

# SMC REGIONAL STORMWATER MONITORING COMPARISON AND EVALUATION

OVERVIEW OF CITY OF LONG BEACH  
MONITORING PROGRAM

May 15, 2012

# MS4 Permit

- Los Angeles RWQCB
- Term: 1999 – ?
- Most monitoring plan details prescribed in permit

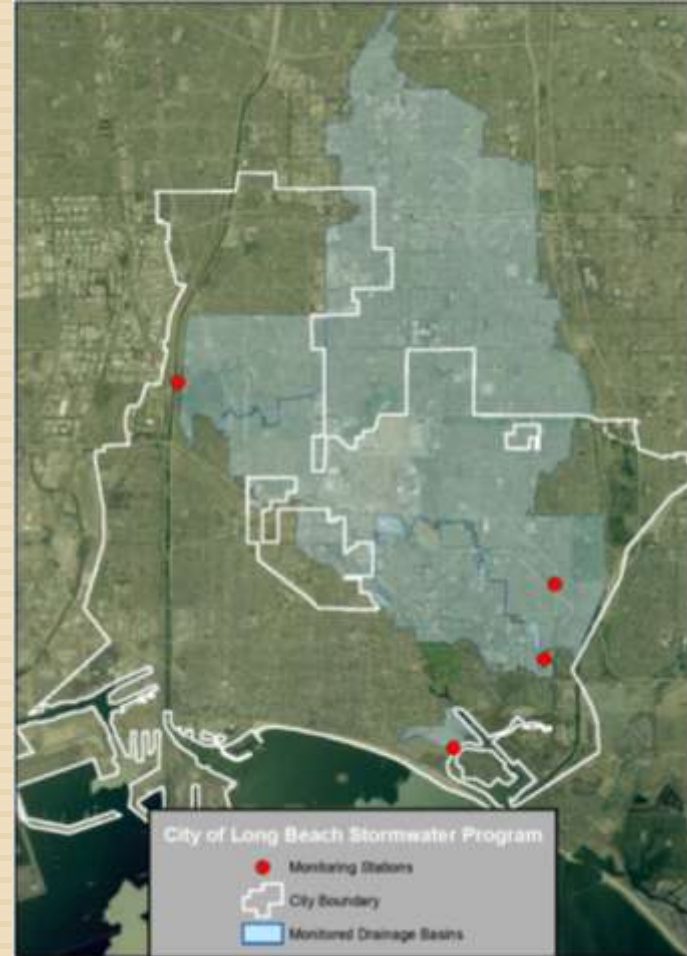
Description	# sites	# storm events	# dry events <sup>1,2</sup>
<b>Mass emission – complete</b>	4	4	2
<b>Mass emission – TSS</b>	4	All > 0.25 inches	

1. Dry events between April 15<sup>th</sup> and Sep 30<sup>th</sup>
2. Only 3 sites, Belmont Pump Station now has a low flow diversion

# Site Selection

- Mass emission stations
  - ▣ Prescribed in permit
  - ▣ Calculate mass emissions from each watershed, cumulative impact of MS4 inputs, trends
- Special Studies
  - ▣ Simulated Parking Lot Runoff (SCCWRP)
  - ▣ Watershed Source Tracking (Colorado Lagoon)
  - ▣ Upstream pH Investigation in Los Cerritos Channel
  - ▣ Stormwater Plume Mapping (Key constituents and toxicity)
  - ▣ Survey of Metals and Chlordane in LCC Estuary Sediments
  - ▣ Synoptic Surveys for Dry Weather Copper and FIB Loading in the LCC

- **Los Cerritos Channel**  
**17,716 acres (7,972 in City)**
- **Bouton Creek-**  
**2,526 acres**
- **Belmont Pump Station**  
**205 acres**
- **Dominguez Gap Pump Station**  
**2,082 acres**



## Mass Emission Sites and Watersheds

# Mass Emission Sampling

- Flow-paced at 4 Mass Emission sites
- Entire storm event sampled – directly match total flow with total rainfall for data analysis
- American Sigma autosamplers for composites; Campbell Scientific CR-1000 for control of sampling/data storage.
- 3 to 4 20-L borosilicate glass composite bottle per event
- Solid Teflon intake hose
- Toxicity samples come from the flow weighted composites – provides chemistry for toxicity assessment
- Single grab samples for bacteria, O&G, TPH
- Continuous measurement of temperature at selected sites
- Point measurements of pH, DO, Conductivity, Salinity, Temperature

