

From BMP Assessment Report (2010)

Table 1

SAN ANTONIO ZOO POINT SOURCE, Existing *E. coli* Load = 3.92E+14 org/yr, Required Load Reduction = 3.91E+14 org/yr (99.9%)

Causes and Sources of Bacterial Impairment	Management Measures and Targeted Critical Areas	Estimated Potential Load Reduction (org/yr)	Technical and Financial Assistance Needed for Each Measure	Education Component for Each Measure (and Other Education)	Schedule of Implementation for Each Measure	Interim Measurable Milestones for Each Measure	Indicators to Measure Progress	Monitoring Component	Responsible Entity
ZOO- Sump and Interceptor	Sump and interceptor maintenance plan and implementation	3.91E+14 (99.9%)	NA	Develop maintenance plan for all interceptors and sumps	SHORT TERM Completed 2009	Regular inspection to document functionality of sumps and interceptors	NA	NA	Zoo
ZOO- Internal waterway	Disinfection of Zoo baseflow		\$2,500,000	None/optional exhibits in Brackenridge Park	SHORT TERM February 2014 Operational	NA	Reduction in base flow-related bacteria concentrations	Monitor zoo outfall to verify disinfection	CoSA (TCI)

Table 2

STORM WATER RUNOFF POINT SOURCES, Existing Load = 5.55E+15 org/yr, Required Load Reduction = 1.67E+15 org/yr (30%)

Causes and Sources of Bacterial Impairment	Management Measures Targeted Critical Areas	Estimated Potential Load Reduction (org/yr)	Technical and Financial Assistance Needed for Each Measure	Education Component for Each Measure (and Other Education)	Schedule Of Implementation for Each Measure	Interim, Measureable Milestones for Each Measure	Indicators to Measure Progress	Monitoring Component	Responsible Entity
URBAN RUNOFF- Avian land deposition	Bird feeding ban at River Walk and City Parks in riparian areas	1.1E+14 (2%)	\$100,000	Signs and exhibits, public awareness programs	LONG TERM 2010+ (Ongoing)	Fewer birds observed along riparian areas	Reduction in runoff-related bacteria concentrations basin-wide	Routine basin monitoring	CoSA (CCDO)
	Bird exclusion/deterrent practices and devices at River Walk and selected riparian areas		\$60,000 / YR	Education of COSA Parks staff by Texas Parks and Wildlife	LONG TERM 2010+ (Ongoing)	Fewer birds roosting along riparian areas	Reduction in runoff-related bacteria concentrations basin-wide	Routine basin monitoring	CoSA (CCDO)
URBAN RUNOFF- Pet land deposition	Increase awareness and enforcement of pet control ordinance	1.7E+14 (3%)	Already funded, additional funds could be used to expand public awareness campaign and enforcement	Public awareness program at Community Link Centers (Valley View, South Park, McCreless and Las Palmas)	LONG TERM 2010+ (Ongoing, Public Campaign Promoting Responsible Pet Ownership)	Pet owner participation, number of citations and complaints	Reduction in runoff-related bacteria concentrations basin-wide	Routine basin monitoring	CoSA (ACS)
	Expand Pooper Scooper programs		Expand existing program to all City Parks: \$100,000	Signs and exhibits, public awareness programs	SHORT TERM 2010-2012 (Ongoing, 75 of 230 Parks)	Pet owner participation, number of citations and complaints; increase in number of mits used per year	Reduction in runoff-related bacteria concentrations basin-wide	Routine basin monitoring	CoSA (Parks)
URBAN RUNOFF- General sources	Inspection of new construction sites	1.4E+15 (25%)	Funded by Bexar County storm water fee	Signs and exhibits at community events, workshop presentations, website information	SHORT TERM 2010-2010 LONG TERM 2012+ (Ongoing)	Reduction of storm water runoff from new construction sites	Reduction in bacteria concentrations	Routine basin monitoring	Bexar County, SAWS

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STORM WATER RUNOFF POINT SOURCES, Existing Load = 5.55E+15 org/yr, Required Load Reduction = 1.67E+15 org/yr (30%)

