APPENDICES TO THE GEOMORPHIC ASSESSMENT OF THE CORTE MADERA CREEK WATERSHED

MARIN COUNTY, CALIFORNIA

FINAL REPORT

December 31, 2000

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List of Appendices

Appendix A. Aerial Photography of the Corte Madera Creek Watershed

Year	Flight Date	Agency	Series	Scale
1946*	7/22/1946	USGS	GS-CP	1:24,000
1957	8/23/1957	NRCS	ABD 59T	1:20,000
1958	11/28/1958	NRCS	CVM 7V-13V	1:20,000
1959	4/15/1959	NRCS	CSI 1V-7V	1:20,000
1960*	4/10/1960	USAF	VM 186 AF59	1:48,000
1961	5/12/1961	NRCS	CSH 1BB-7BB	1:20,000
1964	5/9/1964	NRCS	ABO 2EE-3EE	1:20,000
1970	4/19/1970	USGS	GS-VCM1	1:80,000
1996*	4/27/1996	--	WAC-96CA	1:24,000

*Reviewed as part of this study.

Appendix B. Descriptions of upland sediment sources and hillslope management problems [1, 2]

Site No.	Location	Subwatershed	Ownership	Description of sediment source and/or hillslope management problem
1	North face Corte Madera Ridge	Larkspur Creek	MCOSD	1999 landslide into Larkspur Creek
2	“Nora’s Canyon”; North face Corte Madera Ridge	Larkspur Creek	MCOSD	Active landsliding into Larkspur Creek
3	Southern Marin Line fire road; North face Corte Madera Ridge	Larkspur Creek	MCOSD	Road-cut culverts plug with sediment during storms; road-cut concentrates runoff
4	Blithedale Ridge	Larkspur Creek	MCOSD	Concentrated runoff “shoots off” road-cut
5	Abandoned land development site at end of Cedar Drive	King Mountain Creek	Private	Active gully headcutting
6	MMWD water line under Southern Marin Line fire road	Larkspur Creek	MMWD	Road-cut culverts plug with sediment during storms; road-cut concentrates runoff; slope failures along fire road
7	Windy Ridge; "Evergreen fire road" at top of Baltimore Canyon	Larkspur Creek	MCOSD	Steep, unmaintained fire road, cut in melange; rock-lined ditch clogs with sediment
8	MMWD water line under Pine Mountain Tunnel fire road	San Anselmo Creek	MMWD	Road-cut culverts plug with sediment during storms; landsliding into Carey Camp Creek during 1980s
9	Outlet of Carey Camp Creek	San Anselmo Creek	MCOSD	MCOSD constructed series of check dams at outlet of Carey Camp Creek; filled with sediment in two years
10	San Anselmo Creek nr outlet of Carey Camp Creek	San Anselmo Creek	MCOSD	Ranchers extracted gravel from San Anselmo Creek; MCOSD placed rip-rap bank protection in 1984-85
11	Fire road below ridge dividing Upper San Anselmo and Cascade Creeks	Upper San Anselmo Ck	MMWD	Steep, high-maintenance fire road; water bars necessary
12	Fire road on ridge dividing Upper San Anselmo and Cascade Creeks	Upper San Anselmo Ck	MMWD	Steep,unmaintained fire road; water bars necessary; gullying
13	Fire road; East face White Hill	San Anselmo Creek	MCOSD	Steep, high-maintenance, gullied fire road; cut in greenstone/melange shear zone
14	Middle fire road; Blue Ridge Creek subwatershed; South Face Blue Ridge	San Anselmo Creek	MCOSD	Creek crossings were management problems ten years ago; now maintained
15	Toyon fire road; East face Pams Blue Ridge	San Anselmo Creek	MCOSD	Fire road channelizes runoff; landslide in 1999
16	Gunshot fire road; Sourth face Loma Alta	Fairfax Creek	MCOSD	Fire road gullied
17	Smith Ridge fire road; South face Loma Alta	Fairfax Creek	MCOSD	Fire road gullied; water bar on hillslope above fire road
18	Smith Ridge fire road; South face Loma Alta	Fairfax Creek	MCOSD	Channel head crossing eroding fire road fill; gullying
19	Lewiz Ranch; East face Loma Alta	Sleepy Hollow Creek	Private	Cattle grazing
20	Fire road;	Sleepy Hollow Creek	MCOSD	Numerous active earthflows on ridge; periodic mass wasting
21	Warren Springs Grade Rd; South face of Bald Hill	Ross Creek	MMWD	Ruts concentrate runoff
22	Fire road; East face of Bald Hill	Ross Creek	MMWD	Ruts and in-slope concentrate runoff, frequent blading required
23	Bill Williams Dam; Bill Williams Creek above Phoenix Lake	Ross Creek	MMWD	Reservoir filled with sediment by 1860s; appears stable
24	Fire road crossing; Channel head of north fork Wood Lane Creek	Wood Lane Creek	MMWD	Slope failure along road-cut
25	Uphill from fire road; East face Pilot Knob above Phoenix Lake	Ross Creek	MMWD	Active landsliding
26	Downstream of Phoenix Dam; North face Ross Hill	Ross Creek	MMWD	1982 landslide into Ross Creek
27	Upstream from Deer Park School; North face Bald Hill	Deer Park Creek	MMWD	Hillslope creep into Deer Park Creek
28	Channel headcutting; Sky Ranch Stables	Unsampled Area	Private	Vegetative cover modification and extensive gullying;n greenstone/melange shear zone
29	Fire roads; South face Blue Ridge	San Anselmo Creek	MCOSD	Redundant fire roads
30	Depositional zone at upland-alluvial channel transition; Marin Stables	Wood Lane Creek	MMWD	Channel instability

[1] Sources: D. Odion, Bill Hogan, and Mike Swezy, MMWD, and Brian Sanford, MCOSD, pers. comm., 1999.
[2] See Figure 23 for site locations.

APPENDIX C
BEDLOAD SEDIMENT TRANSPORT MODELING METHODS

Hydrologists, river engineers, and fishery biologists often need to know the amount of sediment discharge from a river basin. Knowledge of sediment transport in sand-channel streams has been well documented. However, prediction of bedload transport in gravel-bed streams has not been as well documented. Recent research results have developed techniques for prediction of gravel transport. These techniques enable the analyst to estimate gravel transport from hydraulic and sediment data.

SEDCOMP, the program used to analyze the sediment transport for the Corte Madera Creek project, takes cross-section data, and bed material measurements and uses a set of parameters to predict bedload transport past a cross-section. The cross-section and energy slope are used to compute bed shear across the cross-section. The bed shear is the force of the weight of the water on the bed, and the bed shear that moves the bedload. The size distribution of the bed material (either surface layer or subsurface layer, although the subsurface layer was used in this project) is then used to predict the movement of bed material as bedload. Bedload measurements should be used to calibrate the parameters by iterative fitting. However, such measurements were not available for Corte Madera Creek. Therefore, parameters were chosen based on published values and field experience. Once determined, an analysis can be made of the predicted movement of each size class of bed material for each measurement. The parameters in SEDCOMP may then be used with a flow duration curve to compute an annual load.

FEATURES OF SEDCOMP

SEDCOMP is a batch mode program. SEDCOMP predicts bedload transport. SEDCOMP can be used to fit parameters to the algorithm if bedload measurements are available for calibration, it can give a detailed picture of fit by size break for a set of measurements, and it can generate a bedload sediment rating curve by entering a cross-section with various stages.

TECHNICAL BACKGROUND

SEDCOMP computes bedload sediment discharge for a given cross-section on a stream. As with most bedload transport equations, it uses bed shear to estimate transport. Bed shear is the force of the water column on the bed, and is calculated based on the weight of the water and the energy slope of the water. Thus, bed shear is the force of the water along the stream bed. The input data are a cross-section, the energy slope, and bed material size distribution. The energy slope was determined using several cross-sections surveyed in the field, resistance to flow determined by a pebble count of the surface material using the Limerinos equation (1), and the use of the Corps of Engineers standard step-backwater program HEC-2.

The data are analyzed using the Parker and Klingeman procedure (1982), that includes the effect of a “hiding factor”(2). The term ‘hiding factor’ is used to describe the fact that when there is a mixture of particles on the stream bed, the larger particles hide the smaller particles. Thus, the smaller particles are harder to move than would be predicted by the usual equations based on bed shear, such as that of Meyer-Peter and Mueller. Similarly, because the larger particles project into the flow more than they would if there were uniformly large particles on the bed, larger particles are moved more easily than otherwise predicted. The result is a more uniform movement of particles of all sizes, which is termed "almost equal mobility."

