SAN ANTONIO RIVER AUTHORITY

Leaders in Watershed Solutions

Development of SARA Water Quality Modeling Tools for Stormwater Quality Management

6/5/2018

SARA Project Team

Dr. Sheeba Thomas
SARA Project Manager

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LAN Project Manager

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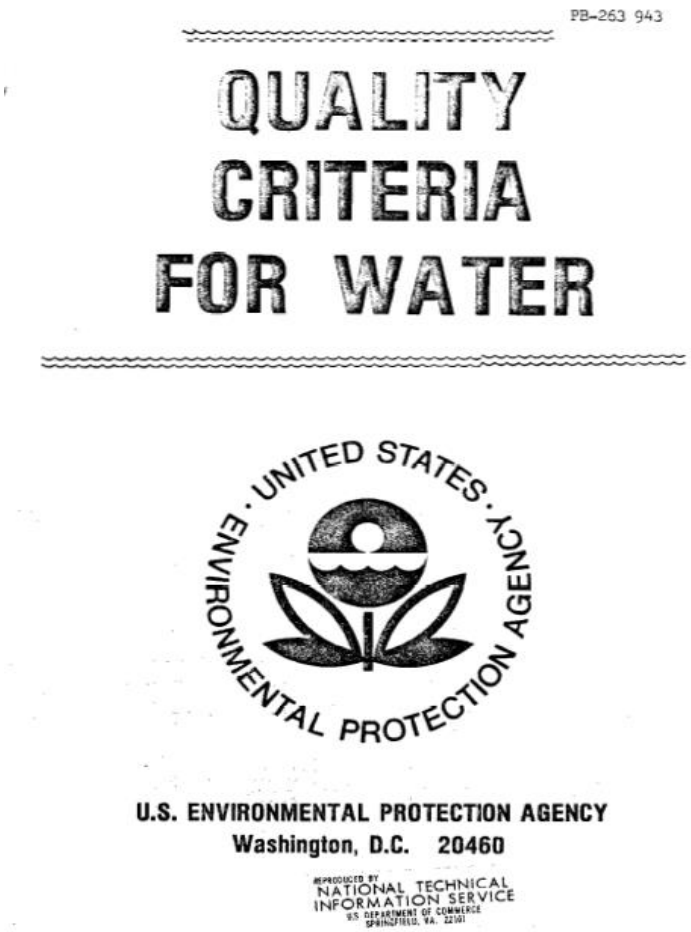
RESPEC Project Manager

Agenda

- **Background**
- **Model and Tool Development**
- **Results**
- **Recent Development and Recommendations**

Background

- **1976 Contact Recreation Criteria**
  - Fecal Coliform
    Geometric Mean (GM) of 200 cfu/dL


PB-263 943

QUALITY CRITERIA FOR WATER

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

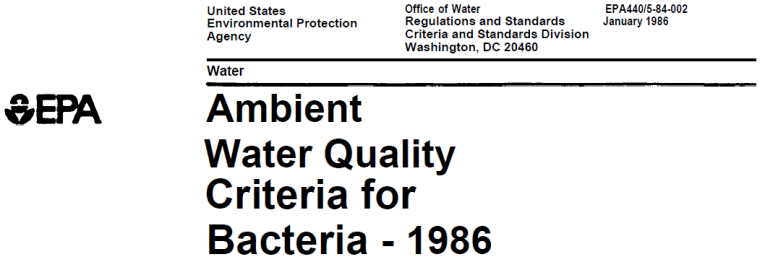
U.S. ENVIRONMENTAL PROTECTION AGENCY
Washington, D.C. 20460

REPRODUCED BY NATIONAL TECHNICAL INFORMATION SERVICE U.S. DEPARTMENT OF COMMERCE SPRINGFIELD, VA. 22161

Background

- **1986 Contact Recreation Criteria**

  - E. coli
    GM of 126 cfu/dL



United States Environmental Protection Agency | Office of Water Regulations and Standards Criteria and Standards Division Washington, DC 20460 | EPA440/5-84-002 January 1986

Water

Ambient Water Quality Criteria for Bacteria - 1986

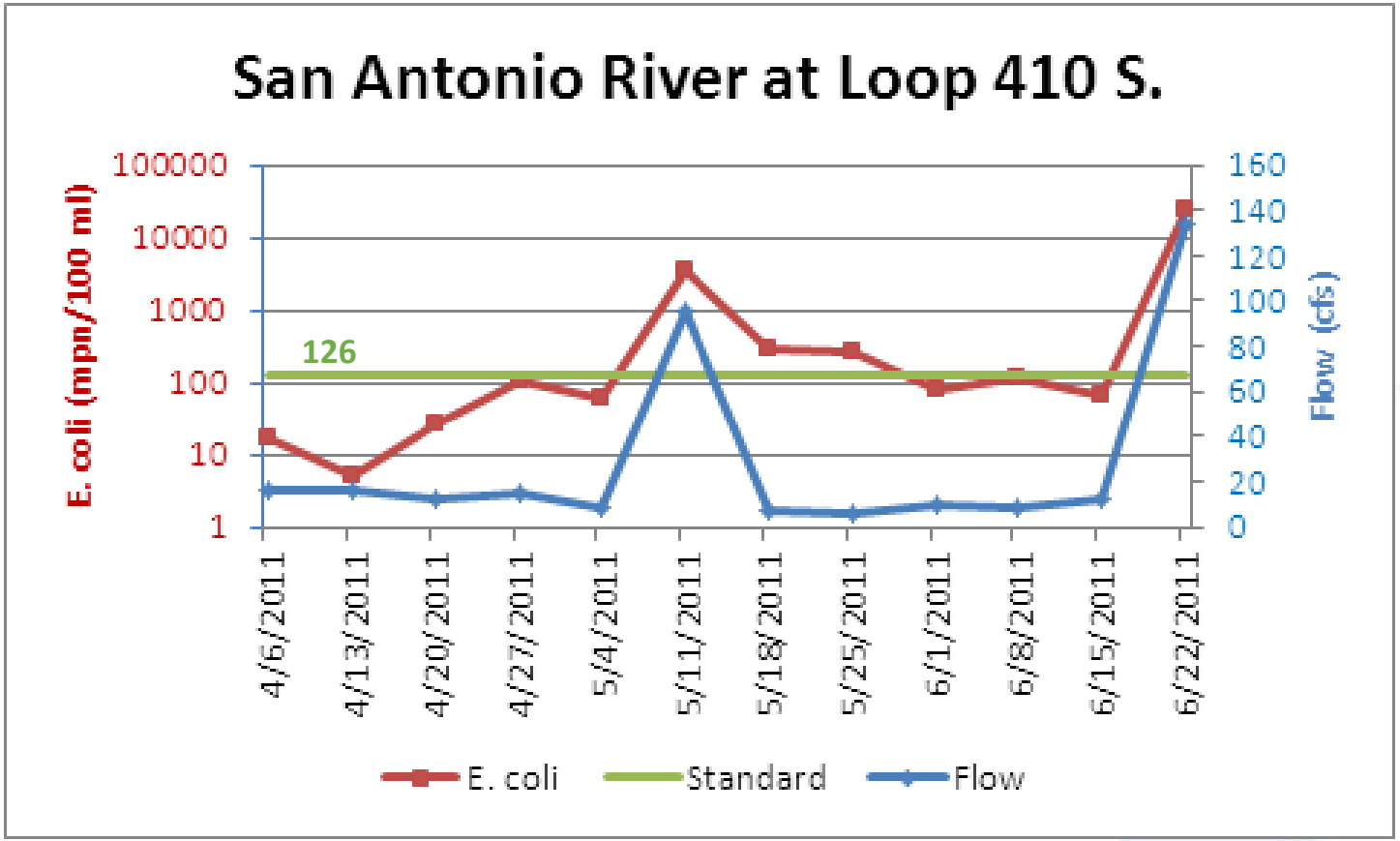
	Acceptable Swimming Associated Gastro-enteritis Rate per 1000 swimmers	Steady State Geometric Mean Indicator Density	Single Sample Maximum Allowable Density: Designated Beach Area (upper 75% C.L.)	Moderate Full Body Contact Recreation upper 82% C.L.)	Lightly Used Full Body Contact Recreation upper 90% C.L.)	Infrequently Used Full Body Contact Recreation (upper 95% C.L.)
Freshwater						
enterococci	8	33 (1)	61	78	107	151
E. coli	8	126 (2)	235	298	409	575

Contact Recreation E-coli Standards

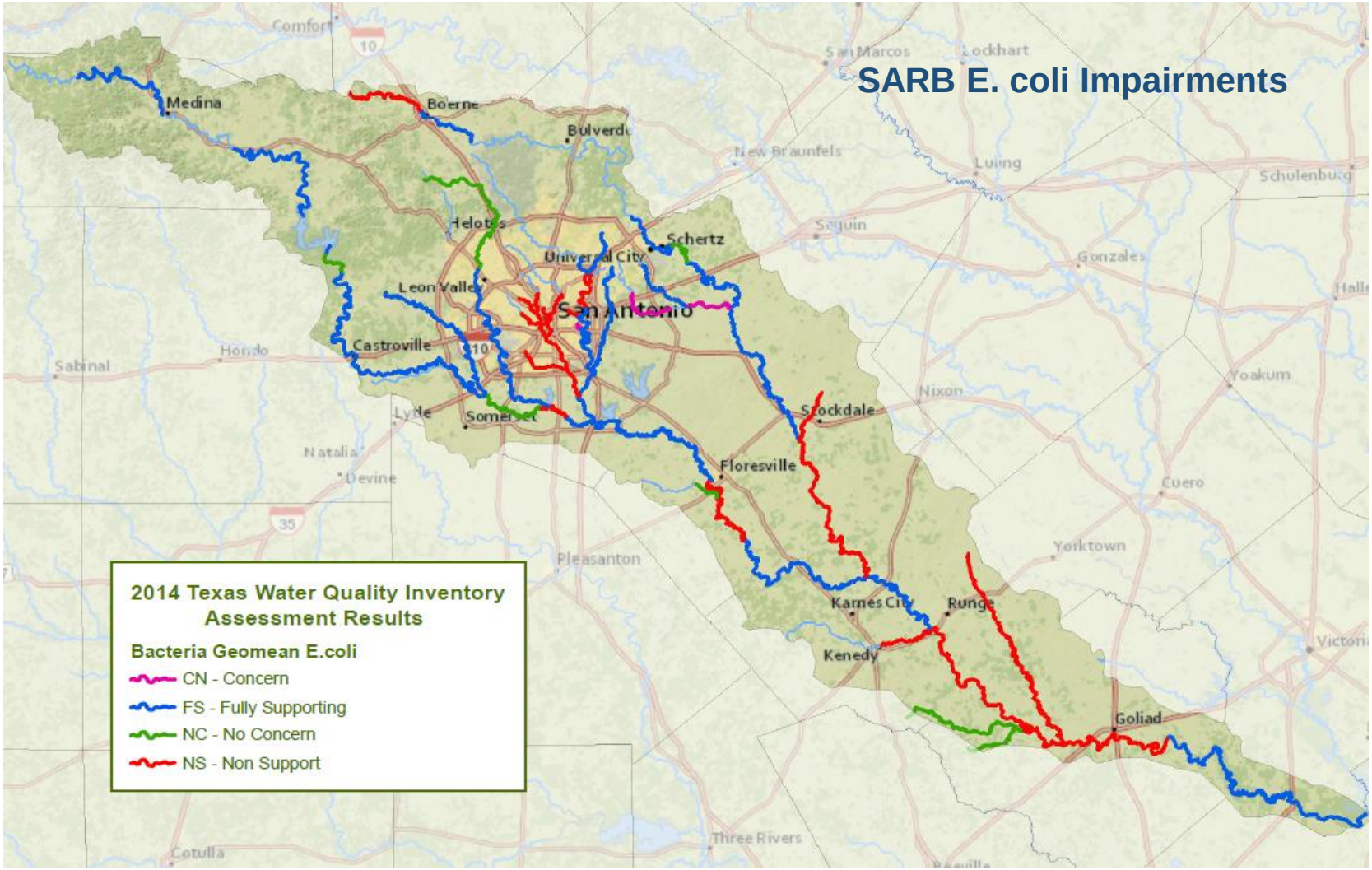
E-Coli Standards	Concentration
Primary Contact Recreation 1	126 #/dL
Primary Contact Recreation 2	206 #/dL
Secondary Contact Recreation 1	630 #/dL
Secondary Contact Recreation 2	1030 #/dL
Noncontact Recreation	2060 #/dL

