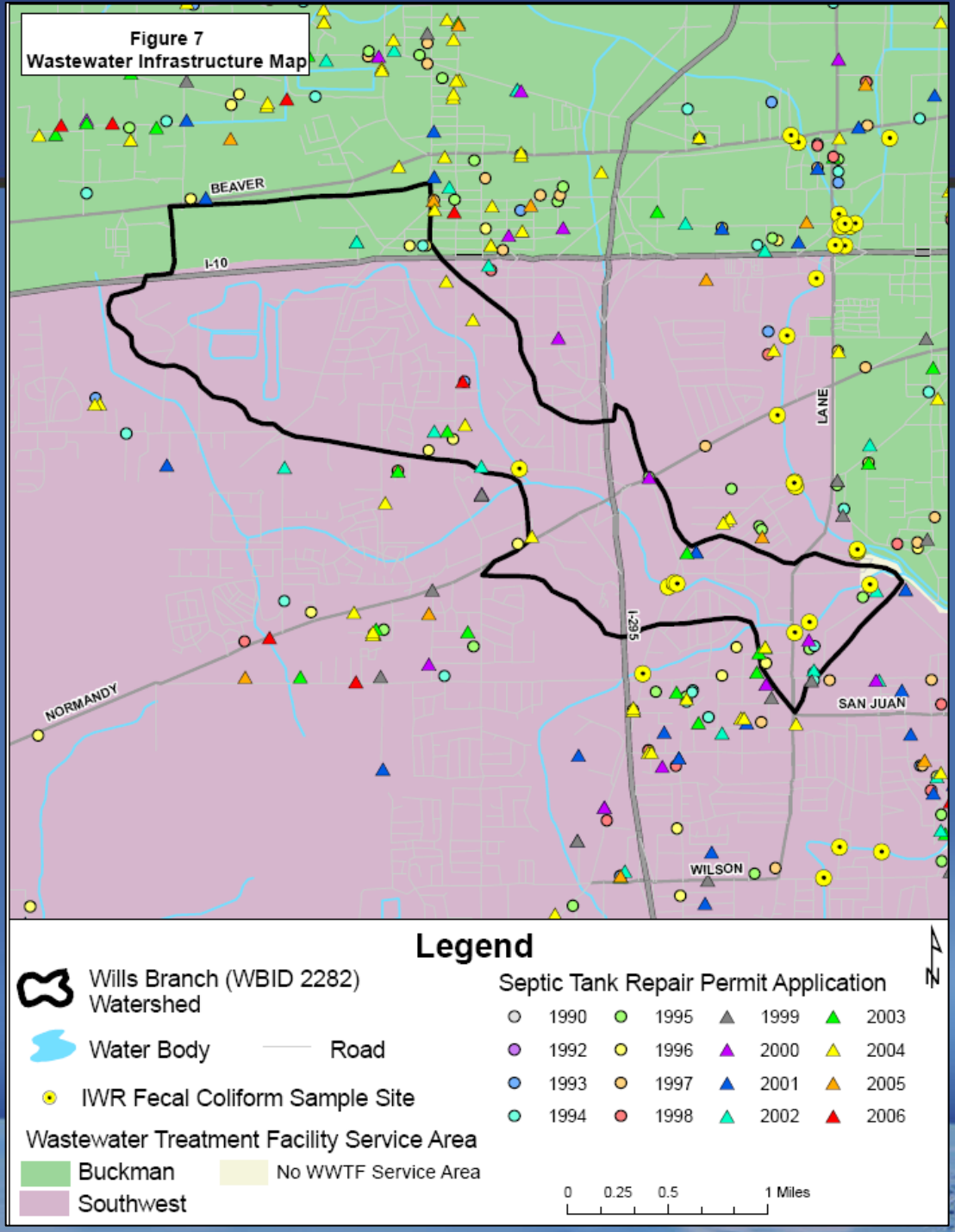
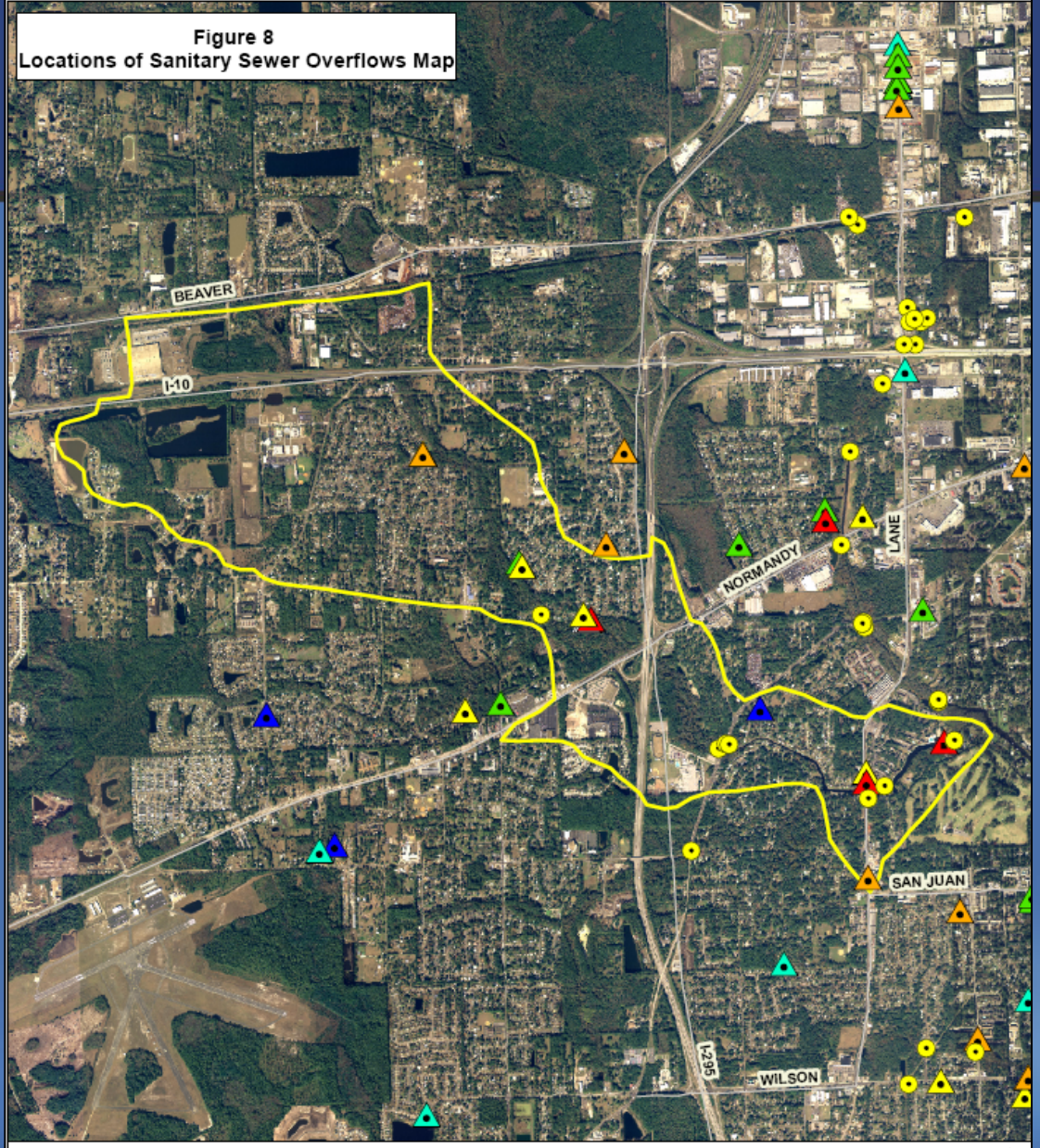


Figure 7
Wastewater Infrastructure Map
BEAVER
I-10
LANE
I-25
NORMANDY
SAN JUAN
WILSON
Legend
Wills Branch (WBID 2282) Watershed
Water Body
Road
IWR Fecal Coliform Sample Site
Wastewater Treatment Facility Service Area
Buckman
Southwest
No WWTF Service Area
Septic Tank Repair Permit Application
1990
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
N
0
0.25
0.5
1 Miles