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URBAN RUNOFF- General sources	Provide illegal dumping signs for existing vegetated swales/filter strips (70.5 miles of earthen channel on Alazan, Apache, Martinez, Olmos, 6-Mile Creek, and USAR)	1.4E+15 (25%)	\$10,000	Signs	SHORT TERM 2010-2012 <i>(Completed, signs were placed along some creeks to discourage dumping)</i>	Regular site inspections to verify that refuse (including fecal material) is no longer being dumped in buffer areas	NA	Routine basin monitoring	CoSA (TCI), Bexar County, SAWS, SARA
	BMP assessment studies		\$50,000	Understanding of feasibility	SHORT TERM 2010-2015	Complete by 2010, make recommendations for basin-wide deployment	NA	NA	SARA, SAWS, CoSA (TCI)
	BMP pilot studies		\$100,000	Local performance data	SHORT TERM 2010-2015	Complete by 2010, make recommendations for basin-wide deployment	NA	BMP monitoring	SARA, SAWS, CoSA (TCI)
	Mission Drive-In redevelopment project: LID practices		\$849,000 from CWA 319(h) grant	Education of elected officials, developers, and general public	SHORT TERM 2010-2013 <i>(Monitoring Ongoing)</i>	LID BMPs installed, BMPs monitored, analysis of cost-benefit, reporting	Reduction in runoff related bacteria from the project site	Monitor BMPs at site	SARA, CoSA (TCI)
	New structural storm water BMPs (should cover ~50% of basin area based on BMPs with 50% overall effectiveness) or LID BMPs		\$58,000,000 (based on \$1.50/cf, and \$20,000/ac)	Education for contractors and property managers on BMP construction and maintenance	LONG TERM basin-wide implementation begins 2012+; redevelopment opportunities	Complete pilot projects and make recommendations for basin-wide deployment by 2015	Reduction in runoff related bacteria concentrations basin-wide	Monitor BMP inlets and outfalls during pilot project; routine basin monitoring for basin-wide deployment	CoSA

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URBAN RUNOFF- General sources	Elmendorf Lake Dredging Project: removal of 80,000 c.y. of silt and sediment from lake	1.4E+15 (25%)	Staff currently trained and project funded \$3,000,000	Educate developers and contractors about BMPs for construction under TPDES permit	SHORT TERM Complete summer 2011	Cubic yards of sediment removed	Reduction in bacteria levels released from lake	Routine basin monitoring	CoSA (Parks)
	Public education, Riverwalk Implementation Plan		\$50,000	Educate citizens on need for bacteria controls	LONG TERM 2010+ (Ongoing)	Media release	RWWA Continuation. Reduction in E. coli levels due to people not feeding the wildlife	NA	CoSA (CCDO), Bexar, SAWS, SARA
	River loop area sediment removal		Funded	NA	SHORT TERM 2010-2012 LONG TERM 2010+ (Completed)	Improved water clarity	Reduced bacteria concentrations in river loop	Routine basin monitoring	CoSA (TCI)
	Evaluate restoration of Westside Creeks		\$150,000	Report, technical data	SHORT TERM 2010-2012 (Ongoing)	Identify bacteria sources and loads	Reduced bacteria concentrations	Synoptic monitoring	SARA
	Urban horse stable assessment		Unknown	NA	LONG TERM 2010+ (Ongoing, Permitting and Inspection process in place)	Reduced bacteria concentrations	Reduced bacteria concentrations	Routine basin monitoring	SARA, CoSA (ACS), SAWS
	Mission Reach ecosystem restoration and recreation project		Entire Mission Reach project budget \$270,000,000	Interpretive signage, outreach publications, media notices and announcements	SHORT TERM completed by 2013 (Completed)	Restore and enhance riparian and aquatic habitats/features	Improve water quality, reduced bacteria concentrations	Routine basin monitoring	SARA

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URBAN RUNOFF – General Sources	Environmental investigations coordinator	1.4E + 15 (25%)	SARA employee assigned to this effort	NA	Ongoing SHORT TERM 2010-2012, LONG TERM 2012+	Identify sources and possible resolutions to water quality issues	Address concerns and issues	Routine basin monitoring	SARA
	Creek Book		FY 2010 \$70,000, FY 2011 \$20,000	Easy to use guide for home owners, property managers, tips on preventing pollution	Ongoing SHORT TERM 2010-2012, LONG TERM 2012+	NA	Conduct survey - how is Creek Book changing behaviors	Monitor results of survey	SARA
	Watershed wise campaign		FY 2010 \$230,000, FY 2011 \$210,000	Provide general watershed education to residents of SAR basin and tributaries	Ongoing SHORT TERM 2010-2012, LONG TERM 2012+	NA	Public survey – how many people are aware of program	Phone survey	SARA
	SAR River Walk Implementation Project		Entire project budget \$320,000	Workshops educate watershed residents, tourists, and merchants to change behaviors and reduce bacteria levels in SAR	Ongoing project time line: January 2008 – September 2010 (Complete)	Identification of merchant and patrons behaviors that contribute to elevated E. coli levels	E. coli reduction in River Walk	Monitoring E. coli levels in SAR Loop upstream of La Villita	RWWA

