

South Platte Coalition for Urban River Evaluation
SPCURE

**South Platte River Segments 6, 14, & 15
TMDL Monitoring Plan (Phase II)
Nutrients, Microbiology, and selected Metals**

Introduction

The South Platte Coalition for Urban River Evaluation (SPCURE) Monitoring committee will direct a study to provide coordinated data collection for nutrients, microbiology, and selected metals for the South Platte River for evaluation of water quality related to TMDL listings.

Rationale

The 303 (d) list is prepared by the Colorado Water Quality Control Division (WQCD) in adherence to provisions of the Clean Water Act requiring identification of threatened and impaired waterbodies in the State. Studies are undertaken by the WQCD or interested parties to evaluate the validity of the listing, as well as provide data used for water quality modeling. The model is the scientific basis for evaluation of allocations to pollutant sources impacting the river segment.

Attachment D lists the water quality parameters considered necessary for TMDL studies. Included are the 1) the 1998 303(d) listed pollutants of concern in the South Platte River 2) analyses required to be performed at Trend Monitoring Sites and (3) a CWQCD synoptic list of all potential variables of interest.

Responsibilities

The Littleton/Englewood Wastewater Treatment Plant (L/E WWTP) Laboratory Division staff will 1) coordinate routine and special studies on behalf of the SPCURE monitoring committee, 2) facilitate collection, recording and distribution of data for model input and calibration, and 3) update the monitoring plan as specified by the SPCURE Monitoring Committee.

Each SP CURE organization participating in the study will 1) review and approve the overall monitoring plan, 2) commit to monthly sampling and analyses for designated sites and 3) provide monthly updates of data to the L/E WWTP staff for compilation and distribution or enter data directly (or indirectly) into USEPA's STORET.

Modeling consultants will utilize the data collected during this study in the development of any TMDL models necessary for evaluation of water quality impaired river segments.

Other interested entities may volunteer to participate and assist. A list of current participants is provided in Attachment A.

Monitoring Study

Monitoring Sites

The monitoring locations are listed in Attachment B. Sites were chosen in order to provide a comprehensive evaluation of the water quality at a specific point in time. The data collected at these sites is essential for modeling efforts in the urban South Platte watershed.

Sampling Schedule

Beginning June 1, 2000 all SPCURE monitoring stations will be monitored by grab sample, at a minimum, of once per month. Attachment C lists the scheduled sampling dates. A second sampling date per month is optional (but encouraged for priority 1 & 2 variables). Segment 15 sampling sites will be sampled on the second sampling date for for copper, DOC, alkalinity and hardness. The monitoring schedule is subject to change if additional information is required.

Sampling Procedures

Each sampling team will submit the field sampling protocol for grab samples to the SP CURE monitoring committee for review. The SPCURE Monitoring committee will work cooperatively to resolve any sampling issues or conflicts. Each sampling team must provide a detailed description of each site, including a GIS site designation.

Analytical Procedures

Each laboratory conducting analyses will supply method references and detection limits. Any modifications to published methods must be submitted to the SPCURE Monitoring Committee for assistance in evaluation of the data.

Quality Assurance

Throughout this collaborative study, all information produced must be of reliable and documented quality that may be defended by SPCURE. Therefore, all analyses should be conducted using approved methods appropriate for the intended purpose. Particular attention should be focused on the procedure recommendations for field and laboratory quality controls as specified in Attachment E.

SP CURE will conduct round robin evaluations for relative accuracy and precision among the participants. Before September 1, 2002, a SP CURE participant laboratory will provide quality control test standards for Nitrate, Ammonia, TOC, and Copper. The samples will be distributed to all participating laboratories. Test results will be collected by the L/E WWTP staff and reviewed for quality control purposes. The SPCURE Monitoring Committee will make recommendations for test modifications, sample splits, or other changes necessary to insure an appropriate level of quality control.

