



Update:
TMDLs for Dissolved Oxygen, Indicator
Bacteria, and pH in Adams and Cow
Bayous and Associated Tributaries

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REVIEW: What is a Total Maximum Daily Load (TMDL)?

A TMDL is a tool which:

- Determines the maximum amount of a particular pollutant (load) that a water body can receive and still meet its standards
- Determines sources of pollution by broad categories (i.e., point and nonpoint), though individual permitted wastewater dischargers are required to be listed.

A TMDL is also a document submitted to the EPA. It identifies the pollutant of concern and its sources, and allocates the allowable loads

REVIEW: Why develop TMDLs?

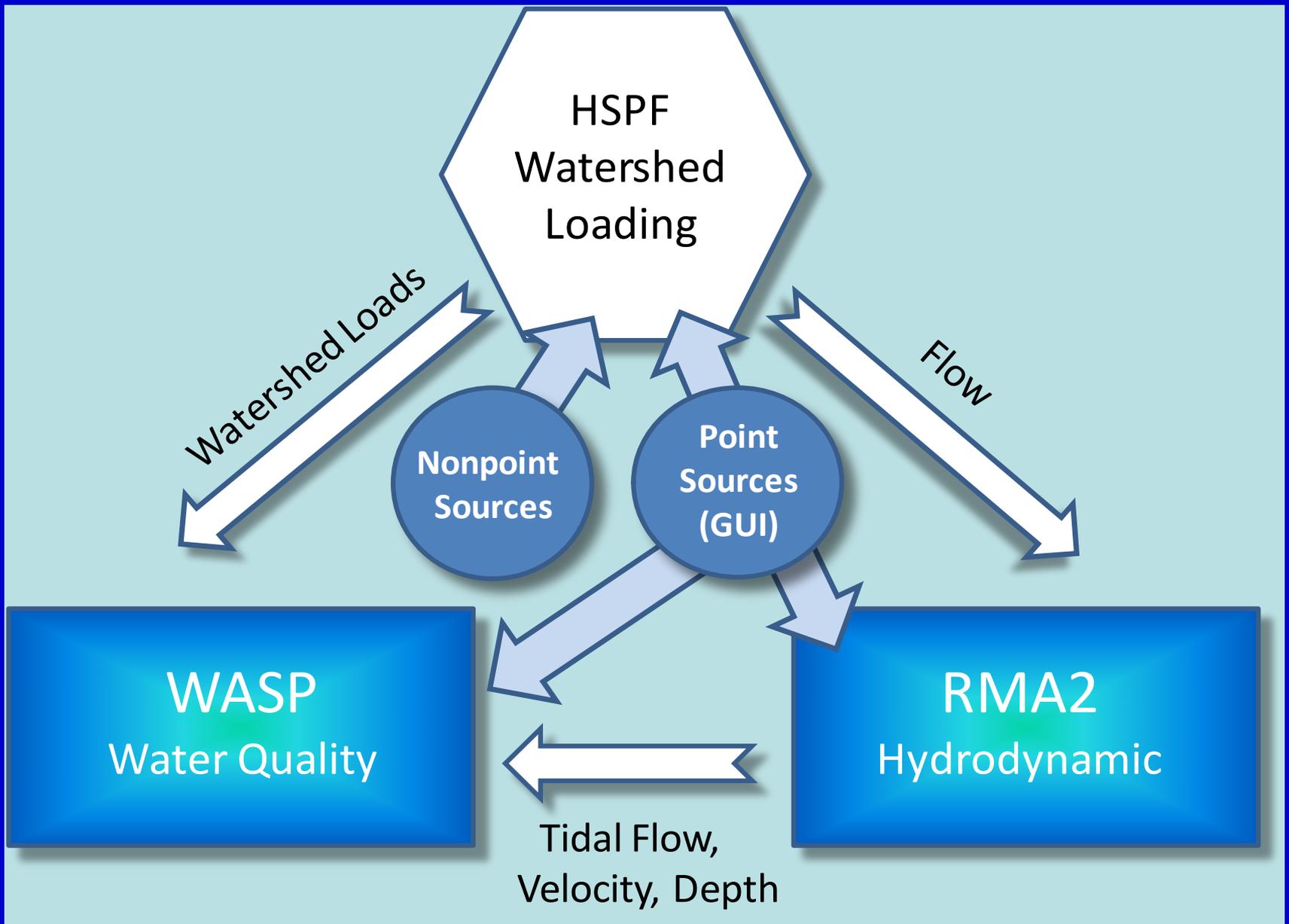
- Restore water quality
- Determine sources of pollution and necessary control strategies
- Comply with federal law
(e.g., Requirements for removal of water bodies from 303(d) List)

Background to TMDL Project

17 TMDLs for dissolved oxygen, indicator bacteria, and pH

- Adopted by TCEQ, June 13, 2007
- Approved by USEPA, August 28, 2007

Changes within the Adams and Cow Bayous watershed and with programmatic approaches have necessitated a re-visiting of these TMDLs.

