Appendix D — Background Concentrations

This Technical Support Document (TSD) provides an analysis of reference stream data that is used to calculate the background load contribution to Rainbow Creek. This TSD presents local data sets from the City of San Diego's Monitoring Network for the determination of background concentrations. Evaluation of reference water quality provides a baseline for establishing background concentrations.

Overview

Soil erosion, the decay of plant material, and the decay of wild animal waste contribute background nitrogen and phosphorus loads from undeveloped land to Rainbow Creek. There is insufficient data to determine site-specific background concentrations in Rainbow Creek. A review of historic monitoring data for Rainbow Creek revealed only two nitrate samples from 1954 (CDWR 1975). Since agricultural irrigation and citrus and avocado orchards were present in the Fallbrook area in the early 1940's (CDWR 1975), this data is considered insufficient to determine background concentrations.

Water quality concentrations from local streams similar to Rainbow Creek will therefore be used as an alternative to site-specific background concentrations. Reference sites are relatively undisturbed by human influences. The definition of a reference condition ranges from a pristine, undisturbed state of a stream, to merely the "best available" or "best attainable" conditions. In the case of the San Diego streams used in this TSD, the "least" and "minimally" impacted sites have been identified to be reference.

Reference Data from City of San Diego's Monitoring Network

The City of San Diego (City) monitors streams that drain into the drinking water reservoirs for the purpose of maintaining the quality of the supply. The City performs monthly monitoring for ammonia, nitrite, nitrate, total Kjeldahl nitrogen, and ortho-phosphate. In 2003, the City began monitoring for total nitrogen and total phosphorus.

For this analysis, each monitoring location was characterized to determine its potential to be a reference site (see Attachment D-1). The locations were reviewed for stream order and proximity to land use. The stream order and existing land use as shown on the San Diego Association of Governments' Regional Economic Development Information (REDI) interactive mapping application was reviewed and noted (SANDAG 2003).

Each monitoring site was scored using an a priori classification system for ranking streams according to intensity of human influence (Karr and Chu 1999). This classification system has been modified for application to San Diego streams and is referred to as the Gibson Score. It is a measure developed by David Gibson, Environmental Scientist, Regional Board that integrates multiple aspects of land use impairment. The score, which ranges from 1 to 72, takes into account the presence of effluent discharges, availability of sources of stressors (e.g., presence of land uses), riparian condition, and instream habitat. Scores of 1 to 9 are considered to be "least"

impacted and scores of 10 to 18 are “minimally” impacted. Both of these categories identify streams with very little or no effluent from land use, and have no identified nearby sources of sediment or wastes. Sites with a score of 1 to 18 are considered to represent reference. Scores higher than 18 are impacted by effluent and are not considered reference. Attachment D-1 presents the evaluation results of each monitoring location in the City of San Diego Monitoring Network.

Using a score of 18 as the threshold value, 19 out of a pool of 47 streams were identified as candidate reference sites. After the reference sites were identified, the City's monitoring data were reviewed for available data. Seven from the 19 streams had insufficient data and could not be used in this analysis. Data sets with at least two sampling events and reported results for nitrate, nitrite, and total Kjeldahl nitrogen (needed for the total nitrogen calculation) were considered for the analysis. The monitoring data consists of samples collected in 2001 through mid-2003, and from a study performed at San Vicente Reservoir in 1997 and 1998. Total nitrogen was calculated by adding nitrate, nitrite, and total Kjeldahl nitrogen for data collected prior to 2003. For the 2003 data, the total nitrogen and total phosphorus results were used in this analysis. Half the detection limit is used for those samples reported as less than the detection limit.

Table D-1 summarizes the reference stream results and provides the reference concentrations for total nitrogen and total phosphorus in San Diego streams. Attachment D-2 presents the reference stream data sets that is used to calculate the average values presented in the summary table. Although the detection limits are not low enough to measure actual values, the concentrations are reasonable when compared with other reference concentrations (see discussion of Alternative Data Sets).