*Source: 2014 Texas Surface Water Quality Standards

The effects of storm events on the E.coli



SARB E. coli Impairments



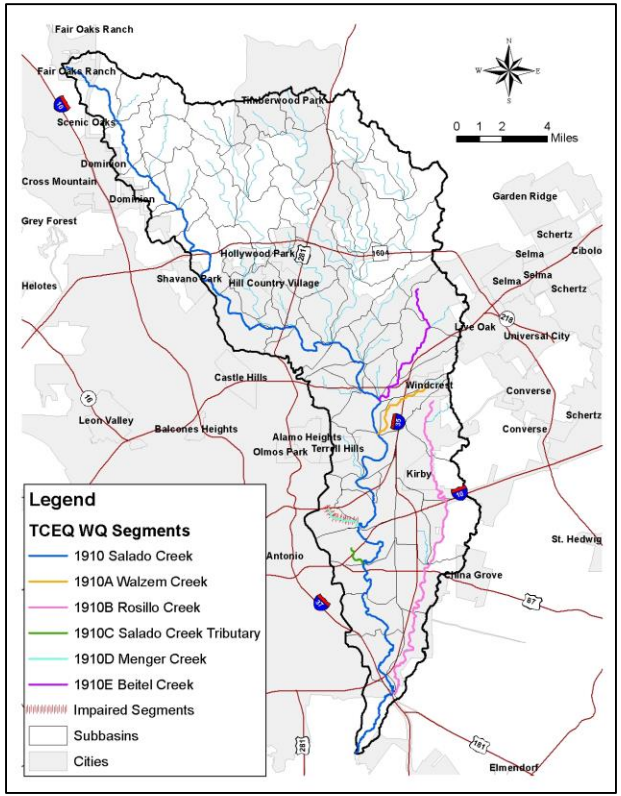
Model and Tools' Development

Drainage Watershed Master Planning

- Quantitative approach
- FEMA and local guidelines
  - Data: LiDAR, GIS, XS, etc.
  - H&H Modeling:
    - HEC-HMS
    - HEC-RAS
  - Floodplain mapping
  - No rise
- Trained professionals
  - PE, CFM
- Planned/modeled prior to CIP project construction
- Goal: manage acceptable risk

WQ Watershed Mater Planning

- To date: mostly <u>Qualitative</u>
  - Best Management
  - To the extent possible/practicable
- 303d listing based on monitoring data (CRP)
  - Quarterly monitoring – temporal gap
  - Limited SWQM station locations – spatial gap
- BMPs/LIDs planning:
  - Little modeling
  - Build first, then monitor to see effectiveness
  - StormCon – ineffective BMP cases
- Lack of quantitative tools



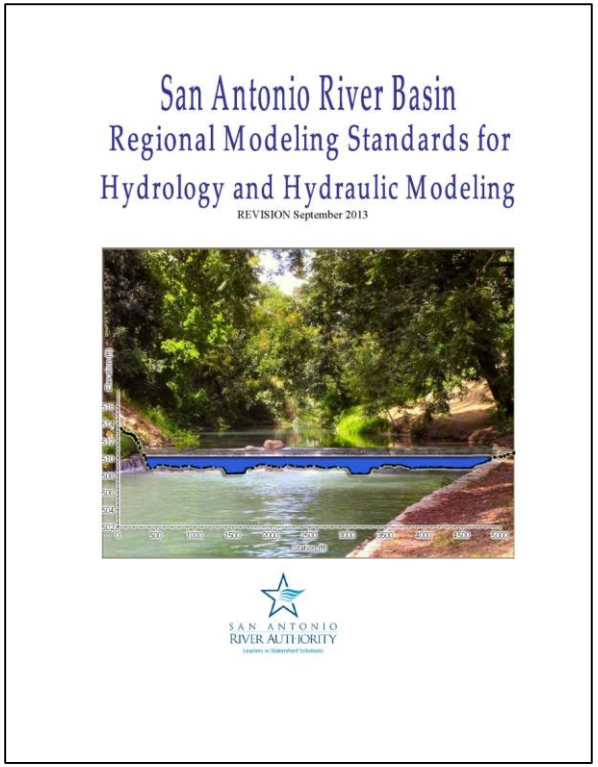
SARA Suite of WQ Modeling Tools

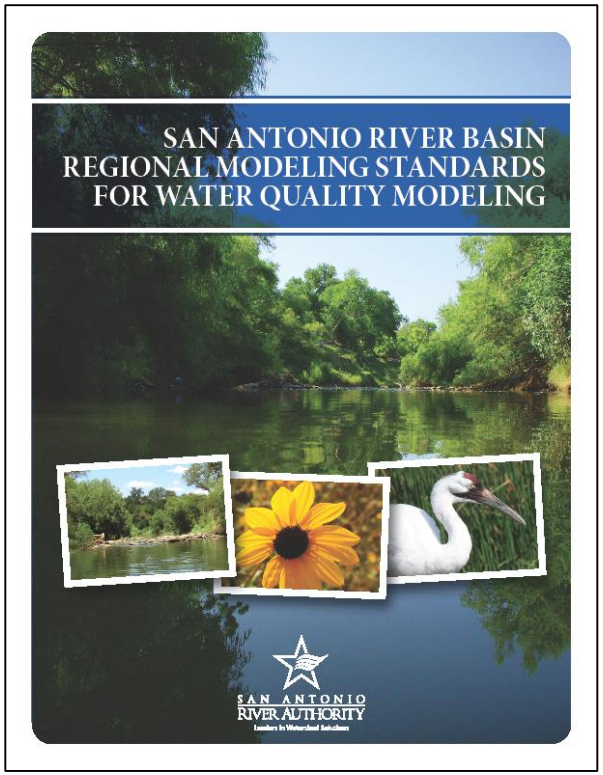
Approach and Tools to allow quantitative WQ planning

- SARA WQ modeling standards
- WQ model development and calibration
  - HSPF
  - EPDRiv1
- Timeseries Utility Tool
- SARA Landuse Adjustment Tool
- Identify WQ Damage Centers
- Load Reduction Tool
- SARA Enhanced BMP Tool
  - BMP Database
  - CEV Tool

- BMP Compiler
- BMP Processor
- BMP Reporter
- EPDRiv1 Enhancements
- Model Simulation Manager

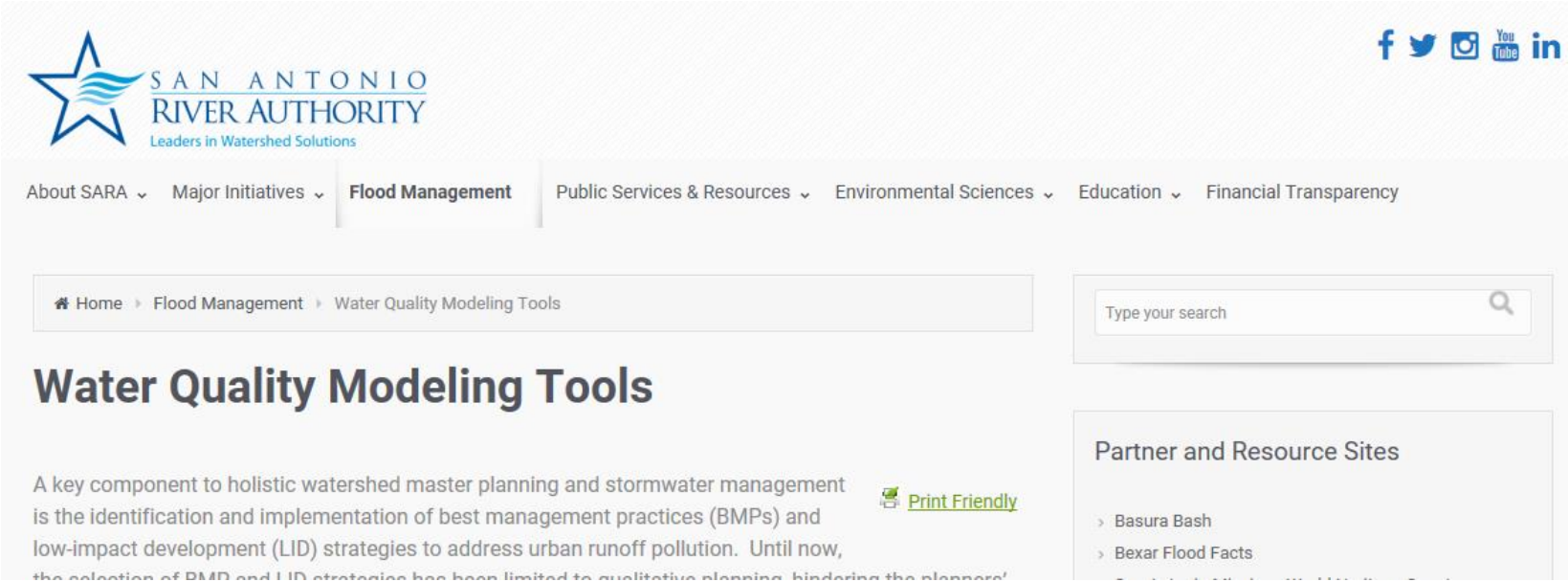
SARA WQ Modeling Standards



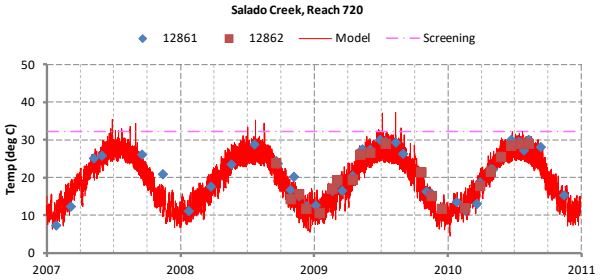


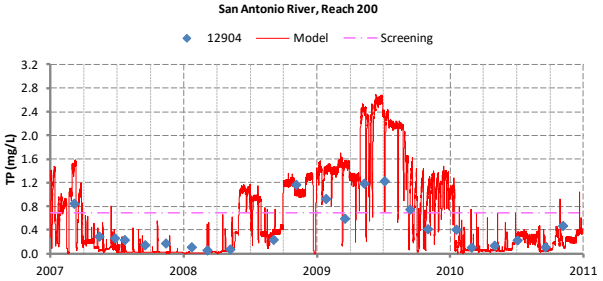
SARA WQ Modeling Tools Download Website

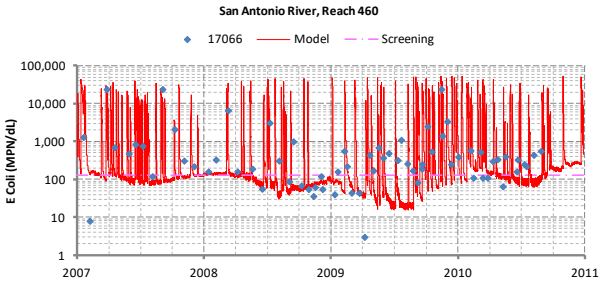
https://www.sara-tx.org/flood-management/water-quality-modeling-tools/

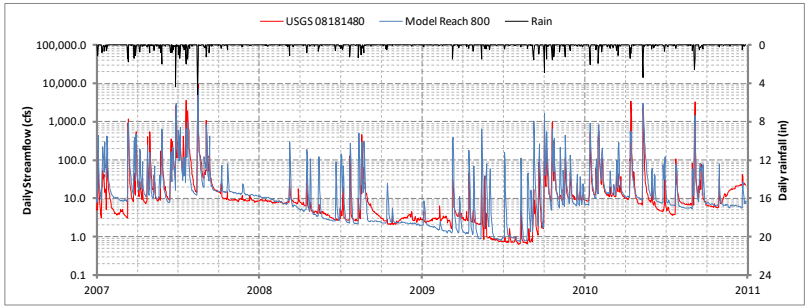


HSPF Modeling – QA and third party review









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www.aquaterra.com

MEMORANDUM

To: Yu-Chun Su, Atkins — Date: January 8, 2014

From: Tony Donigian, Brian Bicknell, Anurag Mishra — Client: Atkins/SARA

Copies: Paul Hummel, Paul Duda — Project No. 23012-01, Task 1

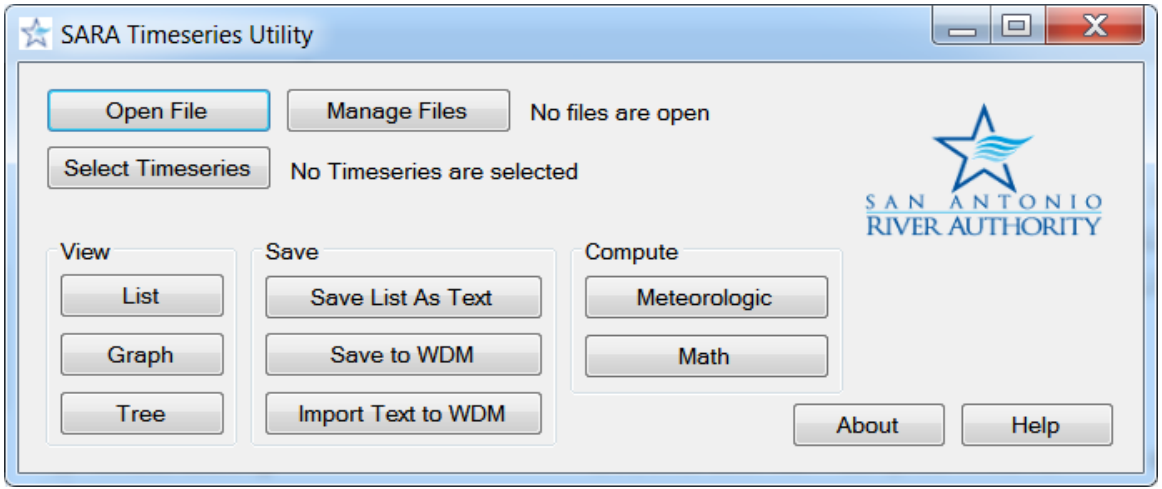
Subject: **Model Review for Salado Creek, Leon Creek, and Upper San Antonio River HSPF Models by Atkins and SARA – FINAL**

General Comments

As per the agreed upon scope of work for this task, this model review was designed as a strictly 'paper' review limited to a review of the available documentation, model results, and the corresponding model input files (HSPF UCIs). The review was thus based on the document, DRAFT, SARA WATER QUALITY MODEL REPORT, prepared by Atkins, August 2012 (file: SARA_WQmodel_report_draft08122012.pdf) and the main UCI files for the three watersheds (files:LeonCk_HSPF11.uci; SaladoCreek_hspf10.uci; UpperSAR_hspf10.uci). Model results for subsequent model runs with changed parameters were also reviewed. No attempt was made to execute the models, confirm their proper operation, nor reproduce the results shown in the documentation report.