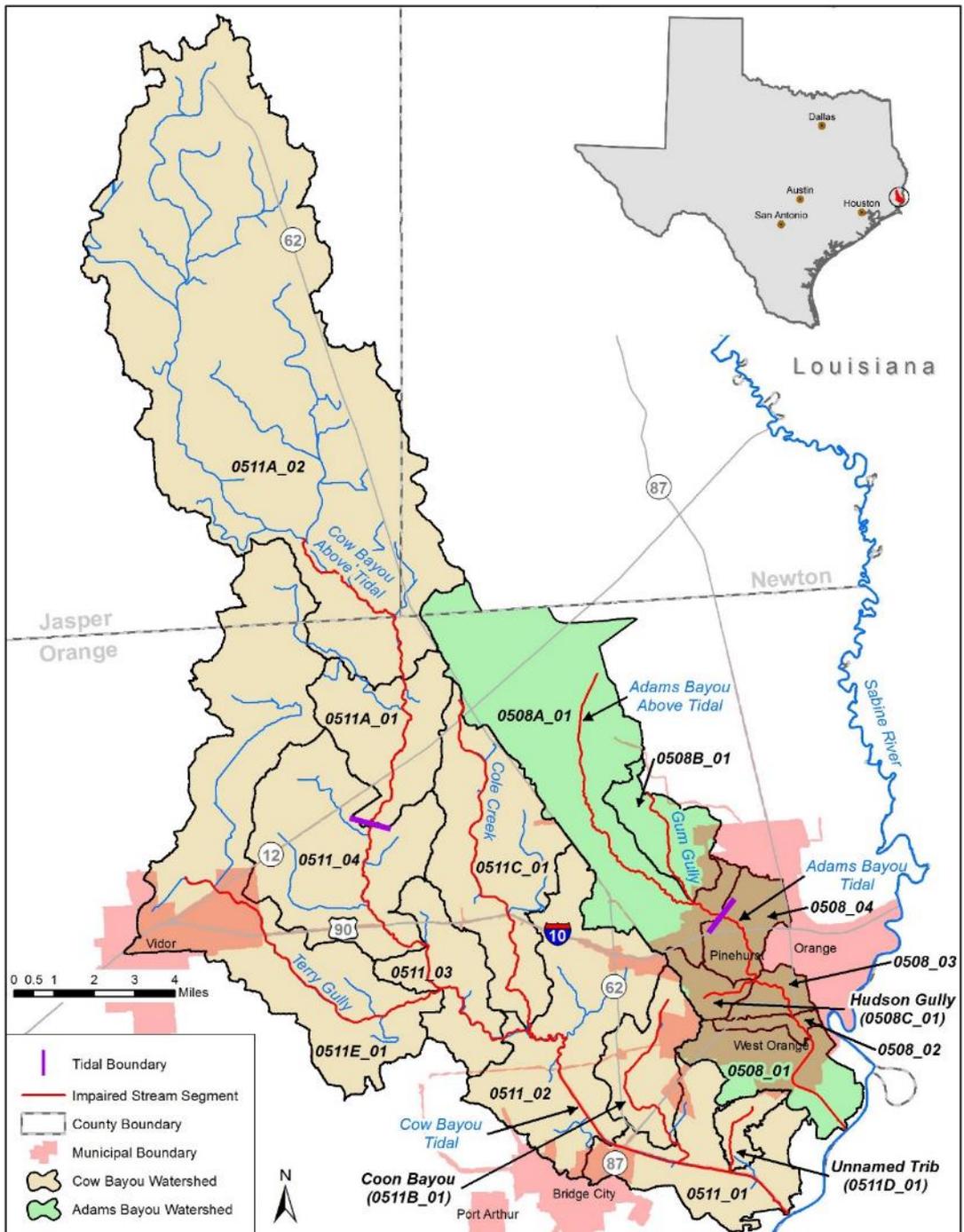


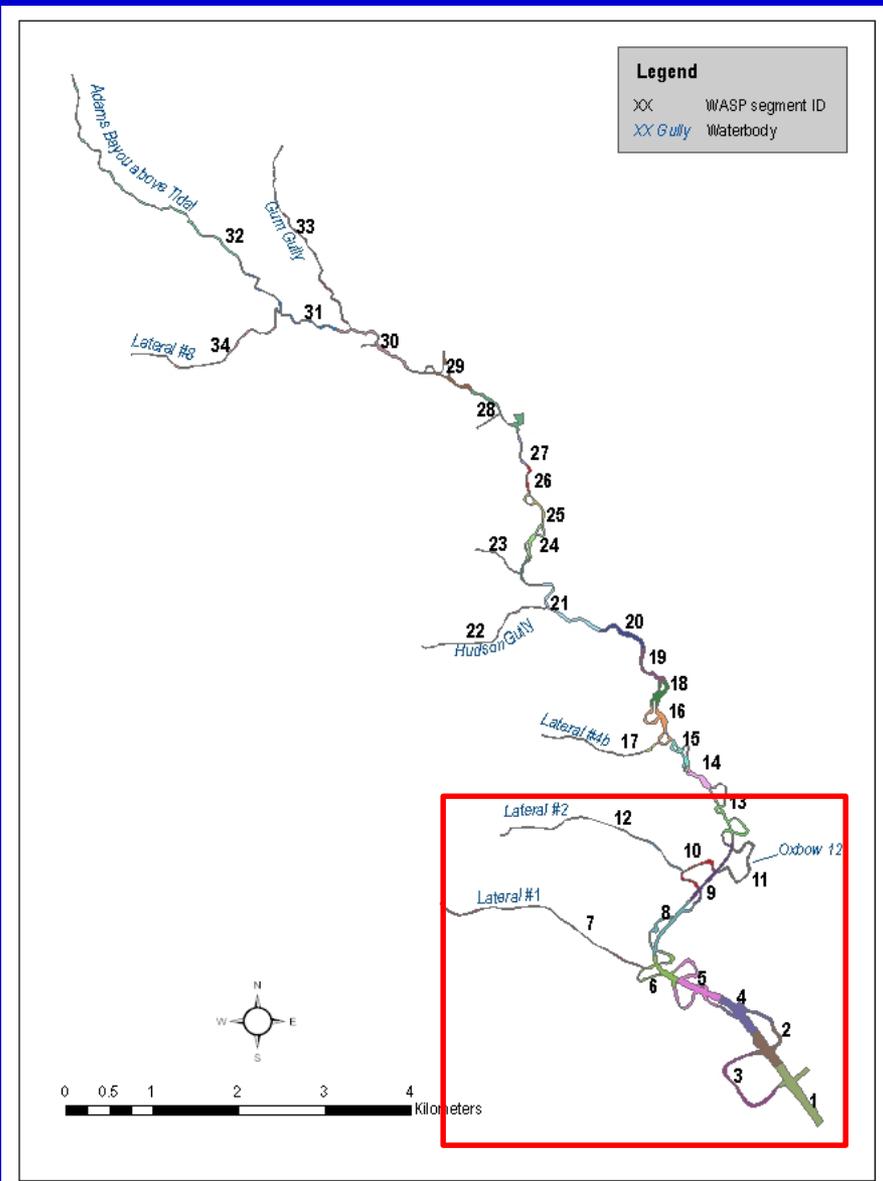
Schematic of Modeling System

Programmatic Changes

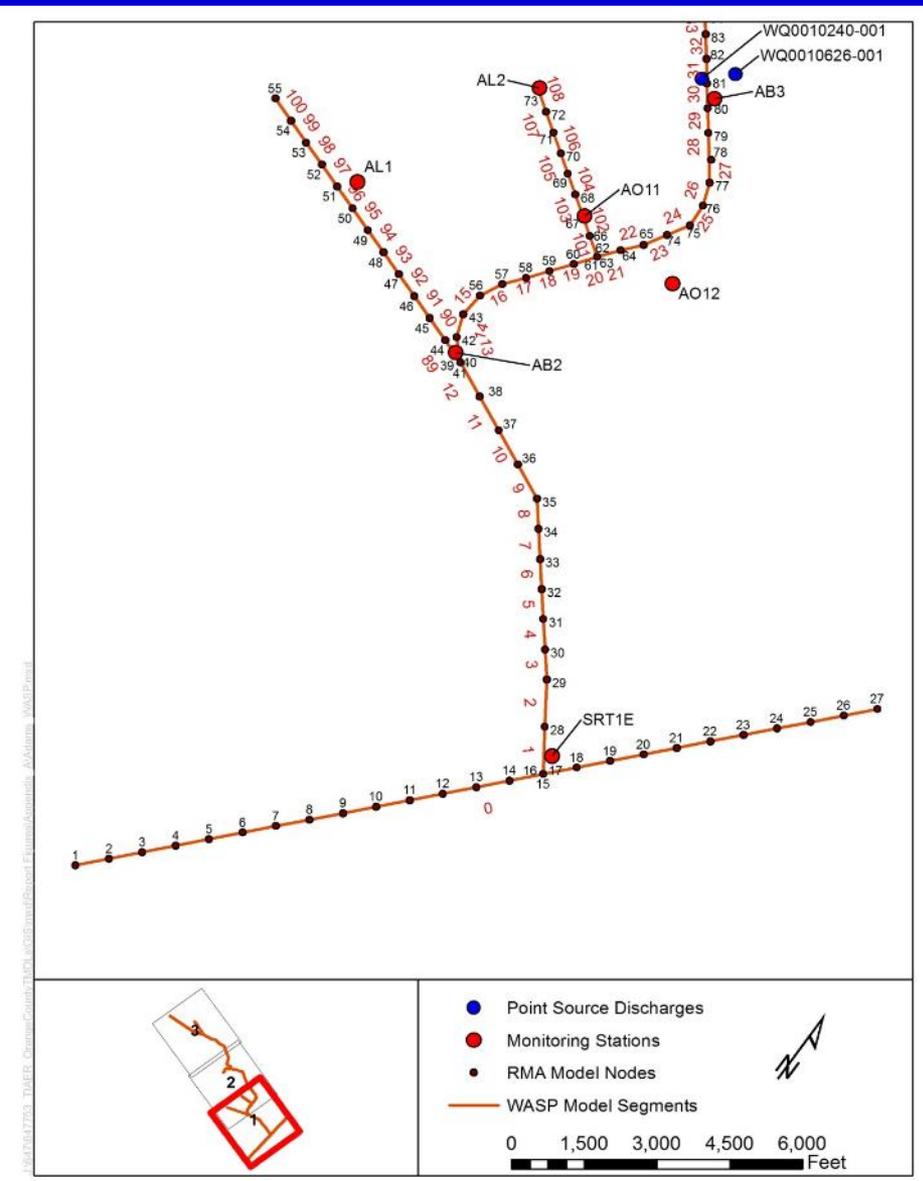
- TMDLs developed at Assessment Unit (AU) level (see next slides)
- TMDLs based on full permitted limits for dischargers and not existing loadings
- Desire for simpler approaches for bacteria indicator TMDLs when such can be obtained without loss of validity of pollutant loading allocations (explained later in presentation)