Table D-1. Average Nutrient Concentrations for Reference Streams in San Diego

Monitoring Station	Average Total Nitrogen[1] (mg/L)	No. of Positive Results (No. of NDs)[1]	Average Total Phosphorus (mg/L)	No. of Positive Results (No. of NDs)
WLC4	0.36	10 (7)	0.09	1 (1)
PVC5	0.26	7 (10)	0.06	1 (1)
KTC7	0.1	0 (6)	NM	0 (0)
TOL2	0.67	13 (5)	NM	0 (0)
CWD9	1.14	62 (24)	0.04	1 (1)
AQA3	0.85	20 (5)	NC	1 (0)
CON3	0.3	11 (21)	0.12	2 (0)
BDC3	0.22	6 (11)	0.04	0 (2)
SDR2b	0.3	6 (8)	0.08	1 (1)
CED3	0.31	5 (6)	0.06	1 (1)
BMD1	0.6	5 (2)	NC	1 (0)
WCH1	0.54	14 (11)	NC	1 (0)
Average	0.47		0.07	
St. Deviation	0.30		0.03	
St. Error	0.09		0.01	

ND – Non detection, sample result was less than the detection limit.
NM – Not measured
NC – Not considered for analysis because only one sampling event was available.
[1]Except for data collected in 2003, total nitrogen was calculated by adding nitrate, nitrite, and total Kjeldahl nitrogen. Therefore, the number of positive results and non detections for each parameter is used.

Alternative Data Sets

For comparison purposes, USEPA proposed nutrient criteria and USGS undeveloped stream basins in the United States were reviewed. Table D-2 summarizes reference concentrations from these alternative data sources. The background reference concentration for San Diego of 0.47 mg N/L is nearly the same as the USEPA result and somewhat higher than the USGS results. The San Diego value for total phosphorus is slightly higher than both the USEPA and the USGS results. Information on both alternative data sets is provided below.

Table D-2. Comparison of San Diego Reference Stream Concentrations with Alternative Data Sources

Data Set/Study	Total N mg/L	Total P mg/L
USEPA, Ecoregion III, Subecoregion 6[a]	0.50	0.03
USGS, Undeveloped Stream Basins[b]	0.26	0.02
San Diego Reference Streams	0.47	0.07

[a] Source: USEPA Ambient Water Quality Criteria Recommendations 2000
[b] Source: Clark et al. 2000

USEPA Nutrient Criteria

USEPA developed criteria recommendations for nutrients using data from the STORET Database for each ecoregion and subecoregion. San Diego County is in Ecoregion III (Xeric West) and Subecoregion 6 (Southern and Central California Chaparral and Oak Woodlands). Ecoregions are defined as regions with relatively similar characteristics, such as, soils, vegetation, climate, geology, land cover, and physiology.

USGS Data from Undeveloped Stream Basins

Nutrient data collected as part of three USGS programs were used to evaluate nutrient concentrations in 85 streams draining relatively undeveloped basins across the nation (Clark et al. 2000). The three programs are the Hydrologic Benchmark Network (HBN), the National Water Quality Assessment (NAWQA), and the Research Program. The HBN program was initiated in 1958 to track water quality trends in streams draining basins free from anthropogenic influence. The NAWQA program, initiated in 1990, was designed to identify and describe major factors that affect observed water quality conditions over large spatial and temporal scales. Research basins were selected that studied the affects of atmospheric deposition on biogeochemical cycling within small, undisturbed watersheds were used in the evaluation.

References

California Department of Water Resources (CDWR), 1975. Impact of Waste Treatment and Disposal on the Quality of Water Supplies, Santa Margarita Watershed, District Report. State of California, The Resources Agency, Department of Water Resources Southern District. January 1975.

Clark, G. M., D. K. Mueller, and M. A. Mast, 2000. Nutrient Concentrations and yields in Undeveloped Stream Basins of the United States. Journal of the American Water Resources Association, Vol. 36, No. 4, August 2000.

Karr, J. R., and E. W. Chu, 1999. Restoring Life in Running Waters: Better Biological Monitoring. Island Press, Covelo, CA.

San Diego Association of Governments (SANDAG), 2003. Regional Economic Development Information (REDI) interactive mapping application.
http://www.sandag.org/index.asp?subclassid=70&fuseaction=home.subclasshome

U.S. Environmental Protection Agency (USEPA), 2000. Ambient Water Quality Criteria Recommendations, Information Supporting the Development of State and Tribal Nutrient Criteria, Rivers and Streams in Nutrient Ecoregion III. EPA 822-B-00-016. USEPA, Office of Water, Washington, D.C. December 2000.