The Parker and Klingeman procedure includes a physically-based semi-empirical equation with two calibration parameters. Those two parameters are: first, a reference critical shear value, TRS50, the shear at which the median diameter of bed material moves, and second, an exponent which relates the shear value required to move any other size present in the bed material to TRS50. The prediction of the size distribution of the bedload is based on the distribution of a parent material. The parent material may be for the pavement material on the bed or the sub-pavement material under the pavement.

Parker and Klingeman's equation 21 is:

$$\frac{\mathrm{TRS(I)}}{\mathrm{TRS50}} = \frac{(\mathrm{DG(I)})\exp(-\mathrm{PEXP})}{\mathrm{DMREF}}$$

where TRS(I) is effective shear for size of material DG(I), and TRS50 is the effective shear for the reference size of material, DMREF, the D50 for either the pavement or subpavement material. The exponent, PEXP, and reference Shields stress, TRS50, in the Parker and Klingeman equations 22 and 27 (TRS50 = 0.0876 for subpavement and = 0.035 for pavement material) are related. They also are related to the Wr*, a dimensionless bedload, for which Parker and Klingeman choose 0.002 (p. 1412). The value of 0.002 is a "small but measurable bedload movement" used to determine the reference shear stress, TRS50. If the size is determined by a proper choice of exponent, the volume transported can be fixed by a proper choice of TRS50. This means that with a good set of data the Parker and Klingeman empirical approach can be calibrated for a wide set of conditions.

Determination of a proper "calibrated" reference shear stress depends upon the determination of energy slope. Thus, slope must be known in order for TRS50 to be used to predict the bed load without calibration. Error in determination of the energy slope and the subsurface reference size, D50s, have a similar effect on prediction. If D50s is increased, a change in reference shear, TRS50, must be made to predict with equal accuracy. Thus, both the size distribution of the parent material and energy slope must be accurately determined in order to use the Parker and Klingeman method without calibration. However, if parameters are calibrated to data, the calibrated parameter values will compensate for any errors in measurement of slope and D50, and the resulting parameters may be used to predict bedload movement for that site. For the Corte Madera Creek project pavement and subpavement samples were taken in the field and seived to determine the parent distribution. The energy slope was determined by HEC-2 as described above. The reference shear is the most important parameter in the P-K model for the determination of amount of bedload. The exponent of the relation (PEXP) is most important for determining the size distribution of the bedload. The greater the difference between the median diameter of the parent material (pavement or subpavement) and the bedload, the smaller the exponent must be. The exponent in Parker and Klingeman's Equation 21 must be different from 1.0 (the Parker and Klingeman paper uses 0.982 with the sub-pavement distribution based on their Oak Creek data). The exponent determines how the size distribution of the bedload is related to that of the parent material. A value of 0.95 was used for the Corte Madera Creek project based on field experience in Oregon and Colorado.

The Parker and Klingeman method will predict bedload movement only for those particle sizes contained in the size distribution for the parent material. Therefore, the sample chosen as the parent material must contain some material in all size classes that are contained in the bedload and are to be predicted.

REFERENCES CITED

1. Limerinos, John T., Determination of the Manning Coefficient from Measured Bed Roughness in Natural Channels, USGS Water Supply Paper 1898-B, 1970.

2. Parker, Gary, and Klingeman, P. C., On Why Gravel Bed Streams are Paved, Water Resources Research, Vol. 18, No. 5, Oct. 1982.

Appendix D. Benchmark elevations and descriptions.

BM ID	CREEK	LOCATION	BM ELEV [1]		BM DESCRIPTION
1.1	San Anselmo Ck	Canyon Rd BDGE	171.26	ft	C manhole cover N of Canyon Rd bridge
1.2			**170.95**	ft	Yellow PS NE corner of Canyon Rd bridge deck
2.1	San Anselmo Ck	Meadow Way BDGE	**151.80**	ft	Yellow PS NE corner of Meadow Way bridge deck
2.2			154.28	ft	Top FH S of Meadow Way bridge, at T-corner, near street sign
3.1	San Anselmo Ck	Bolinas-FFX Rd BDGE	**124.15**	ft	Yellow PS, CL Bolinas-Fairfax bridge, on DS sidewalk
4.1	San Anselmo Ck	Creek Rd BDGE	**119.20**	ft	Top FH N of Creek Rd bridge
4.2			117.11	ft	C manhole Cover N of Creek Rd bridge
4.3			116.81	ft	Yellow PS CL and C Creek Rd Bridge
5.1	Fairfax Ck	Along Olema Rd	**174.55**	ft	Blue PS on water meter cover E edge Olema Rd, ~1900 ft S of SFD Blvd, S of Apt Bldgs, at dam on Fairfax Creek
6.1	Fairfax Ck	Olema Rd BDGE	**137.85**	ft	Yellow PS on S Olema Rd bridge wall
6.2			134.71	ft	C sewer manhole SW of Olema Rd bridge
7.1	Fairfax Ck	Marin Rd BDGE	143.60	ft	C manhole at corner Bothin Rd and Manor Rd
7.2			145.26	ft	C manhole at corner Manor Rd and SF Drake Rd
7.3			**146.25**	ft	Yellow PS on S Manor Rd bridge wall
8.1	Fairfax Ck	Scenic Rd BDGE	123.44	ft	Top FH NW of Scenic Rd bridge
8.2			122.39	ft	USACE HWM#433 on fencepost NW of Scenic Rd bridge deck
8.3			**126.95**	ft	Yellow PS US (N) CL Scenic Rd bridge deck on sidewalk at base of "heart" lightpost
8.4			126.78	ft	C sewer manhole at corner Arroyo Rd and Scenic Rd
9.1	Fairfax Ck	Park Rd	???	ft	C manhole S corner Wreden St and Park Rd, W of Andi Peri Park
9.2			**124.15** [2]	ft	Top FH at corner Wreden St and Park Rd, W of Andi Peri Park
10.1	San Anselmo Ck	Pastori Ave BDGE	**95.95**	ft	Yellow PS NE corner Pastori Ave bridge deck
11.1	Sleepy Hollow Ck	Caleta Ave BDGE	**118.05**	ft	Yellow PS on S or DS sidewalk on Caleta AVe BDGE deck, along CL, along DS BDGE wall
11.2			117.21	ft	C MH W end Caleta Ave BDGE deck
11.3			117.94	ft	C MH E end Caleta Ave BDGE deck
12.1	Sleepy Hollow Ck	Arroyo Ave BDGE	**96.45**	ft	Yellow X on S or DS sidewalk Arroyo Ave BDGE deck
12.2			95.53	ft	C MH W OF Arroyo Ave BDGE deck, at intersection of Arroyo and Butterfield Rd
12.3			96.44	ft	C MH E OF Arroyo Ave BDGE deck
13.1	Sleepy Hollow Ck	Broadmoor Ave BDGE	**81.00**	ft	Yellow PS on E or DS curb on Broadmoor Ave BDGE deck along CL
13.2			81.36	ft	C Sanitary Sewer MH N of Broadmoor Ave BDGE deck, E of C Broadmoor Ave
13.3			80.96	ft	C Sanitary Sewer MH S of Broadmoor Ave BDGE deck, E of C Broadmoor Ave
14.1	Sleepy Hollow Ck	Morningside Ave BDGE	**77.00**	ft	Yellow PS on E or DS curb on Morningside Ave BDGE deck
14.2			77.27	ft	C MH N of Morningside Ave BDGE deck
14.3			76.53	ft	C MH S of Morningside Ave BDGE deck
15.1	Sleepy Hollow Ck	Mountain View Ave BDGE	**76.75**	ft	Yellow PS on NE Mountain View Ave BDGE abutment, 2 ft W of Rivera St. Sign Post
15.2			76.57	ft	C MH N of Mountain View Ave BDGE deck, at corner of Mountain View and Rivera St
16.1	Sleepy Hollow Ck	SFD BLVD BDGE	**75.85**	ft	Yellow PS on E or US curb on SFD BLVD BDGE deck, along CL, above stenciled drain inlet
17.1	Sleepy Hollow Ck	Saunders Ave BDGE	**69.35**	ft	Yellow PS on N or US curb on Saunders Ave BDGE deck along CL
17.2			69.90	ft	C MH W of Saunders Ave BDGE deck, N of C of Saunders Ave
18.1	Sleepy Hollow Ck	Taylor Ave BDGE	**65.95**	ft	Yellow PS on curb at NW corner of Taylor Ave BDGE deck above stenciled drain inlet
19.1	San Anselmo Ck	Saunders Ave BDGE	**63.65**	ft	Yellow PS on curb at NW corner of Saunders Ave BDGE deck, above stenciled drain inlet

[1] Bold elevations provided by Don Hobbs, MCFCD, via 1/18/2000 email transmittal, elevations are in 1929 NGVD, vertical error = +/- 0.1 ft; Other elevations are measured relative to bold elevations, 1929 NGVD, vertical error = +/- 0.15 ft

[2] Elevation provided by MCFCD appears to be an error; elevation appears about 10 feet higher than USGS topographic map; data provided could be erroneous entry of data for site no. 3.1

ABBREVIATIONS					
C	CENTER	PS	PAINT SPOT	N	NORTH
CL	CENTER LINE OF CREEK	X	PAINTED X	S	SOUTH
DS	DOWNSTREAM	BDGE	BRIDGE	E	EAST
US	UPSTREAM	MH	MANHOLE COVER	W	WEST
FH	FIRE HYDRANT	SFD	SIR FRANCIS DRAKE		

Appendix E. Raw subwatershed channel survey data.