# Event summary

- Go / no-go decision based on multiple forecasts and models (and experience)
- One to two field teams of 2 persons (~4 sites each), 1 person storm control
- Pre-Storm site visit (try < 6 hrs before event): ice bottles, check intakes and general site conditions
- Teams positioned within study area within 3-6 hours of expected rainfall, no night-time restrictions
- Storm control remotely sets sites to trigger and adjusts flow pacing remotely just prior to rainfall
- Bacteria samples taken near peak or falling leg and delivered to the lab (6 hrs hold time)

# Event summary

- Storm control monitors sampling progress and directs field teams to sites where bottles are filling and require change out
- Storm control may adjust flow pacing when bottles are changed out if actual rainfall is expected to far exceed predicted rainfall
- When rainfall ends and flow has fully subsided, field crews collect the final bottle and prepare for subsampling
- Maintenance conducted after major events and at least once a month through the storm season depending on specific site characteristics

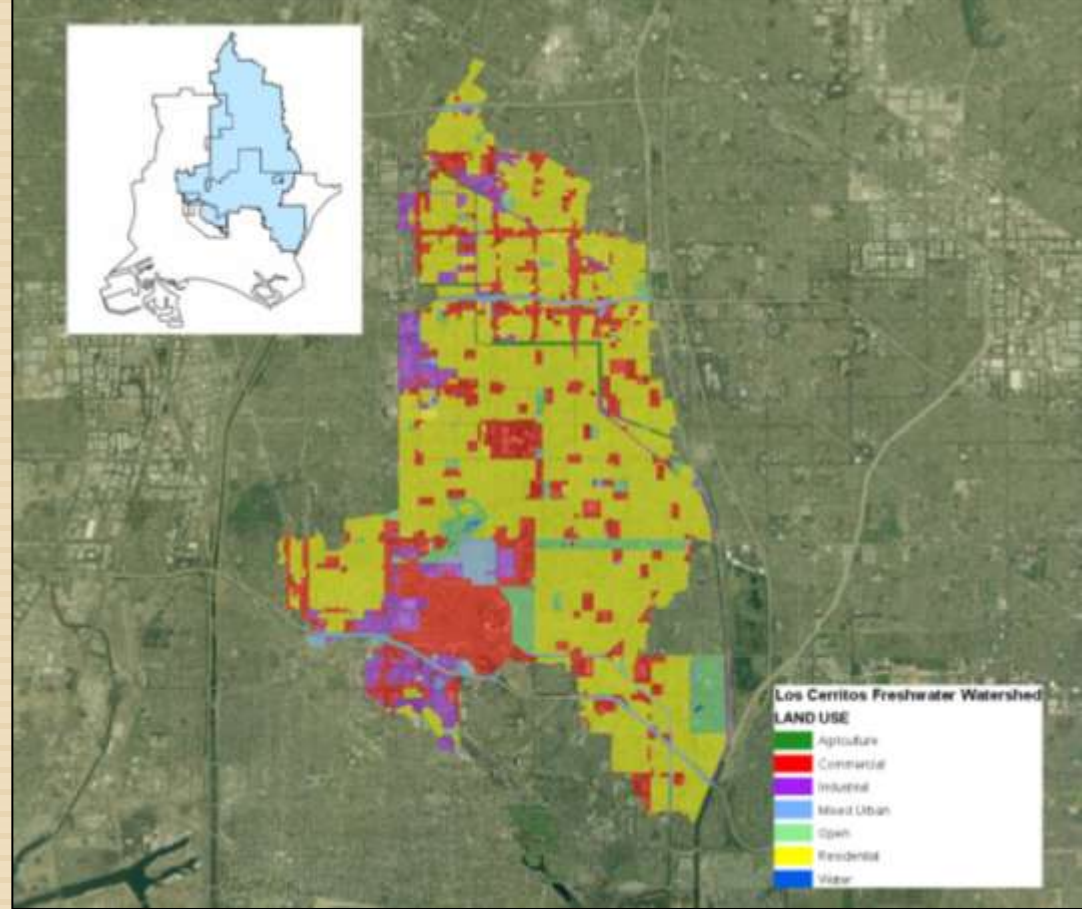
# Analytes

- Conventional – TSS,TVS, BOD, COD, TOC, alkalinity, pH (field & lab) nutrients, specific conductance, fluoride, chloride, MBAS, total hardness
- Indicator Bacteria (total & fecal coliform, enterococcus
- Dissolved and Total Metals (11)
- Chlorinated Pesticides
- PCBs
- Organochlorine Pesticides
- Organophosphate Pesticides (diazinon, chlorpyrifos, malathion)
- Pyrethroid Pesticides (11)
- Toxicity Testing/TIEs (urchin, water flea)



# Quality Assurance

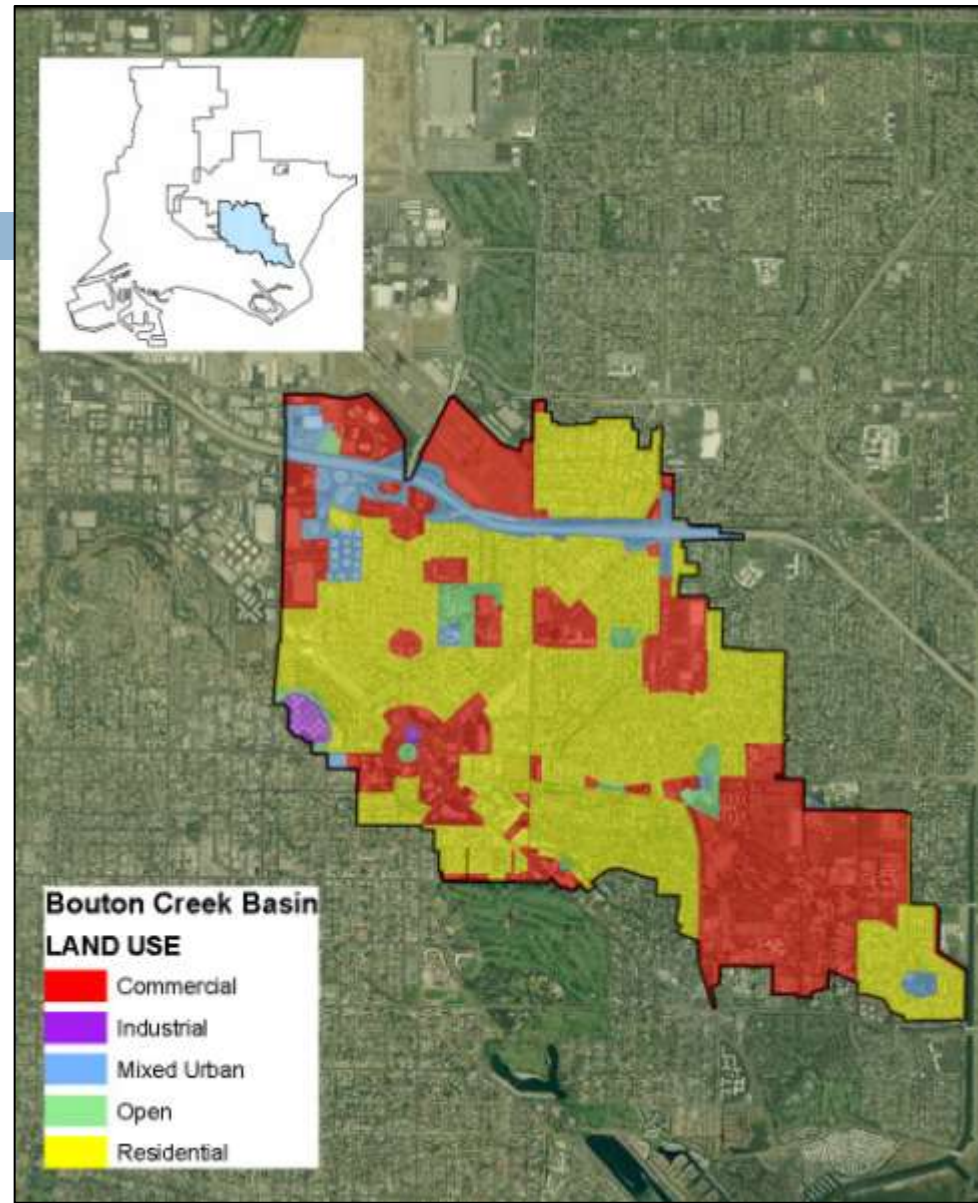
- Field/Subsampling Dup, Matrix Spike/Spike Duplicates for each Event
- Composite Bottles batch cleaned, blanked, and individually tracked.
- QA-Grade Laboratory bottles purchased in Lots and blanked before deployment
- Subsampling hoses batch cleaned inside and out, blanked, bagged on the ends and stored in large sealed bags for later use.
- Subsampling of Composites perform by field staff trained in the procedures – allows for blind dups and effective testing of entire process