Figure 8
Locations of Sanitary Sewer Overflows Map



Legend

Wills Branch (WBID 2282) Watershed

IWR Fecal Coliform Sample Site

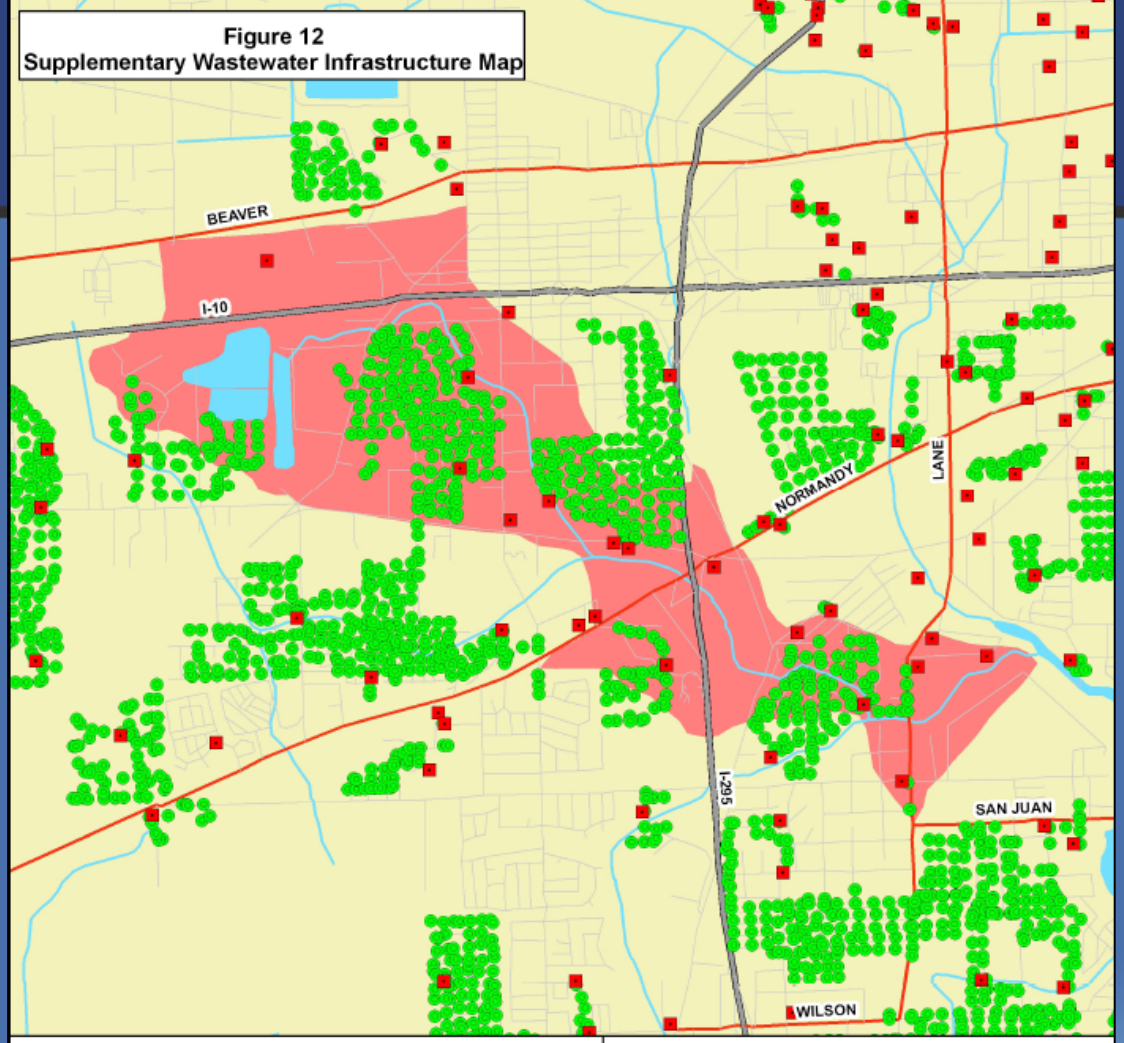
Location of Wastewater Spill Incident

2001 2002 2003 2004 2005 2006 2007

0 0.2 0.4 0.8 1.2 Miles

N

Figure 12
Supplementary Wastewater Infrastructure Map



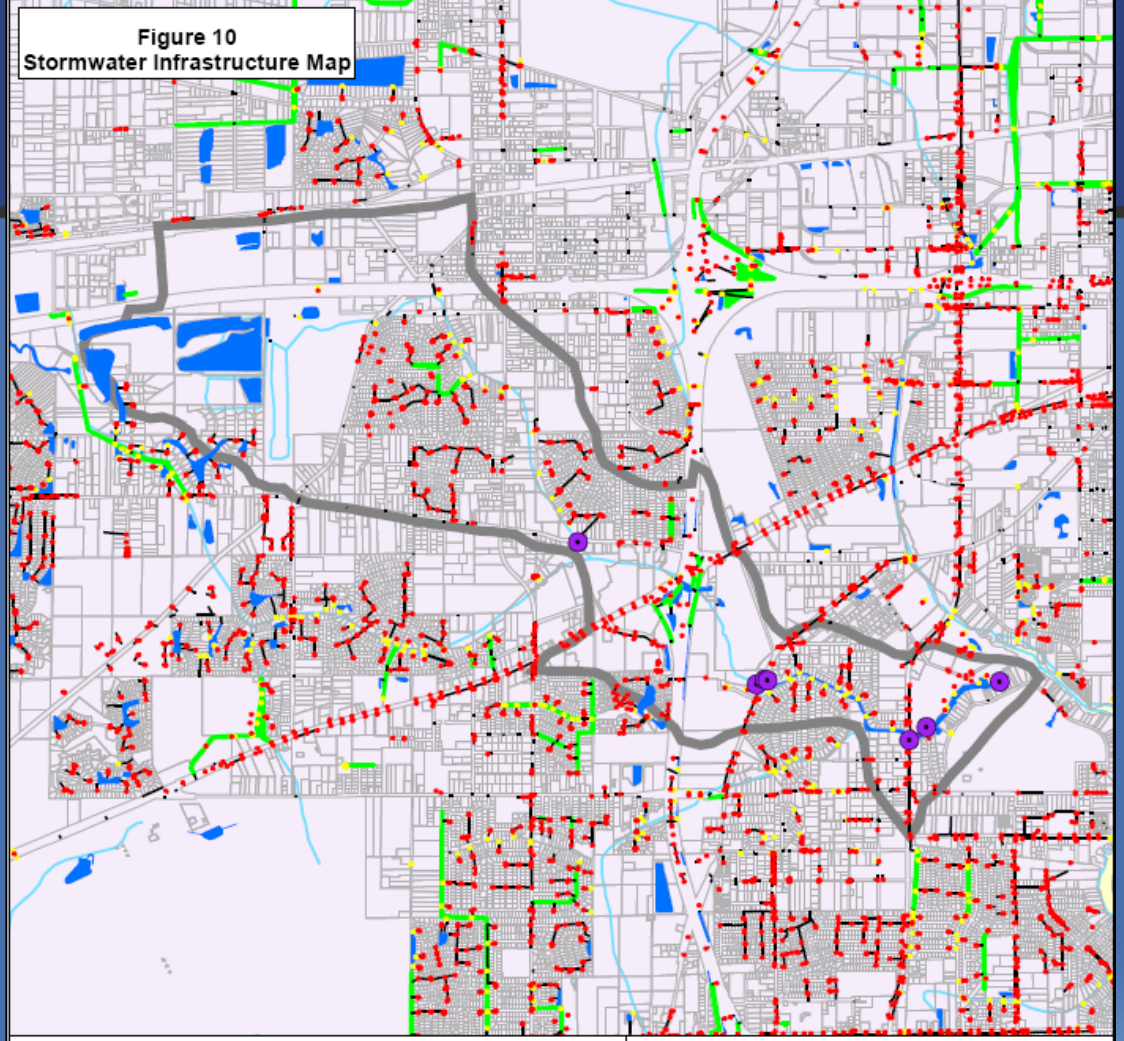
Legend

- Wills Branch (WBID 2282) Watershed
- Water Body
- Interstate
- Primary Road
- Local Road
- Lift Station
- Manhole