Adams and Cow Bayous Watershed: Segments & AUs





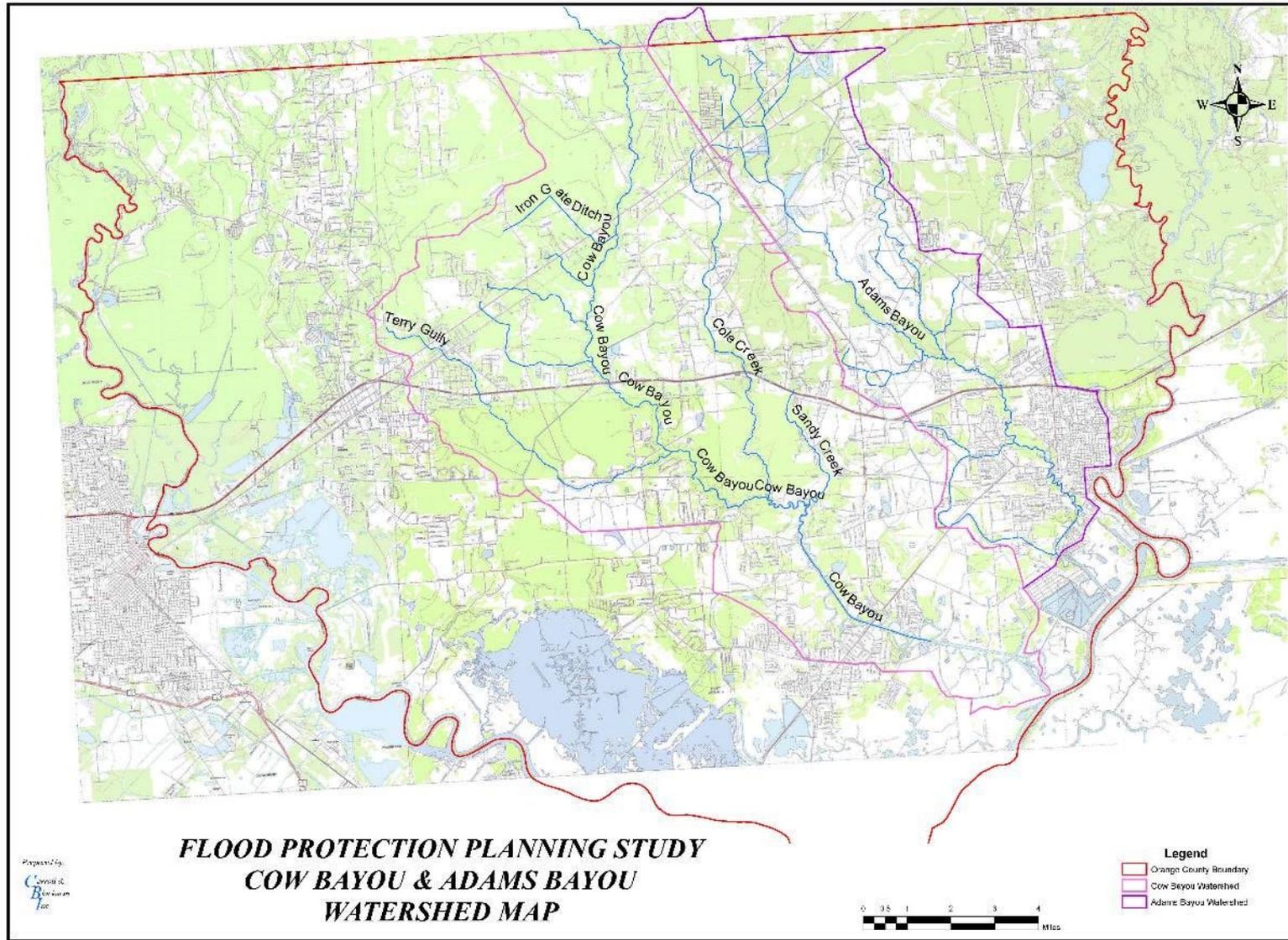
Original TMDL WASP Segmentation



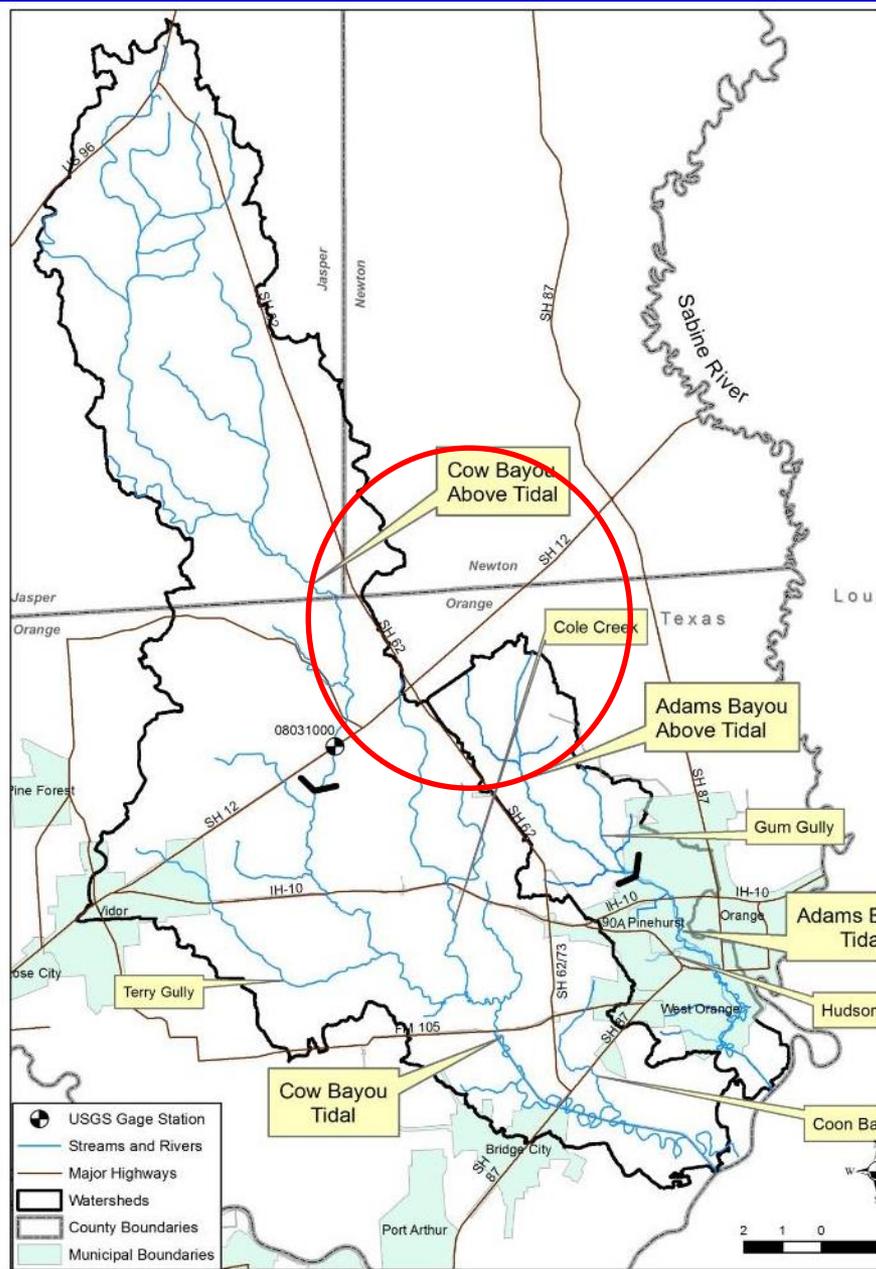
Refined WASP Segmentation

Watershed Changes

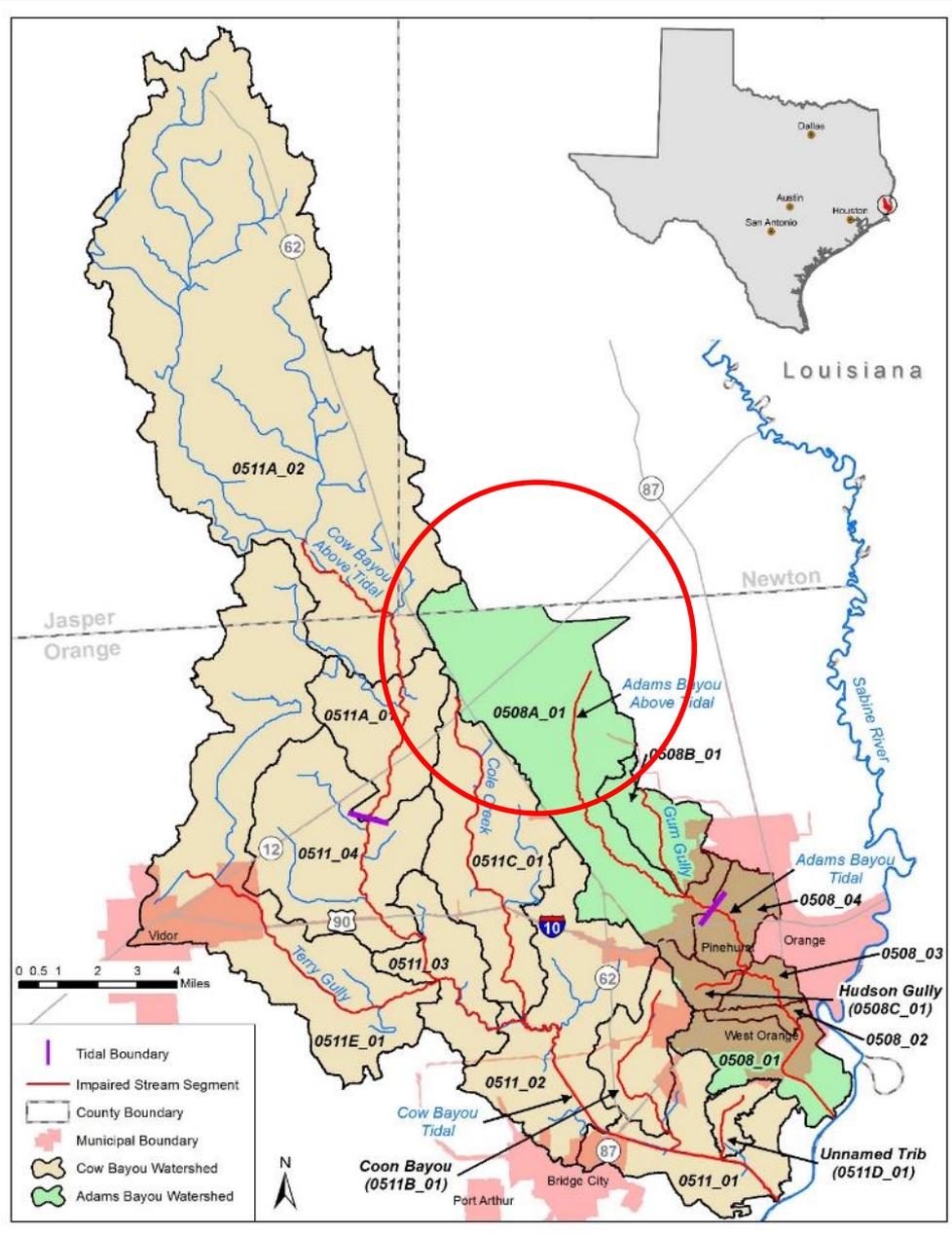
- New and eliminated permitted discharges
- Expansion of availability of centralized wastewater collection and treatment (Orangefield Water Supply Corp. WWTF)
- Revised drainage area for upstream end of Adams Bayou watershed



Carroll & Blackman Report for Orange County
Drainage District and TWDB



Original Adams Bayou Watershed



Corrected Adams Bayou Watershed

Programmatic Changes

- TMDLs developed at Assessment Unit (AU) level
- TMDLs based on full permitted limits for dischargers and not existing loadings
- **Desire for simpler approaches for bacteria indicator TMDLs when such can be obtained without loss of validity of pollutant loading allocations**

TMDL Allocation Process

- The load duration curve (LDC) method provides for allocation of pollutant (bacteria) loadings to the general categories of point and non-point sources. Point sources include regulated stormwater sources.
- The LDC method is widely used across the country and in Texas.
- For this project the LDC method is being modified for tidal waters. (This modified approach used on TCEQ adopted and EPA approved TMDLs for Tidal segments of Mission and Aransas Rivers.)

