

Lahontan Regional Water Quality Control Board

Lake Tahoe TMDL  
Contractors Meeting

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## **STORMWATER MONITORING PROJECT**

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# Loading

Heyvaert / Reuter - revision 12/10/02

	Erosion Hazard	Coverage and Contributions by Landscape Classification											Notes	
		Water	Developed									Bare	Vegetated	a
			Single Family Residential	Multi Family Residential	Commercial	Communications / Utilities	Institutional	Agriculture / Livestock	Transportation	Recreation / Open Space	Mixed Urban			
LTB coverage by land use type and erosion hazard (m2)	Slight	974,100	24,955,950	6,044,350	2,704,141	0	1,909,700	508,100	6,268,900	12,596,200	9,002,800	3,768,000	181,070,100	b
	Moderate	120,700	10,118,100	2,533,400	516,498	400	552,700	26,400	2,771,500	7,740,400	2,060,900	1,116,700	173,610,600	
	High	258,800	9,292,800	4,744,200	583,024	1,400	444,000	0	3,866,600	14,683,100	2,582,600	363,000	307,923,500	
Runoff coefficients (C)	Slight	1.00	0.30	0.50	0.80	0.60	0.60	0.25	0.80	0.20	0.50	0.90	0.10	c
	Moderate	1.00	0.40	0.60	0.85	0.70	0.70	0.30	0.85	0.25	0.60	0.90	0.15	
	High	1.00	0.50	0.70	0.95	0.80	0.80	0.35	0.90	0.30	0.70	0.90	0.20	
TP concentrations by land use type	(mg/L)	0.03	0.15	0.30	0.60	0.45	0.45	0.75	1.00	0.10	0.45	0.04	0.05	d, l
Loading calculations (MT of TP / year)	Slight	0.03	1.01	0.82	1.17	0.00	0.46	0.09	4.51	0.23	1.82	0.12	0.81	e, g, h
	Moderate	0.00	0.55	0.41	0.24	0.00	0.16	0.01	2.12	0.17	0.50	0.04	1.17	
	High	0.01	0.63	0.90	0.30	0.00	0.14	0.00	3.13	0.40	0.73	0.01	2.77	
Distribution of 21 autosamplers based on relative TP loading	Slight	0	1	1	1	0	0	0	5	0	2	0	na (1)	f
	Moderate	0	1	0	0	0	0	0	2	0	1	0	na (2)	
	High	0	1	1	0	0	0	0	3	0	1	0	na (4)	
Distribution of 16 autosamplers, not including transportation	Slight	0	2		2	0	1	0	na (5)	0	3	0	na (2)	
	Moderate	0	1		0	0	0	0	na (2)	0	1	0	na (2)	
	High	0	1		0	0	0	0	na (3)	1	1	0	na (2)	

a) USGS land use and land cover classifications (based on Anderson 1976).

b) Erosion hazard (EH) rating from SCS soil survey (1974). Based on ease with which soil particles can be detached and transported, permeability of the soil, infiltration and slope. Coverage is not a factor.

c) C-factors assigned to moderate EH lands taken from ASCE (1992). Adjustment to C-factors for slight and high EH lands supported in chart provided by K.B. Foster.

d) TP concentrations derived from Reuter et al. (2001)

e) Total TP loading from these calculations: 25.5 MT (comparable to 25.6 MT of TP loading from streams and direct runoff in nutrient budget of Reuter et al. 2001)

f) Suggest that LTIMP stream data could be substituted for autosampler installations over undisturbed areas (vegetated classification). Otherwise recommend additional autosampler installations.

g) Load calculations: TP load (MT) = area (m2) \* C-factor \* annual precipitation (m) \* TP concentration (g/m3) / 10<sup>6</sup>