Table 3

DIRECT NONPOINT SOURCES, Existing Load = 1.51E+14 org/yr, Required Load Reduction = 0.76E+14 org/yr (50%)

Causes and Sources of Bacterial Impairment	Management Measures and Targeted Critical Areas	Estimated Potential Load Reductions (org/yr)	Technical and Financial Assistance Needed for Each Measure	Education Component for Each Measure (and Other Education)	Schedule of Implementation for Each Measure	Interim Measurable Milestones for Each Measure	Indicators to Measure Progress	Monitoring Component	Responsible Entity
WILDLIFE- Animal pound wash-down	Relocate facility to another watershed	1.5E+12 (1%)	Already funded	None	SHORT TERM Completed 2009	NA	Reduction in baseflow-related bacteria concentrations	Routine basin monitoring	CoSA (ACS)
WILDLIFE- Bat colony in Houston Street bridge	Bat exclusion/deterrent practices and devices	1.5E+12 (1%)	Assistance from Texas Parks and Wildlife, \$3,000	None	SHORT TERM Completed 2009	Annual inspection to verify exclusion of bats from city	Reduction in baseflow-related bacteria concentrations	Monitoring at bridge, routine basin monitoring	CoSA (CCDO)
WILDLIFE- Avian direct deposition	Bird feeding ban at River Walk and City Parks in riparian areas	2.3E+13 (15%)	\$100,000	Signs and exhibits, public awareness programs	SHORT TERM 2010-2012 (Ongoing)	Fewer birds observed along riparian areas	Reduction in baseflow-related bacteria concentrations	Routine basin monitoring	CoSA (CCDO)
	Bird exclusion/deterrent practices and devices at River Walk and selected riparian areas		\$100,000	Education of CoSA Parks staff by Texas Parks and Wildlife	SHORT TERM 2010-2012 (Ongoing)	Fewer birds roosting along riparian areas	Reduction in baseflow-related bacteria concentrations	Routine basin monitoring	CoSA (CCDO)
WILDLIFE- Feral hog deposition	Access review	1.5E+12 (1%)	Unknown	Education of landowner	LONG TERM 2012-2015+	Reduce waste deposition	Reduction in baseflow-related bacteria concentrations	Routine basin monitoring	SARA, TSSWCB
LIVESTOCK	CAFO Review	<1%	Unknown	Education of landowner	SHORT TERM 2010-12	Eliminate release of waste	Reduction in baseflow bacteria in PiCoSA Creek	Routine basin monitoring	SARA
LIVESTOCK	Access review	7.6E+12 (5%)	Unknown	Education of landowner	LONG TERM 2012-2015+ (Ongoing)	Reduce waste deposition	Reduction in baseflow-related bacteria concentrations (Permitting and Inspections are performed through ACS)	Routine basin monitoring	SARA, TSSWCB, CoSA (ACS)

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HUMAN ORIGIN-wastewater collection system	Adaptive monitoring pilot effort	1.8E+13 (12%)	SARA sampling crews, lab, SARA funding for FY 2011 \$26,366; will continue in subsequent years	NA	SHORT TERM Ongoing 2011 LONG TERM 2012+	Identification of "hot spots" for bacteria concentrations; annual summary report	Reductions in bacteria concentrations	Synoptic and intensive monitoring	SARA
	Infrastructure assessments of "hot spots"- San Pedro Cr @ Alamo St., Apache Cr @ Brazos St., etc.		SAWS inspection crews, sampling equipment, inspection equipment	NA	SHORT TERM Ongoing 2011	Repairs to infrastructure replacement of specific pipe segments, contaminant if needed	Reduction in baseflow-related bacteria concentrations	Synoptic monitoring	SARA, CoSA, Alamo Heights, Balcones Heights, Castle Hills, Leon Valley, Olmos Park, Terrell Hills, Fort Sam Houston, other small systems
	Identify and repair illicit connections to River Walk		Already funded, \$1,300,000	Education and training with TPDES permit	SHORT TERM 2009-2010 (Complete)	Number of illicit connections documented, repaired	Reduction in baseflow-related bacteria concentrations	Routine basin monitoring	CoSA, SAWS
	Private lateral rehab		Investigate the level to which private sewer laterals may be contributing to bacteria loadings	Homeowner education	LONG TERM research issue beginning 2012+; scope development, funding, pilot testing, and evaluation to follow	Number of defective connections, number repaired	Reduction in baseflow-related bacteria concentrations	Routine basin monitoring	SAWS, Alamo Heights, Balcones Heights, Castle Hills, Leon Valley, Olmos Park, Terrell Hills, Fort Sam Houston, other small systems
	Odor/corrosion control program: optimize existing ferrous sulfate injection program to preserve structural integrity of mains		Currently part of SAWS wastewater infrastructure master plan	None	SAWS continues to implement, other utilities develop plan (Ongoing)	Development of additional plans	Reduction in baseflow-related bacteria concentrations	Routine basin monitoring	SAWS, Alamo Heights, Balcones Heights, Castle Hills, Leon Valley, Olmos Park, Terrell Hills, Fort Sam Houston, other small systems