Subwatershed:	Larkspur
Location:	Upstream of Cane St. Bridge
Date(s) surveyed:	6/5/1999 11/2/1999
Surveyors:	Plunkett Smeltzer
	Miglio Plunkett
	Ross
	Wheeler
Location of notes:	Data Files pp. 18-24 CMC Book
Benchmarks:	Yellow X CL Cane St. bridge deck — Elevation 100 ft
	Fire Hydrant top SE Cane St. bridge deck — ft 99.89 ft
	TOP RB PIN CS 2 — ft 97.225 ft
LP stationing:	0.0 at US face of Cane St. Bridge; CL
Data entered on:	12/2/1999 11/8/1999
Data entered by:	Smeltzer Smeltzer
Notes:	11/2/99 subsurface sediment sample at STA 53 ft
	11/2/99 surface sediment samples at STA 50 ft - 35 ft; STA 30 ft - 5 ft; STA 80 ft - 95 ft

Long profi 11/2/1999

LP STA (ft)	CH BED ELEV (ft)	FP ELEV (ft)	NOTES		
168.6	90.99	NA			
156.8	91.93	NA			
143	92.25	NA			
127	91.91	96.765	CS 5		
118.4	90.78	NA			
108	90.59	NA			
98	90.68	96.66	CS 4		
87	91.34	NA			
75	90.93	94.465	CS 3		
66	91.565	NA		REACH	CS
55	91.84	NA		CALC	CALC
44.5	91.96	NA			
34.7	91.48	NA	CS 1		
24	91.43	NA			
13.8	90.39	NA			
0	91.87	NA			

11/2/1999 CH BED SLOPE = 0.013428 6/5/1999 CH BED SLOPE = 0.013693
CS 1 - CS 5 CH BED SLOPE = 0.005137
FP SLOPE = NA

Cross-section data:

CS 1
Date: 11/2/1999
Station: 34.7 ft
RB pin: nail in base of RW (0.0)
LB pin: (none) ds edge of bay at LB
HI: 101.545 ft

STA	FS	BS	ELEV	NOTES
		1.545		
0	4.395		97.15	RB PIN
6.6	5.15		96.395	
10	6.24		95.305	
12.6	7.39		94.155	
14	8.12		93.425	
15.5	8.98		92.565	REC
18	9.45		92.095	
19.8	9.53		92.015	
22.4	9.58		91.965	
23.8	9.78		91.765	WSE
25.1	10.11		91.435	TH
27.3	9.84		91.705	LEC
28	9.12		92.425	
30.4	8.36		93.185	
32	8.21		93.335	
36.3	3.61		97.935	EST

CS 2
Date: 6/5/1999
Station: 53 ft
RB pin: re-bar stake at edge of driveway
LB pin: re-bar stake at edge of driveway (0.0)
HI: 106.465 ft

STA	FS	BS	ELEV	NOTES
0.00	5		101.465	TOP LB PII
0.00	5.3		101.165	BASE LB F
2.46	6.21		100.255	TOP LB
4.92	7.96		98.505	
7.55	9.78		96.685	
9.51	11.9		94.565	
11.15	12.52		93.945	
13.12	13.78		92.685	
13.78	14.39		92.075	
14.11	14.54		91.925	
16.08	14.2		92.265	
17.72	14.12		92.345	
19.36	14.31		92.155	
21.00	14.66		91.805	
23.29	14.64		91.825	
25.59	14.49		91.975	
27.23	14.74		91.725	TH
28.22	13.13		93.335	
32.48	11.06		95.405	
35.10	10.04		96.425	
39.04	9.42		97.045	BASE RB PIN
39.04	9.24		97.225	TOP RB PIN

CS 3
Date: 11/2/1999
Station: 75 ft
RB pin: nail in base of 2' RW (0.0)
LB pin: (none) ds edge of LB RW
HI: 101.545 ft

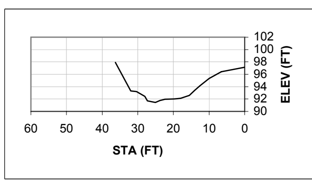
STA	FS	BS	ELEV	NOTES
0	5.32		96.225	RB PIN
2.6	6.8		94.745	
4.2	8.08		93.465	
7.5	9.32		92.225	REC
10.2	9.26		92.285	
13.3	10.13		91.415	
15.7	10.83		90.715	TH
20.4	9.29		92.255	TOP LB
25.1	7.08		94.465	
29.8	2.64		98.905	EST

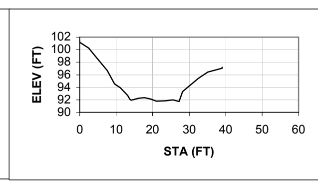
CS 4
Date: 11/2/1999
Station: 98 ft
RB pin: nail in base of 2' RW at RB toe (0.0)
LB pin: ds edge of 1' RW in RW pair on LB
HI: 101.76 ft

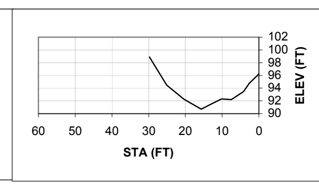
STA	FS	BS	ELEV	NOTES
0	6.89		94.87	RB PIN
1.4	11.08		90.68	TH
2.8	10.74		91.02	
4.4	10.21		91.55	
5.9	9.72		92.04	
8.2	9.65		92.11	
10.5	10.13		91.63	
12.5	10.36		91.4	
15.2	9.64		92.12	
17	7.8		93.96	
17.9	7.485		94.275	
20	6.79		94.97	
20.2	5.1		96.66	
30.7	4.54		97.22	LB PIN

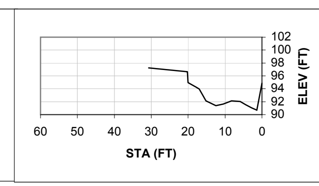
CS 5
Date: 6/5/1999
Station: 127 ft
RB pin: re-bar at edge of parking lot
LB pin: re-bar at base of adjacent house
HI: 103.475 ft

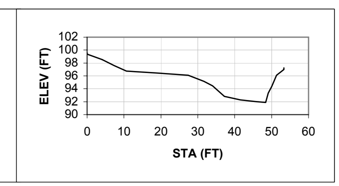
STA	FS	BS	ELEV	NOTES
0.00	3.91		99.565	TOP LB PIN
0.00	4.08		99.395	BASE LB PIN
4.10	4.94		98.535	
7.38	5.91		97.565	
10.66	6.71		96.765	
18.86	7.02		96.455	
27.40	7.38		96.095	
31.66	8.32		95.155	
33.96	8.99		94.485	
37.24	10.67		92.805	
41.50	11.18		92.295	
45.44	11.46		92.015	
48.39	11.61		91.865	TH
49.05	10.15		93.325	
50.03	9.12		94.355	
51.35	7.38		96.095	
53.31	6.5		96.975	BASE RB PIN
53.31	6.23		97.245	TOP RB PIN











Appendix E. Raw subwatershed channel survey data.