SARA Timeseries Utility Tool

- Enhanced efficiency in reading large timeseries records (e.g. HSPF binary output).
- Developed, tested, and released to public through EPA BASINS user community on 10/24/2013.
- Replaced WDMUtil
- Added GSSHA Converter in 2014



SARA Tools Suggested by National Experts

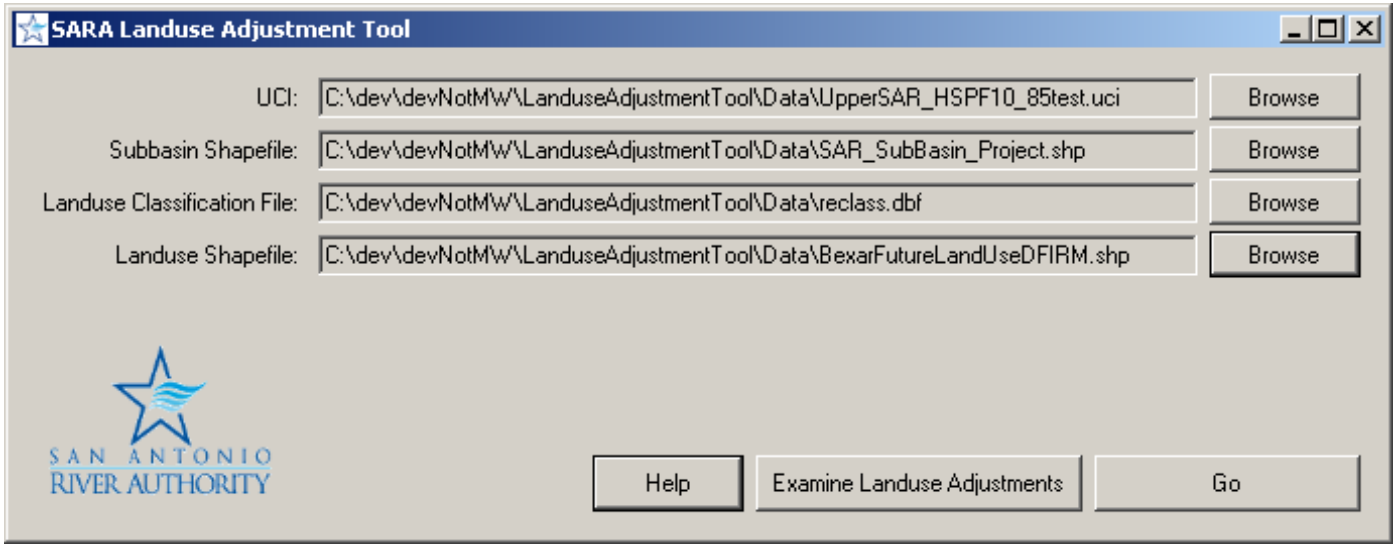
From: Tom Jobes [mailto:TJobes@sjrwmd.com]
Sent: Monday, April 18, 2016 10:09 AM
To: Private list for BASINS users
Subject: RE:[basinsinfo] WdmUtil and Office 2016

Thanks for the reply, Laura. There is no special connection with Office products – it's simply that the Office 2016 installation apparently breaks some system call used by WdmUtil, probably by updating a system DLL in a way that makes it incompatible with the old programs. Uninstalling and reinstalling WdmUtil etc. does not help. Virtual XP might be worth looking at as a temporary fix, though **I do recommend for you (and my colleagues) to make the move to SARA** and BASINS 4 in the long run.

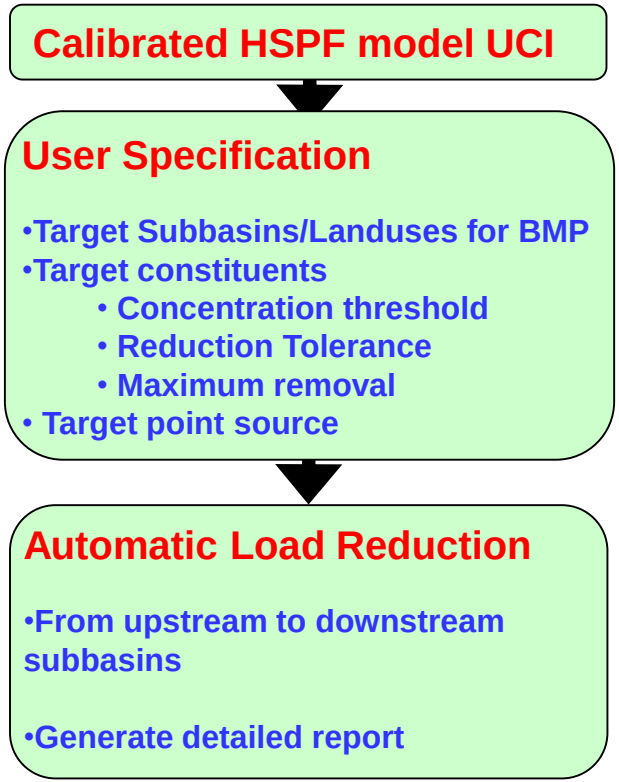
Tom Jobes
Senior Engineer Scientist
Bureau of Watershed Management
St. Johns River Water Management District
P.O. Box 1429 ● Palatka, FL 32178-1429
Office: (386) 329-4463
Email: tjobes@sjrwmd.com
Website: www.sjrwmd.com
Connect with us: Newsletter, Facebook, Twitter, Instagram, YouTube, Pinterest

SARA Landuse Adjustment Tool

- **Process existing-condition HSPF model and future-condition GIS landuse data.**
- **Create future-condition HSPF model.**



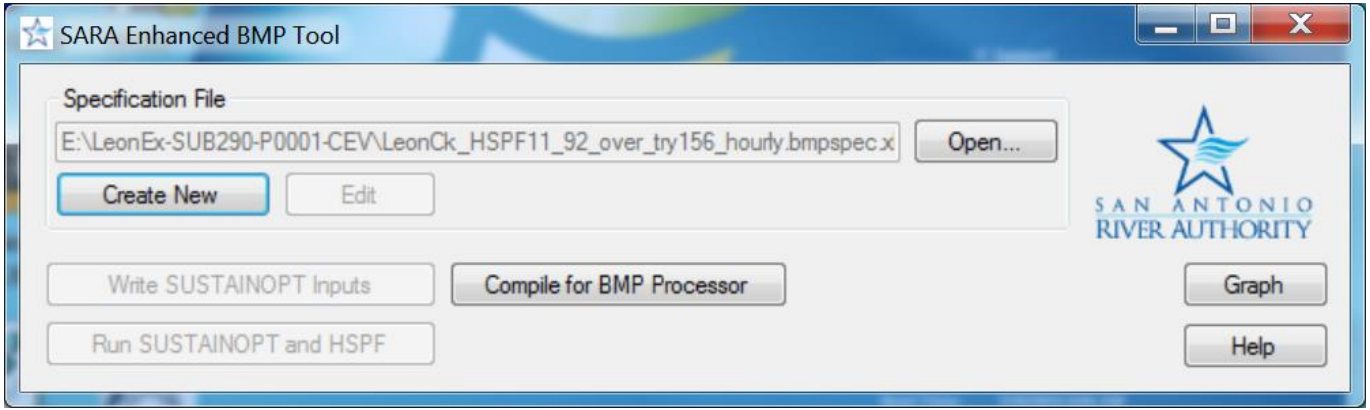
SARA Load Reduction Tool



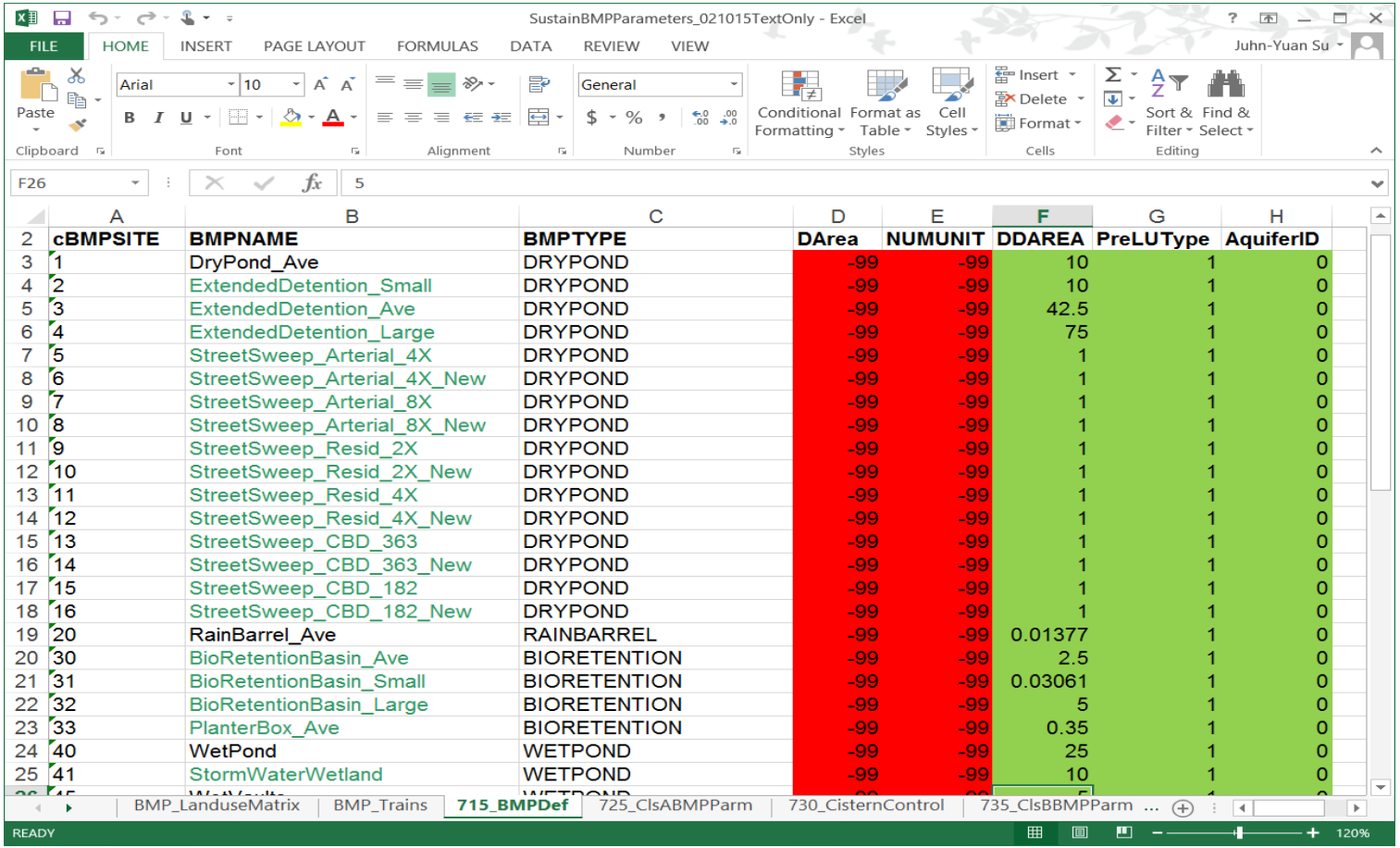
- **Uses load reduction factors in HSPF BMP Module.**
- **Automates tedious process for large watershed models.**
- **Compared to manual processes.**
- **Developed, tested, and released to public through EPA BASINS user community on 5/09/2014.**

SARA Enhanced BMP Tool

- **Identify LID/BMPs to achieve needed load reductions.**
- **Use LRT results or any calibrated HSPF models.**
- **Combines robust land surface representation from HSPF with EPA SUSTAIN's BMP capabilities.**
- **Avoids ArcGIS version issue inherent in SUSTAIN by using non-GIS component (SUSTAINOPT)**