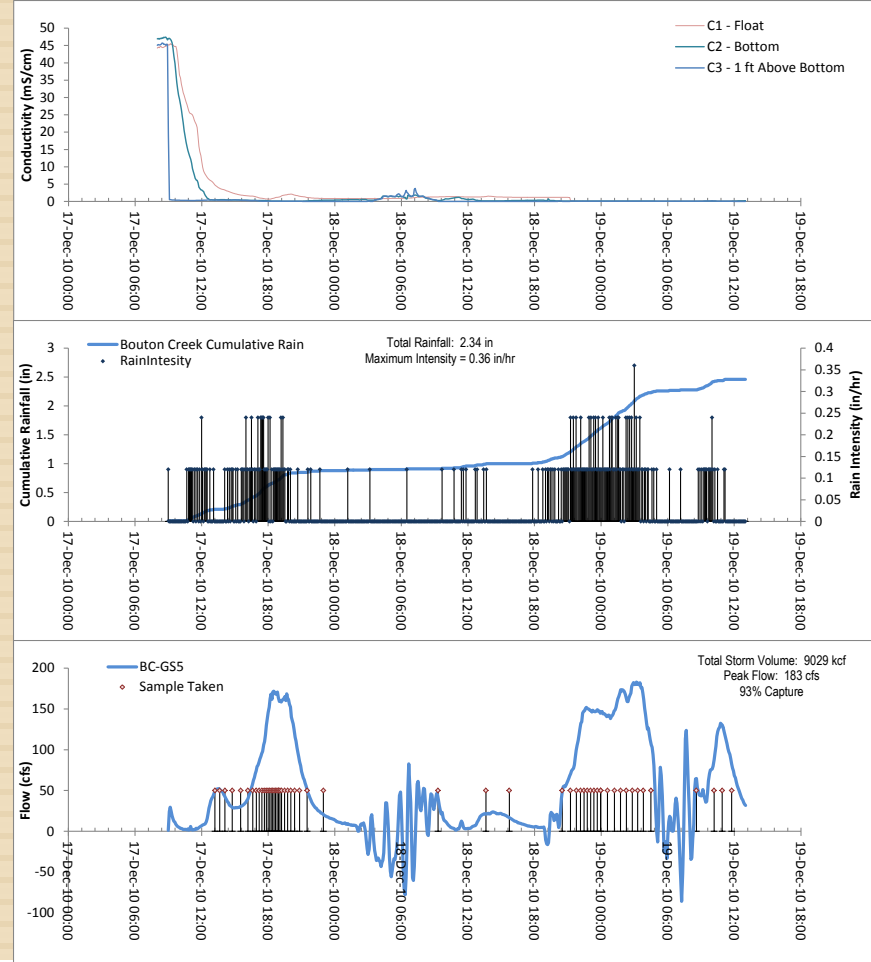
## Los Cerritos Channel

Uses Stage-Discharge Rating Curve from former Gaging Station (~150-200 ft upstream )