0 0.2 0.4 0.8 1.2 Miles

Overview

Figure 10
Stormwater Infrastructure Map



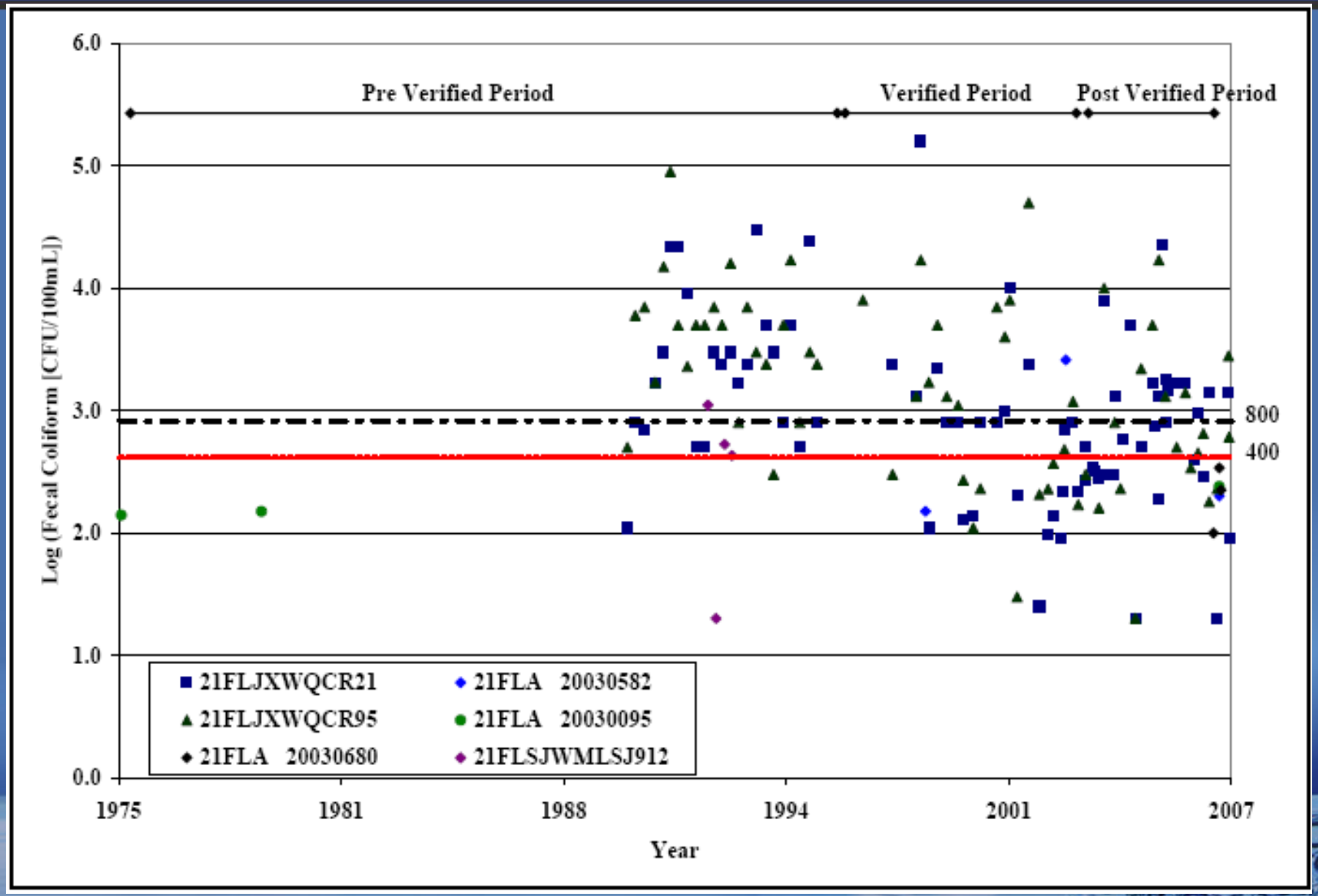
Legend

- Wills Branch Watershed (WBID 2282)
- Closed Conveyance
- Pond
- Inlet
- Outfall
- Ditch
- IWR Fecal Coliform Sample Site
- Parcel
- Water Body
- MS4: Duval Main

0 0.25 0.5 1 Miles

Overview

Time Series Analysis of FC Data



Existing County-Wide Management Actions

- **TAT** intensive localized sampling
- **JEA**
  - FOG Reduction Program
  - SSO Root Cause Program
  - Pop-Top Program
- **COJ EQD**
  - Private lift station inspection program
  - PIC Program (as of Oct. 2007)
- **DCHD**
  - OSTDS inspection program
  - Designation of failure and nuisance areas
    - Based on information provided by COJ EQD and PWD
- **COJ PWD and FDOT**
  - Routine cleaning program and complaint-driven maintenance

Suggested Management Actions

- Establish additional routine sampling locations to assist in targeting sources
- Perform infrastructure inspections upstream of chronic elevated concentrations
- Implement a subsidized septic tank-pumping program that could be used in conjunction with septic system phase-out programs
- Conduct more extensive routine maintenance of stormwater conveyance systems

Technical Report Schedule

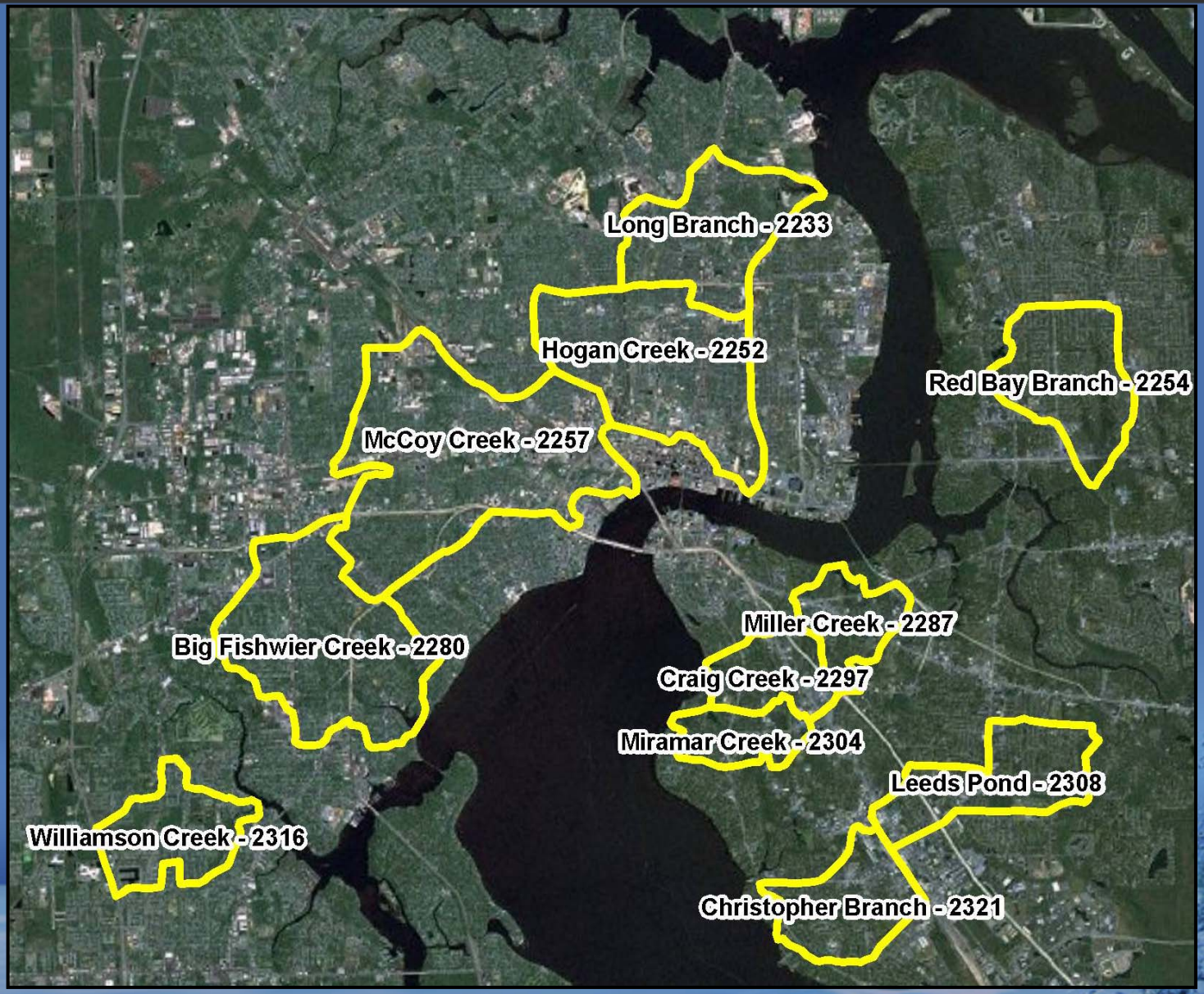
- TAT data submittal deadline
- FDEP review period
  - PBS&J incorporation of comments
- Work Group review period
  - PBS&J incorporation of comments
- Draft Final to FDEP
- All reports due by November 8, 2010