Model Calibration Studies

24 hour Diurnal River Study

Modeling of the river dynamics may be improved by performing 24-hour diurnal studies along the main stem of the South Platte River. The SPCURE Monitoring Committee will determine sites and frequency recommendations following discussion with the modeling team. One warm-weather low-flow study and one cold-weather low-flow study have been suggested. Sampling would be conducted over a 24-hour period at 2-hour intervals. Discrete grab samples would be collected and analyzed for all parameters listed in the TMDL column in Attachment D.

Groundwater Quality

Studies of groundwater quality may be undertaken to determine the general quality of the contributions into Segments 6, 14, & 15. (Note: Where possible, existing data from other sources will be used in place of additional sampling.) Wells to be considered should not be influenced by proximity to the river and should represent flows that would enter the river. Quantity of groundwater flow into Segments 6 and 14 will be based on flow balances at existing meters rather than new data collection; however, other agencies may be contacted to determine if there is site specific groundwater accretion data.

Completed Model Calibration Studies

Calibration and quality assurance projects have been conducted previously by the SPCURE participants for the development of other TMDLs. Should the need arise, these studies can be reviewed and evaluated for their impact on this TMDL study. The following is a description of previous Quality Assurance projects.

Surface Ungaged Sites

Participants located possible sources of inflow from ungaged sources. Any additional sources should be presented to the Monitoring Committee for discussion.

Sample Site Homogeneity

Participants evaluated monitoring locations for homogeneity by conducting a transect profile of the proposed location at eight distinct sample sites. Homogeneity was confirmed at critical sampling sites.

Diurnal River Temperature

Several entities tested for diurnal temperature variations above and below discharges in order to measure daily and seasonal variation.

Trend Monitoring Sites

In addition to analyses performed for TMDL studies, some SPCURE participants have agreed to collect and analyze samples for CWQCD Trend Monitoring Sites. These sites have been indicated by red, bold type in Attachment B. Attachment D lists analyses to be performed for the Trend Monitoring Sites. Sampling will be conducted for these sites on the first sampling event of each month (see Attachment C.)

Monitoring Plan Coordination

All data, supporting documentation and questions related to the monitoring program should be directed to:

Phil Russell
L/E WWTP
2900 S. Platte River Drive
Englewood, CO 80110
303-762-2611
303-762-2620 (Fax)
prussell@ci.englewood.co.us

Cathy Shugarts
SPCURE Watershed Coordinator
303-286-3084
303-286-3029 (Fax)
SPCURE@earthlink.net

SPCURE Monitoring Committee - Member Information

Contact	Facility	Phone	E-mail Address	Comments
Cathy Shugarts	SP CURE Watershed Coordinator	303-286-3084 303-286-3029 (FAX)	SPCURE@earthlink.net	
Phil Russell	L/E WWTP 2900 S. Platte River Drive Englewood, CO 80110	303-762-2611 303-762-2620 (FAX)	prussell@ci.englewood.co.us	Samples to Phil Russell 2900 S. Platte River Drive Englewood, CO 80110
Christine Johnston	Xcel Energy	720-497-2156 720-497-2117 (FAX)	christine.johnston@xcelenergy.com	
Todd Harris	Metro	303-286-3255 303-286-3029 (FAX)	tharris@mwr.dst.co.us JVANROYEN@mwr.dst.co.us JDorsch@mwr.dst.co.us	Samples to Todd Harris
Paul Grundemann	Centennial	303-791-7181 303-791-6549 (FAX)	pgrunde@rmi.net ABaker@cwsdhrmd.org	Samples to Al Baker Centennial WWTP 8700 S. Santa Fe Drive Highlands Ranch, CO 80126 303-791-2185 (523)
Randy Giffin	Aurora	303-739-6770 303-699-3918 (FAX)	rgiffin@ci.aurora.co.us	Samples to Randy Giffin Wemlinger Water Treatment Plant 18301 E. Quincy Aurora, CO 80015
Vic Lucero Brittney Hand	Thornton	303-255-7771 303-255-7729 (FAX)	Vlucero@ci.thornton.co.us brittney.hand@ci.thornton.co.us	Samples to Brittney Hand City of Thornton Water Quality Lab 9500 Civic Cntr Dr Thornton, CO 80229 303-255-7773

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SPCURE Monitoring Committee - Member Information (cont.)