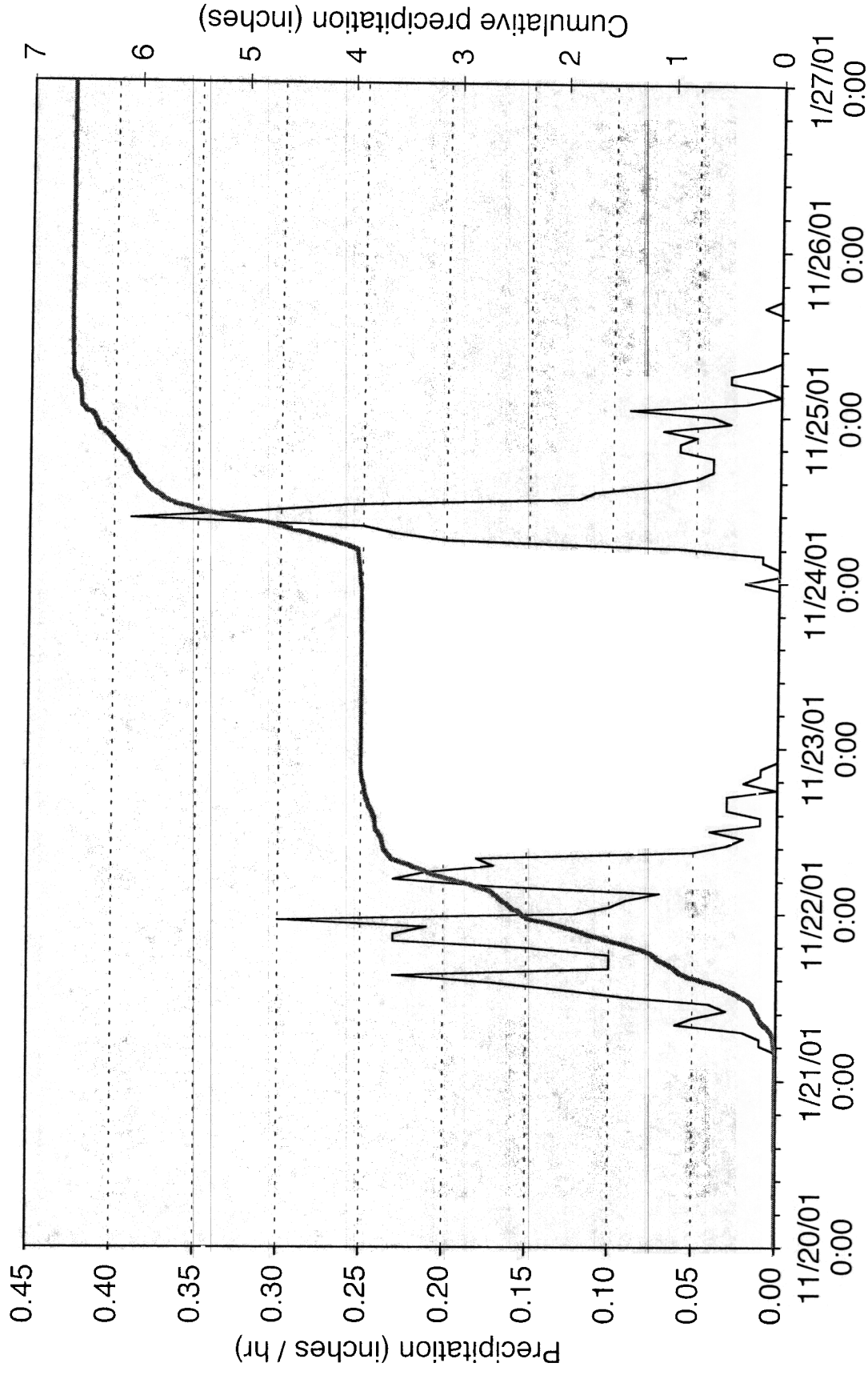
h) Basin-wide mean annual precipitation: estimated from 1981-97 average precipitation at Tahoe City (90 cm / year)

i) Assume P-concentrations from a given land-use remain the same across EH ratings