SARA BMP Tool Database

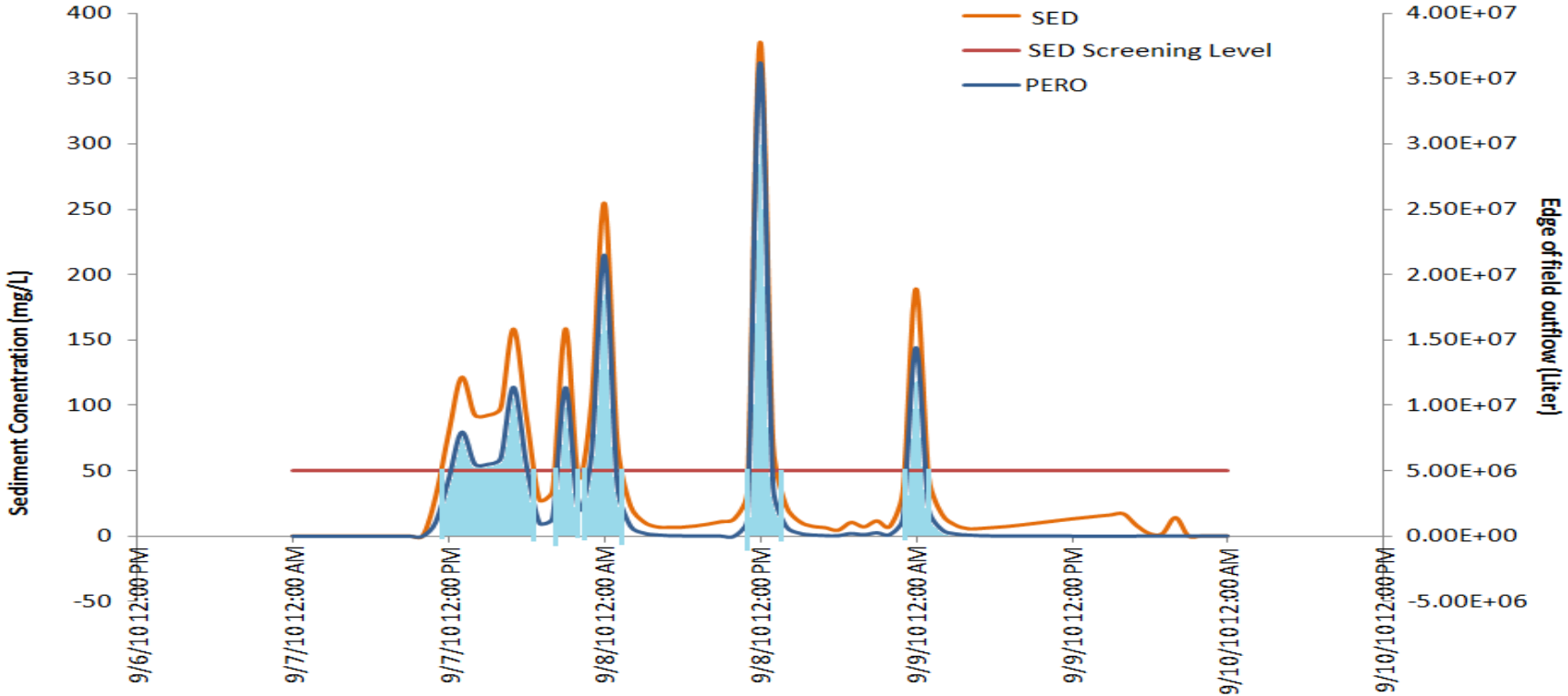


	A	B	C	D	E	F	G	H
2	cBMPSITE	BMPNAME	BMPTYPE	DArea	NUMUNIT	DDAREA	PreLUType	AquiferID
3	1	DryPond_Ave	DRYPOND	-99	-99	10	1	0
4	2	ExtendedDetention_Small	DRYPOND	-99	-99	10	1	0
5	3	ExtendedDetention_Ave	DRYPOND	-99	-99	42.5	1	0
6	4	ExtendedDetention_Large	DRYPOND	-99	-99	75	1	0
7	5	StreetSweep_Arterial_4X	DRYPOND	-99	-99	1	1	0
8	6	StreetSweep_Arterial_4X_New	DRYPOND	-99	-99	1	1	0
9	7	StreetSweep_Arterial_8X	DRYPOND	-99	-99	1	1	0
10	8	StreetSweep_Arterial_8X_New	DRYPOND	-99	-99	1	1	0
11	9	StreetSweep_Resid_2X	DRYPOND	-99	-99	1	1	0
12	10	StreetSweep_Resid_2X_New	DRYPOND	-99	-99	1	1	0
13	11	StreetSweep_Resid_4X	DRYPOND	-99	-99	1	1	0
14	12	StreetSweep_Resid_4X_New	DRYPOND	-99	-99	1	1	0
15	13	StreetSweep_CBD_363	DRYPOND	-99	-99	1	1	0
16	14	StreetSweep_CBD_363_New	DRYPOND	-99	-99	1	1	0
17	15	StreetSweep_CBD_182	DRYPOND	-99	-99	1	1	0
18	16	StreetSweep_CBD_182_New	DRYPOND	-99	-99	1	1	0
19	20	RainBarrel_Ave	RAINBARREL	-99	-99	0.01377	1	0
20	30	BioRetentionBasin_Ave	BIORETENTION	-99	-99	2.5	1	0
21	31	BioRetentionBasin_Small	BIORETENTION	-99	-99	0.03061	1	0
22	32	BioRetentionBasin_Large	BIORETENTION	-99	-99	5	1	0
23	33	PlanterBox_Ave	BIORETENTION	-99	-99	0.35	1	0
24	40	WetPond	WETPOND	-99	-99	25	1	0
25	41	StormWaterWetland	WETPOND	-99	-99	10	1	0

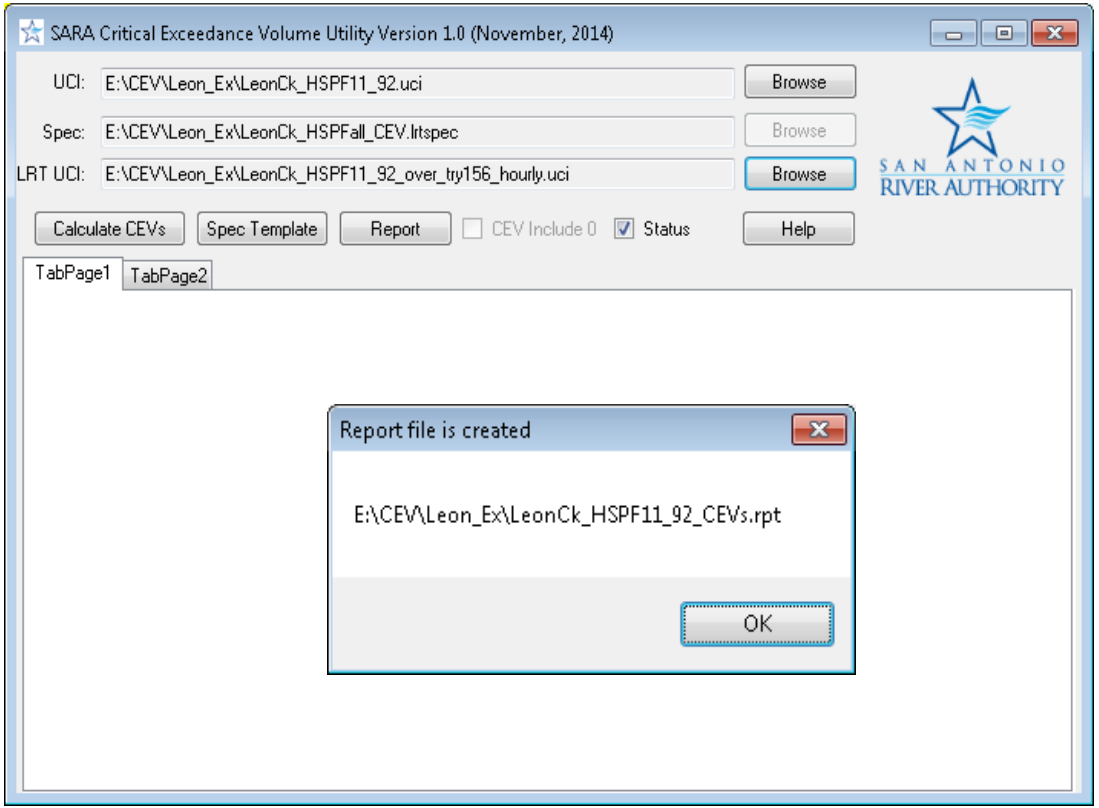
LID/BMP Removal Efficiencies

LID/BMPs	Fecal Coliform % Effectiveness		E. coli % Effectiveness		Pathogens % Effectiveness		Total P % Effectiveness	
	From	To	From	To	From	To	From	To
STRUCTURAL								
Bioretention Basin	70	70	70	70			50	50
Bioswale	-187	84			-100	-25	-100	99
Catch Basin Insert (see Note 2)	50	50					5	10
Dry Pond					30	30	0	0
Extended Detention Basin	0	0			78	78	20	94
Green Roof	99.3	99.3					-839	-839
Infiltration Basin	75	98			65	100	50	80
Infiltration Trench	96	96			65	100	15	45
Media Filter	47	47			30	30	30	30
Porous Pavement/Permeable Pavement	71	71					20	78
Rain Barrel/Cistern	100	100	100	100	100	100	100	100
Sand Filter	-70	54			30	30	27	80
Stormwater Wetland	85	85			55	97	48	48
Vegetative Filter Strip/Buffer Strip	0	0			30	30	-36	-36
Vegetative Swale	0	0			30	30	15	45
Vortex Separator	50	50					15	20
Wet Pond	64	99			30	30	43	43
Wet Vault					30	30	30	30
NON-STRUCTURAL								
Pet Waste Management (see Note 3)	2	6					5	5
Storm Sewer Maintenance								
Street Sweeping Art 4X	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.2
Street Sweeping Art 8X	58.4	58.4	58.4	58.4	58.4	58.4	58.4	58.4
Street Sweeping Res 2X	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8
Street Sweeping Res 4X	73.6	73.6	73.6	73.6	73.6	73.6	73.6	73.6
Street Sweeping CBD 363	98	98	98	98	98	98	98	98
Street Sweeping CBD 182	49.1	49.1	49.1	49.1	49.1	49.1	49.1	49.1