Contact	Facility	Phone	E-mail Address	Comments
Joan Chavez Blair Corning	S. Adams	303-289-5769	joanchavez@sacwsd.org bcorning@sacwsd.org	Samples to Joan Chavez S. Adams County Water and Sanitation District 9702 Monaco St. Henderson, CO 80640
Andrew Wacker	Glendale	303-639-4503 303-639-4519 (FAX) 303-356-9102	awacker@glendale.co.us	Samples to Andrew Wacker City of Glendale Public Works 4360 E. Virginia Ave. Glendale, CO 80246
Toni Lusk	Brighton	303-659-4050 (City) 303-655-2159 (FAX)	N/A	Samples to Toni Lusk City of Brighton 325 N. Kuner Rd. Brighton, CO 80601
<u>Jon Novick</u> Janet Burgesser	DDEH	<u>720-865-5468</u> 720-865- 5457	<u>Jon.Novick@ci.denver.co.us</u> Janet.burgesser@ci.denver.co.us	
Dick Parachini	CDPHE/WQCD	303-692-3392 303-782-0390(FAX)	dick.parachini@state.co.us	
Sarah Johnson Joni Nuttle	Consultant/Modeling Data	303-692-3533	sarah.johnson@state.co.us joni.nuttle@state.co.us	

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Meeting: Second Tuesday of Month

SPCURE Monitoring Committee - Sample Sites

Contact	Facility	Sample Sites	Comments
Paul Grundemann 303-791-7181 303-791-6549(FAX) pgrundemann@cwsdhrmd.org Al Baker 303-791-2185 (x 523) 303-791-8395 (FAX) abaker@cwsdhrmd.org	Centennial	Effluent Upstream¹ C-470 ² Mineral Ave ² Union Ave ²	39° 33.417' N 105° 02.117' W 39° 34.033' N 105° 02.800' W 39° 34.000' N 105° 02.367' W 39° 34.917' N 105° 01.867' W 39° 37.967' N 105° 00.933' W
Phil Russell 303-762-2611 303-762-2620(FAX) prussell@englewoodgov.org	L/E WWTP	Effluent Upstream (Dartmouth) Downstream (Evans) Bear Creek (Gaging Station)¹ S. Platte, upstream of Bear Creek ² Little Dry Creek ² PSC Outfall ² Big Dry Creek ²	39° 40.079' N 104° 59.999' W 39° 39.762' N 105° 00.259' W 39° 40.491' N 104° 59.852' W 39° 39.137' N 105° 01.979' W 39° 38.770' N 105° 00.879' W 39° 39.884' N 105° 00.215' W 39° 40.189' N 104° 59.924' W 39° 37.827' N 105° 00.820' W
Christine Johnston 720-497-2156 720-497-2117 (FAX) christine.johnston@xcelenergy.com	Xcel Energy	Upstream - Zuni Power Station Effluent - Zuni Power Station	
Randy Giffin 303-739-6770 303-699-3918(FAX) griffin@ci.aurora.co.us	Aurora	Effluent Upstream Downstream	39° 45.683' N 105° 51.283' W 39° 45.417' N 105° 50.817' W 39° 45.667' N 105° 51.950' W
Todd Harris 303-286-3255 303-286-3029(FAX) tharris@mwr.dst.co.us James Dorsch 303-286-3368 303-286-3029 (FAX) jdorsch@mwr.dst.co.us	Metro	Effluent Upstream - 64 th Street Sand Creek (above FRICO siphon)¹ Downstream (78 th Ave.) 124th Ave (Henderson)¹	39° 48.470' N 104° 57.158' W 39° 48.461' N 104° 57.319' W 39° 48.397' N 104° 57.002' W 39° 50.210' N 104° 56.553' W 39° 55.211' N 104° 52.009' W