45 Reports Completed

+ 3 reports in review process

Detailed Assessment of Fecal Coliform Sources

Study Area

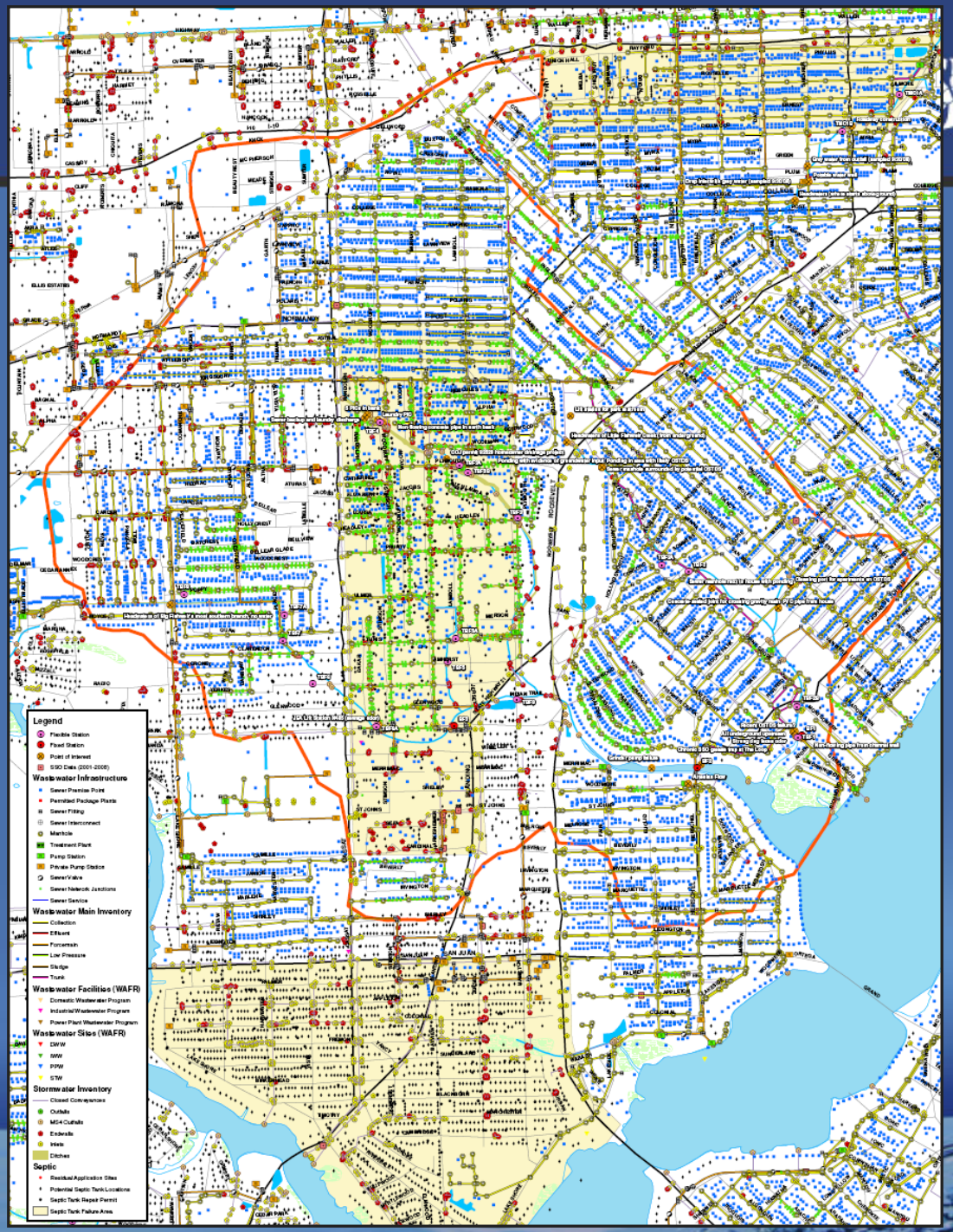

Long Branch - 2233
Hogan Creek - 2252
Red Bay Branch - 2254
McCoy Creek - 2257
Miller Creek - 2287
Big Fishwier Creek - 2280
Craig Creek - 2297
Miramar Creek - 2304
Leeds Pond - 2308
Williamson Creek - 2316
Christopher Branch - 2321

Approach

Use "weight-of-evidence" approach to assess potential sources of fecal contamination

- Analysis of existing monitoring and GIS data
- "Maps on the table" workshop
- Field reconnaissance ("Walk the WBID")
- Microbial Source Tracking (MST)
- Continual updates and investigation with local stakeholders

Approach:
GIS Analysis



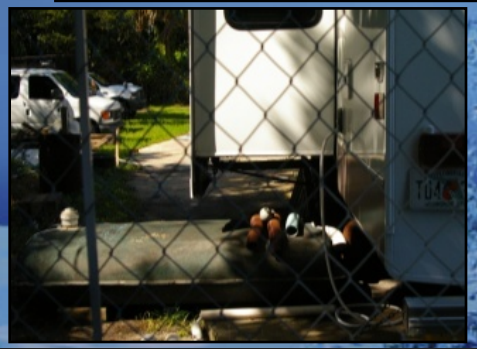
Approach: *Walk the WBID*

Representatives from each TAT entity with the most field knowledge of basins

>20 participants

COJ EQD, COJ PWD, DCHD, FDEP, FDOT, JEA, PBS&J, and USF

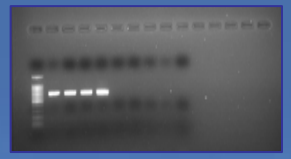
8 days over two events (Sept. & Oct. 2008)



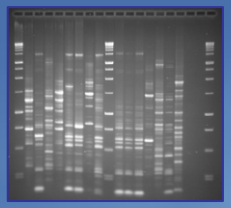
Walk the WBID: *General Findings*

Central Hypothesis of MST

- Certain microbial species or types are associated with the gastrointestinal tract of specific animal hosts
- This association can be used to “track” the fecal microorganism back to its host
- “Toolbox approach” – methods constantly evolving