Subwatershed: Tamalpais Creek
Location: d/s Evergreen Rd

Date(s) surveyed: 11/2/1999
Surveyors: Smeltzer
Plunkett

Location of notes: CMC book pp.25-32

Benchmarks:
C Manhole Cover N or Evergreen Rd Bridge, CL Evergreen Rd | 100 ft
Yellow X painted on NE bridge abutment/deck Evergreen Rd Bridge | ft | 99.13 ft

Long Profile Stationing: STA 0.00 ft is CL pipe crossing channel d/s Evergreen Rd, u/s thalweg

Data entered on: 12/2/1999
Data entered by: Smeltzer

Notes:
11/2/99 surface sediment samples at STA 5 ft - STA 30 ft and STA 60 ft - STA 90 ft
11/2/99 subsurface sediment sample at CS 3; 70 ft

Long profi

LP STA (ft)	CH BED ELEV (ft)	FP ELEV (ft)	NOTES
0	87.22	95.39	CS 1; LB
31	88.1	96.1	CS 2; LB
70	87.86	96.78	CS 3
92	87.57	97.16	CS 4
114	88.33	97.46	CS 5
152	88.88	98.55	CS 6

CS 1 - CS 6 CH BED SLOPE = 0.010921
FP SLOPE = 0.020789

Cross-section data:

CS 1
Date: 11/2/1999
Station: 0 ft
RB pin: (none)
LB pin: (none)
HI: 102.07 ft

STA	FS	BS	ELEV	NOTES
-4	6.6		95.47	EST
0	8.6		93.47	EST; TOP
1.6	15.385		86.685	REC
3.8	14.85		87.22	TH
8.2	14.68		87.39	LEC
10.5	14.22		87.85	
14.5	12		90.07	
23.4	8.79		93.28	
36	6.68		95.39	

CS 2
Date: 11/2/1999
Station: 31 ft
RB pin: (re-bar stake on hillslope below trail)
LB pin: (none)
HI: 102.07 ft

STA	FS	BS	ELEV	NOTES
0	3.5		98.57	TOP RB PI
4.4	6.81		95.26	
7	9.22		92.85	
9.7	10.89		91.18	
12.3	12.04		90.03	
13.8	13.59		88.48	REC
18.9	13.84		88.23	
25.7	13.92		88.15	
27.6	13.97		88.1	TH
29.4	13.81		88.26	LEC
30.7	13.43		88.64	
32.9	10.9		91.17	
46.5	5.97		96.1	
58	5.57		96.5	

CS 3
Date: 11/2/1999
Station: 70 ft
RB pin: (none) (base of hollow bay at head or RB slur
LB pin: (none)
HI: 102.07 ft

STA	FS	BS	ELEV	NOTES
0.4	5.13		96.94	BASE OF I
5.8	5.43		96.64	
11.2	5.27		96.8	
17.5	5.29		96.78	
25.8	5.71		96.36	
30	6.05		96.02	TOP RB
34.4	12.39		89.68	REC
39	14.21		87.86	TH
41.7	13.98		88.09	
43.5	13.82		88.25	
47.2	13.65		88.42	
49	13.31		88.76	LEC
50.7	9.52		92.55	
56.3	6.96		95.11	
59.4	6.62		95.45	

CS 4
Date: 11/2/1999
Station: 92 ft
RB pin: (none) (base of 1.3 ft d oak)
LB pin: (none) (4x4 post on fence)
HI: 102.07 ft

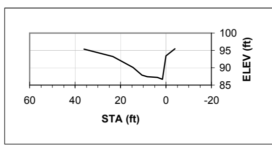
STA	FS	BS	ELEV	NOTES
0	4.19		97.88	BASE OF (
6	4.94		97.13	
10	4.91		97.16	
16	5.19		96.88	
35	5.305		96.765	TOP RB
40.8	7.9		94.17	
43.8	9.71		92.36	
45.4	14.5		87.57	TH
48.7	13.79		88.28	
51.8	12.76		89.31	
55.3	12.76		89.31	
58.7	12.55		89.52	LEC
62	10.81		91.26	
63.7	6.57		95.5	FENCE

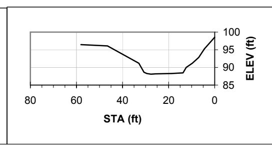
CS 5
Date: 11/2/1999
Station: 114 ft
RB pin: (none) (base of 4-prong bay tree)
LB pin: (none) (gate in brown fence; thru scour pool a
HI: 102.07 ft

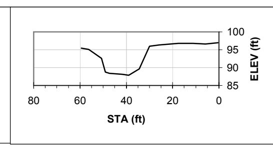
STA	FS	BS	ELEV	NOTES
0	3.28		98.79	
9.5	4.16		97.91	
19	4.61		97.46	
32	4.78		97.29	
41	5.3		96.77	TOP RB
43.6	6.4		95.67	
45.8	9.2		92.87	
48.4	10.59		91.48	
52.4	12.04		90.03	
55.6	12.72		89.35	
57	13.58		88.49	REC
58.6	13.74		88.33	TH
61	13.5		88.57	
64.5	13.54		88.53	
71	13.5		88.57	UNDERCUT 3-4 FT UNDER BAY
78	6.7		95.37	EST; AT FENCE

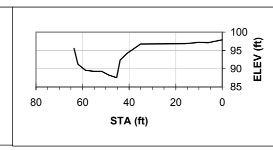
CS 6
Date: 11/2/1999
Station: 152 ft
RB pin: (none) (base of bay tree)
LB pin: (none) (base of fence)
HI: 102.07 ft

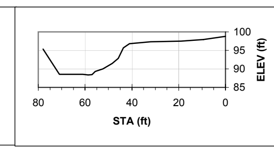
STA	FS	BS	ELEV	NOTES
0	3.52		98.55	
6	4.96		97.11	
11.5	6.16		95.91	
17.7	7.49		94.58	
23.6	8.43		93.64	TOP RB
26.7	8.29		93.78	
33.2	12.51		89.56	REC
36.9	13.07		89	
39.4	13.11		88.96	
40.9	13.19		88.88	TH
43.5	13.05		89.02	
45.7	12.75		89.32	LEC
47.7	10.67		91.4	
51.6	6.8		95.27	BASE OF FENCE

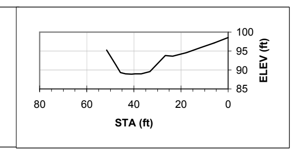












Appendix E. Raw subwatershed channel survey data.

Subwatershed:	Ross Creek	
Location:	Ross Creek d/s of Shady Lane, u/s confluence with Corte Madera Creek	
Date(s) surveyed:	6/5/1999	11/5/1999
Surveyors:	Smeltzer	Smeltzer
	Andy Peri	Plunkett
Location of notes:	Data sheets	Corte Madera Book pp. 40-42
Benchmarks:	Center of manhole at intersection of Shady Lane and Locust, near shady lane bridge	100 ft
Long Profile Stationing:		0.00 equals nail in base of Acacia tree (d=0.8 ft) at RB at confluence with Corte Madera Creek
		Concrete bedrock step = ~ sta 279 ft
Data entered on:	11/24/1999	
Data entered by:	Smeltzer	

Long profile data:
Date: 6/5/1999

STA	FS	BS	HI	ELEV	NOTES	
		3.33	103.33	100	BM (Manhole cover at Shady-Locust intersection)	
	14.46			88.87	TP3	
		2.99	91.86		TP3	
	4.36			87.5	TP2	
		3.09	90.59		TP2	
	4.1			86.49	TP1	
		11.74	98.23		TP1	
	5.12			93.11	TOP RB PIN	
160				85.51	CS 1	
178				85.32	CS 2	
213				85.06	CS 3	
238				85	CS 4	-0.006538
279				86.64	BEDROCK SILL	

REACH CH BED SLOPE= 0.009496
CS 1 - CS 4 CH BED SLOPE= 0.006538
FP SLOPE= NA

Notes: 11/5/99 subsurface sediment sample at sta 178 ft
6/5/99 surface sediment sample (n=313) at sta 178-160 ft

Cross-section data:

CS 1
Date: 11/5/1999
Station: 160 ft
RB pin: (none) top of horizontal log foundation beam, 1
LB pin: (none)
HI: 101.02

STA	FS	BS	ELEV	NOTES
		7.91		TOP CS 2 RB PIN
0	2.19		98.83	
4.7	6.49		94.53	
8.4	8.1		92.92	
11.8	9.18		91.84	
15.3	9.99		91.03	
18.3	12.18		88.84	
21.4	14.31		86.71	TOE LB, LI
27.5	15.44		85.58	
31.6	15.51		85.51	
36.5	15.31		85.71	TOE RB, R
39.6	14.34		86.68	
43.4	13.89		87.13	
46.6	12.59		88.43	
48.2	11.84		89.18	
50.7	9.86		91.16	
52.8	7.92		93.1	
56.1	5.85		95.17	
61	4		97.02	

CS 2
Date: 6/5/1999
Station: 178 ft
RB pin: (none) re-rod stake about 47 ft from LB PIN, 5
LB pin: (none) re-rod stake 3-4 ft below terrac edge
HI: 98.22