¹ Trend Monitoring Sites² Limited Sampling/Analyses

Sampling Locations

South Platte River CURE Monitoring Sub Committee - Sample Sites

Contact	Facility	Sample Sites	Comments
Vic Lucero 303-255-7771 303-255-7729(FAX) vic.lucero@cityofthornton.net Brittney Hand 303-255-7772 303-255-7729(FAX) brittney.hand@cityofthornton.net	Thornton	Above Burlington Ditch Clear Creek at Derby¹ SPR above confluence w/Clear Creek	39° 47.512' N 104° 58.000' W 39° 49.695' N 104° 57. 495' W 39° 49.651' N 104° 56. 936' W
Blair Corning 303-289-5769 303-289-7976 (FAX) bcorning@sacwsd.org	S. Adams	Effluent Upstream - McKay Rd.	39° 52.443' N 104° 54.746' W 39° 52.457' N 104° 54.815' W
Toni Lusk 303-655-2093 303-655-2159 (FAX)	Brighton	Effluent Upstream – 160 th Downstream	39° 59.558' N 104° 49.619' W 39° 59.528' N 104° 49.709' W 39° 59.633' N 104° 49.552' W
Jon Novick 720-865-5468 720-865-5534 (FAX) jon.novick@ci.denver.co.us	DDEH	Cherry Creek near Champa (USGS)¹ N14 (14 th Ave.) N25E (25 th Ave.) N36L (36 th Ave.) N48L (48 th Ave.) E102 (Dartmouth) ER3 (nr. Yale) E53 (Locust) E40 (Colo Blvd) E6 (Pearl) SC1 (Sand Creek dnstrm of confluence w/ Westerly Creek) SC2 (Sand Creek upstrm of confluence w/ Westerly Creek) WC2 (Westerly Creek midway btwn WCRC and Sand Creek Confluence) WCRC (Westerly Creek @ Sand Creek Bike Trail) WC5A (Westerly Creek midway btwn SIA and Montview)	39° 44.550' N 104° 59.967' W 39° 44.312' N 105° 01.083' W 39° 45.274' N 105° 00.511' W 39° 46.155' N 104° 58.996' W 39° 47.030' N 104° 58.524' W 39° 39.742' N 104° 52.168' W 39° 39.985' N 104° 52.972' W 39° 42.384' N 104° 56.461' W 39° 41.835' N 104° 55.429' W 39° 43.279' N 104° 58.801' W 39° 46.081' N 104° 52.654' W 39° 46.070' N 104° 52.599' W 39° 45.950' N 104° 52.598' W 39° 45.884' N 104° 52.518' W 39° 45.087' N 104° 52.748' W

Attachment B

Final: 12/12/00
Revised: 5/05/04

Andrew Hawthorn 303-639-4503 303-639-4519 (FAX) ahawthorn@glendale.co.us	Glendale	Effluent 39° 42.350' N 104° 56.167' W Cherry Creek Gage 39° 42.279' N 104° 56.019' W (Upstream from WWTP) Cherry Creek at Colorado Blvd 39° 42.379' N 104° 56.425' W	
Joni Nuttle 303-692-3533 joni.nuttle@state.co.us	CDHPE	SPR @ 19th Street Denver Gage¹ 39° 45.583' N 105° 00.167' W	

¹ Trend Monitoring Sites

Sampling Schedule - SP CURE Monitoring Committee

Month	SAMPLING DATES	
	Primary Event	Secondary Event
January 2005	5 th	19 th
February 2005	2 nd	16 th
March 2005	2 nd	16 th
April 2005	6 th	20 th
May 2005	4 th	18 th
June 2005	1 st	15 th
July 2005	6 th	20 th
August 2005	3 rd	17 th
September 2005	7 th	21 st
October 2005	5 th	19 th
November 2005	2 nd	16 th
December 2005	7 th	21 st
January 2006	4 th	18 th
February 2006	1 st	15 th
March 2006	1 st	15 th
April 2006	5 th	19 th
May 2006	3 rd	17 th
June 2006	7 th	21 st
July 2006	5 th	19 th
August 2006	2 nd	16 th
September 2006	6 th	20 th
October 2006	4 th	18 th
November 2006	1 st	15 th
December 2006	6 th	20 th
January 2007	3 rd	17 th

Sampling should be performed the first Wednesday of every month and analyzed for priority 1 and 2 analytes in Attachment D. Sampling for the Secondary Event is strongly encouraged to sample for, at least, Priority 1 and 2 analytes during that sample period.