Library-independent MST

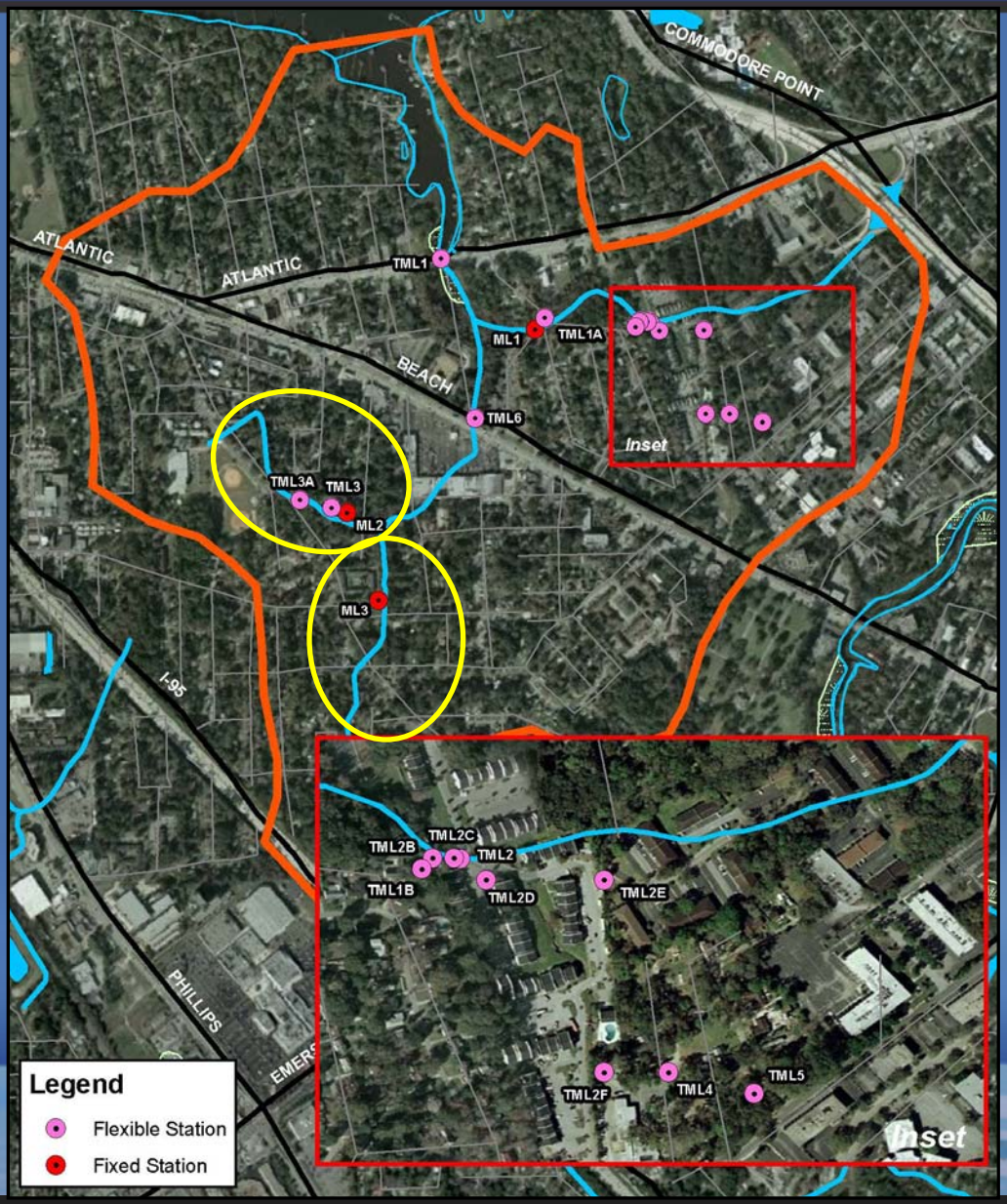


Library-dependent MST

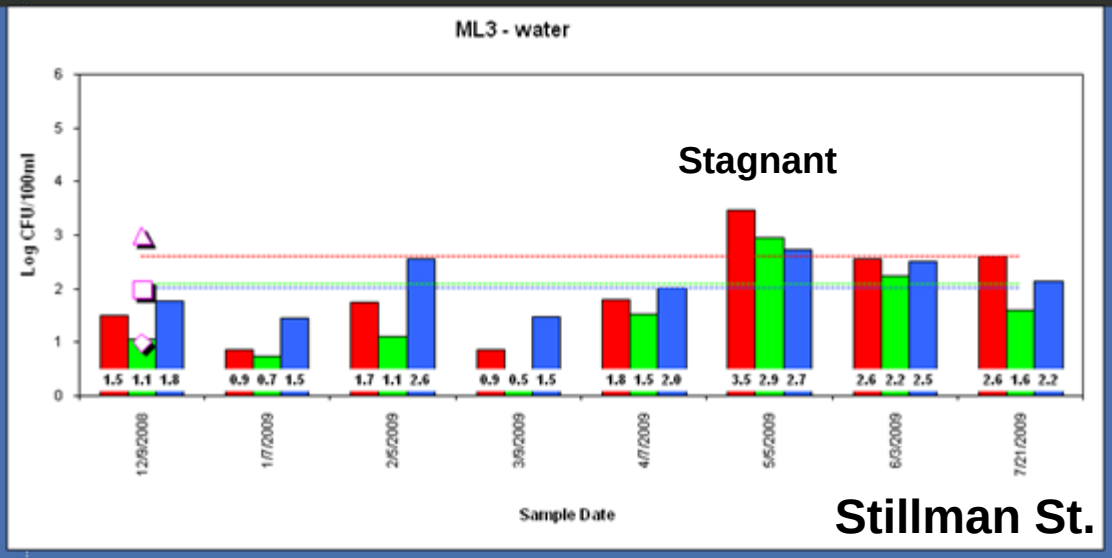
Approach: *Microbial Source Tracking*

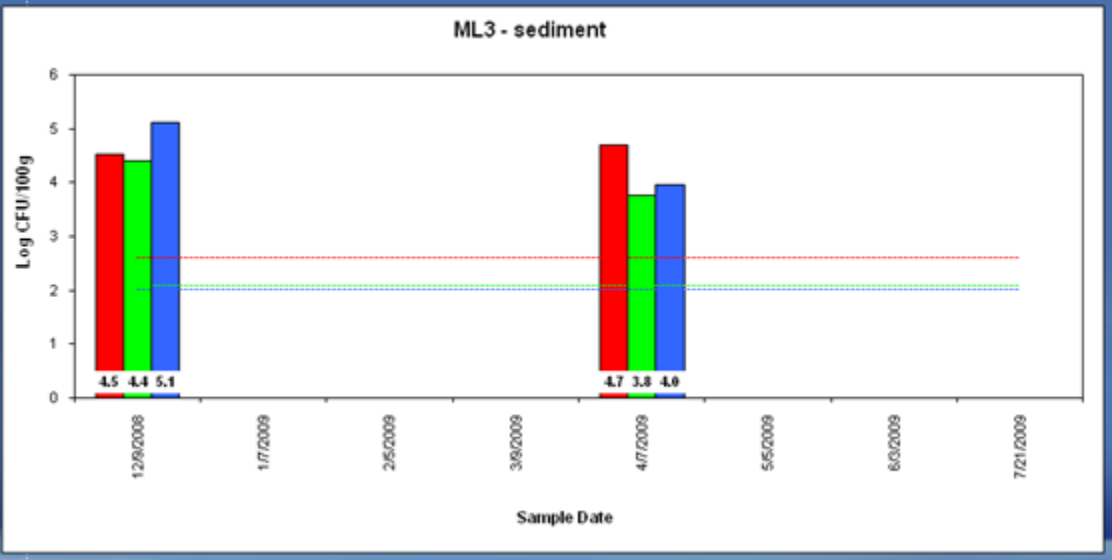
- Sampling performed by PBS&J, USF, and the TAT over 8 months (December – July)
- Analysis by TAT labs, USF, and Source Molecular
- Bimonthly meetings with TAT
- Ongoing communication and field investigation

Miller Creek (WBID 2287)