Attachment D-1. Evaluation of Station Locations for the City of San Diego Monitoring Network

Watershed	Site	Steam Order	Land Uses[1]	Gibson Score[2]	Scoring Considerations
Otay/ Dulzura	UOR1	1	Open Space, Agriculture	54	Ephemeral drainage with major construction throughout its drainage area.
	JAM4	3	Open, w/ Industrial and Agriculture Use Upstream	28	Agricultural areas and rural residential areas upstream. Major campground and road crossings. Evidence of instream erosion and channel incision on Dulzura Creek.
	DUL1a	2*	Agriculture & Residential *surrounding, water from Barrett	NS	Not Scored. Reservoir discharge point into Dulzura Creek.
	PVR2	1	Open, Park	18	Proctor Valley has been heavily grazed and is the site for frequent trash dumping and illegal activities.
	HOL3	2	Sample location in Agriculture dominated area	31	Intermittent stream in previously grazed area. Rural residential and agricultural activities in drainage area.
Barrett/ Dulzura	WLC4	2	Open	10	Minor rural residential area upstream (<10 units). Historic grazing on tributary ceased in 1999.
	BHC3	2	Public Facility, Open	50	Located below Barrett Honor Camp and site of historic accidental waste water discharges. Area is heavily grazed.
	NPC3a	2	Open	10	Located above Pine Valley Recreational Cabin area in the Cleveland National Forest. Minor grazing activities and recreation in drainage area.
	NPC3b	2	Open	13	Located in the Pine Valley Recreational Cabin area.
	NPC3c	2	Open	13	Located in the Pine Valley Recreational Cabin area.
	NPC3d	2	Open	13	Located below the Pine Valley Recreational Cabin area and above the community of Pine Valley.
	PVC1	2	Agriculture & Residential immediately upstream, then Open	28	Located below Pine Valley at the Pine Creek Trailhead. Significant septic drainage fields, a wastewater treatment facility and two major horse stables.
	PVC1A	2	Agriculture & Residential immediately upstream, then Open	28	Located below Pine Valley at the Pine Creek Trailhead. Significant septic drainage fields, a wastewater treatment facility and two major horse stables.
	PVC5	2	Open	10	Located at the mouth of Pine Creek at Barrett Reservoir. Most of the upstream drainage area lies in the Pine Creek Wilderness area. Located approximately 15 river miles below PVC1(a).

[1] Source: Regional Economic Development Information, SANDAG

[2] Source: A measure developed by SDRWQCB staff, David Gibson, using the scoring system developed by Karr and Chu (1999).

Attachment D-1. Evaluation of Station Locations for the City of San Diego Monitoring Network Continued

Watershed	Site	Steam Order	Land Uses[1]	Gibson Score[2]	Scoring Considerations
Barrett/ Dulzura	SKY1	2	Open	28	Located in a remote area above Barrett Reservoir. Some light dry land agriculture. The Corral Canyon Offroad Vehicle recreational area is at the top of the watershed approximately 7 river miles away. Two impoundments approximately 1 mile upstream.
	CWD9	3	Open but downstream of illegal immigrant camp	13	Located approximately 5 miles downstream of Morena Reservoir. A major undocumented immigrant encampment is located in Salazar Canyon approximately 2 miles upstream. Historic grazing in Hauser Canyon.
	DUL0	*	*Reservoir Tailwater	NS	Not scored.
Morena/ Dulzura	MOR3	2	Open	13	Located in a largely undisturbed drainage above Morena Reservoir. Some light grazing and recently constructed rural residences (2).
	KTC7	2	Open	10	Located in Kitchen Creek Canyon approximately 2 river miles downstream of Cibbets Flats campground. Minimal grazing activity in upper watershed approximately 5 river miles upstream.
	CWD4	2	Agriculture	32	Low gradient site in alluvial valley. Significant impacts upstream including intensive grazing, plowed field agriculture, community high school, freeway and road crossings, and rural residences.
	LAP4	2	Agriculture	33	Significant grazing pressure onsite and immediately upstream. Also, freeway and road crossings and rural residential areas.
San Vicente	TOL2	2	Park, Open	5	Mostly undeveloped unincorporated county area with natural park reserve areas.
	KIM4	2	Park, Open, Res.(Fernbrook)	53	Heavily developed rural residential, road crossings, and upstream agriculture.
	AQA3	1	Park, Small amount of Residential	10	Small intermittent stream with minor agriculture and rural residential. Some road runoff from Hwy 67 and driveway roads.

[1] Source: Regional Economic Development Information, SANDAG
[2] Source: A measure developed by SDRWQCB staff, David Gibson, to integrate multiple aspects of land use impairment.