Segment 15 sites should be sampled for copper, hardness, pH, alkalinity and DOC on the first and third Wednesday of the month.

Trend Sites should be sampled on the first Wednesday of the month for analytes listed in the appropriate column in Attachment D.

Sampling Schedule - SP CURE Monitoring Committee

Month	SAMPLING DATES	
	Primary Event	Secondary Event
January 2008	2 nd to 9th	16 th
February 2008	6 th	20 th to 27 th
March 2008	5 th	19 th
April 2008	2 nd	16 th
May 2008	7 th	21 st
June 2008	4 th	18 th
July 2008	2 nd to 9th	16 th
August 2008	6 th	20 th
September 2008	3 rd to 10th	17 th
October 2008	1 st	15 th
November 2008	5 th	19 th
December 2008	3 rd	17 th
January 2009	7 th	21 st
February 2009	4 th	18 th
March 2009	4 th	18 th
April 2009	1 st	15 th
May 2009	6 th	20 th
June 2009	3 rd	17 th
July 2009	1 st	15 th
August 2009	5 th	19 th
September 2009	2 nd	16 th
October 2009	7 th	21 st
November 2009	4 th	18 th
December 2009	2 nd	16 th
January 2010	6 th	20 th

Sampling should be performed the first Wednesday of every month and analyzed for priority 1 and 2 analytes in Attachment D. Sampling for the Secondary Event is strongly encouraged to sample for, at least, Priority 1 and 2 analytes during that sample period.

Segment 15 sites should be sampled for copper, hardness, pH, alkalinity and DOC on the first and third Wednesday of the month.

Trend Sites should be sampled on the first Wednesday of the month for analytes listed in the appropriate column in Attachment D.

Attachment D**Date: 2/24/02****Analytical Variable Lists**

Analytes	Priority	TMDL	WQCD Trend Monitoring	303(d)	Comments
Non-Metals					
Flow*	1	X	X		
Field Temp (C)	1	X	X		
Field pH	1	X	X		
Ammonia (NH3) as N	1	X	X		
Nitrate (NO3) or (NO2+NO3) as N	1	X	X	X	
Nitrite (NO2)	4				
TKN	4		X		
CBOD	4				
BOD	4				
DO	2	X	X	X	
Alkalinity	1	X			Segment 15 sites, twice monthly
Hardness	1	X			Segment 15 sites, twice monthly
Conductivity	2	X	X		
P as Total	2		X		
TSS	2	X	X		
TDS	2		X		
TOC	1	X			
DOC	1	X			Segment 15 sites, twice monthly. Include Filter Blank
Turbidity	2	X			
Fecal Coliform	1	X	X	X	
E. Coli	1	X	X		
Chlorophyll-A	4				
Sulfate	2		X		

* Unless directly measured, flow data will be obtained from the most reliable established gage station in the vicinity of the sampling site.

Priority: 1-Critical to development of a TMDL. 2-Necessary for a TMDL, should be completed if possible. 3-Important to the completion of future South Platte TMDLs. 4-Supporting information.

Attachment D (Cont.)**Date: 2/24/02****Analytical Variable Lists**

Analytes Metals	Priority	TMDL	WQCD Trend Monitoring	303(d)	Comments
Hg, Total	2		X		Quarterly
Ag, D	2		X		
Al, D	3				
As, D	3		X		
Cd, D	2		X	X	
Cr, D	4				
Cu, D	1	X	X	X	Segment 15 sites, twice monthly
Fe, D	4		X		
Fe, TR	4		X		Quarterly
Ni, D	4				
Mn, D	2	X	X	X	
Pb, D	3		X		
Se, D	3		X		Priority 1 for Sand Creek
Zn, D	3		X		

Priority: 1-Critical to development of a TMDL. 2-Necessary for a TMDL, should be completed if possible. 3-Important to the completion of future South Platte TMDLs. 4-Supporting information.