# Bouton Creek

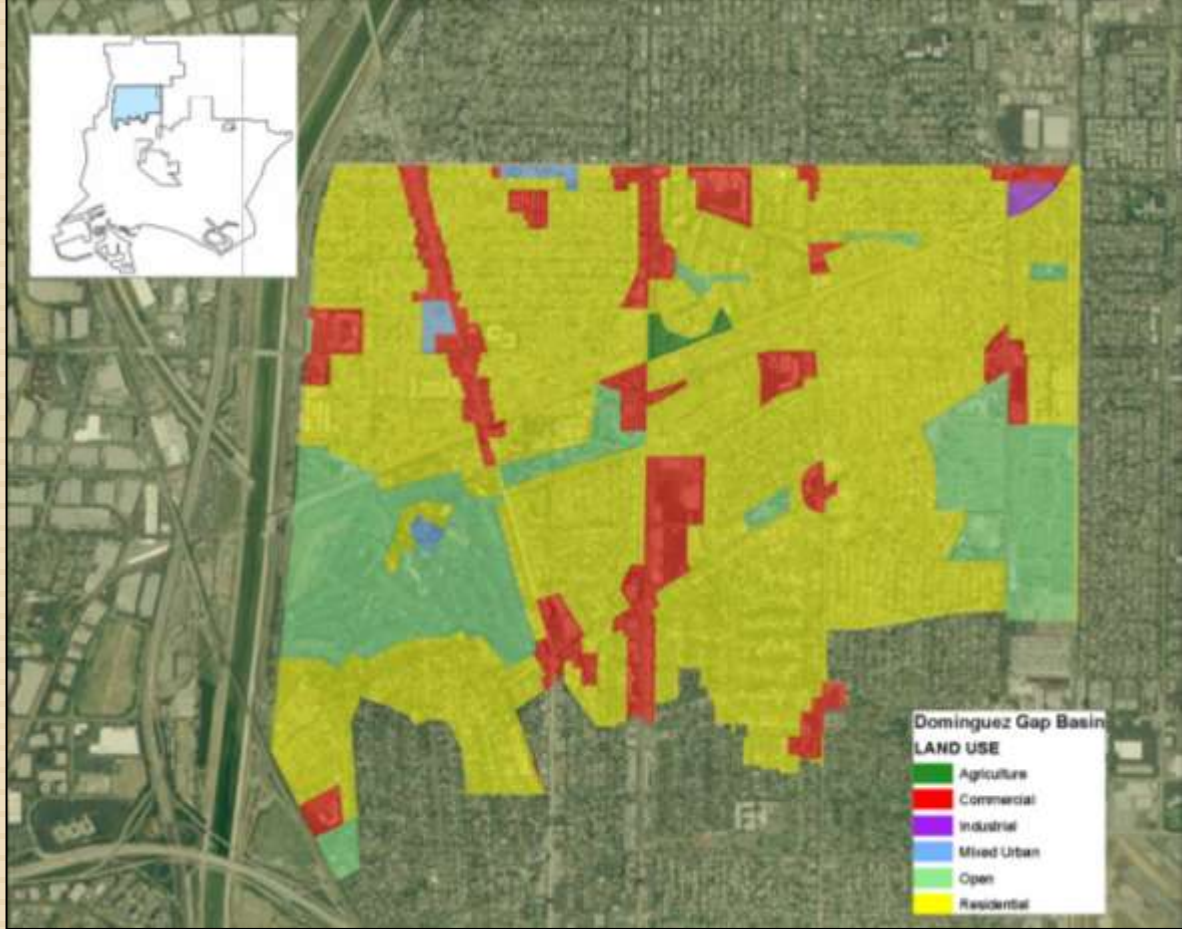


- 3 Conductivity/Temp Sensors
- Directional Flow Measurement