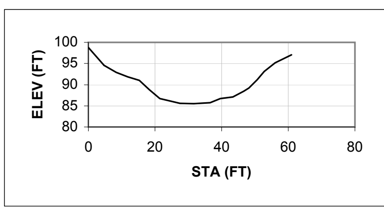
STA	FS	BS	ELEV	NOTES
		5.11		
0.5	2.98		95.24	TOP LB PII
0.5	3.48		94.74	BASE LB F
3	5.64		92.58	
5	9.44		88.78	
7	11.63		86.59	
8.4	12.36		85.86	LEW
11.1	12.9		85.32	TH
17	12.38		85.84	REW
22	11.98		86.24	REC
25	11.02		87.2	
28	10.05		88.17	
36	8.71		89.51	
42.5	5.94		92.28	
47	5.2		93.02	BASE RB PIN
47	5.11		93.11	TOP RB PIN

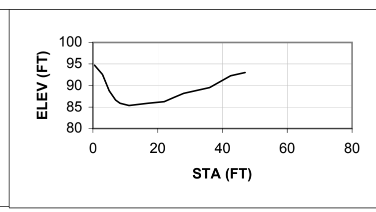
CS 3
Date: 11/5/1999
Station: 213 ft
RB pin: (none)
LB pin: (none)
HI: 101.02

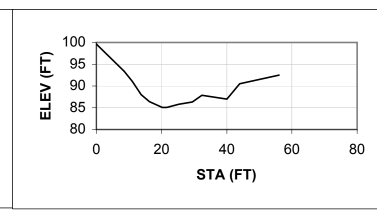
STA	FS	BS	ELEV	NOTES
0	1.36		99.66	BASE OF F
8.5	7.66		93.36	
11	9.92		91.1	
13.7	13.02		88	
16.3	14.62		86.4	TOE LB, LI
20.2	15.96		85.06	
21.6	15.96		85.06	TH
25.3	15.22		85.8	
29.4	14.73		86.29	TOE RB, R
32.4	13.13		87.89	
40	14.06		86.96	
44	10.51		90.51	
56	8.51		92.51	EST

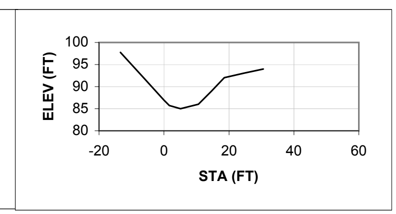
CS 4
Date: 11/5/1999
Station: 238 ft
RB pin: (none)
LB pin: (none)
HI: 101.02

STA	FS	BS	ELEV	NOTES
-13.4	3.26		97.76	EST
-5.9	9.26		91.76	EST
0	14.04		86.98	RIP RAP
1.6	15.26		85.76	LB TOE, LEC
5.1	16.02		85	TH
10.6	15.01		86.01	
14.6	12.01		89.01	EST
18.6	9.01		92.01	EST
24.6	8.01		93.01	EST
30.6	7.01		94.01	EST









Appendix E. Raw subwatershed channel survey data.

Subwatershed: Sorich Creek
Location: d/s of Jerry Draper's bridge at end of Sacramento Ave

Date(s) surveyed: 11/13/1999
Surveyors: Smeltzer
Draper

Location of notes: CMC book pp. 63-67

Benchmarks:

Jerry Draper's BM at NE bridge abutment (corner of parcel # 17722010)	100	ft
top of nail in base of willow at LB at trib confluence near CS 1	89.395	ft

Long Profile Stationing: 96.0 ft equals barbed wire fence drossing stream on Jerry's property line, d/s thalweg; 0.00 arbitrary

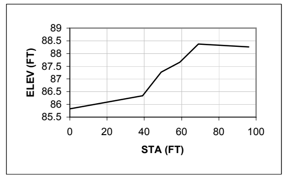
Data entered on: 12/1/1999
Data entered by: Smeltzer

Notes:
11/13/99 surface sediment sample at sta 71ft - 91 ft
11/13/99 subsurface sediment sample at sta 86 ft
tree roots spanning bed control grade
CS 1 and CS 6 are synthetic

Long profi

	LP STA (ft)	CH BED ELEV (ft)	RB FP ELEV (ft)	NOTES	
U/S	96	88.255	NA	CS 6	SYNTHETIC
	69	88.38	89.59	CS 5	
	59	87.66	88.56	CS 4	
	49	87.27	88.50	CS 3	
	39	86.35	88.73	CS 2	
D/S	0	85.825	NA	CS 1	SYNTHETIC

REACH CH BED SLOPE = 0.025312
CS 1 - CS 4 CH BED SLOPE = 0.067667
FP SLOPE = 0.028667



Cross-section data:

CS 1 CS 2 ADJUSTED TO TH
Date: 11/13/1999 SYNTHETIC
Station: 0 ft
RB pin: (none)
LB pin: (none)
HI: 93.785 ft

STA	FS	BS	ELEV	NOTES
-10	4.6		88.67	EST
0	4.7		88.57	
2	5.06		88.21	TOP RB
3	6.35		86.92	REC
4	7.17		86.10	
5	7.35		85.92	
6	7.44		85.83	TH
7	7.24		86.03	
8	6.89		86.38	
9	6.66		86.61	LEC
10	6.34		86.93	
11	5.75		87.52	
14	4.62		88.65	
18	4.6		88.67	EST

CS 2
Date: 11/13/1999
Station: 39 ft
RB pin: (none)
LB pin: (none)
HI: 93.785 ft

STA	FS	BS	ELEV	NOTES
-10	4.6		89.19	EST
0	4.7		89.09	
2	5.06		88.73	TOP RB
3	6.35		87.44	REC
4	7.17		86.62	
5	7.35		86.44	
6	7.44		86.35	TH
7	7.24		86.55	
8	6.89		86.90	
9	6.66		87.13	LEC
10	6.34		87.45	
11	5.75		88.04	
14	4.62		89.17	
18	4.6		89.19	EST

CS 3
Date: 11/13/1999
Station: 49 ft
RB pin: (none)
LB pin: (none)
HI: 93.785 ft

STA	FS	BS	ELEV	NOTES
-10	4.6		89.19	EST
0	4.67		89.12	
2	5.29		88.50	
2.5	6.41		87.38	REC
3	6.01		87.78	
4	6.52		87.27	
5	6.43		87.36	
6	6.2		87.59	LEC
7	5.62		88.17	
8	5.44		88.35	
9	5.29		88.50	
10	4.58		89.21	
18	4.6		89.19	EST

CS 4
Date: 11/13/1999
Station: 59 ft
RB pin: (none)
LB pin: (none)
HI: 93.785 ft

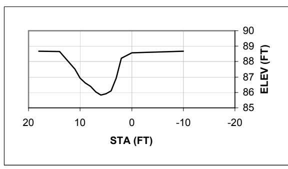
STA	FS	BS	ELEV	NOTES
-10	4.3		89.49	
0	4.4		89.39	
2	5.23		88.56	TOP RB
2.5	6.12		87.67	REC
3	6.11		87.68	
4	6.13		87.66	
5	6.12		87.67	
6	6.84		86.95	LEC
7	5.29		88.50	
8	5.04		88.75	
9	4.66		89.13	
10	4.35		89.44	
12	4.19		89.60	

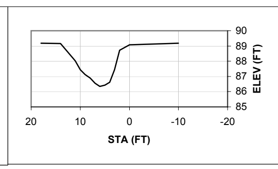
CS 5
Date: 11/13/1999
Station: 69 ft
RB pin: (none)
LB pin: (none)
HI: 93.79 ft

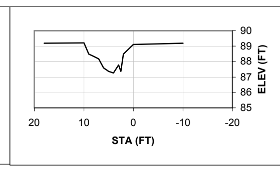
STA	FS	BS	ELEV	NOTES
-10	4.2		89.59	EST
0	4.2		89.59	TOP RB
2	5.37		88.42	REC
3	5.32		88.47	
4	5.41		88.38	TH
5	5.36		88.43	
6	5.25		88.54	
7	5.01		88.78	
8	4.82		88.97	LEC
9	4.41		89.38	
10	4.04		89.75	
11	3.99		89.80	
39	4		89.79	EST

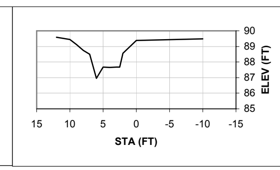
CS 6 SYNTHETIC (CS 5 ADJUSTED TO TH)
Date: 11/13/1999
Station: 96 ft
RB pin: (none)
LB pin: (none)
HI: 93.79 ft

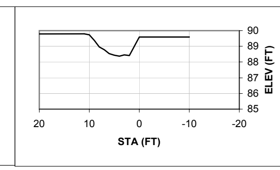
STA	FS	BS	ELEV	NOTES
-10	4.2		89.46	EST
0	4.2		89.46	TOP RB
2	5.37		88.29	REC
3	5.32		88.34	
4	5.41		88.25	TH
5	5.36		88.30	
6	5.25		88.41	
7	5.01		88.65	
8	4.82		88.84	LEC
9	4.41		89.25	
10	4.04		89.62	
11	3.99		89.67	
39	4		89.66	EST

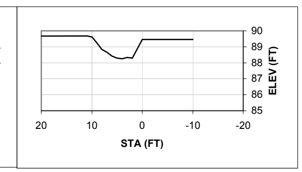












Appendix E. Raw subwatershed channel survey data.