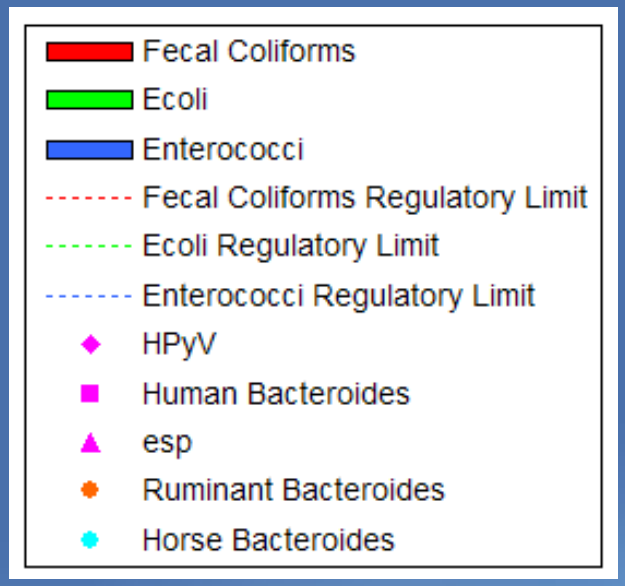


Miller Creek (WBID 2287)

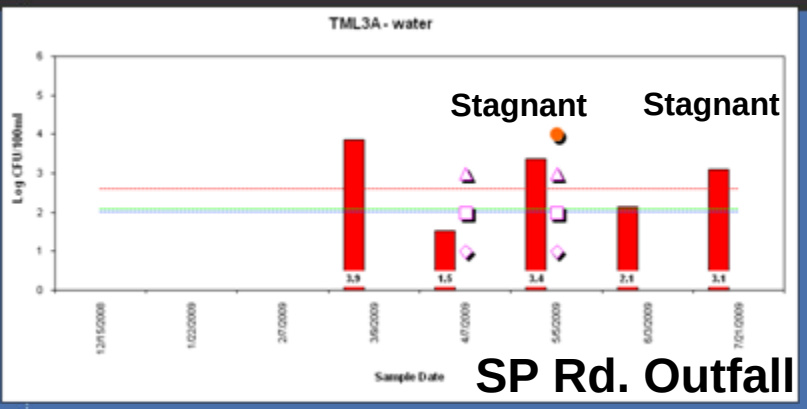




Southern Fork

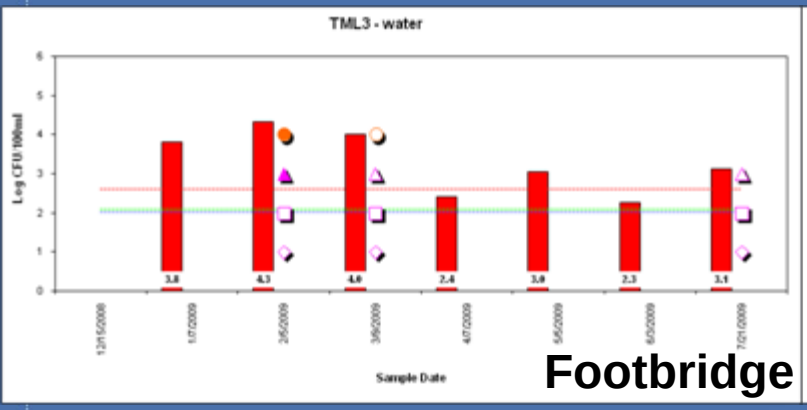


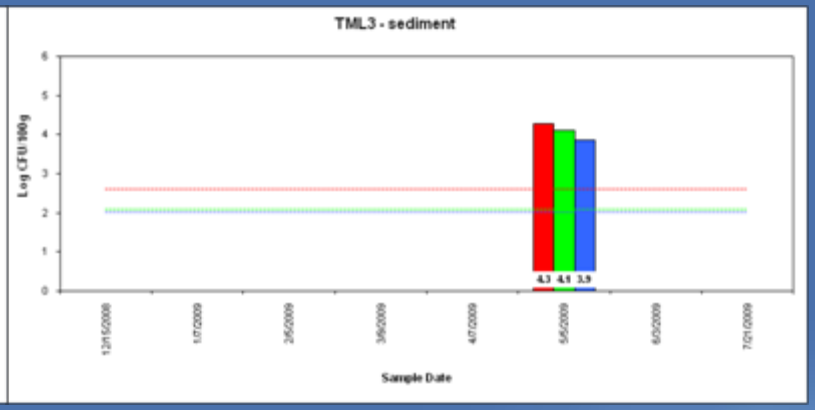
Miller Creek (WBID 2287)



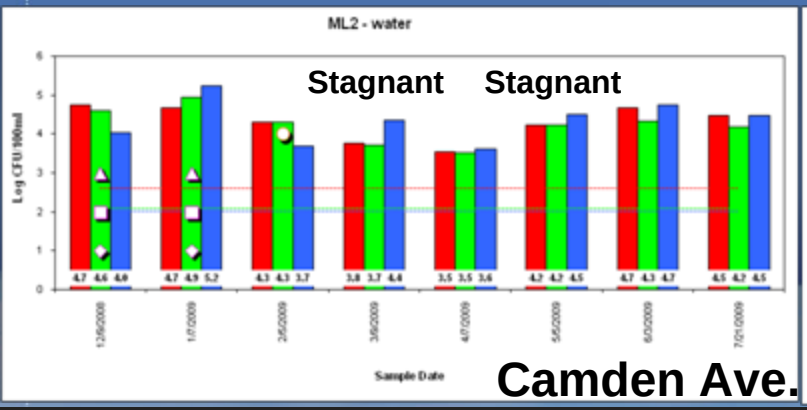
Northern Fork

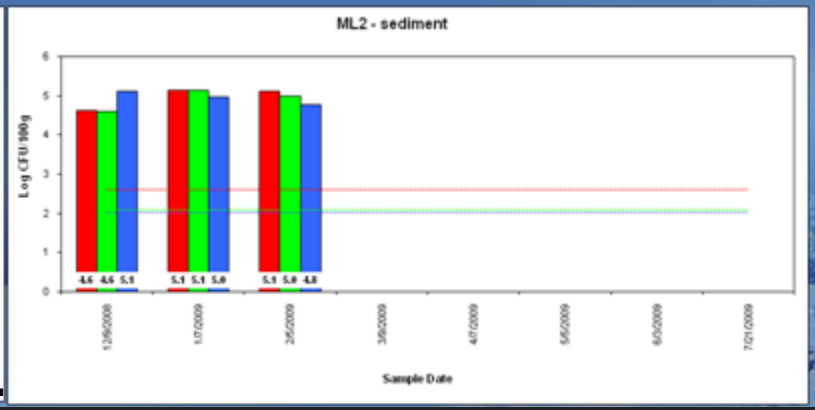
SP Rd. Outfall *esp* = 0.0006%; <1% human contamination