Attachment D-1. Evaluation of Station Locations for the City of San Diego Monitoring Network Continued

Watershed	Site	Steam Order	Land Uses[1]	Gibson Score[2]	Scoring Considerations
San Vicente	SNC4	3*	Park, Open, Residential, Agriculture, * receives raw water from Sutherland	53	Major developments and golf course immediately upstream. Historic waste water runoff less than 0.5 miles upstream. Road crossings, horse stables, and trash.
	SNC5	2	Residential, Park, Commercial, Agriculture (Barona)	53	Major developments and golf course immediately upstream. Historic waste water runoff upstream. Agriculture, road crossings, horse stables, and trash.
	BAR4	2	Park, Open, Agriculture, Residential (Barona)	54	Historically overgrazed valley. Rural residential area. Major site of new development associated with Tribal Casino including golf course and wastewater treatment and land application areas.
El Capitan	CON3	3	Open	1	Very undeveloped watershed, but benthic habitat limited by bedrock bottom canyon. Some tribal grazing historically in upper canyons.
	PZC3	2	Open, Residential (Alpine)	32	Rural residential with septic and numerous road crossings.
	CHC3	2	Open, Residential (Alpine)	50	Rural residential and dense subdivision residential with numerous road crossings, freeway crossing, agriculture, and septic fields.
	BDC3	2*	Open, Park, small amount of Residential & Agriculture *Bottom of Lake Cuyamaca Drainage,	10	Located approximately 12 miles downstream of Lake Cuyamaca. Flows regulated by water transfers from Cuyamaca to El Capitan Reservoirs. Some agriculture and rural residential areas approximately 5 river miles upstream.
	SDR2b	3*	Open, *Julian near headwaters	1	Located approximately 15 miles downstream of Julian. Rural residential and agricultural areas in Julian, but almost none between Julian (Coleman Creek) and this site. Some potential agricultural and rural residential impacts from Ritchie Creek drainage
	CED3	2	Open, Residential & Agriculture (Pine Hills) may or may not effect	1	Located approximately10 miles downstream from Sandy Creek rural residential area and approximately 12 miles downstream from the Harrison and Pine Hills rural residential areas.
	CUY2	*	Park, Some Residential, *drains from Lake Cuyamaca	14	Reservoir discharge point into Boulder Creek. Minor natural flows, mostly regulated flows. Rural residential and recreational activities.

[1] Source: Regional Economic Development Information, SANDAG
[2] Source: A measure developed by SDRWQCB staff, David Gibson, to integrate multiple aspects of land use impairment.

Attachment D-1. Evaluation of Station Locations for the City of San Diego Monitoring Network Continued

Watershed	Site	Steam Order	Land Uses[1]	Gibson Score[2]	Scoring Considerations
Hodges	DDC3	1	Residential	72	Potentially significant pollutant sources present.
	FEL3	2	Escondido	68	Potentially significant pollutant sources present.
	KCC3	2	Escondido	71	Potentially significant pollutant sources present.
	MON2	1	Open, Adjacent Residential Surrounding	68	Potentially significant pollutant sources present.
	GVC2	2	Open, Adjacent Residential Surrounding	64	Potentially significant pollutant sources present.
	SYC2	2	Agriculture, Residential	23	Potentially significant pollutant sources present.
	CDC4	2	Agriculture & Residential Surrounding	50	Potentially significant pollutant sources present.
	SMC4	3	Adjacent Agriculture, Open, Ramona	36	Potentially significant pollutant sources present.
	GJC4	2	Adjacent Agriculture, Open	36	Potentially significant pollutant sources present.
	YSA8	3*	Adjacent Agriculture, Park, Open, *Sutherland tailwater	36	Potentially significant pollutant sources present.
	TEM1	3	Agriculture along corridor, Open at headwaters	33	Site is actually Santa Ysabel Creek below confluence with Temescal Creek. Significant agriculture (grazing and plowed field) immediately upstream. Fair to poor riparian and instream habitat.
Sutherland	BMD1	2	Open, Agriculture near headwaters	11	Grazing activities upstream of sample site approximately 4 river miles upstream. Minor mining activities without drainage problems. Instream habitat is fair and riparian habitat is excellent.
	WCH1	2	Open, large area of Agriculture near headwaters which may not be maintained. No plowed fields.	18	Site is actually Santa Ysabel Creek below the Witch Creek confluence and above high water line of Sutherland Reservoir. Rural residential, road crossings and septic fields approximately 4 river miles upstream. Extensive local grazing pressure historically. Riparian condition is depressed and instream condition is fair to poor.

[1] Source: Regional Economic Development Information, SANDAG
[2] Source: A measure developed by SDRWQCB staff, David Gibson, to integrate multiple aspects of land use impairment.