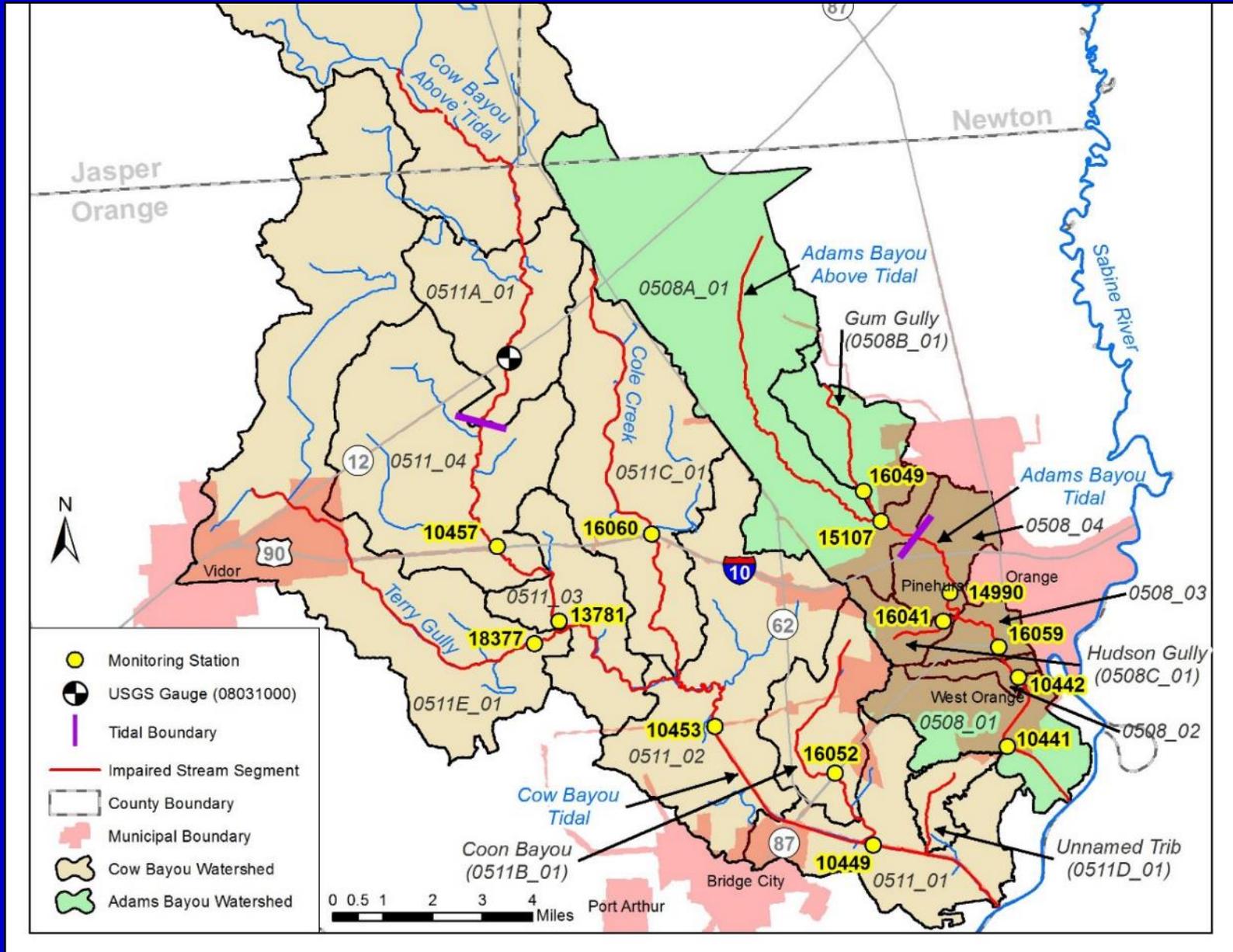
Modified LDC Analysis

- LDCs are graphs of the frequency distribution of loads of bacteria in the bayous.
- LDCs are a simple statistical method that provides a basic description of the water quality problem.
- The modified LDC method is based on the assumption that combining river water and seawater increases loading capacity in a tidal bayou.

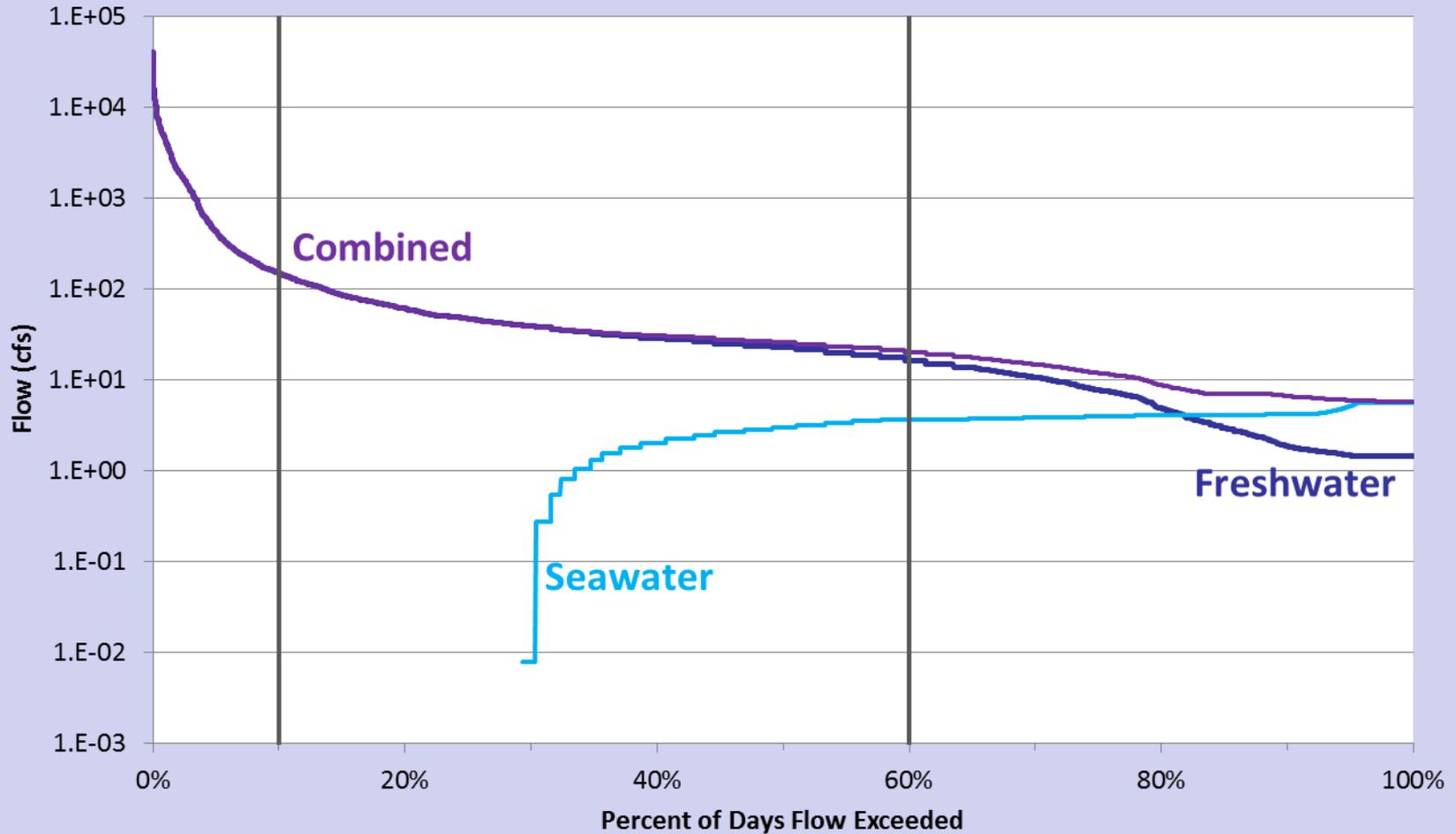
Development of a Bacteria LDC

- Requires streamflow data, salinity data, bacteria data (e.g., *E. coli* and Enterococci), and the relevant bacteria criterion.
- Use locations on Adams and Cow Bayous and associated tributaries for LDC development.