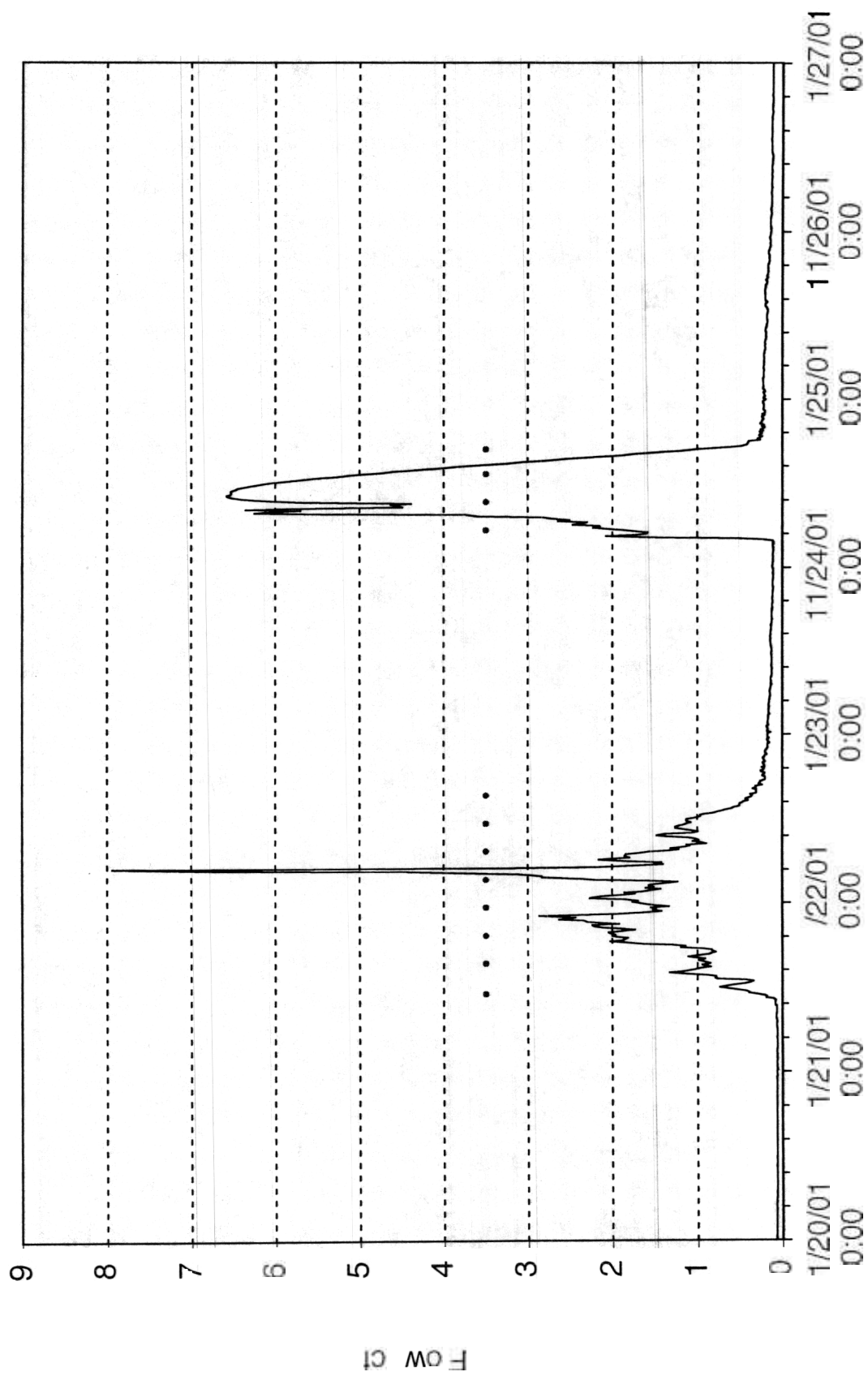
TMDL SWM revision 12/10/02

Autosampler Sites			Percent Coverage by Landscape Classification													Percent Coverage by Erosion Hazard			Drainage Area
ID	Location	Site	Water	Single Family Residential	Multi Family Residential	Commercial	Communications / Utilities	Institutional	Agriculture / Livestock	Transportation	Recreation / Open Space	Mixed Urban	Bare	Vegetated	Slight	Moderate	High	(m2)	
1	Speedboat Ave	asphalt culvert		63						10		24			85	15		8,000	
2	Sequoia Ave.	above basin		54						29	4	9		5	93	7		10,500	
3	Northwood Blvd.	McCourt Blvd.		55	8					27		3		4	57	11	33	164,100	
4	Rubicon	Mountain Dr.		56						2				43				26,600	
5	Dale Dr.	drainage		66						25		3		6				131,673	
6	Andria Dr.	drainage culvert		67						32				1	98	2	65	55,591	
7	SLT-Y outlet	stores																	
8	B Street	Bonanza																	
9	Incline Village Raley's																		
10	Don Chesapo's																		
11	Osgood Basin	inflow										62		4	100			17,000	
12	Incline Village Raley's																		
13	Lakaview Village																		
14																			
15																			
16																			
A	Coon Street Basin	inflow		7	60	7		1		7		20			100			1,500	
B	TCWTS	inflow		12	11	40				26	7			3	96	4		71,832	
C	Park Ave																		
D	SLT Casinos																		
E	Recommended distribution of 21 autosamplers, based on best professional judgement	Slight Moderate High	0 0 0	3 2 2	1 1 1	4 0 0	0 0 0	1 0 0	0 0 0	na (4) na (4) na (4)	0 0 1	3 1 1	0 0 0	na (2) na (2) na (2)					
	Distribution of existing autosamplers by ID	Slight Moderate High		2, 3, 8 1, 6 4, 6	11, A 13	7, 9, 12, B				CalTrans/NDQOT CalTrans/NDQOT CalTrans/NDQOT		10, C			We do not consider sites with less than 50% in a single category as adequately representative for that particular landscape classification.				
	Suggested distribution for new autosamplers sites	Slight Moderate High	0 0 0	0 0 0	0 1 0	0 0 0	0 0 0	1 0 0	0 0 0	0 0 0	0 0 1	1 1 1	0 0 0	2 2 2					