Attachment D-2. City of San Diego Monitoring Network Data Set

Station	Date	Ammonia-N mg/L	Nitrate-N mg/L	Nitrite – N mg/L	TKN mg/L	TN[a] mg/L	PO_4-P mg/L	TP mg/L
Wilson Creek (WLC4)	1/17/01	< 0.02	< 0.05	< 0.002	0.17	0.20	< 0.07	NM
	2/6/01	< 0.02	< 0.05	< 0.002	0.16	0.18	< 0.07	NM
	2/27/01	< 0.02	< 0.05	0.004	0.31	0.34	< 0.07	NM
	3/20/01	< 0.02	< 0.05	< 0.002	0.21	0.23	< 0.07	NM
	4/10/01	0.09	0.33	0.061	0.74	1.12	< 0.07	NM
	3/4/03	< 0.04	< 0.05	< 0.003	NM	0.38[b]	< 0.07	0.14[b]
	4/8/03	< 0.04	< 0.05	< 0.003	NM	< 0.16[b]	< 0.07	< 0.08[b]
Average[c]		**0.02**	**0.07**	**0.01**	**0.32**	**0.36**	**0.04**	**0.09**
St. Deviation		**0.03**	**0.12**	**0.02**	**0.24**	**0.35**	**0.00**	**0.07**
St. Error		**0.01**	**0.04**	**0.01**	**0.11**	**0.13**	**0.00**	**0.05**
Pine Valley Creek (PVC5)	1/17/01	< 0.02	< 0.05	< 0.002	0.19	0.21	< 0.07	NM
	2/6/01	< 0.02	< 0.05	< 0.002	0.17	0.19	< 0.07	NM
	2/27/01	< 0.02	< 0.05	< 0.002	0.28	0.30	< 0.07	NM
	3/20/01	< 0.02	< 0.05	< 0.002	0.23	0.25	< 0.07	NM
	4/10/01	< 0.02	< 0.05	< 0.002	0.28	0.30	< 0.07	NM
	3/4/03	< 0.04	< 0.05	< 0.003	NM	0.35[b]	< 0.07	< 0.08[b]
	4/8/03	< 0.04	< 0.05	< 0.003	NM	0.19[b]	< 0.07	0.07[b]
Average[c]		**0.01**	**0.02**	**0.001**	**0.23**	**0.26**	**0.04**	**0.06**
St. Deviation		**0.005**	**0.00**	**0.000**	**0.05**	**0.06**	**0.00**	**0.02**
St. Error		**0.002**	**0.00**	**0.000**	**0.02**	**0.02**	**0.00**	**0.02**
Kitchen Creek (KTC7)	1/18/01	< 0.02	< 0.05	< 0.002	< 0.15	0.10	< 0.07	NM
	2/7/01	< 0.02	< 0.05	< 0.002	< 0.15	0.10	< 0.07	NM
Average[c]		**0.01**	**0.02**	**0.001**	**0.08**	**0.10**	**0.03**	
St. Deviation		**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	
St. Error		**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	
San Vicente Reservoir, above high water line (TOL2)	1/27/97	< 0.02	1.70	0.005	0.68	2.39	< 0.003	NM
	2/10/97	< 0.02	0.03	0.002	0.35	0.39	< 0.003	NM
	3/24/98	< 0.02	< 0.05	< 0.002	0.20	0.23	< 0.065	NM
	4/27/98	0.02	< 0.002	0.002	0.41	0.41	< 0.007	NM
	3/26/98	0.02	< 0.05	< 0.002	0.30	0.33	< 0.065	NM
	6/22/98	< 0.02	0.01	0.002	0.30	0.31	< 0.007	NM
Average[c]		**0.02**	**0.30**	**0.002**	**0.37**	**0.67**	**0.01**	
St. Deviation		**0.0005**	**0.69**	**0.002**	**0.17**	**0.8**	**0.02**	
St. Error		**0.0002**	**0.28**	**0.001**	**0.07**	**0.3**	**0.01**	

NM – not measured.

Non detection results are presented as less than the detection limit.

[a] Except for data collected in 2003, Total N calculated by adding nitrate, nitrite, and TKN and using half the reported minimum detection limit (MDL) as a surrogate value for non detections.

[b] In 2003, the City began reporting Total Nitrogen and Total Phosphorus, and discontinued reporting TKN.

[c] Averages calculated using half the reported MDL as a surrogate value for non detections.