Subwatershed:	Sleepy Hollow Creek
Location:	Sleepy Hollow Creek u/s Caleta Rd bridge, d/s Tom Cronin's residence
Date(s) surveyed:	10/10/1999
Surveyors:	Smeltzer Dawdy Penny Clarke
Location of notes:	Corte Madera Book pp. 10-14
Benchmarks:	Yellow paint spot on d/s edge of Caleta Rd bridge deck/sidewalk — 100 ft Storm manhole cover on Caleta Rd west of Caleta Rd bridge deck — ft — 99.18 ft TP in channel — 84.67 ft
Long Profile Stationing:	0.00 ft = CS 3 128 ft = u/s face of Caleta Rd bridge, beginning of scour pool
Data entered on:	11/24/1999
Data entered by:	Smeltzer

Notes:

10/10/99 subsurface sediment sample at sta = 72 ft (CS 1)
10/10/99 surface sediment sample (n=300) at sta = 105-128 ft

Long profile

	STA	FS	BS	HI	ELEV	NOTES
Date: 10/10/99				92.25		
	0					U/S FACE CALETA RD BRIDGE
	3	9.89			82.36	
	4	9.91			82.34	
	11	9.9			82.35	
	18	9.69			82.56	
	24	9.69			82.56	
	29	9.8			82.45	
	37	9.46			82.79	TREE ROOT INDUCED SUBSTRATE POOL
	57	9.32			82.93	
	62	9.06			83.19	
	67	9.15			83.1	
	72	9.19			83.06	CS 1
	78	9.13			83.12	
	83	8.97			83.28	
	90	9.07			83.18	
	95	9.08			83.17	
	100	9.24			83.01	CS 2
	107	9.16			83.09	
	112	8.87			83.38	
	116	8.54			83.71	
	122	8.42			83.83	
	128	8.3			83.95	CS 3

REACH CH BED SLOPE= 0.01272
CS 1 - CS 3 CH BED SLOPE= 0.015893

Cross-section data:

CS 1
Date: 10/10/1999
Station: 72 ft
RB pin: (none)
LB pin: (none)
HI: 92.25

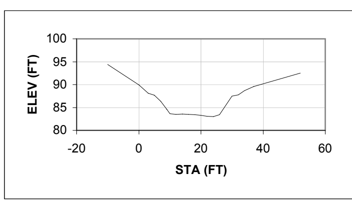
STA	FS	BS	ELEV	NOTES
		7.58		TP in CH
-10	-2.18		94.43	EST; BASE OF FENCE
0	2.32		89.93	
3	4.12		88.13	
5	4.58		87.67	
7	5.9		86.35	
9	7.6		84.65	
10	8.6		83.65	LEC
12	8.74		83.51	
14	8.66		83.59	
16	8.77		83.48	
18	8.8		83.45	SUBSURF/
20	8.97		83.28	
22	9.19		83.06	
24	9.24		83.01	
26	8.8		83.45	
30	4.76		87.49	TOE RB
32	4.46		87.79	
34	3.6		88.65	
37	2.7		89.55	BASE OF V
52	-0.3		92.55	EST

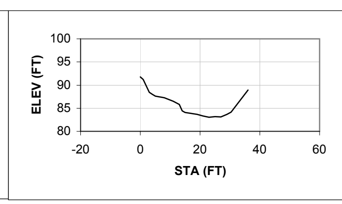
CS 2
Date: 10/10/1999
Station: 100 ft
RB pin: (none)
LB pin: (none)
HI: 93.82

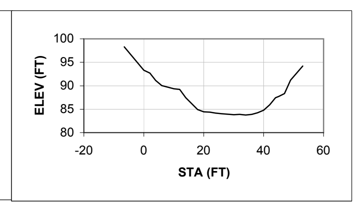
STA	FS	BS	ELEV	NOTES
0	2.08		91.74	BASE OF L
1	2.63		91.19	
3	5.38		88.44	
4	5.81		88.01	
5	6.2		87.62	
8	6.53		87.29	
11	7.32		86.5	
13	8.04		85.78	
14	9.4		84.42	
15	9.76		84.06	LEC=15.6
17	9.95		83.87	
19	10.18		83.64	
21	10.51		83.31	
23	10.79		83.03	
25	10.62		83.2	TH
27	10.68		83.14	
29	10.16		83.66	REC
30.4	9.66		84.16	TOE RB
36	4.92		88.9	EST; BASE

CS 3
Date: 10/10/1999
Station: 128 ft
RB pin: (none)
LB pin: (none)
HI: 93.82

STA	FS	BS	ELEV	NOTES
		9.15		TP in CH
-6.5	-4.46		98.28	EST
0	0.54		93.28	
2	1.11		92.71	
4	2.7		91.12	
6	3.78		90.04	
8	4.14		89.68	
10	4.47		89.35	BEHIND BIG EUC
12	4.63		89.19	BEHIND BIG EUC
14	6.4		87.42	BEHIND BIG EUC
18	8.92		84.9	LEC
20	9.38		84.44	
22	9.48		84.34	
24	9.68		84.14	
26	9.82		84	
30	9.97		83.85	
32	9.96		83.86	
34	10.04		83.78	
36	9.91		83.91	
38	9.62		84.2	REC
40	9.01		84.81	
42	7.88		85.94	TERRACE ELEV = +14
44	6.41		87.41	
45	6.08		87.74	
47	5.5		88.32	
49	2.62		91.2	
53	-0.38		94.2	EST







Appendix E. Raw subwatershed channel survey data.

Subwatershed:	Fairfax Creek	
Location:	Andi Peri Park	
Date(s) surveyed:	6/12/1999	11/5/1999
Surveyors:	Carter	Smeltzer
	Abrams	Plunkett
	Klizewski	
	Brilliant	
	Kennard	
	Leo	
Location of notes:	Data Sheets	CMC book pp. 48-55

Long profi	LP STA (ft)	CH BED ELEV (ft)	FP ELEV (ft)	NOTES
	0	88.76	97.72	CS 1
	31	89.6		
	64	89.07		
	99	89.75		
	142	90.76		
	176	89.47		
	271	91.23	98.94	CS 7
	REACH	CH BED SLOPE =	0.009114	
		FP SLOPE =	0.004502	

Benchmarks: Center Manhole Cover at corner of Wreden Ave and Park St 100 ft
TOP FH at corner of Wreden Ave and Park St ft 99.32 ft

Long Profile Stationing: 0.00 ft at CS 1 (6/12/99); 18.0 ft at pipe over channel; u/s bkf thalweg

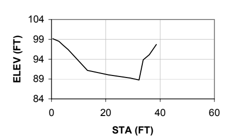
Data entered on: 12/1/1999 12/1/1999
Data entered by: Smeltzer Smeltzer

Notes:
11/5/99 Subsurface sediment sample at STA 0.00
11/5/99 Surface sediment sample at STA 140 ft - 160 ft
6/12/99 Surface sediment sample at STA 15 ft - (-)5 ft
6/12/99 Surface sediment sample at STA 20 ft - 30 ft

Cross-section data:

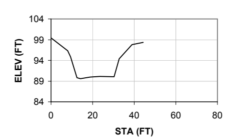
CS 1
Date: 6/12/1999
Station: 0 ft
RB pin: (none)
LB pin: re-bar stake ~ 4 ft from building
HI: 104.15 ft

STA	FS	BS	ELEV	NOTES
0.5	4.79		99.36	TOP LB PIN
0.5	5.01		99.14	BASE LB PIN
2.7	5.66		98.49	
4.3	6.57		97.58	
6.2	7.72		96.43	TOP LB
13.2	12.96		91.19	
21	14.12		90.03	
29.1	14.9		89.25	
32.3	15.39		88.76	TH
33.8	10.33		93.82	
36	9.03		95.12	
38.6	6.43		97.72	BASE RB F
38.6	6.32		97.83	TOP RB PI



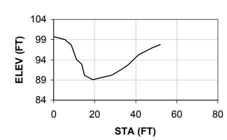
CS 2
Date: 11/5/1999
Station: 31 ft
RB pin: (none)
LB pin: (none)
HI: 102.39 ft