## Bouton Creek

### Tidal Conditions

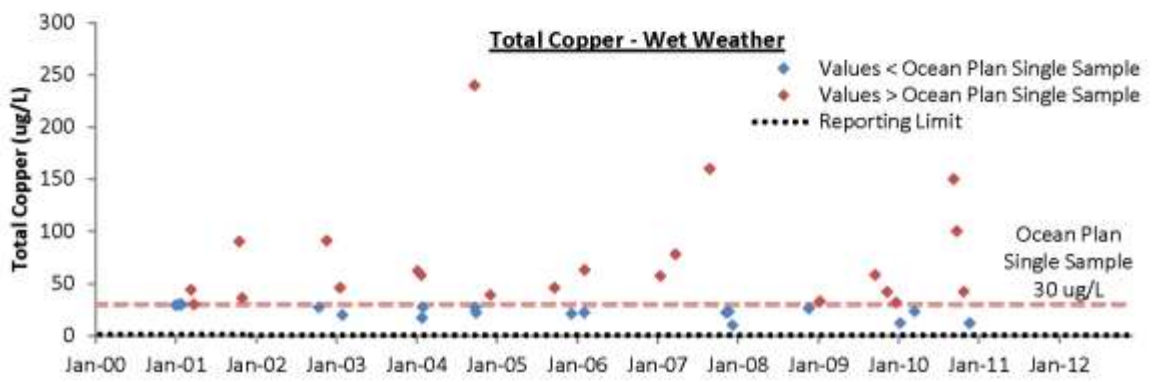
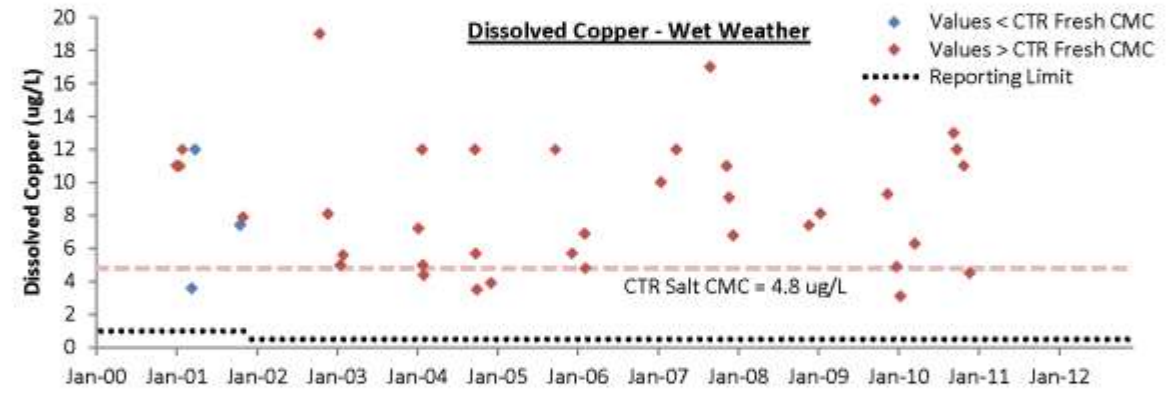
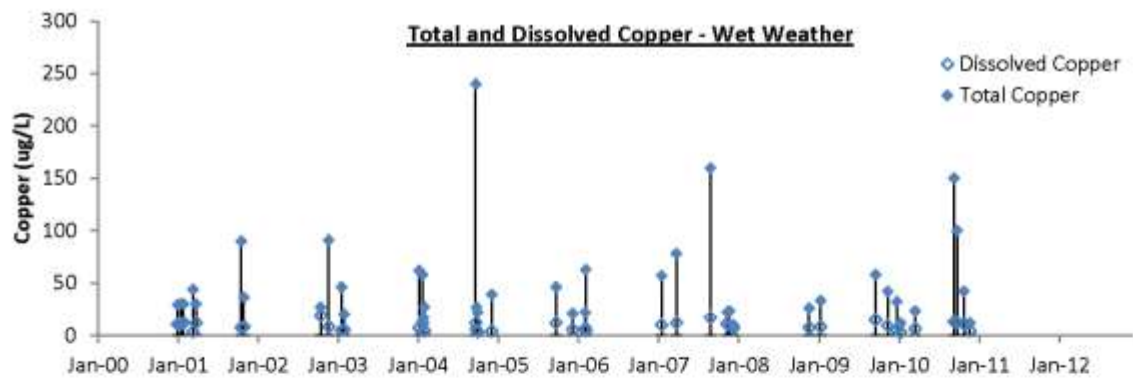