Attachment D-2. City of San Diego Monitoring Network Data Set - Continued

Station	Date	Ammonia -N mg/L	Nitrate-N mg/L	Nitrite – N mg/L	TKN mg/L	TN[a] mg/L	PO_4-P mg/L	TP mg/L
Cottonwood Creek (CWD9)	1/17/01	0.09	< 0.05	0.003	0.59	0.61	< 0.07	NM
	2/6/01	0.03	< 0.05	< 0.002	0.52	0.54	< 0.07	NM
	2/27/01	0.83	< 0.05	0.013	1.52	1.56	< 0.07	NM
	3/14/01	< 0.02	< 0.05	< 0.002	0.33	0.35	< 0.07	NM
	3/20/01	< 0.02	2.48	0.024	0.93	3.44	< 0.07	NM
	3/28/01	0.10	0.33	0.036	0.93	1.29	< 0.07	NM
	4/4/01	0.15	0.36	0.054	1.15	1.56	< 0.07	NM
	4/10/01	0.10	0.50	0.054	1.07	1.63	< 0.07	NM
	4/18/01	< 0.02	0.63	0.024	0.80	1.46	< 0.07	NM
	4/25/01	< 0.02	0.66	0.013	0.95	1.63	0.05	NM
	5/9/01	< 0.02	0.71	0.013	0.80	1.52	< 0.07	NM
	5/16/01	< 0.02	0.75	0.014	0.85	1.61	< 0.07	NM
	5/22/01	< 0.02	0.77	0.017	0.78	1.57	< 0.07	NM
	6/6/01	< 0.02	0.87	0.023	0.92	1.81	0.09	NM
	6/20/01	< 0.02	0.96	0.019	0.85	1.83	0.11	NM
	6/27/01	< 0.02	0.84	0.014	1.06	1.91	0.11	NM
	7/5/01	< 0.02	0.71	0.007	1.02	1.73	0.10	NM
	7/11/01	< 0.02	0.63	0.005	0.70	1.34	0.09	NM
	7/17/01	< 0.02	0.26	< 0.002	1.38	1.64	0.03	NM
	7/25/01	< 0.02	0.12	< 0.002	1.38	1.51	0.03	NM
	7/31/01	< 0.02	0.19	< 0.002	0.99	1.18	0.08	NM
	8/8/01	< 0.02	0.02	< 0.002	0.42	0.45	< 0.07	NM
	12/4/01	< 0.02	< 0.05	< 0.002	0.28	0.30	< 0.07	NM
	1/2/02	< 0.02	< 0.05	< 0.002	< 0.10	0.07	< 0.07	NM
	2/5/02	< 0.02	< 0.05	< 0.002	< 0.10	0.07	< 0.07	NM
	4/3/02	< 0.02	< 0.05	< 0.002	0.25	0.28	< 0.07	NM
	5/7/02	< 0.02	< 0.05	< 0.002	0.38	0.40	< 0.07	NM
	11/5/02	< 0.04	< 0.05	0.008	< 0.16	0.11	0.14	NM
	3/4/03	< 0.04	< 0.05	< 0.003	NM	0.23[b]	< 0.07	0.04[b]
	4/8/03	< 0.04	0.36	< 0.003	NM	0.51[b]	< 0.07	< 0.08[b]
Average[c]		**0.05**	**0.41**	**0.01**	**0.75**	**1.14**	**0.05**	**0.04**
St. Deviation		**0.15**	**0.51**	**0.01**	**0.41**	**0.77**	**0.03**	**0.00**
St. Error		**0.03**	**0.09**	**0.00**	**0.08**	**0.14**	**0.01**	**0.00**

NM – not measured.

Non detection results are presented as less than the detection limit.

[a] Except for data collected in 2003, Total N calculated by adding nitrate, nitrite, and TKN and using half the reported minimum detection limit (MDL) as a surrogate value for non detections.

[b] In 2003, the City began reporting Total Nitrogen and Total Phosphorus, and discontinued reporting TKN.

[c] Averages calculated using half the reported MDL as a surrogate value for non detections.