# Ward Lake Level Station



# TCWTS Inflow



TMDL SWM data

Site	Date Time	Level (ft)	Velocity (ft/s)	AV Flow (cfs)	Manning Flow (cfs)	Revised Flow (cfs)	WLL Logger Date Time	Logger Precipitation (inches)	Cumulative Precipitation (inches)	Sample	Date Time	Bottle ID
TCWTS-1	11/22/05 12:50		na	na	0.3365	0.34	11/21/05 0:00	2.96	0.00			
TCWTS-1	11/22/05 13:00		na	na	0.4152	0.42	11/22/05 4:29	2.97	0.01			
TCWTS-1	11/22/05 13:10		3.150	0.7558	0.6779	0.76	11/22/05 5:00	2.98	0.02			
TCWTS-1	11/22/05 13:20		3.214	0.7912	0.7034	0.79	11/22/05 6:19	2.99	0.03			
TCWTS-1	11/22/05 13:30		3.310	0.7771	0.6571	0.78	11/22/05 6:47	3.00	0.04			
TCWTS-1	11/22/05 13:40		3.490	0.8755	0.7228	0.88	11/22/05 7:00	3.01	0.05			
TCWTS-1	11/22/05 13:50		3.480	1.0927	0.9972	1.09	11/22/05 7:13	3.02	0.06			
TCWTS-1	11/22/05 14:00		3.800	1.3258	1.1596	1.33	11/22/05 7:33	3.03	0.07			
TCWTS-1	11/22/05 14:10		3.590	1.1781	1.0622	1.18	11/22/05 7:44	3.04	0.08			
TCWTS-1	11/22/05 14:20		3.590	1.0971	0.9591	1.10	11/22/05 7:49	3.05	0.09			
TCWTS-1	11/22/05 14:30		3.440	1.0226	0.9219	1.02	11/22/05 7:54	3.06	0.10			
TCWTS-1	11/22/05 14:40		3.380	0.9473	0.8472	0.95	11/22/05 8:02	3.07	0.11			
TCWTS-1	11/22/05 14:50		3.270	0.8376	0.7447	0.84	11/22/05 8:12	3.08	0.12			
TCWTS-1	11/22/05 15:00		3.310	0.8919	0.8008	0.89	11/22/05 8:20	3.09	0.13			
TCWTS-1	11/22/05 15:10		3.400	0.9437	0.8355	0.94	11/22/05 8:31	3.10	0.14			
TCWTS-1	11/22/05 15:20		3.310	0.8478	0.7447	0.85	11/22/05 8:46	3.11	0.15			
TCWTS-1	11/22/05 15:30		3.380	0.8837	0.7669	0.88	11/22/05 9:06	3.12	0.16			
TCWTS-1	11/22/05 15:40		3.440	0.9362	0.8123	0.94	11/22/05 9:24	3.13	0.17			
TCWTS-1	11/22/05 15:50		3.450	0.9857	0.8710	0.99	11/22/05 9:44	3.14	0.18			
TCWTS-1	11/22/05 16:00		3.270	0.9076	0.8355	0.91	11/22/05 10:01	3.15	0.19			
TCWTS-1	11/22/05 16:10		3.480	1.0249	0.9096	1.02	11/22/05 10:15	3.16	0.20			
TCWTS-1	11/22/05 16:20		3.540	1.1016	0.9844	1.10	11/22/05 10:34	3.17	0.21			
TCWTS-1	11/22/05 16:30		3.380	0.9473	0.8472	0.95	11/22/05 10:56	3.18	0.22			
TCWTS-1	11/22/05 16:40		3.440	0.8540	0.7120	0.85	11/22/05 11:06	3.19	0.23			