Project Area Showing Monitoring Stations



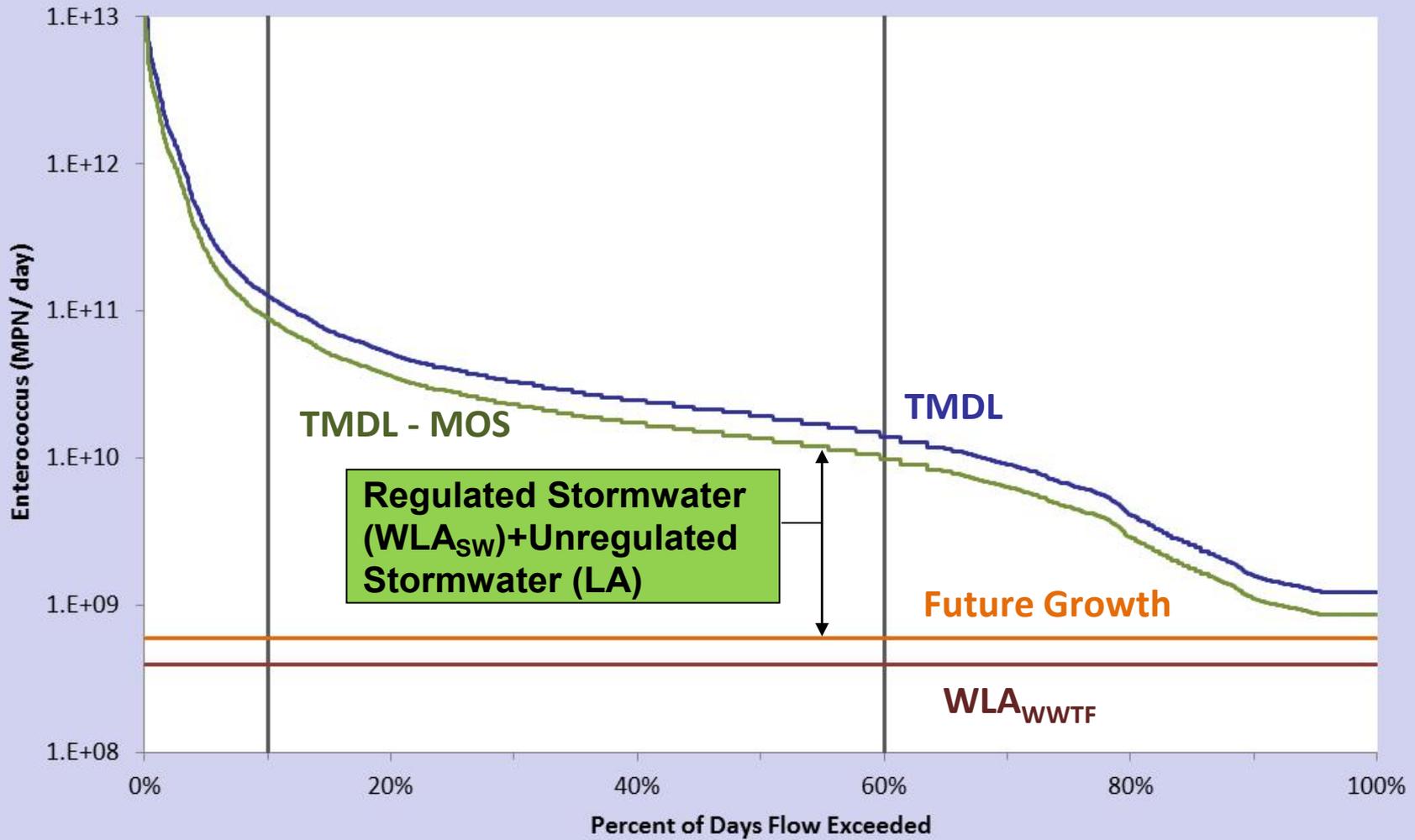
Modified Flow Duration Curve



Example of Modified Flow Duration Curve with Seawater Addition

Use of Load Duration Curve to Develop TMDL

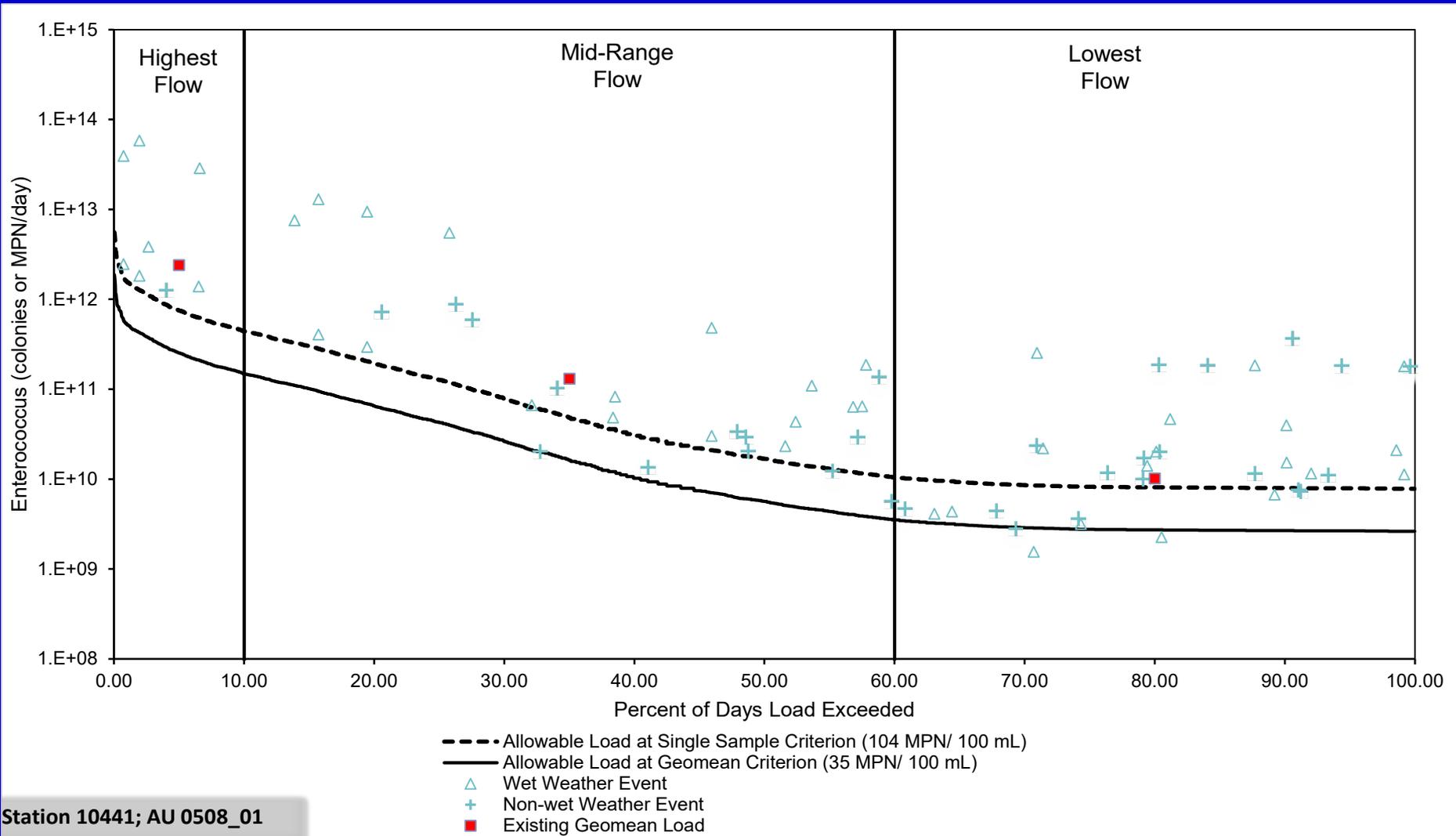
$$(TMDL = WLA_{WWTF} + WLA_{SW} + LA + FG + MOS)$$