Footbridge



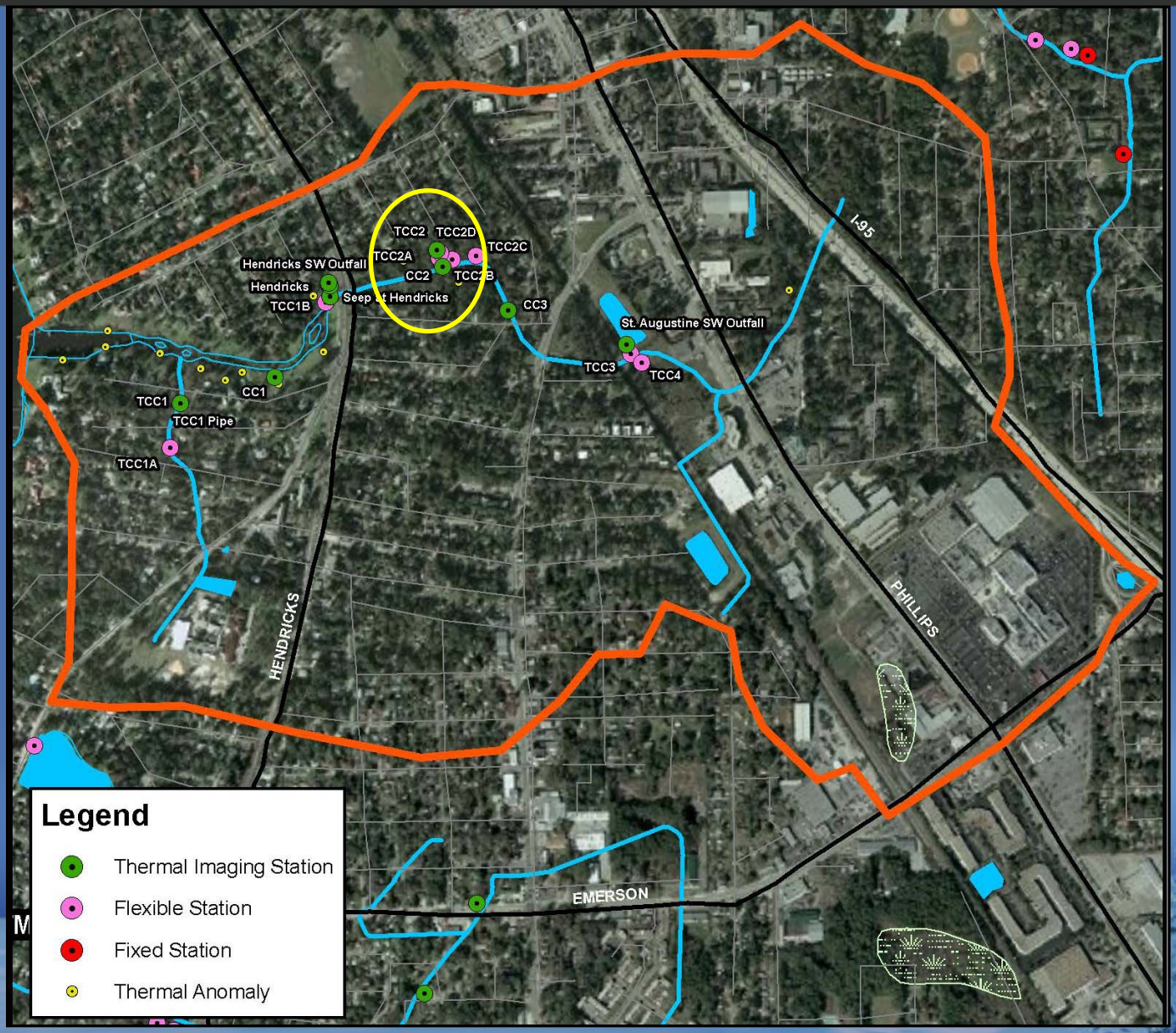


Camden Ave.

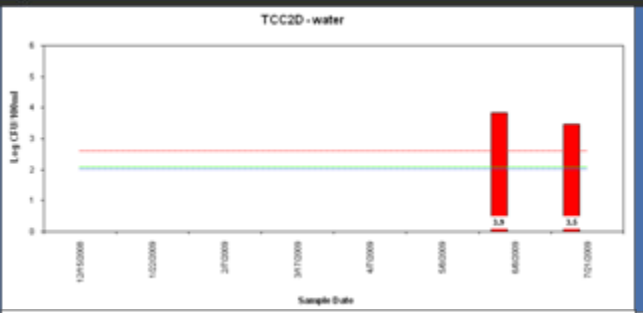
Miller Creek (WBID 2287)

Northern Fork

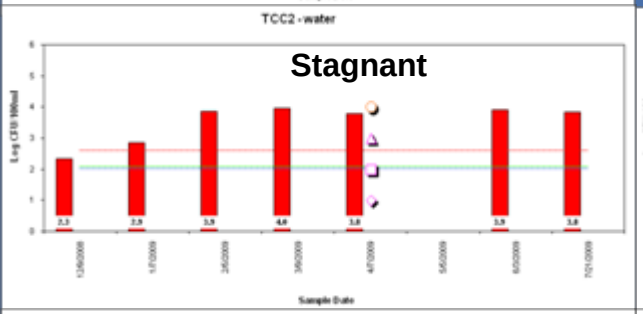
Craig Creek (WBID 2297)

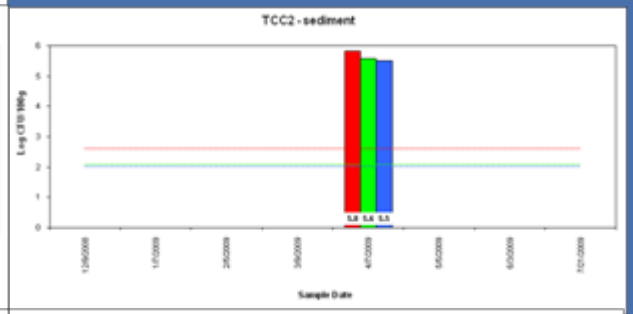


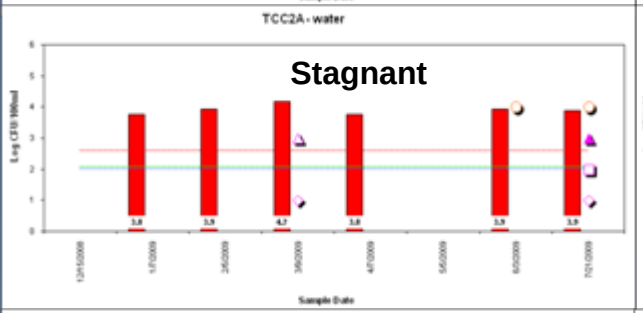
Craig Creek (WBID 2297)

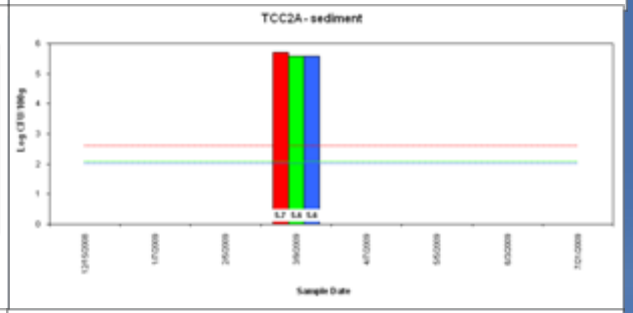


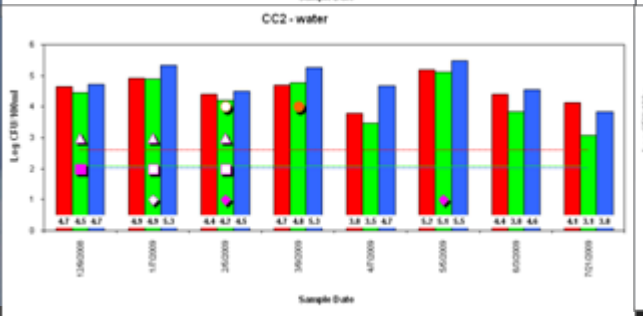
"2nd Trib"

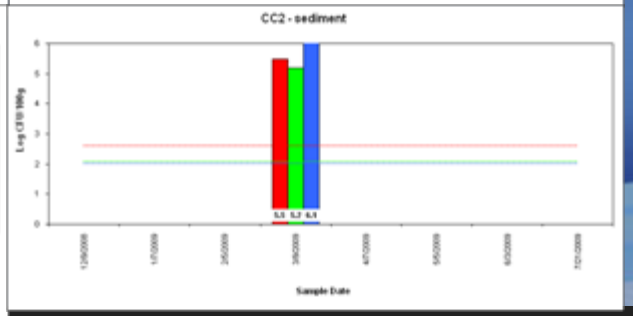












esp = 0.03%; 1% human contamination

H-Bac = 0.08%; 1% human contamination

HPyVs = 188, 167

Craig Creek Investigation

- April 21, 2009: JEA dye tested gravity line between Hendricks Ave. and Fieldston Ln.; no leaks detected