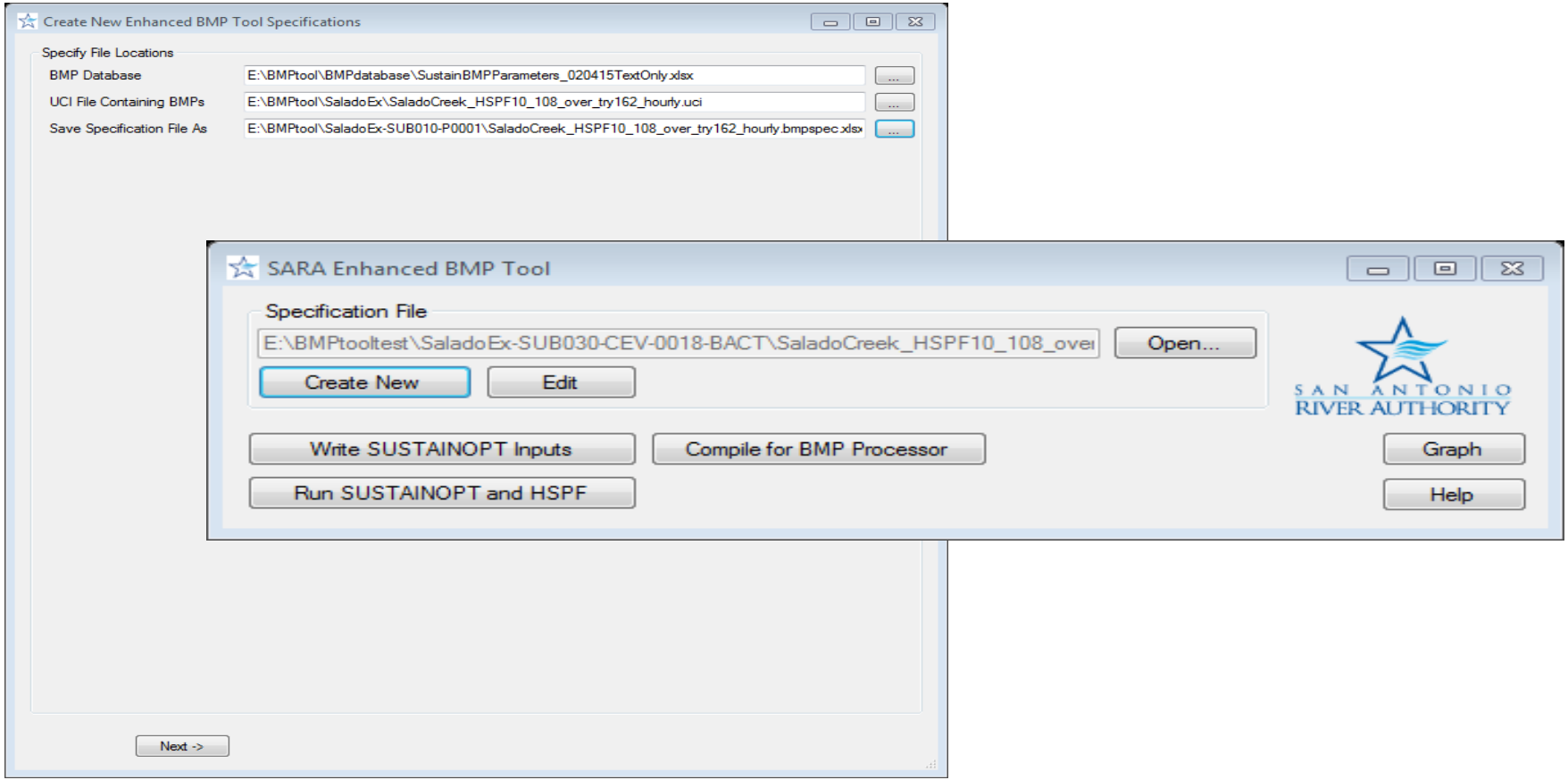
Development of CEVs



Running CEV Utility Tool



Running Enhanced BMP Tool



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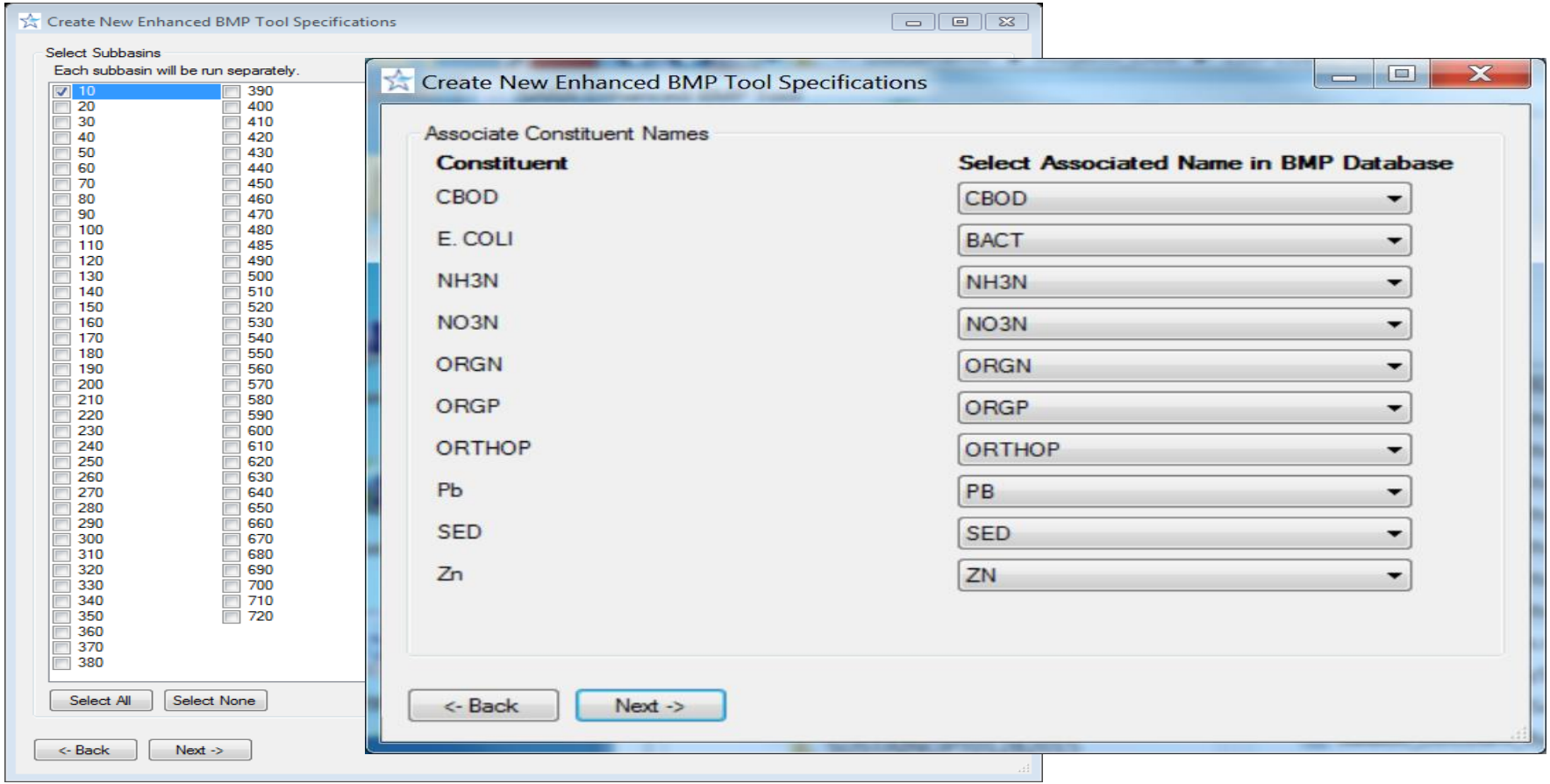

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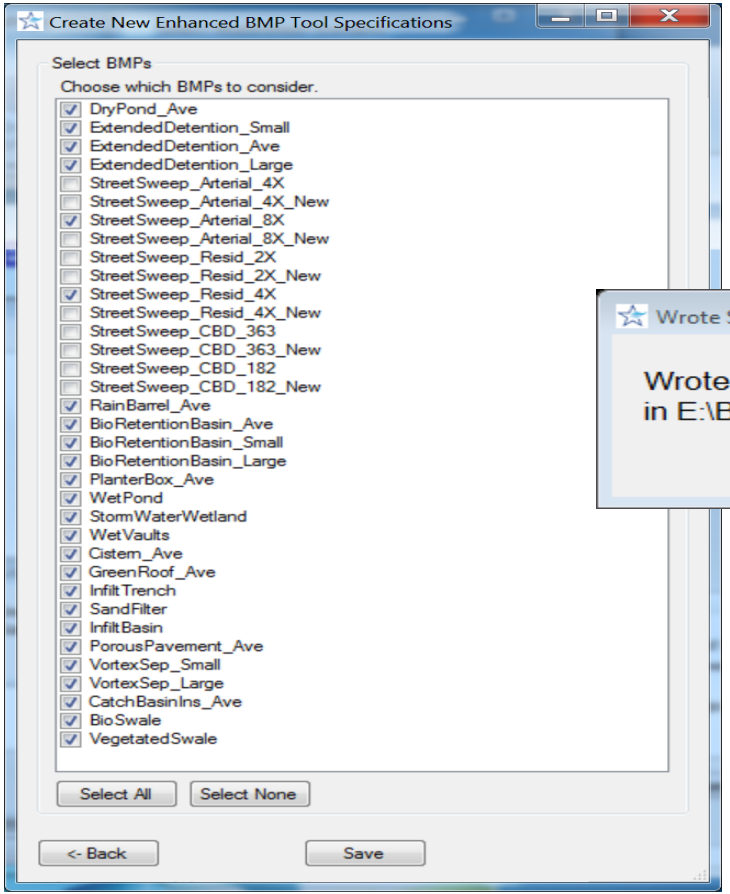

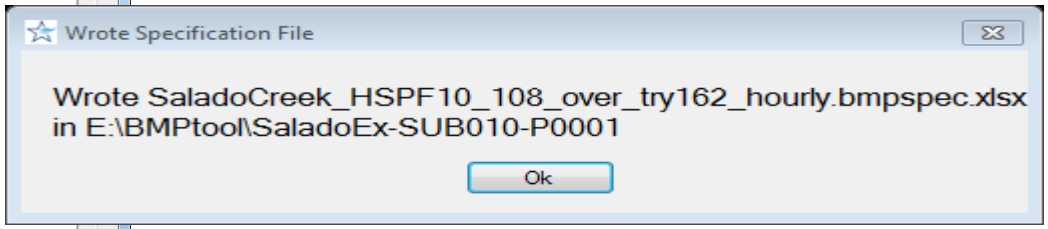

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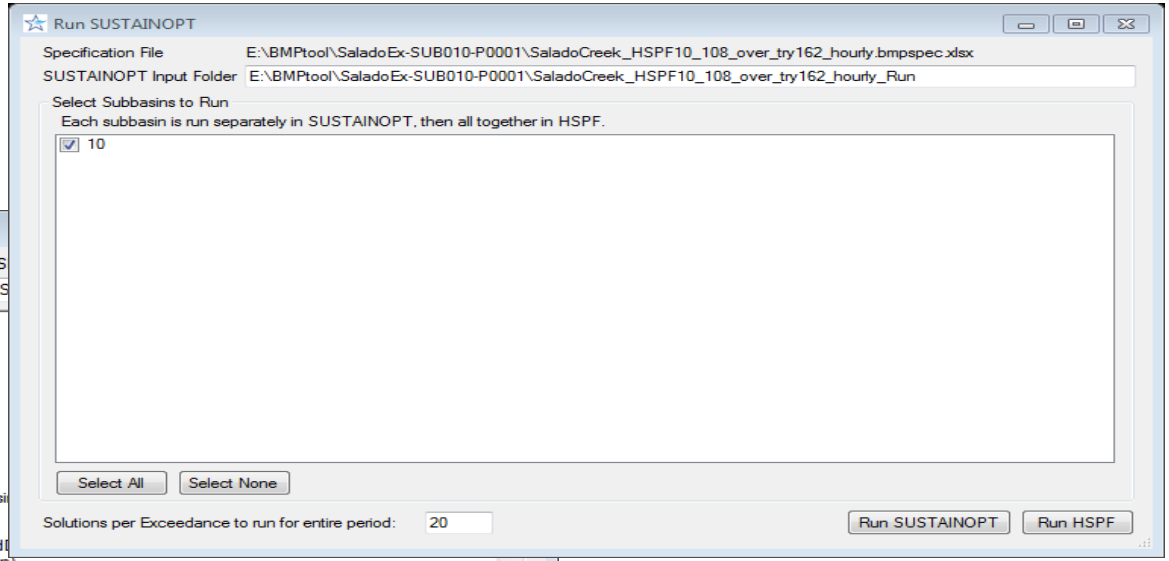
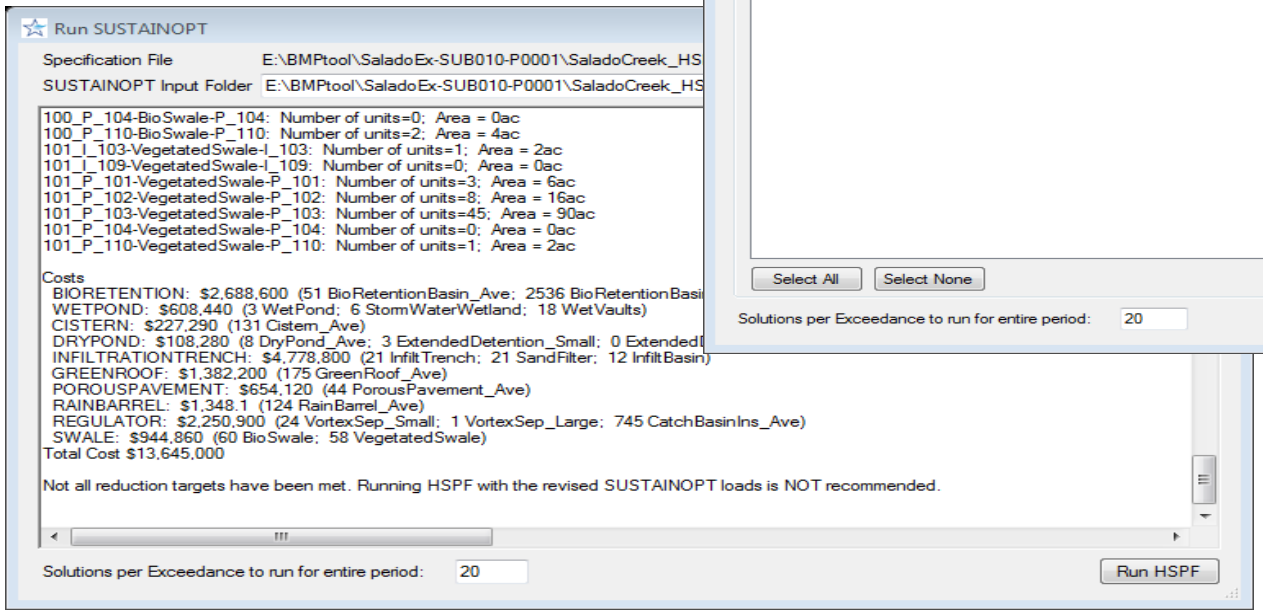
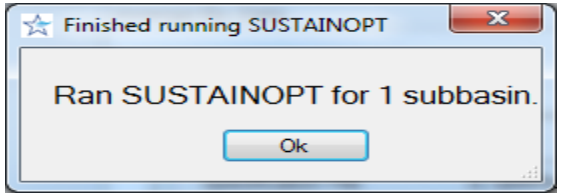






HSPF/SUSTAINOPT Linkage

HSPF

unit loads (inches of water, units/ac of constituents) and areas per each landuse