— TMDL — TMDL - MOS — WLA for WWTFs — Future Growth

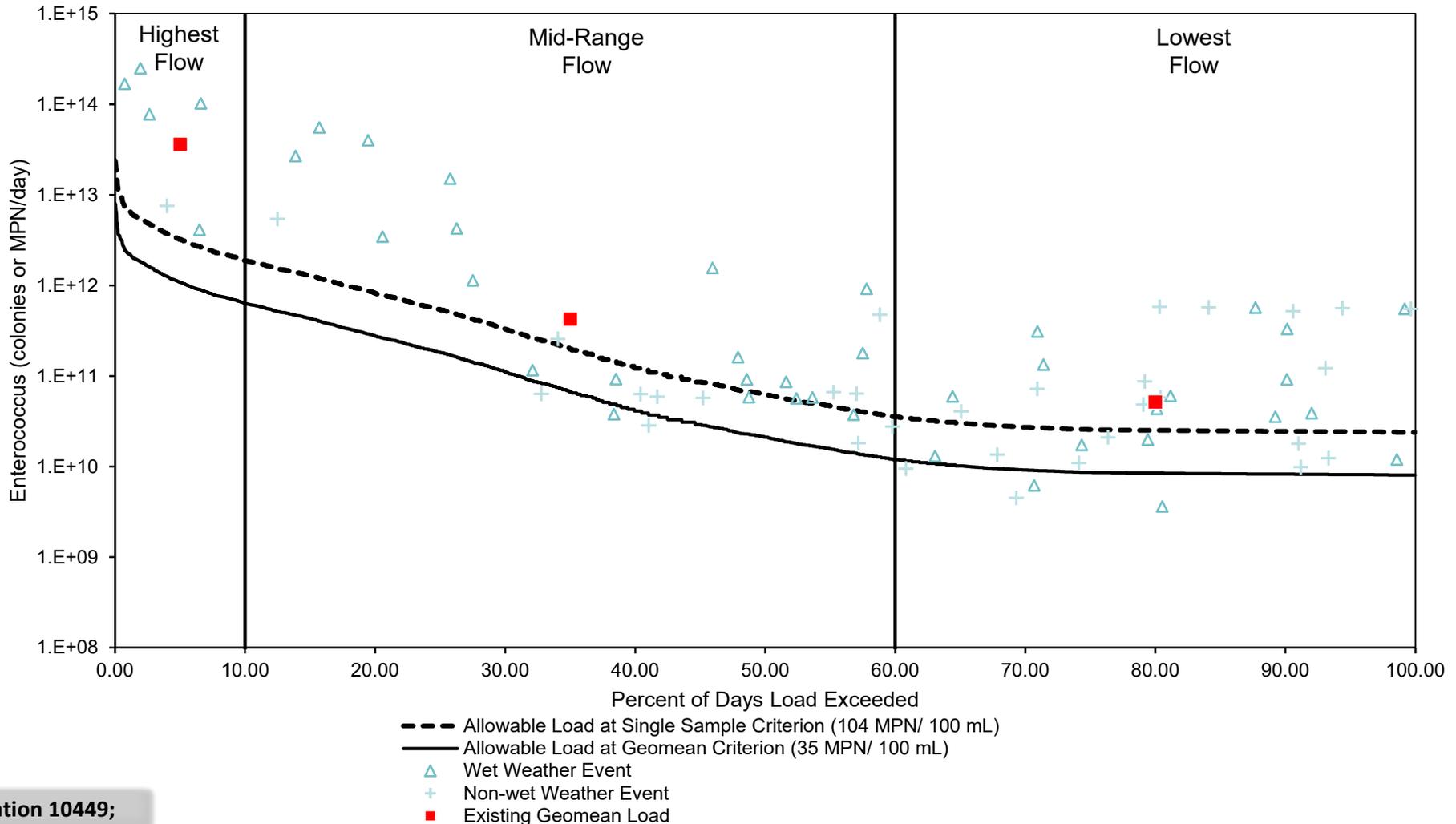
Preliminary Modified LDC

Station 10441 – Adams Bayou AU 0508_01



Preliminary Modified LDC

Station 10449 – Cow Bayou AU 0511_01



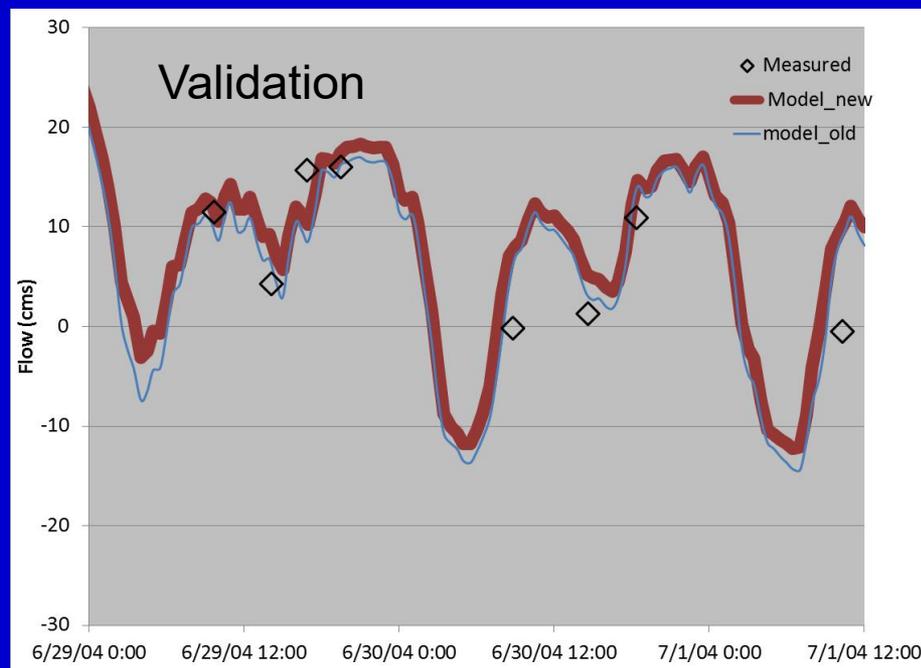
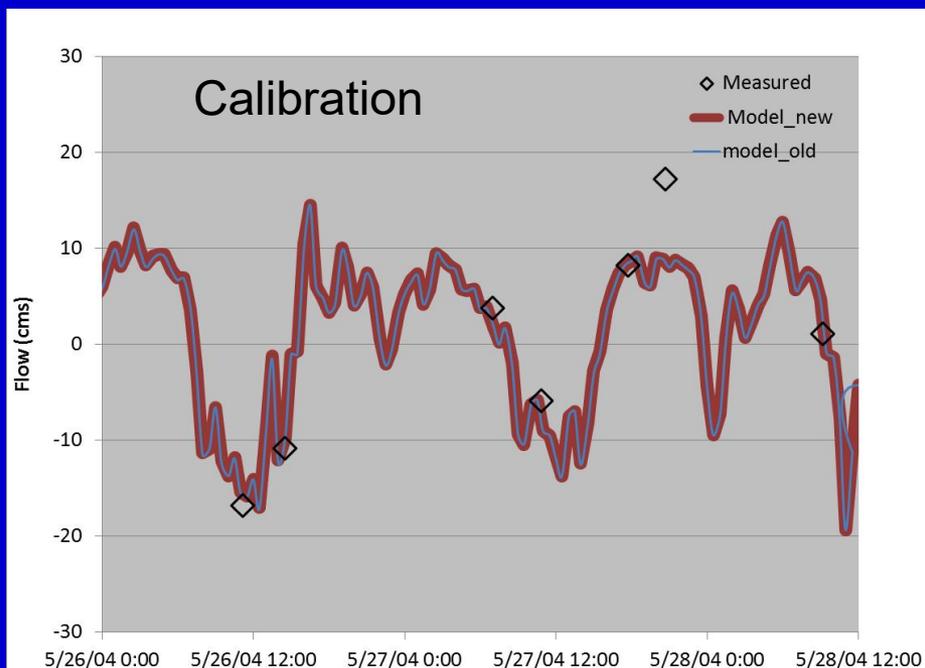
Work Remaining for FY2017 (Sept. 2016 – Aug. 2017)

- Reevaluate Modeling System for Adams Bayou watershed.