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HUMAN ORIGIN-wastewater collection system	Wastewater main cleaning program: improve flow capacity	1.8E+13 (12%)	Unknown	Eliminate illegal dumping of debris in manholes, i.e. vandalism	LONG TERM Existing and ongoing 2010+	Miles of mains cleaned annually	Reduction in baseflow-related bacteria concentrations	Routine basin monitoring	SAWS, Alamo Heights, Balcones Heights, Castle Hills, Leon Valley, Olmos Park, Terrell Hills, Fort Sam Houston, other small systems
	Capital improvement program: Existing projects under design or construction		\$50,000,000	NA	LONG TERM under design or construction 2009-2014+	Miles of mains constructed, new infrastructure	Reduction in bacteria concentrations	Routine basin monitoring, synoptic monitoring	SAWS, Alamo Heights, Balcones Heights, Castle Hills, Leon Valley, Olmos Park, Terrell Hills, Fort Sam Houston, other small systems
	Capital improvement projects: additional programs		Unknown	None	LONG TERM existing and ongoing 2010+	Miles of mains renewed annually	Reduction in baseflow-related bacteria concentrations	Routine basin monitoring	SAWS, Alamo Heights, Balcones Heights, Castle Hills, Leon Valley, Olmos Park, Terrell Hills, Fort Sam Houston, other small systems
HUMAN ORIGIN-homeless/vagrant population	Provide restroom facilities and maintenance in areas with significant vagrant populations	2.3E+12 (1.5%)	Unknown	None	SHORT TERM 2009-2011 (Public Restrooms available at approximately six locations downtown)	Inspection to verify utilization of facilities provided	Reduction in baseflow-related bacteria concentrations	Routine basin monitoring	CoSA (CCDO)
	Cleaning, brush control in encampment and dumping		Unknown	None	LONG TERM 2010+ (Ongoing)	Inspections to verify	Reduction in baseflow-related bacteria concentrations	Routine basin monitoring	CoSA (TCI, Code, SAPD)

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HUMAN ORIGIN- septic systems	Inspection and repair (if necessary) of near-stream septic systems	2.3E+12 (1.5%)	Unknown	None	LONG TERM 2010-2012	Number of failures located, number repaired	Reduction in baseflow-related bacteria concentrations	Routine basin monitoring	Bexar County, Hill Country Village, Hollywood Park, Shavano Park
	Connection of 117 homes in Espada community.		NA	None	SHORT TERM Completed 2008	# of homes connected to sewer	Reduction in baseflow-related bacteria concentrations	Routine basin monitoring	SAWS, CoSA
MISC- Low Flows	Introduce new 0.65 MGD outfall at HB Gonzalez Convention Center	Effective reduction 1.1E+12 (0.7%)	Already completed	None	SHORT TERM Completed 2007	Flow records	Reduction in baseflow-related bacteria concentrations	Basin monitoring inside and downstream of River Loop	SAWS
MISC- River Walk/ downtown sources (from improper waste disposal and debris accumulation)	Owner/tourist awareness and education campaign	7.6E+11 (0.5%)	Part of City plan to improve overall water quality in River Walk, \$320,000	Provide training to stakeholders for proper cleanup and educate on water	SHORT TERM Began 2008 (Ongoing)	Stakeholder participation; visual improvements in appearance of water	Reduction in baseflow-related bacteria concentrations	Basin monitoring inside and downstream of River Loop	RWWA
	Investigate and implement measures to improve flow circulation/water quality		Not currently funded; \$12,000-\$100,000 required	Technical assistance required	SHORT TERM began 2008 (Ongoing)	Visual improvements in appearance of water Prelim Tech Report	Reduction in baseflow-related bacteria concentrations	Basin monitoring inside and downstream of River Loop	CoSA (TCI)
	Specially designed boat (Lady Eco) for removing floating debris (~30,000 lb/yr)		\$100,000 received from Parks Foundation	Instruction provided by Aquasweep	LONG TERM began 2008 (Ongoing)	Annual load of debris removed	Reduction in baseflow-related bacteria concentrations	Basin monitoring inside and downstream of River Loop	CoSA (CCDO)
	Investigate and implement measures to improve cleaning and maintenance operations, in order to prevent load from entering River Loop		Current costs: City-\$46,000; SAWS grant-\$15,000. More funding needed to purchase additional power washing equipment	Education and training for maintenance personnel	SHORT TERM Completed 2008	Monitor and inspect River Loop clean-up practices	Reduction in baseflow-related bacteria concentrations	Basin monitoring inside and downstream of River Loop	CoSA (CCDO)