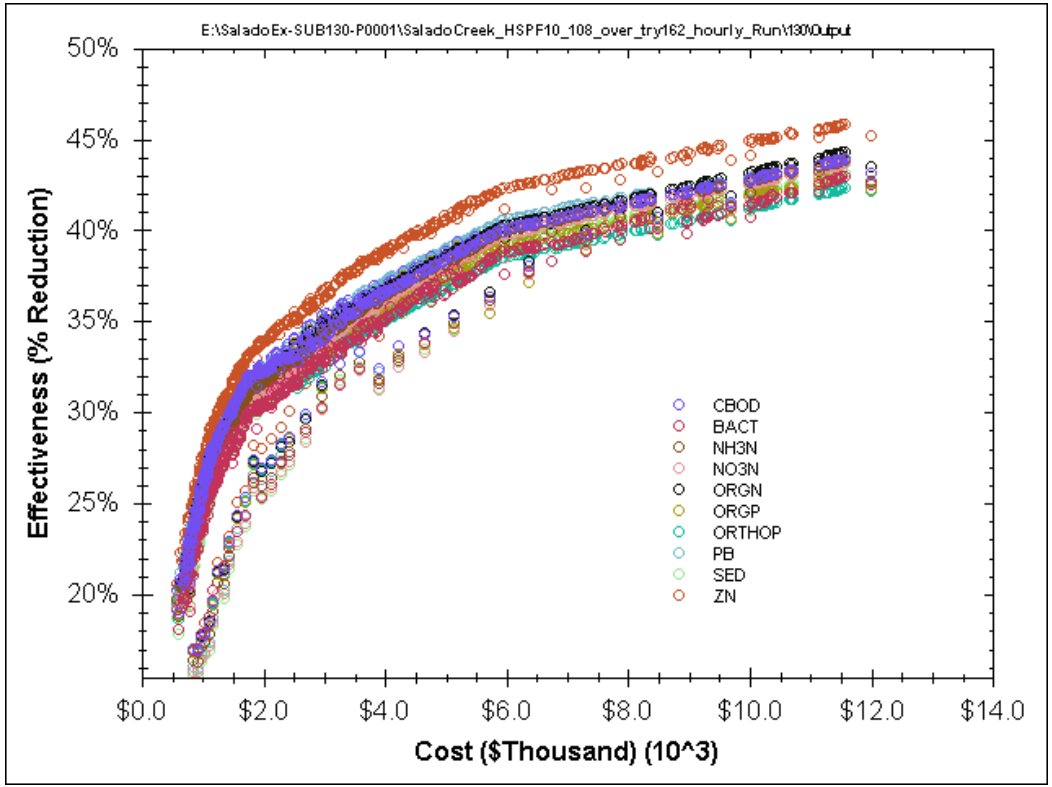
SUSTAINOPT

Total subbasin flows/loads computed from optimal set of landuse/BMP combinations

HSPF

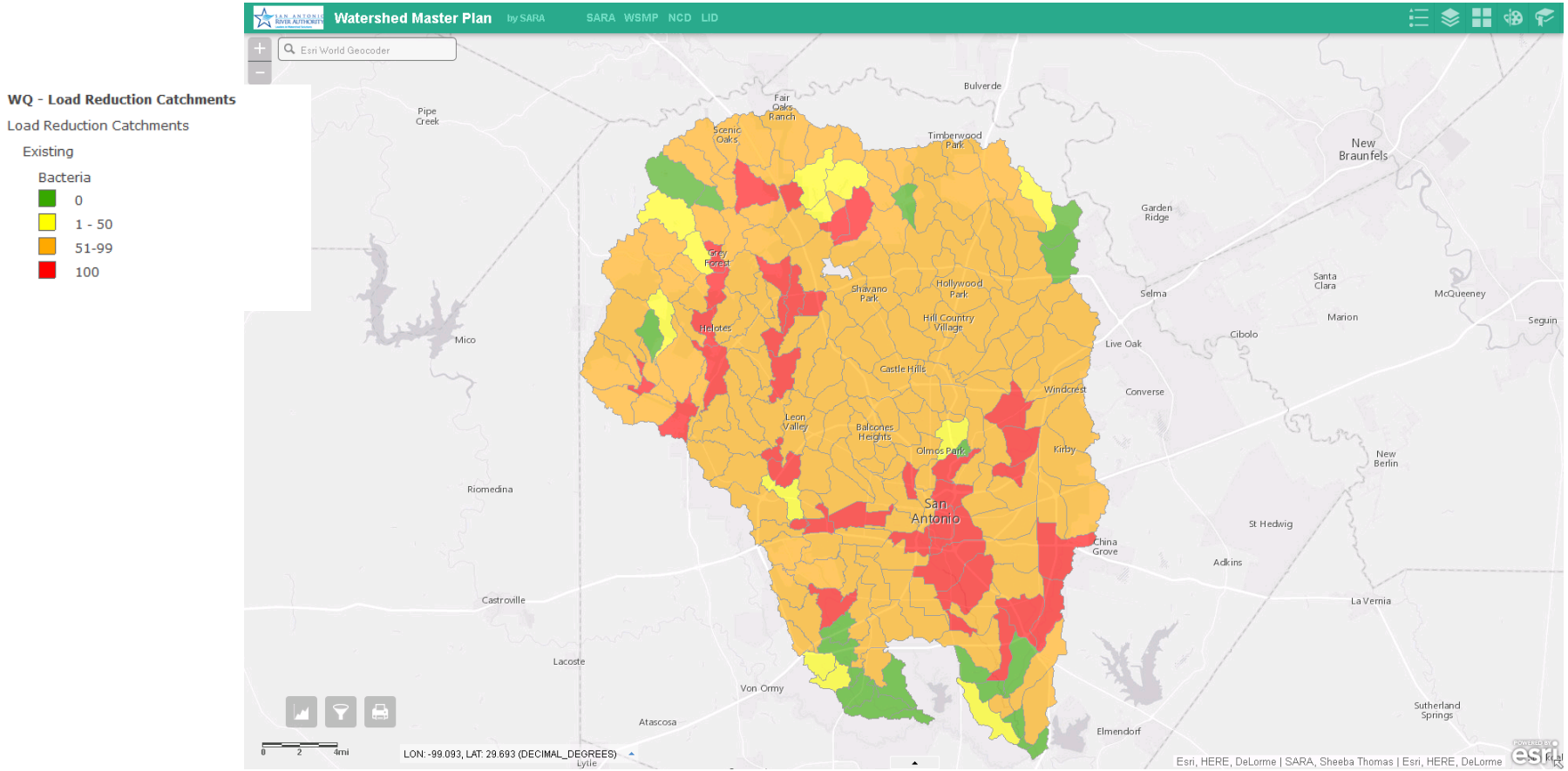
Revised flows/loads input into reach routing simulation

Cost Effective Curves



Results

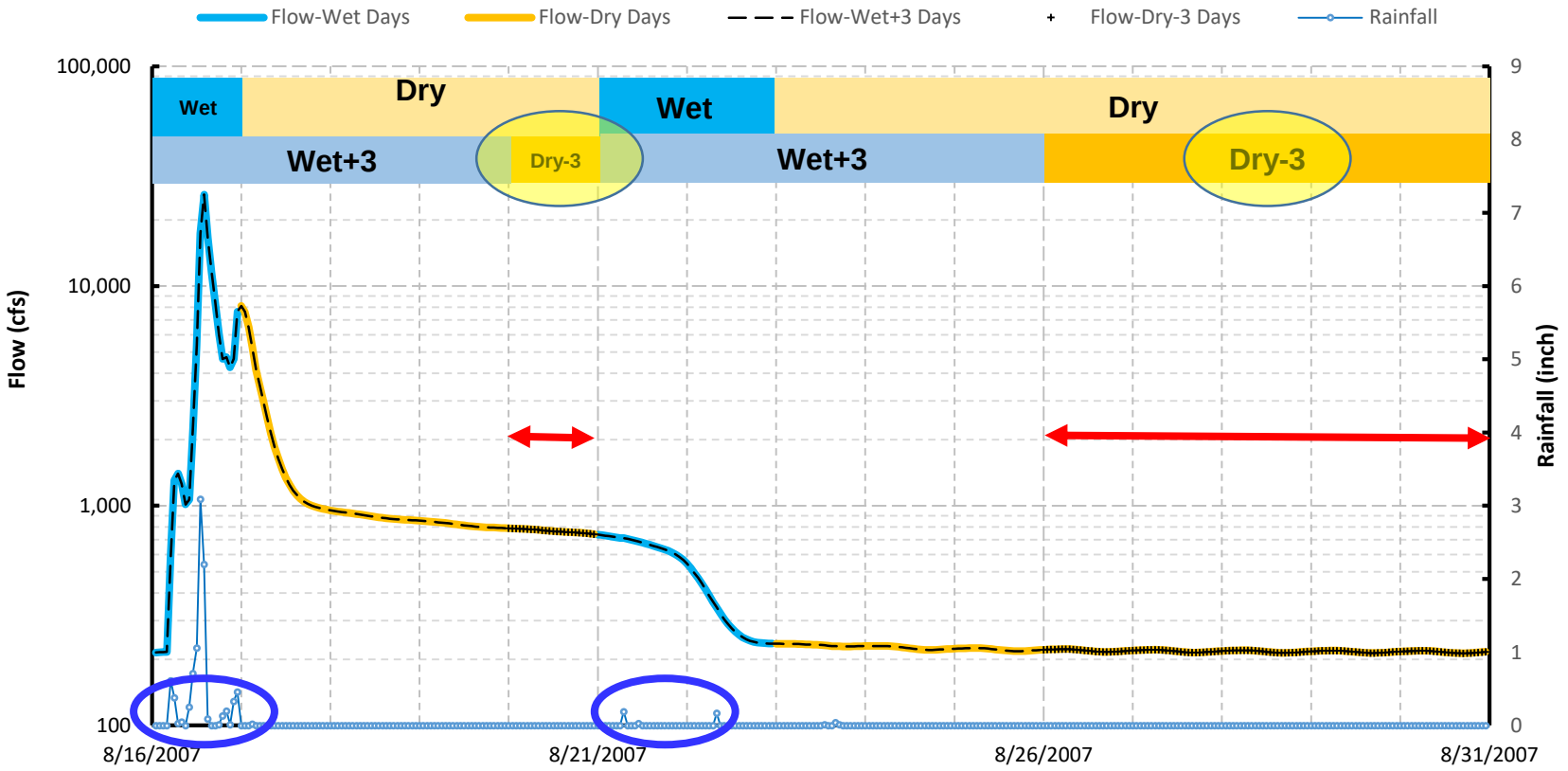
Required % Load Reduction in Catchments



Comparison of FWGM with SSO removal and BMP Application

Subbasin ID	Existing Conditions with SSO	Existing Conditions w/o SSO	No SSO with BMPs Analysis
100	4,971 #/dL	4,711 #/dL (5%⬇)	1,483 #/dL (70%⬇)
400	5,000 #/dL	3,833 #/dL (23%⬇)	364 #/dL (93%⬇)
510	1,873 #/dL	953 #/dL (49%⬇)	319 #/dL (83%⬇)

Wet/Dry Days

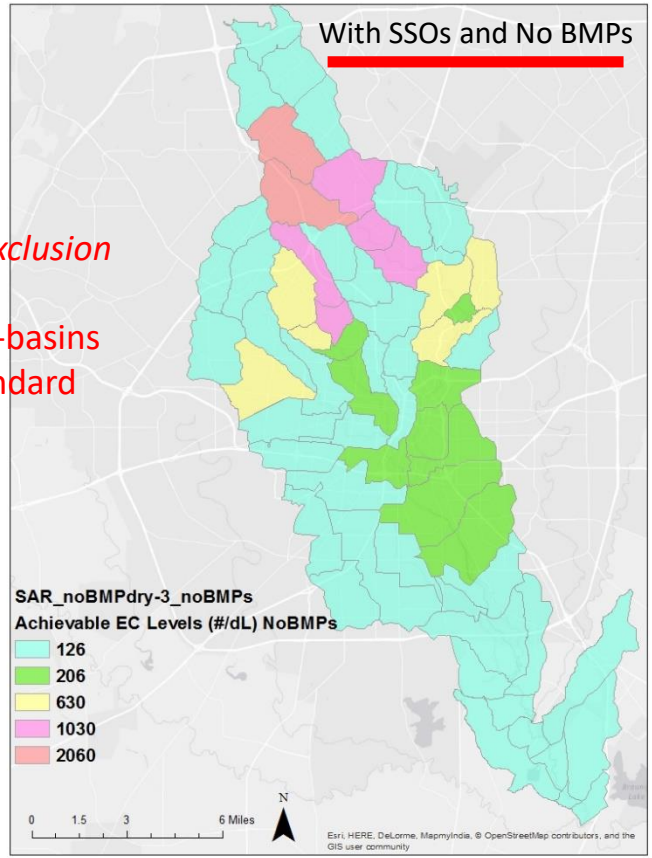

Flow-Wet Days
Flow-Dry Days
Flow-Wet+3 Days
Flow-Dry-3 Days
Rainfall
Wet
Dry
Wet
Dry
Wet+3
Dry-3
Wet+3
Dry-3
100,000
10,000
1,000
100
Flow (cfs)
9
8
7
6
5
4
3
2
1
0
Rainfall (inch)
8/16/2007
8/21/2007
8/26/2007
8/31/2007