- Reallocate pollutant loadings for DO TMDLs for Adams Bayou watershed.
- Update DO and bacteria TSDs.
- Draft document developed of pH, DO and bacteria TMDLs.

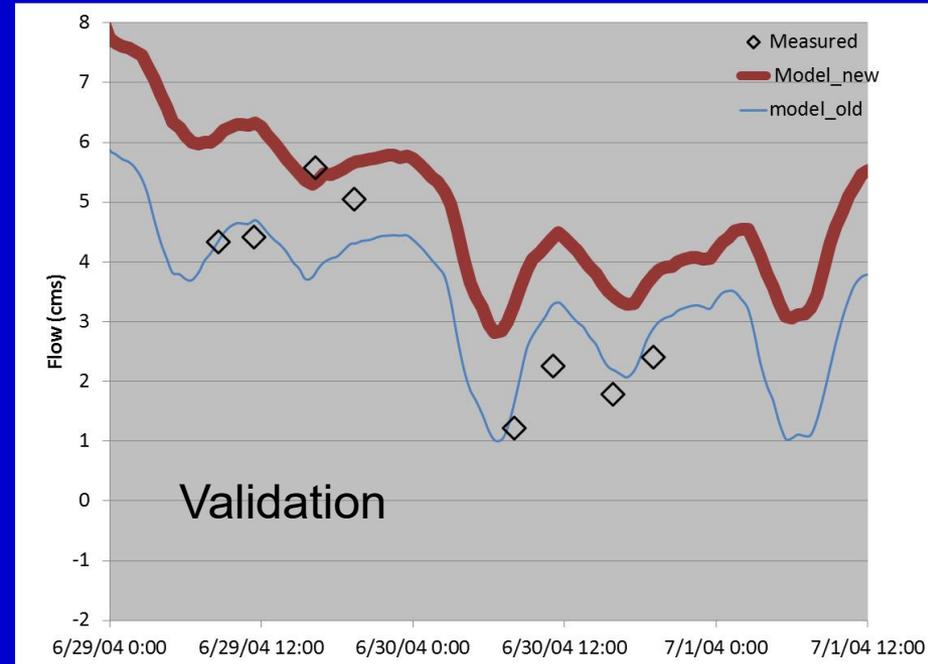
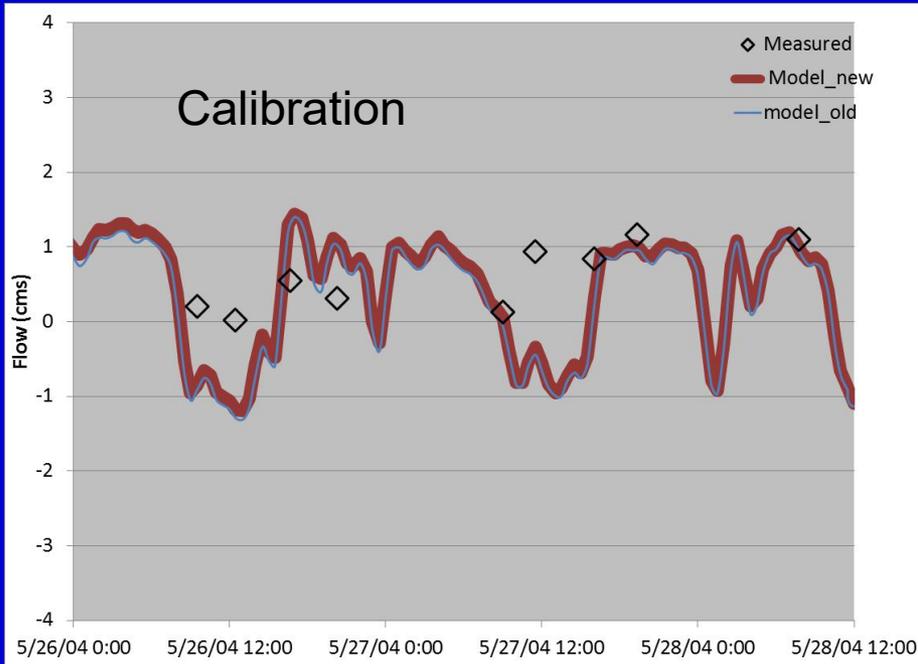
THANK YOU
Questions?

Extra Slides on Modeling

Flow Comparisons Lowermost Station Adams Bayou Tidal



Flow Comparisons Uppermost Station Adams Bayou Tidal



Dissolved Oxygen Comparison