Attachment D-2. City of San Diego Monitoring Network Data Set - Continued

Station	Date	Ammonia-N mg/L	Nitrate-N mg/L	Nitrite – N mg/L	TKN mg/L	TN[a] mg/L	PO_4-P mg/L	TP mg/L
San Vicente Reservoir, above high water line (AQA3)								
	1/27/97	< 0.02	2.84	0.013	0.73	3.59	0.01	NM
	2/10/97	< 0.02	0.03	0.002	0.43	0.47	< 0.08	NM
	2/24/97	< 0.02	< 0.02	< 0.002	0.62	0.63	< 0.08	NM
	3/24/98	< 0.02	0.20	0.005	0.29	0.50	< 0.07	NM
	4/27/98	0.02	0.22	0.003	0.45	0.67	< 0.07	NM
	5/26/98	0.02	< 0.05	< 0.002	0.32	0.35	< 0.07	NM
	6/22/98	< 0.02	< 0.002	0.002	0.34	0.34	0.01	NM
	3/26/01	< 0.02	0.18	0.002	0.25	0.43	< 0.07	NM
	3/10/03	< 0.04	0.15	< 0.003	NM	0.65[b]	< 0.07	0.17[b]
Average[c]		**0.01**	**0.41**	**0.003**	**0.43**	**0.85**	**0.03**	
St. Deviation		**0.005**	**0.918**	**0.004**	**0.169**	**1.036**	**0.012**	
St. Error		**0.002**	**0.306**	**0.001**	**0.060**	**0.345**	**0.004**	
Conejos Creek (CON3)								
	1/22/01	< 0.02	< 0.05	< 0.002	0.30	0.32	< 0.07	NM
	2/12/01	< 0.02	< 0.05	< 0.002	0.20	0.22	< 0.07	NM
	3/5/01	< 0.02	< 0.05	< 0.002	0.48	0.51	0.04	NM
	3/26/01	< 0.02	< 0.05	< 0.002	0.36	0.38	< 0.07	NM
	4/16/01	< 0.02	< 0.05	< 0.002	0.15	0.18	< 0.07	NM
	5/7/01	< 0.02	< 0.05	< 0.002	0.46	0.48	< 0.07	NM
	5/29/01	< 0.02	< 0.05	< 0.002	0.16	0.18	< 0.07	NM
	2/11/02	< 0.02	< 0.05	< 0.002	< 0.10	0.07	< 0.07	NM
	3/11/02	< 0.02	< 0.05	< 0.002	0.18	0.20	< 0.07	NM
	4/8/02	< 0.02	< 0.05	< 0.002	0.24	0.26	< 0.07	NM
	3/10/03	< 0.04	< 0.05	< 0.003	NM	0.49[b]	< 0.07	0.09[b]
	4/14/03	< 0.04	< 0.05	< 0.003	NM	0.26[b]	< 0.07	0.16[b]
Average[c]		**0.01**	**0.02**	**0.001**	**0.26**	**0.30**	**0.03**	**0.12**
St. Deviation		**0.004**	**0.00**	**0.00**	**0.14**	**0.14**	**0.002**	**0.047**
St. Error		**0.001**	**0.00**	**0.00**	**0.04**	**0.04**	**0.001**	**0.033**
Boulder Creek (BDC3)	3/6/01	< 0.02	< 0.05	< 0.002	0.24	0.28	< 0.07	NM
	3/27/01	< 0.02	< 0.05	< 0.002	0.22	0.26	< 0.07	NM
	4/17/01	< 0.02	< 0.05	< 0.002	0.31	0.36	< 0.07	NM
	5/8/01	< 0.02	< 0.05	< 0.002	0.27	0.32	< 0.07	NM
	5/30/01	< 0.02	< 0.05	< 0.002	< 0.10	0.15	< 0.07	NM
	3/11/03	< 0.04	< 0.05	< 0.003	NM	0.16[b]	< 0.07	< 0.08[b]
	4/15/03	< 0.04	< 0.05	0.024	NM	0.25[b]	< 0.07	< 0.08[b]
Average[c]		**0.01**	**0.02**	**0.005**	**0.22**	**0.22**	**0.03**	**0.04**
St. Deviation		**0.005**	**0.00**	**0.01**	**0.10**	**0.10**	**0.00**	**0.00**
St. Error		**0.002**	**0.00**	**0.003**	**0.04**	**0.04**	**0.00**	**0.00**

NM – not measured.

Non detection results are presented as less than the detection limit.

[a] Except for data collected in 2003, Total N calculated by adding nitrate, nitrite, and TKN and using half the reported minimum detection limit (MDL) as a surrogate value for non detections.

[b] In 2003, the City began reporting Total Nitrogen and Total Phosphorus, and discontinued reporting TKN.

[c] Averages calculated using half the reported MDL as a surrogate value for non detections.