Achievable Existing Conditions Standards under Dry-3 Conditions

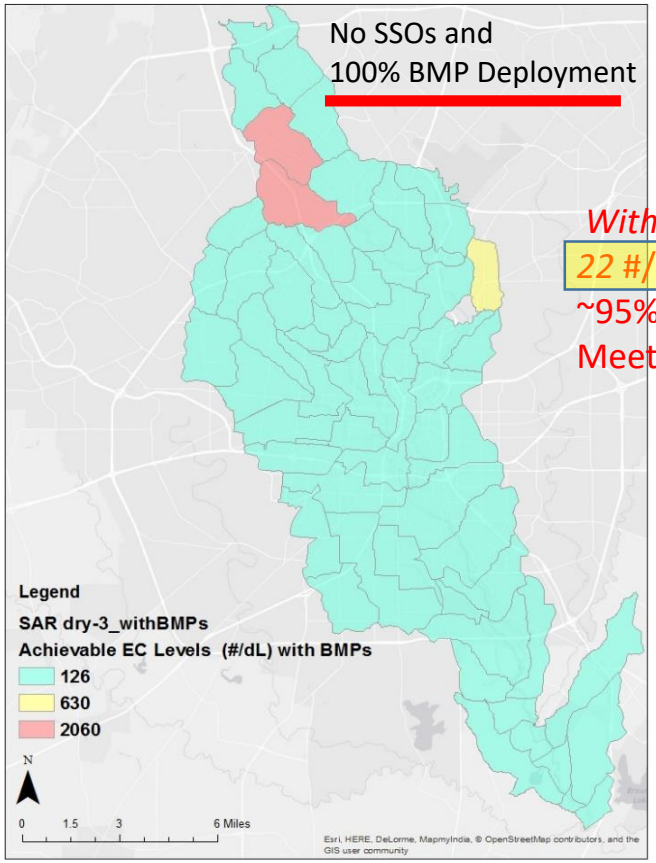
(i.e. only 72 hours after a storm event)

With flow exclusion
73 #/dL
~70% of sub-basins meeting standard

All flows
162 #/dL



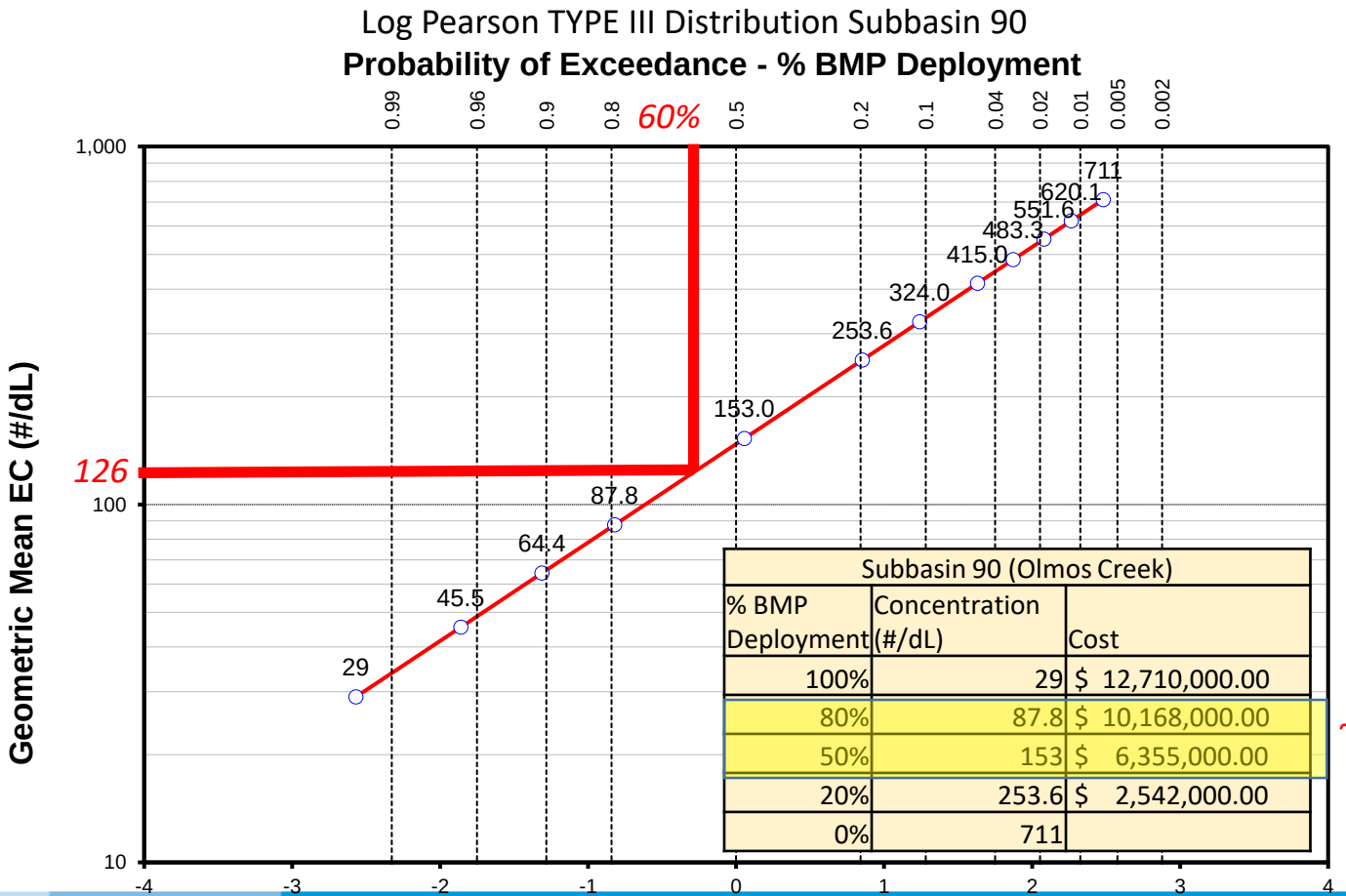
Extreme best case condition



With flow exclusion
22 #/dL
~95% of sub-basins Meeting standard

All flows
50 #/dL

Achievable EC Levels with % BMP Deployment (Subbasin 90)

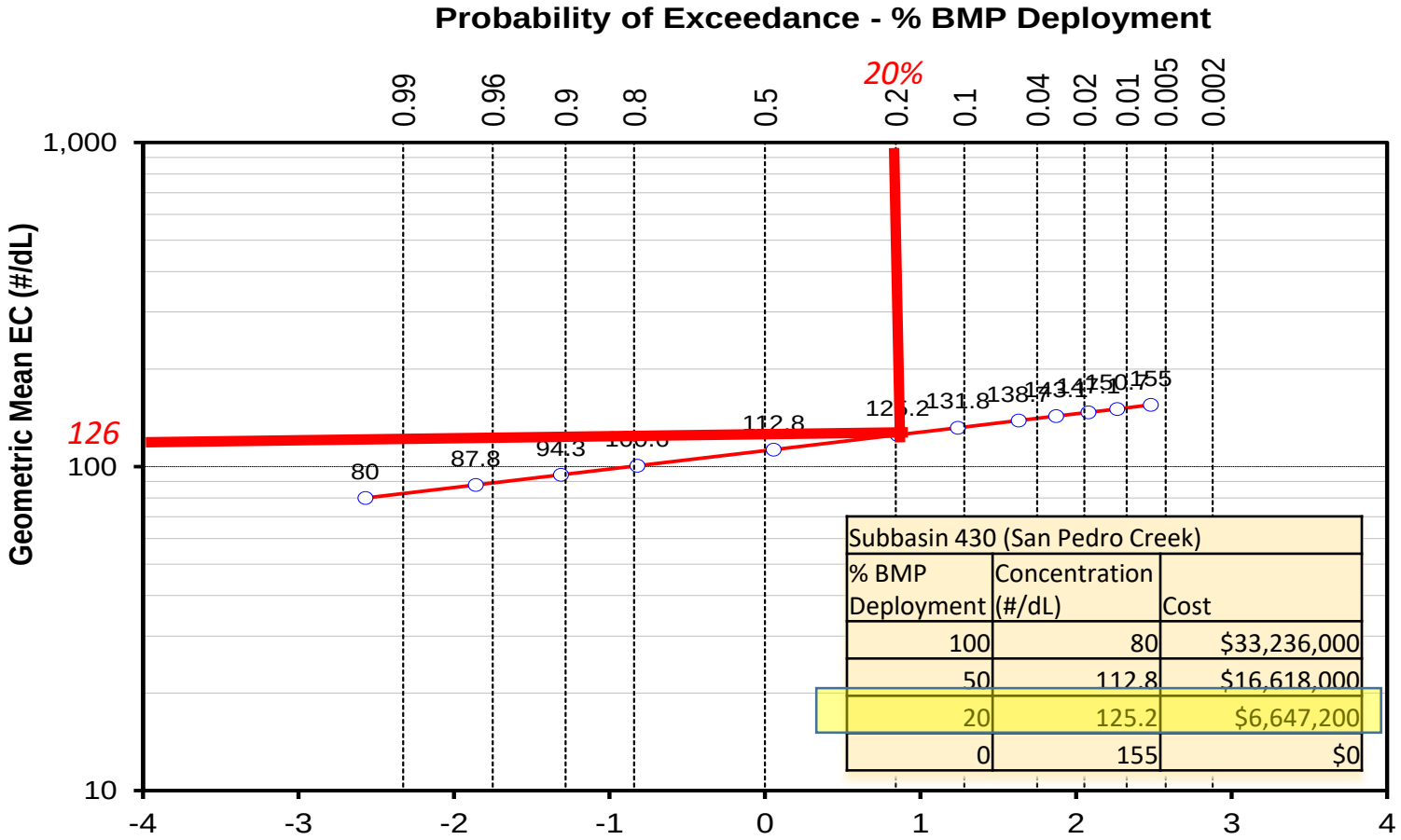


Subbasin 90 (Olmos Creek)		
% BMP Deployment	Concentration (#/dL)	Cost
100%	29	$ 12,710,000.00
80%	87.8	$ 10,168,000.00
50%	153	$ 6,355,000.00
20%	253.6	$ 2,542,000.00
0%	711	

~$7.6M

Achievable EC Levels with % BMP Deployment

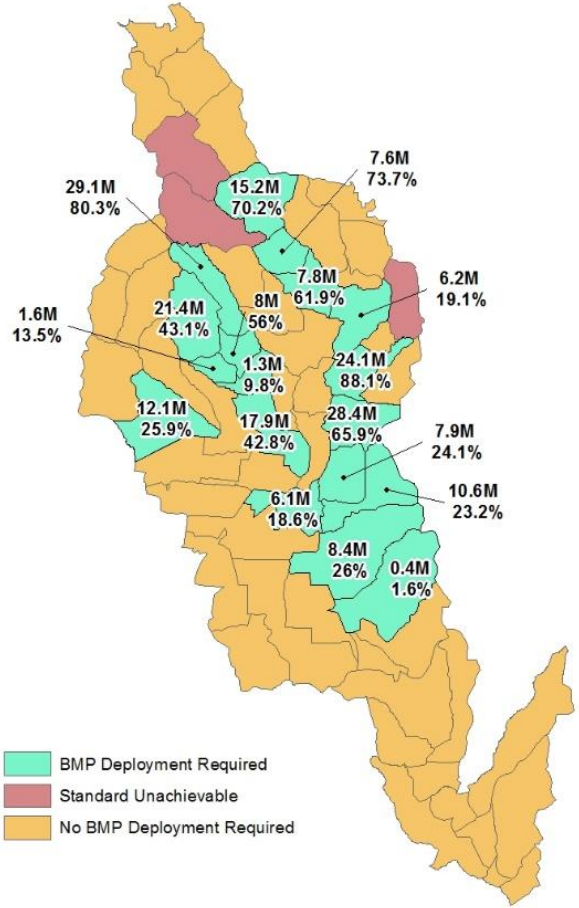
(Subbasin 430)



Subbasin 430 (San Pedro Creek)		
% BMP Deployment	Concentration (#/dL)	Cost
100	80	$33,236,000
50	112.8	$16,618,000
20	125.2	$6,647,200
0	155	$0

~$6.6M

Annualized Cost and % BMP Deployment Required



- Dry-3 and No SSOs condition only
- Approximately 95% of the subbasins meeting standard under the above conditions

Conclusion and Next Steps

Concerns with Current Contact Recreation(CR) Standard

- CR criteria non attainable under all flow conditions for all water bodies; GM influenced beyond the CR standards due to stormwater pulses.
- Costly 303d delisting (TMDLs, I-Plan, etc.)
- Background bacteria levels are typically high in humid, warm, urban environments

SARA's Recommendation for Application of WQ Standards to the Basin

- **Need more epidemiological studies to better understand the health risks**
- **Use of sub-basin specific goals**
  - Criteria based on
    - Wet days – no CR criteria apply (not safe to swim!)
    - 3 days following a wet day– noncontact recreation
    - Dry-3 – Primary CR apply
  - Subbasin level criteria
    - % of the time meeting criteria will be subbasin specific
- **Or, develop conditional basin attainment goals**
  - Like – " 72 hours after a storm event, with a deployment of 30% BMPs, meet 126 #/dL GM, in 90% of all sub-watersheds.