## DOMINGUEZ GAP PUMP STATION



# DATA ANALYSIS

## Graphical Comparisons



Correlation matrix (Spearman):

r	TOT RAIN	ANTE DAY	TSS	DISS CD	TOT CD	DISS CU	TOT CU	DISS PB	TOT PB	DISS ZN	TOT ZN
TOT RAIN	1										
ANTE DAY	-0.187	1									
TSS	-0.113	0.239	1								
DISS CD	-0.100	-0.091	-0.034	1							
TOT CD	-0.237	0.179	0.770	0.295	1						
DISS CU	-0.423	0.348	0.257	0.254	0.388	1					
TOT CU	-0.372	0.298	0.786	0.020	0.802	0.613	1				
DISS PB	-0.262	0.250	0.208	0.392	0.379	0.547	0.369	1			
TOT PB	-0.187	0.085	0.818	0.146	0.876	0.269	0.813	0.319	1		
DISS ZN	-0.311	0.252	0.184	0.442	0.457	0.736	0.472	0.574	0.277	1	
TOT ZN	-0.352	0.245	0.781	0.144	0.893	0.512	0.915	0.330	0.837	0.492	1

Values in bold are different from 0 with a significance level alpha=0.05

Red Bar Equals a Negative Correlation, Blue Bar Equals a Positive Correlation (Larger the Bar, Higher the Correlation).

Coefficients of determination (Spearman):

R <sup>2</sup>	TOT RAIN	ANTE DAY	TSS	DISS CD	TOT CD	DISS CU	TOT CU	DISS PB	TOT PB	DISS ZN	TOT ZN
TOT RAIN	1										
ANTE DAY	0.001	1									
TSS	0.035	0.057	1								
DISS CD	0.010	0.008	0.001	1							
TOT CD	0.056	0.032	0.593	0.087	1						
DISS CU	0.184	0.121	0.066	0.085	0.151	1					
TOT CU	0.139	0.089	0.587	0.000	0.643	0.376	1				
DISS PB	0.069	0.062	0.043	0.154	0.144	0.299	0.136	1			
TOT PB	0.035	0.007	0.669	0.021	0.767	0.072	0.660	0.102	1		
DISS ZN	0.101	0.063	0.034	0.196	0.209	0.542	0.223	0.329	0.077	1	
TOT ZN	0.127	0.060	0.610	0.021	0.797	0.262	0.837	0.109	0.701	0.242	1

Values in bold are different from 0 with a significance level alpha=0.05

Larger the Blue Bar, Higher the Coefficient of Determination or the Proportion of Variance Explained.

# Correlation Coefficients and R<sup>2</sup> Values

Combined Data Set (without Dominguez Gap)

Multiple Linear Regression Results: Stepwise Backward Procedure									
		Dependent Y's							
Explanatory X's	Model Statistics	Diss. Cadmium	Total Cadmium	Diss. Copper	Total Copper	Diss. Lead	Total Lead	Diss. Zinc	Total Zinc
<i>(overall importance from high to low)</i>	R <sup>2</sup>	0.10	0.65	0.34	0.77	0.32	0.68	0.21	0.67
	F	5.22	127.7	17.6	91.0	16.3	74.4	12.0	96.1
	Pr > F	0.002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
TSS	F		233.9		200.2	12.4	204.2		174.7
	Pr > F		< 0.0001		< 0.0001	0.001	< 0.0001		< 0.0001
ANTEDAY	F	6.0		13.7	36.9	6.8		9.13	14.5
	Pr > F	0.015		0.000	< 0.0001	0.010		0.003	0.000
SEASONRAIN	F			11.5	8.0	9.6	3.2	6.3	
	Pr > F			0.001	0.005	0.002	0.075	0.014	
DURATION	F		4.4		5.7		10.1		8.7
	Pr > F		0.037		0.019		0.002		0.004
TOTFLOW	F			5.3	10.7	12.7			
	Pr > F			0.023	0.001	0.000			
TOTRAIN	F	5.6		11.6				9.46	
	Pr > F	0.019		0.001				0.003	
MAXINT	F						6.25		
	Pr > F						0.014		
ANTERAIN	F	5.2							
	Pr > F	0.025							

## Multiple Linear Regression

Complete Data except Dominguez Gap