Attachment E**Date: 2/24/02****Quality Control**

The following table outlines quality controls recommended for each set of metals analytes from each sampling event.

Table 1. Quality Control for **Metals**

Quality Control Sample	Frequency	Acceptance Criteria
Field Blank ¹	One per sampling event, per team	Report
Field Duplicate ²	Optional	Report
Filter Blank ³	One per manufacturer's lot of filter paper	Report
Lab Replicate	One per analytical run	As per individual lab-specified acceptance criteria
Lab Spike	One per analytical run	As per individual lab-specified acceptance criteria
Lab control sample standard	One per analytical run	As per individual lab-specified acceptance criteria
Lab blank	One per analytical run	As per individual lab-specified acceptance criteria

¹ Analysis of the field blank is optional. Analysis may be requested if the sample analytical results are questionable.

² Collection and analysis of a field duplicate is optional. The field blank may be analyzed for the priority 1 and 2 analytes listed in Attachment D.

³ The filter blank should be analyzed for DOC, Cd and Cu. Analysis of the filter blank for the other dissolved metals in Attachment D is optional. Analysis may be requested if the sample analytical results are questionable.

Analytical data should not be blank corrected.

All the metals QA data should be reported in the quality control summary included with the final report or entered in the STORET database.

Attachment E (Cont.)

For all other analyses, the following are recommended for each set of analytes from each sampling event:

Table 2. Quality Assurance for **non-Metals** analyses.

Analyses	Laboratory Blank	Control Standard	Laboratory Spike	Laboratory Replicate	Comments
Report	Result	Result & %RSD*	Result & % Recovery	Result	
Flow					
Field Temp (C)					
Field pH		X			
Ammonia (NH3) as N	X	X	X	X	
Nitrate (NO3) or (NO2+NO3) as N	X	X	X	X	
TKN	X	X	X	X	
CBOD	X	X			
BOD	X	X			
DO				X	
Alkalinity	X	X		X	
Hardness	X	X		X	
Conductivity		X			
P as Total	X	X		X	
TSS	X				
TDS	X				
TOC	X	X		X	
DOC	X	X		X	Include a filter blank.
Turbidity	X	X		X	
Fecal Coliform	X				
E. Coli	X				
Sulfate	X	X		X	

*RSD = Relative Standard Deviation

Analytical data should not be blank corrected.

All the QA data should be reported in the quality control summary included with the final report or entered in the STORET database.

Attachment E (Cont.)

Quality Control Definitions

Field duplicate:

An additional grab sample is collected at selected stations to estimate natural variability in the sampled water and/or the error associated with sampling equipment and technique. Two separate samples are obtained and appropriately preserved for analysis.

Field blank:

Prepared by processing a pure (deionized or better) water sample in the field using the same techniques used in sampling. Measures possible contamination introduced during sample collection.

Filter blank:

A deionized (or better) water sample is filtered in the laboratory through the filter prescribed by the analytical method and appropriately preserved prior to analysis. Used to evaluate possible contamination introduced in the laboratory during the sample filtration process.

Laboratory replicate:

A second aliquot (split) is prepared from a preserved field sample. It is processed identically like the original sample. The original and laboratory replicate are used to evaluate laboratory precision.

Laboratory spike:

A known concentration of the analyte to be measured (spike) is added to an aliquot of sample, prior to the preparation and analysis of the sample. Used to evaluate possible analytical interference(s) in a sample. The amount of the spike recovered is calculated to evaluate method performance.

Laboratory control:

A sample of known composition is analyzed using the same preparation process, reagents and analytical method used for the sample. The laboratory control sample evaluates the complete analytical process.

Laboratory blank:

A sample of deionized (or better) water is analyzed using the same preparation process, reagents and analytical method used for the sample. The lab blank evaluates possible contamination introduced in the laboratory throughout the analytical process.