Visit with EPA Athens Lab, GA

Oct. 2015

Stephen R. Kraemer, Ph.D,
Research Hydrologist
US EPA National Exposure Research Laboratory
Ecosystems Research Division

Discussion with EPA

- EPA very pleased with the SARA Timeseries Utility Tool. They looked very happy to see the quality of work produced.
- EPA seemed to agree to have a link on the BASINS website so users can follow the link to a SARA website to download the SARA tools
- EPA would like to review more technical write-up on the SARA tools.
- EPA has been focusing on applying green infrastructure (GI) to rural/agricultural areas, but there is a push to also focus on urban areas. The SARA tools would be helpful in this area.
- EPA's Cincinnati Lab has on-going projects on continuous development of SWMM, EPA expressed interest using parts of SA Basin to do a case study with HSPF and SWMM

EPA - Discussion on E-Coli levels

- EPA recognized that the 126 level was not attainable in many cases. They mentioned a health-risk based study was on-going and potentially another epidemiological study was likely on-going as well.
- EPA stated that any change in water quality standard needed to start from the state, so SARA should discuss the matter with TCEQ to start the process. SARA stated that bacteria delisting was a national issue especially for Texas and many other states with warmer climates. SARA mentioned that the 126 value was in the federal 1987 Clean Water Act. EPA recognized that it was based on one epidemiological study back then and its application to all water bodies instead of just swimming beaches might be an issue.

Discussions with Texas Commission on Environmental Quality (TCEQ) (Jan 24, 2017)

- It was generally acknowledged that the 126 #/dL criterion was not attainable under all conditions
- EPA will be reluctant to accept any proposed change without demonstration of health effect.
- TCEQ has tried the approach of different flow regimes but not successful
  - EPA Review of 2010 Texas Surface Water Quality Standards
- SARA may want to check if other cities have success in attaining the 126 criterion. EPA would use those as examples of what could work.

EPA's Office of Water Seeking Feedback on Reducing Regulatory Burden

Dear Stakeholder,

Consistent with Executive Order 13777, EPA is seeking public input on existing regulations that could be repealed, replaced or modified to make them less burdensome.
As a part of this effort, we will be accepting written public comments through May 15, 2017, at docket EPA-HQ-OA-2017-0190. In addition, EPA's Office of Water (OW) will host a public listening session to obtain additional feedback on water regulatory actions on Tuesday, May 2, 2017, from 11 a.m. to 2 p.m. EDT. Please visit: www.epa.gov/aboutepa/office-water-feedback-reducing-regulatory-burden or see below for details.

Background

On February 24, 2017, President Donald Trump issued Executive Order (EO) 13777 on Enforcing the Regulatory Reform Agenda. The EO establishes the, "policy of the United States to alleviate unnecessary regulatory burdens placed on the American people". Among other things, it requires each agency to create a Regulatory Reform Task Force to evaluate existing regulations and to identify regulations that could be repealed, replaced or modified to make them less burdensome.
As part of implementing the EO, OW will be hosting a public listening session to solicit proposals for OW regulations that could be repealed, replaced, or modified to make them less burdensome. The focus of this listening session will be on water actions only.

Submitting Comments and/or Proposals to the Docket

The docket will be open for submitting recommendations until May 15, 2017. For those wishing to submit recommendations online, visit Docket ID No. EPA-HQ-OA-2017-0190 at Regulations.gov. Follow the online instructions for submitting comments. Once submitted, comments cannot be edited or removed from Regulations.gov.

To allow us to more effectively evaluate your suggestions, the Agency is requesting comments include:

- Supporting data or other information such as cost information

- Provide a Federal Register (FR) or Code of Federal Regulations (CFR) citation when referencing a specific regulation

- Provide specific suggestions regarding repeal, replacement, or modification.

SARA Submitted a Response to EPA

May, 12, 2017

San Antonio River Authority's (SARA) Comments and Proposals to "EPA's Office of Water Seeking Feedback on Reducing Regulatory Burden"

Docket ID No. EPA-HQ-OA-2017-0190

In 1986, the U.S. Environmental Protection Agency (EPA) published "Ambient Water Quality Criteria for Bacteria–1986." That document contained EPA's recommended water quality criteria for bacteria for the protection of bathers from gastrointestinal illness in recreational waters. The water quality criteria established levels of indicator bacteria, namely Escherichia coli (E. coli) and enterococci, that demonstrate the presence of fecal pollution and which should not be exceeded in order to protect bathers in fresh and marine recreational waters. For fresh water bodies, an E. coli level of 126 #/dL was established for primary contact recreation. The San Antonio River Authority (SARA) supports a bacteria standard for contact recreation, however we believe, for the reasons stated below, that the present standard should be modified to reflect eco-region, climate, flow conditions and other variables.

SARA recommends the following:

1. EPA work with the states and stakeholders to revise the bacteria standard to allow site-specific bacteria standards based on flow conditions and climatic conditions. One standard may not be appropriate for all the places due to varying physiographic and environmental conditions. In other words, an appropriate standard for South Texas may not be relevant for Oregon, or Virginia. For example, in warmer climates, E. coli are naturally occurring in the sediment, etc., and can add to the high bacteria levels in the streams especially during storm events.
2. SARA's suggestion includes the following:
    a. Attain Non-Contact Recreation standard during and after storm events, e.g. during and 72 hours after a 0.1 in/day or higher rainfall.
    b. Attain 126 #/dL for all other days for a percentage of the watershed and times as supported by best science.
3. SARA recommends EPA conduct additional epidemiological studies and solicit scientific stakeholder input to better correlate health risk to bacteria levels. The 126 standard was developed over 30 years ago based on coastal studies that were of a limited size which has led to questions about the scientific and health accuracy of the 126 standard. Developing stronger scientific data to support the bacteria standard is needed, and it needs to be region specific so the climate, soil, and other local factors can be incorporated. Many scientists and health officials have questioned the data behind the 126 level and as it is increasingly more difficult to meet that standard, particularly in warm, urban environments where bacteria occurs naturally in sediment and soils. It is important to develop more conclusive data to protect human and environmental health to support the 126, or a more appropriate standard, that is based on contemporary eco-region specific science. Is the 126 standard the right level to mitigate health risks?
4. Recommend EPA consistently promote LID (post construction BMPs) as the desired method in MS4 permit requirements, TMDLs and IPs to address bacteria. Such consistency will help advance the technical capabilities and improve the cost effectiveness of the BMPs/LIDs. The more the LID is used, the better and more cost effective it will become.
5. Recommend EPA link the monitoring and modeling data back to the MS4 permits to ensure there are permit actions that are reasonable and achievable that have been demonstrated to actually lead to improved water quality.

Indiana's Water Quality Standards (WQS) Regulation for Combined Sewer Overflows (CSOs)

Indiana's CSO Rule

Indiana indicated that after a CSO community implements all feasible controls identified in a LTCP, it may still be infeasible to attain a full body contact recreation use for 365 days in some cases. Indiana wants their WQS regulations to correctly reflect the highest attainable designated use for these waters.

The rule adopts provisions to allow for the coordination of LTCPs and WQS. Specifically, it:

(1) Establishes a CSO Wet weather limited use. This use is a subcategory of the recreation use. Once assigned to a specific waterbody in a future action, this use would apply only during and after a CSO event for up to 4 days and serve to suspend the normally applicable bacteria criteria. At all other times, the current designated use and associated bacteria criteria would apply. The CSO wet weather limited use, as it is assigned to a specific waterbody in WQS, will have to include a description of the limitation (e.g. expected number of overflows or percent capture of storm flow in a typical year). The use designation must reflect the highest attainable use expected AFTER implementation of the LTCP.

E. Coli criteria for Classified surface water

Use	Colony Forming Units (CFUs)/100mL			
Primary Contact Recreation	Geometric Mean Apr. 1 – Oct. 31	Geometric Mean Nov. 1 – Mar. 31	Single Sample Maximum Apr. 1 – Oct. 31	Single Sample Maximum Nov. 1 – Mar. 31
Swimming Beach	160	800	732	3655
Public Access	262	1310	1198	6580
Restricted Access	427	2135	1950	9760
Secondary Contact Recreation	Geometric Mean Jan. 1 – Dec. 31		Single Sample Maximum Jan. 1 – Dec. 31	
Public Access	2135		9760	
Restricted Access	2135		9760	

Kansas surface water quality standards, Prepared by the Kansas Dept of Health and Enviroment. June 21, 2015

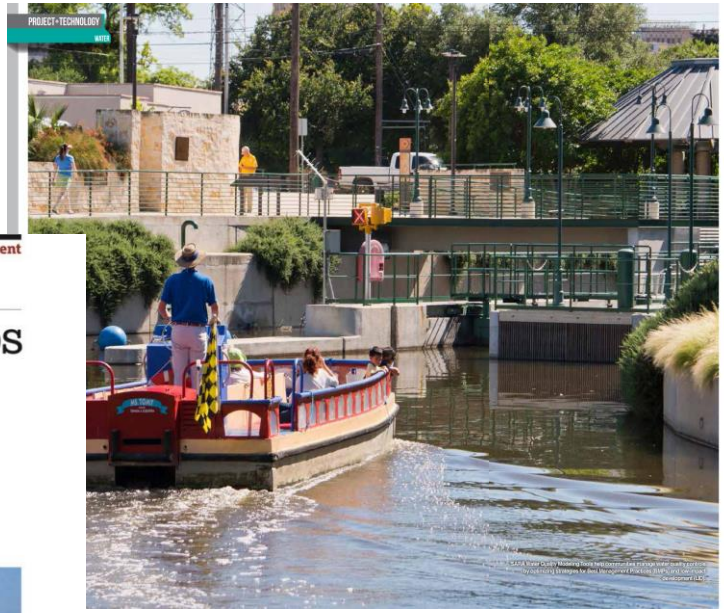
Project Exposure

- **Conferences**
- **Newsletters**

- **Web access**

  https://www.sara-tx.org/flood-management/water-quality-modeling-tools/

SARA Tools Gaining National Attention



Watershed Management

San Antonio River Authority develops tools to improve water quality

The San Antonio River Authority in the US state of Texas has invested substantially in the development of innovative tools to support sustainable water quality enhancements in the San Antonio River Basin.

Through a collaborated effort with the US Federal Emergency Management Agency (FEMA), the City of San Antonio, Bexar County, and other stakeholders, the San Antonio River Authority (SARA) completed a flood insurance study for the Bexar County watersheds in the San Antonio River Basin. The study produced a set of up-to-date hydrologic and hydraulic models that allowed SARA to conduct holistic watershed master planning on several major watersheds including the Salado Creek, Leon Creek, and Upper San Antonio River watersheds. The holistic master plan is to integrate hydrologic, hydraulic, stream restoration, water quality, and other components into a watershed-wide planning process to assist in prioritizing

SELECTION AND IMPLEMENTATION OF BEST MANAGEMENT PRACTICES (BMPS) AND LOW IMPACT DEVELOPMENT (LID) STRATEGIES TO ADDRESS URBAN RUNOFF POLLUTION HAVE BECOME IMPORTANT COMPONENTS OF HOLISTIC WATERSHED MASTER PLANNING.

Aerial view of the San Antonio area showing its urban watershed.
Photo by Yu-Chun Su, LA

BMP/LID OPTIMIZATION IN SAN ANTONIO

WATER QUALITY MODELING TOOLS PROVIDE ALTERNATIVE APPROACH TO STORMWATER MANAGEMENT.

By Sheeba Thomas, Ph.D., P.E., PMP, CFM, and Yu-Chun Su, Ph.D., P.E., CFM, CPESC, CPSWQ

IN ADDITION TO flood controls, selection and implementation of Best Management Practices (BMPs) and low-impact development (LID) strategies to address urban runoff pollution have become important components of holistic watershed master planning and stormwater management. These strategies can not only help address existing water quality impairments and support regulatory compliance, but also guide future watershed planning — especially when substantial population growth and urbanization is projected.

However, the efforts have been limited to qualitative planning due to the lack of suitable tools to conduct quantitative assessment. As a result, the effectiveness of the BMP/LID could only rely on follow-up long-term monitoring to verify, and in many cases, there is a lack of planning effort prior to implementing BMP or LID strategies.

To help address this issue and support compliance with increasing water quality regulations, under the sponsorship and direction of the San Antonio River Authority (SARA), a project team led by Lockwood, Andrews & Newnam, Inc. (LAN) and AQUA TERRA Consultants (a division of RESPEC) created a suite of water quality modeling tools. The developed tools enabled quantitative water quality master planning and BMP/LID prioritization, and were applied to three major watersheds in the San Antonio River Basin (SARB): the Salado Creek, Leon Creek, and Upper San Antonio River (USAR) watersheds.

Innovative SARA tools

The SARA modeling tools developed are on the cutting edge of the water quality modeling profession nationwide. Dynamic watershed and instream water quality models were first developed for selected SARB watersheds using the Hydrological Simulation

American Council of Engineering Companies (ACEC) National Recognition Award

Recent Developments and Next Steps

- Presentation to EPA and TCEQ
- Coordination with local entities for planning
- Follow-up meeting with TCEQ for further discussion on TSWQS revision
- Need more communities to deliver similar message to agencies

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