Attachment D-2. City of San Diego Monitoring Network Data Set - Continued

Station	Date	Ammonia-N mg/L	Nitrate-N mg/L	Nitrite – N mg/L	TKN mg/L	TN[a] mg/L	PO_4-P mg/L	TP mg/L
San Diego River (SDR2b)	3/6/01	< 0.02	< 0.05	< 0.002	0.41	0.44	< 0.07	NM
	3/27/01	< 0.02	< 0.05	< 0.002	0.23	0.26	< 0.07	NM
	4/17/01	< 0.02	< 0.05	< 0.002	0.17	0.20	< 0.07	NM
	5/8/01	< 0.02	< 0.05	< 0.002	0.24	0.26	< 0.07	NM
	3/11/03	< 0.04	< 0.05	< 0.003	NM	0.38[b]	< 0.07	0.12[b]
	4/15/03	< 0.04	< 0.05	< 0.003	NM	0.29[b]	< 0.07	< 0.08[b]
Average[c]		**0.01**	**0.02**	**0.001**	**0.26**	**0.30**	**0.03**	**0.08**
St. Deviation		**0.01**	**0.00**	**0.000**	**0.10**	**0.09**	**0.00**	**0.06**
St. Error		**0.002**	**0.00**	**0.000**	**0.05**	**0.04**	**0.00**	**0.04**
Cedar Creek (CED3)	3/6/01	< 0.02	< 0.05	< 0.002	0.43	0.45	< 0.07	NM
	3/27/01	0.02	< 0.05	< 0.002	0.20	0.23	< 0.07	NM
	4/17/01	< 0.02	< 0.05	< 0.002	0.13	0.15	< 0.07	NM
	3/11/03	< 0.04	< 0.05	< 0.003	NM	0.46[b]	< 0.07	< 0.08[b]
	4/15/03	< 0.04	< 0.05	0.003	NM	0.27[b]	< 0.07	0.08[b]
Average[c]		**0.02**	**0.02**	**0.002**	**0.25**	**0.31**	**0.03**	**0.06**
St. Deviation		**0.006**	**0.00**	**0.001**	**0.155**	**0.138**	**0.00**	**0.03**
St. Error		**0.003**	**0.00**	**0.000**	**0.089**	**0.062**	**0.00**	**0.02**
Bloomdale Creek (BMD1)								
	3/13/01	< 0.02	0.35	0.004	0.77	1.12	< 0.07	NM
	4/24/01	< 0.02	< 0.05	< 0.002	0.35	0.36	< 0.07	NM
	3/25/03	< 0.04	< 0.05	0.003	NM	0.31[b]	< 0.07	0.09[b]
Average[c]		**0.01**	**0.12**	**0.003**	**0.56**	**0.60**	**0.03**	
St. Deviation		**0.01**	**0.20**	**0.002**	**0.29**	**0.46**	**0.00**	
St. Error		**0.003**	**0.12**	**0.001**	**0.21**	**0.26**	**0.00**	
Santa Ysabel Creek (WCH1)	6/30/01	< 0.02	< 0.05	< 0.002	0.38	0.40	< 0.07	NM
	3/13/01	0.11	0.53	0.012	1.20	1.74	< 0.07	NM
	4/3/01	0.17	< 0.05	0.005	0.55	0.58	< 0.07	NM
	4/24/01	0.09	< 0.05	0.004	0.35	0.38	< 0.07	NM
	6/5/01	< 0.02	< 0.05	< 0.002	0.36	0.38	< 0.07	NM
	1/23/02	< 0.02	0.20	< 0.002	0.12	0.32	< 0.07	NM
	3/26/02	< 0.02	< 0.05	< 0.002	0.26	0.28	< 0.07	NM
	4/23/02	< 0.02	< 0.05	< 0.002	0.47	0.49	< 0.07	NM
	3/25/03	< 0.04	< 0.05	0.003	NM	0.30[b]	< 0.07	0.11[b]
Average[c]		**0.05**	**0.10**	**0.003**	**0.46**	**0.54**	**0.03**	
St. Deviation		**0.06**	**0.17**	**0.003**	**0.33**	**0.46**	**0.00**	
St. Error		**0.02**	**0.06**	**0.001**	**0.12**	**0.15**	**0.00**	

NM – not measured.

Non detection results are presented as less than the detection limit.

[a] Except for data collected in 2003, Total N calculated by adding nitrate, nitrite, and TKN and using half the reported minimum detection limit (MDL) as a surrogate value for non detections.

[b] In 2003, the City began reporting Total Nitrogen and Total Phosphorus, and discontinued reporting TKN.

[c] Averages calculated using half the reported MDL as a surrogate value for non detections.