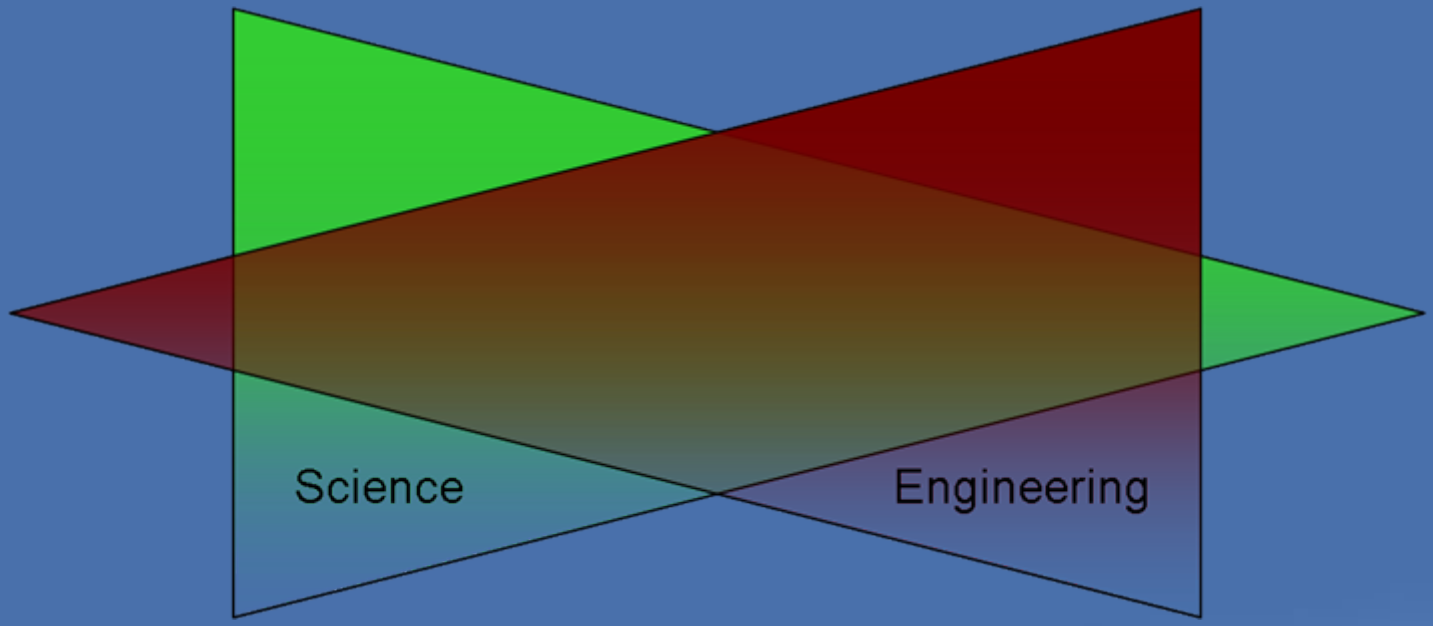
- April 23, 2009: PBS&J ruled out 2 nearby thermal anomalies

- July 7, 2009: JEA inspected other sewer lines in area; all lines identified as HDPE (as of ~2003) except along Thornwood Ln. which were made of vitrified clay and cast iron. Laterals associated with HDPE lines are HDPE to the right-of-way.

- August 20, 2009: JEA completed CIPP of VC and CI lines. Laterals remain VC on JEA and private side (unless replaced by owner). As of August 25, 2009, there are no plans to replace these laterals.

Science and Engineering

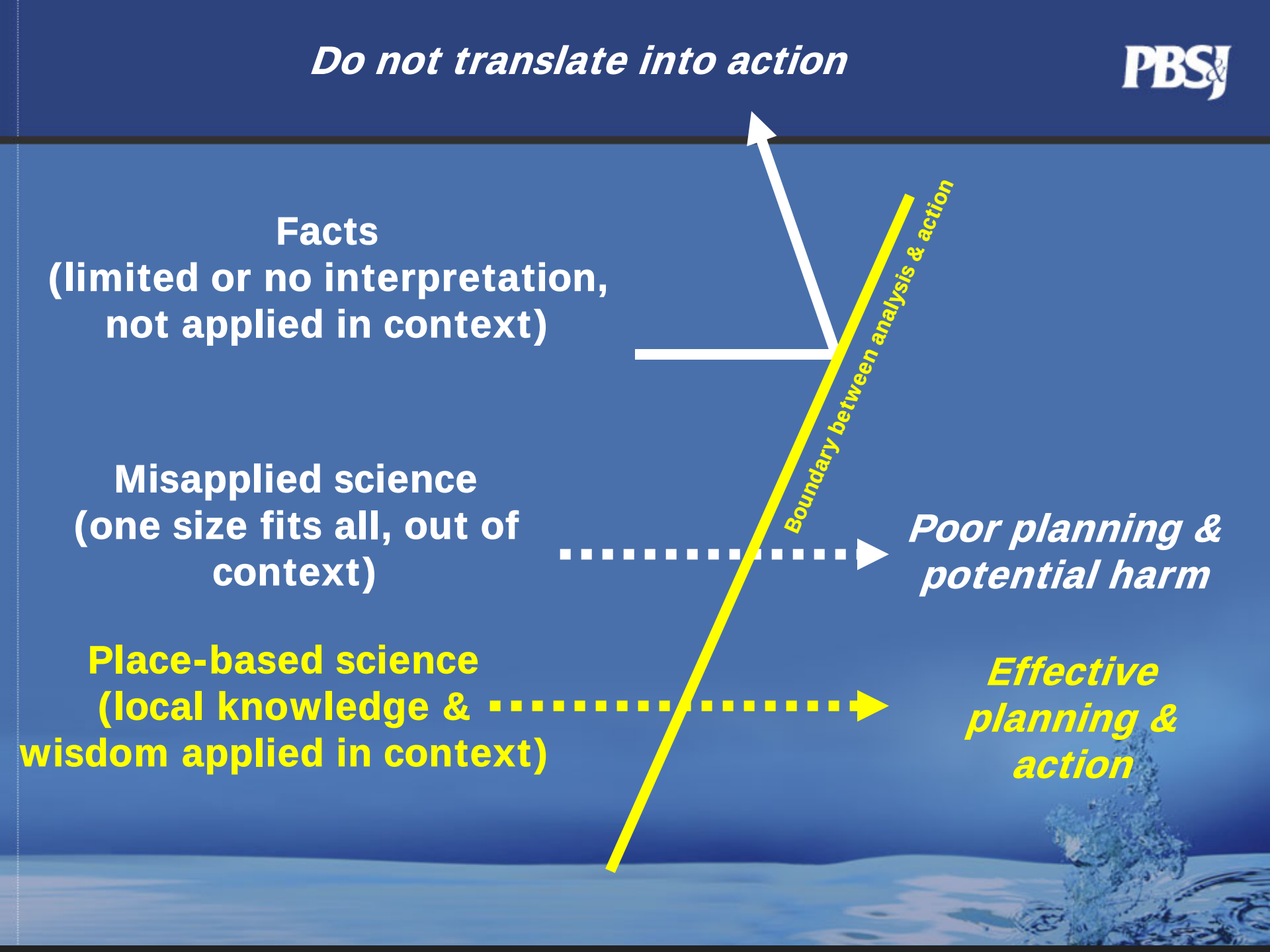
TMDLs: *science & engineering*



Observe → Analyze → Design → Construct

Need sound science to have sound engineering

Do not translate into action



Acknowledgements

- Florida Department of Environmental Protection (FDEP)
- LSJR TAT and Work Group
- Dr. Valerie J. (“Jody”) Harwood, University of S Florida
- Shannon McQuaig, University of South Florida
- Chris Staley, University of South Florida
- Source Molecular
- DEP Law Enforcement

More Information

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