TCWTS-1	11/22/05 16:50		3.330	0.8354	0.7228	0.84	11/22/05 11:14	3.20	0.24			
TCWTS-1	11/22/05 17:00		3.220	0.7809	0.6885	0.78	11/22/05 11:20	3.21	0.25			
TCWTS-1	11/22/05 17:10		3.290	0.8254	0.7228	0.83	11/22/05 11:27	3.22	0.26			
TCWTS-1	11/22/05 17:20		3.480	0.8349	0.6779	0.83	11/22/05 11:33	3.23	0.27			
TCWTS-1	11/22/05 17:30		3.370	0.9537	0.8591	0.95	11/22/05 11:39	3.24	0.28			
TCWTS-1	11/22/05 17:40		3.530	1.1888	1.1023	1.19	11/22/05 11:45	3.25	0.29			
TCWTS-1	11/22/05 17:50		3.480	1.1321	1.0491	1.13	11/22/05 11:51	3.26	0.30			
TCWTS-1	11/22/05 18:00		3.530	1.2832	1.2298	1.28	11/22/05 11:56	3.27	0.31			
TCWTS-1	11/22/05 18:10		na	na	1.6352	1.64	11/22/05 12:00	3.28	0.32			
TCWTS-1	11/22/05 18:20		na	na	1.8562	1.86	11/22/05 12:04	3.29	0.33			
TCWTS-1	11/22/05 18:30		na	na	2.0210	2.02	11/22/05 12:10	3.30	0.34			
TCWTS-1	11/22/05 18:40		3.740	1.8757	1.9485	1.88	11/22/05 12:14	3.31	0.35			
TCWTS-1	11/22/05 18:50		3.720	1.8537	1.9306	1.85	11/22/05 12:19	3.32	0.36			
TCWTS-1	11/22/05 19:00		3.590	1.8121	1.9665	1.81	11/22/05 12:24	3.33	0.37			
TCWTS-1	11/22/05 19:10		3.750	1.9418	2.0394	1.94	11/22/05 12:29	3.34	0.38			
TCWTS-1	11/22/05 19:20		3.810	1.9978	2.0763	2.00	11/22/05 12:34	3.35	0.39			

TMDL SWM chemistry

Site	Sample Date	Time	Bottle #	DP (ppb)	NH4 (ppb)	NO3 (ppb)	SRP (ppb)	TKN (ppb)	TP (ppb)	TSS (mg/L)
TCWTS-1	11/22/05	11:02	0001	68	24	220	48	426	113	12
TCWTS-1	11/22/05	13:51	0002	328	79	212	295	497	531	45
TCWTS-1	11/22/05	17:51	0003	306	7	385	283	1170	482	41
TCWTS-1	11/22/05	21:51	0004	247	19	504	221	747	454	42
TCWTS-1	11/23/05	1:51	0005	244	3	754	221	826	352	19
TCWTS-1	11/23/05	5:51	0006	208	1	867	188	991	479	123
TCWTS-1	11/23/05	9:51	0007	188	37	1479	158	1710	251	23
TCWTS-1	11/23/05	13:51	0008	217	43	1638	183	945	288	18
TCWTS-1	11/25/05	4:12	0009	170	27	1204	141	1669	390	97
TCWTS-1	11/25/05	7:51	0010	197	2	364	175	1158	835	174
TCWTS-1	11/25/05	11:51	0011	187	42	969	158	1405	408	81
TCWTS-1	11/25/05	15:51	0012	134	60	1875	101	1718	499	113



TMDL Stormwater Monitoring Site