Table 4

EXISTING PROGRAMS, that reduce bacteria and should be continued, but are not recommended for expansion and are not expected to result in new load reductions

Causes and Sources of Bacterial Impairment	Management Measures and Targeted Critical Areas	Estimated Potential Load Reduction (org/yr)	Technical and Financial Assistance Needed for Each Measure	Education Component for Each Measure (and Other Education)	Schedule of Implementation for Each Measure	Interim Measurable Milestones for Each Measure	Indicators to Measure Progress	Monitoring Component	Responsible Entity
HUMAN ORIGIN-landfills	Assessment of abandoned landfill sites	7.6E+11 (0.5%)	Unknown	None	SHORT TERM 2010-2012	Assess potential contributions	Reduction in baseflow bacteria concentrations	Basin monitoring inside and downstream of River Loop	CoSA, SAWS, SARA
Fecal deposition collecting in streets	Citywide street sweeping, twice/yr on residential streets, 4/yr on major streets (11,025 tons/yr waste removal)	NA	Currently funded by storm water fee	Existing community outreach programs, presentations	Existing and ongoing	Miles/years of gutter cleaned and tons/year of waste removed	NA	NA	CoSA (TCI)
Fecal deposition collecting on sidewalks	Downtown sidewalk cleaning (trash, waste, and litter). Scrubber cleans over 2.5 million sqft of sidewalk annually	NA	Currently funded and staff trained by storm water fee	Existing community outreach programs which educates the public on the importance of proper waste disposal	Existing and ongoing (Sidewalk scrubbers were purchased to prevent runoff during sidewalk cleaning processes)	Reduction in TSS, floatables, bacteria, etc. in city storm drains and River Loop; keep records on sqft cleaned	NA	NA	CoSA (CCDO)

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URBAN RUNOFF- Pet land deposition	Pooper Scooper program at city parks with mutt mitt dispensers (28,000 lb/yr based on 112,000 mitts x ~4 oz/mitt) note: this item includes existing program, recommendations for expansion included under storm water source section	NA	\$5600/yr for mitts, ~\$360/yr/dispenser	Programs and signs	Existing and ongoing at the following parks: Bluegrass Island, Clover Island, Guenther Mill, HEB, Johnson St bridge, Josephine St, King William, Mahncke, Mesquite, Nueva St, Scates, Sheridan, Wesley, and Woodlawn	Mitts per year	NA	NA	CoSA (Parks)
Zoo animal husbandry wastewater	Wet well installation to reroute zoo animal wastewater that has historically been released into USAR; and divert it to SAWS sanitary sewer system	NA	Already completed \$33,000	Zoo maintenance personnel briefed on the sump and wet well operation	Installed 2004	Bacteria from Hippo, pheasant, parrot-raptor, and seal pens diverted from USAR	NA	NA	SAWS
Low flows	Reclaimed wastewater outfalls (002 & 003), operating near Brackenridge Park	NA	Currently funded	None	Existing and ongoing	Flow records	NA	NA	SAWS

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San Antonio River Tunnel	Maintenance: removal of debris after storm events (150 tons/yr)	NA	Currently funded	Education is being provide on illegal dumping into drainage ways by community outreach	Existing and ongoing	Tons of debris removed	NA	NA	CoSA (TCI)

Key:



- Ongoing or completed items
- Items started
- Changed, not in original form
- Repeated in two sections

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