STA	FS	BS	ELEV	NOTES
		5.135		C MH COVER AT WREDEN AND PARK
	3.07		99.32	
	5.345			TP-1
		2.6		TP-1
	3.03		99.36	TOP CS 1
0	2.98		99.41	
8	6.06		96.33	EST
9.4	7.56		94.83	
12.5	12.55		89.84	LEC
14.2	12.79		89.6	TH
18.8	12.42		89.97	
23.6	12.25		90.14	
30.3	12.38		90.01	REC
32.7	8.04		94.35	
38.9	4.62		97.77	
44.3	4.05		98.34	



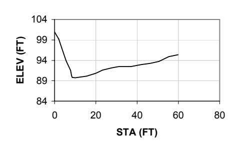
CS 3
Date: 11/5/1999
Station: 64 ft
RB pin: (none)
LB pin: (none)
HI: 102.39 ft

STA	FS	BS	ELEV	NOTES
0	2.67		99.72	
5.4	3.39		99	
8.5	4.75		97.64	
11	8.29		94.1	
13.7	9.53		92.86	
14.9	12.22		90.17	LEC
19.1	13.32		89.07	TH
24.2	12.69		89.7	
28.2	12.19		90.2	REC
32.7	10.91		91.48	
36.2	9.69		92.7	
41.3	7.17		95.22	
48	5.39		97	
52	4.6		97.79	



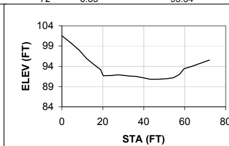
CS 4
Date: 11/5/1999
Station: 99 ft
RB pin: (none)
LB pin: (none)
HI: 102.39 ft

STA	FS	BS	ELEV	NOTES
0	1.43		100.96	
2	3.21		99.18	
3	4.58		97.81	
5.6	8.53		93.86	
7.7	10.87		91.52	
8.2	12.15		90.24	
8.6	12.57		89.82	LEC
10.1	12.64		89.75	TH
15.5	12.25		90.14	REC
20	11.54		90.85	
23.3	10.79		91.6	
27.8	10.27		92.12	
31.2	9.9		92.49	
37.1	9.92		92.47	
41.9	9.45		92.94	
46.4	9.11		93.28	
50.5	8.65		93.74	
55.4	7.47		94.92	
59.8	7		95.39	



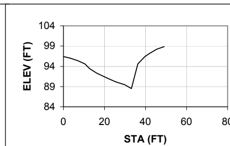
CS 5
Date: 11/5/1999
Station: 142 ft
RB pin: (none)
LB pin: (none)
HI: 102.39 ft

STA	FS	BS	ELEV	NOTES
0	0.82		101.57	
4.7	2.7		99.69	
8.4	4.37		98.02	
12	6.47		95.92	
15.5	7.9		94.49	
18.9	9.2		93.19	
20.2	10.7		91.69	LEW
24.6	10.66		91.73	
27.5	10.47		91.92	
30.4	10.61		91.78	
33.2	10.79		91.6	
36.1	10.91		91.48	
39.6	11.23		91.16	
43.2	11.6		90.79	
46.9	11.63		90.76	TH
51.5	11.47		90.92	
54.5	11.16		91.23	
57.4	10.42		91.97	
59.7	8.98		93.41	
63.3	8.43		93.96	
67.2	7.69		94.7	
72	6.85		95.54	



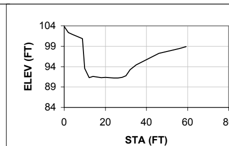
CS 6
Date: 11/5/1999
Station: 176 ft
RB pin: (none)
LB pin: (none)
HI: 102.39 ft

STA	FS	BS	ELEV	NOTES
0	5.94		96.45	
3.3	6.38		96.01	
7	6.98		95.41	
10.5	7.76		94.63	
12.8	8.99		93.4	
16.2	10.11		92.28	
21.5	11.32		91.07	
25.5	12.24		90.15	
29.9	12.92		89.47	TH
33.2	13.88		88.51	3 FT UNDE
34.3	11.47		90.92	REC
36.2	7.76		94.63	
39.7	6.01		96.38	
42	5.19		97.2	
45.4	4.16		98.23	
49	3.52		98.87	R FP/TERF



CS 7
Date: 6/12/1999
Station: 271 ft
RB pin: re-bar stake at base of stump
LB pin: re-bar stake on LB
HI: 106.94 ft

STA	FS	BS	ELEV	NOTES
0	3.95		102.99	TOP LB PIN
0	3.12		103.82	BASE LB PIN
2	4.57		102.37	
4.1	5.08		101.86	
8.9	6.1		100.84	
9.95	13.4		93.54	
12.1	15.65		91.29	
14	15.36		91.58	
16.1	15.52		91.42	
18.1	15.62		91.32	
20.1	15.58		91.36	
24.1	15.71		91.23	TH
26.1	15.7		91.24	
28.1	15.55		91.39	
30	15.2		91.74	
32	13.65		93.29	
35	12.52		94.42	
46	9.69		97.25	
56	8.5		98.44	
59.3	8		98.94	BASE RB PIN
59.3	7.95		98.99	TOP RB PIN



Appendix E. Raw subwatershed channel survey data.

Subwatershed: Deer Park Creek
Location: Fairfax, at d/s end of Deer Park below culvert and above Meerna Rd.
Drainage area:

Date(s) surveyed: 10/9/1999 11/5/1999
Surveyors: Smeltzer Smeltzer
Wheeler Plunkett
Vitomski

Location of notes: 1999 Corte Madera Creek Book

pp. 7-9 pp. 43-47

Benchmarks:

Yellow paint spot on u/s side Meerna Ave above Meerna culvert	100	ft	
Top fire hydrant on Meerna Ave E of Meerna culvert		ft	102.9 ft
Top of sewer manhole cover on RB below Deer Park culvert		ft	102.475 ft
			102.36 ft

Long profile stationing: field: 0.4 ft = d/s end of Deer Park culvert; u/s end of Meerna culvert = ~ 233 ft
Changed in calcs to 0.00 at u/s end of Meerna culvert; 232.4 at d/s end of DP culvert
Data entered on: 11/18/1999 11/24/1999
Data entered by: Smeltzer Smeltzer

Notes: 10/9/99 subsurface sediment sample at sta 170 ft
10/9/99 surface sediment sample (n=96) at sta 170-185 ft (47-62 ft)
11/5/99 surface sediment sample (n=171) at sta 45-65 ft (168-188 ft)

	STA (ft)	FS (ft)	CH ELEV	FP ELEV	NOTES	
Long profi	232.2	9.89	97.57		D/S END OF U/S (DP) CULVERT	
10/9/1999	232.1	10.75	96.71			
	228	11.23	96.23			
	221.6	12.26	95.20			
	214.9	11.84	95.62			
	205.4	10.05	97.41			
	183.6	10.28	97.18			
	173.6	10.42	97.04			
	168.6	11.43	96.61		CS 6	
	160.6	11.19	96.27			
	147.6	10.99	96.47		CS 5	
	142.6	10.86	96.60			
	121.1	11.79	96.25		CS 4	
	120.1	11.13	96.33			
	109.6	11.42	96.04			
	103.6	12.71	95.33		CS 3	
	102.6	11.77	95.69			
	83.6	11.62	95.84			
	76.6	11.8	95.66		CS 2	
	66.6	12.38	95.66		CS 1	0.009314
	61.6	11.88	95.58			
	49.6	12.05	95.41			
	41.6	12.54	94.92			
	32.6	13.21	94.25			
	23.6	12.48	94.98			
	13.6	12.68	94.78			
	0	13.13	94.33		U/S END OF D/S MEERNA CULVERT	

REACH CH BED SLOPE = 0.013953
CS 1 - CS 6 CH BED SLOPE = 0.009314
FP SLOPE = NA

Cross-section data:

CS 1				
Date:	11/5/1999			
Station:	66.6 ft			
RB pin:	(none)			
LB pin:	(none)			
HI:	108.035			
STA	**FS**	**BS**	**ELEV**	**NOTES**
		8.035		
0	7.02		101.02	
4.7	7.56		100.48	
8.9	8.21		99.83	
12.6	9.00		99.04	
18	9.73		98.31	
20.3	10.97		97.07	
21.8	11.99		96.05	TOE RB, R
25.5	12.38		95.66	TH
28.2	12.31		95.73	TOE LB, LI
29.4	10.08		97.96	
31.9	8.19		99.85	
34	7.22		100.82	TOP LB
39	6.85		101.19	

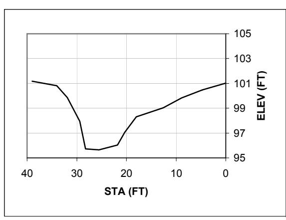
CS 2				
Date:	10/9/1999			
Station:	76.6 ft			
RB pin:	(none)			
LB pin:	(none)			
HI:	107.46			
STA	**FS**	**BS**	**ELEV**	**NOTES**
		7.46		
1	5.69		101.77	TOP LB
3	5.97		101.49	
7	7.55		99.91	
9	8.44		99.02	
11	9.64		97.82	
12.6	11.65		95.81	LEC
17	11.8		95.66	REC
18.5	11.3		96.16	
21.7	9.13		98.33	
25	7.8		99.66	
28	6.55		100.91	
35	6.49		100.97	TOP RB

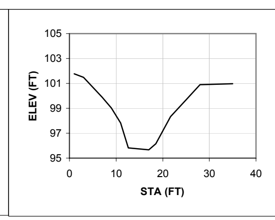
CS 3				
Date:	11/5/1999			
Station:	103.6 ft			
RB pin:	(none)			
LB pin:	(none)			
HI:	108.035			
STA	**FS**	**BS**	**ELEV**	**NOTES**
0	6.05		101.99	
4.3	5.9		102.14	
9.6	6.08		101.96	
13.4	6.99		101.05	
15.6	8.85		99.19	
18.4	12.39		95.65	REC
21.2	12.71		95.33	TH
24.2	12.93		95.11	
26.4	11.87		96.17	LB TOE, LI
27.8	8.59		99.45	
30.4	7.42		100.62	
34.4	6.44		101.60	LT TERRA

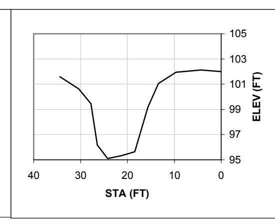
CS 4				
Date:	11/5/1999			
Station:	121.1 ft			
RB pin:	(none)			
LB pin:	(none)			
HI:	108.035			
STA	**FS**	**BS**	**ELEV**	**NOTES**
0	6.26		101.78	RB TERRA
4.4	6.43		101.61	
7.8	7.05		100.99	
9.9	8.25		99.79	TOP RB
10.8	10.81		97.23	
11.4	11.15		96.89	TOE RB, R
14.9	11.79		96.25	TH
18.6	11.66		96.38	
19.6	11.27		96.77	TOE LB, LI
20.5	8.95		99.09	
23.3	6.86		101.18	
29	6.19		101.85	LT TERRACE

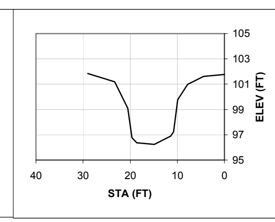
CS 5				
Date:	10/9/1999			
Station:	147.6 ft			
RB pin:	(none)			
LB pin:	(none)			
HI:	107.46			
STA	**FS**	**BS**	**ELEV**	**NOTES**
0	4.88		102.58	LT TERRACE
4	5.59		101.87	
6	6.23		101.23	TOP LB
7.6	7.15		100.31	
8.5	8.57		98.89	
11	10.5		96.96	LEC
15.1	10.99		96.47	TH
16.8	10.97		96.49	REC
17.4	10.38		97.08	
18.8	6.86		100.60	TOP RB
23	6.15		101.31	

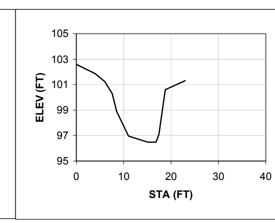
CS 6				
Date:	11/5/1999			
Station:	168.6 ft			
RB pin:	(none)			
LB pin:	(none)			
HI:	108.035			
STA	**FS**	**BS**	**ELEV**	**NOTES**
	5.56		102.48	manhole cover at RB
0	5.53		102.51	
2.5	8.86		99.18	
3.6	11.06		96.98	TOE RB, REC
5	11.43		96.61	TH
7.3	11.27		96.77	
9.3	11.14		96.90	TOE LB, LEC
10.1	10.83		97.21	
11.9	9.39		98.65	
13.5	7.7		100.34	
16.7	5.66		102.38	

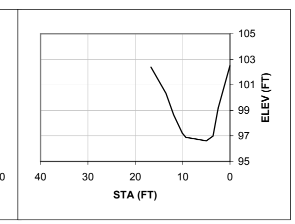












Appendix E. Raw subwatershed channel survey data.

Subwatershed: Wood Lane Creek
Location: Wood Lane Creek at Marin Stables, u/s Marin Stables culvert, d/s barn

Date(s) surveyed: 11/6/1999
Surveyors: Wheeler
Smeltzer
Vitomski

Location of notes: pp. 56-61 Corte Madera Creek book

Benchmarks: MMWD BM "LS-6865" 10 ft N of entrance gate 100 ft

Long Profile Stationing: 0.00 ft at u/s end of driveway culvert, u/s thalweg

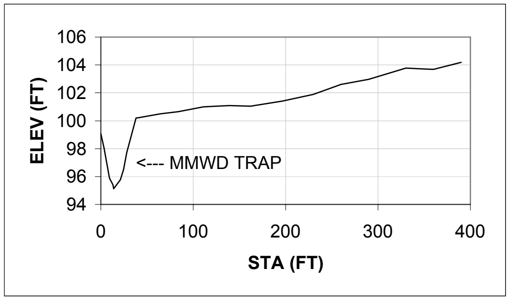
Data entered on: 12/1/1999
Data entered by: Smeltzer

Notes: Subsurface sediment sample at 121 ft
Surface sediment samples at sta 65 ft - sta 180 ft

Long profile data:

LP STA (ft)	CH BED ELEV (ft)	RB FP ELEV (ft)	NOTES
0	99.06		INVERT U/S END CULVERT
3.3	98.03		
9.3	95.88		
13	95.40	102.86	
14	95.12		
21	95.76		
24.7	96.49	102.14	
28	97.72		
38	100.19		U/S END OF EXCAVATION; BED ELEVATION
41	100.22	102.24	CS 1
64	100.49	102.78	CS 2
84	100.65	102.32	CS 3
111	101.00	102.86	CS 4
139	101.08	102.67	CS 5
162	101.04		CS 6
196.5	101.42		CS 7
230	101.89		
260	102.60		
290	102.97		
330	103.77		
360	103.69		
390	104.18		

REACH CH BED SLOPE= 0.013128
CS 1 - CS 7 CH BED SLOPE= 0.007717
FP SLOPE= -0.001508 (altered floodplain)



Cross-section data:

CS 1
Date: 11/6/1999
Station: 41 ft
RB pin: (none)
LB pin: (none)
HI: 107.04

STA	FS	BS	ELEV	NOTES
		7.04		
-20	4.8		102.24	EST
0	4.8		102.24	
4	5.5		101.54	
7.6	6.56		100.48	LEC
10.5	6.82		100.22	
16	6.78		100.26	
23.6	6.76		100.28	REC
26.7	6.13		100.91	
33	4.1		102.94	
36.3	2.98		104.06	
41	4.09		102.95	
65	4.09		102.95	EST

CS 2
Date: 11/6/1999
Station: 64 ft
RB pin: (none)
LB pin: (none)
HI: 107.04

STA	FS	BS	ELEV	NOTES
-40	4.26		102.78	EST
0	4.26		102.78	
3	4.83		102.21	
4	6.53		100.51	LEC
6	6.54		100.5	
8	6.5		100.54	
10	6.55		100.49	
14	6.53		100.51	REC
16.2	5.8		101.24	
18.1	5.19		101.85	
20.1	4.65		102.39	
24	3.39		103.65	
29	4.61		102.43	
60	3.4		103.64	EST

CS 3
Date: 11/6/1999
Station: 84 ft
RB pin: (none)
LB pin: (none)
HI: 107.04

STA	FS	BS	ELEV	NOTES
-20	4.5		102.54	EST
0	4.72		102.32	
3.3	3.11		103.93	
6.8	4.5		102.54	
7.9	6.41		100.63	LEC
12.7	6.39		100.65	
17.6	6.27		100.77	REC
18.6	4.24		102.8	
19.8	3.71		103.33	
23	4.26		102.78	
26	4.58		102.46	
46	4.5		102.54	EST

CS 4
Date: 11/6/1999
Station: 111 ft
RB pin: (none)
LB pin: (none)
HI: 107.04

STA	FS	BS	ELEV	NOTES
-20	4		103.04	EST
0	3.4		103.64	
2.2	4.18		102.86	
3.2	5.82		101.22	LEC
7.5	6.04		101.00	
12.8	5.96		101.08	REC
14.5	5.07		101.97	
17	3.7		103.34	
19.5	4.15		102.89	
39.5	4.05		102.99	EST

CS 5
Date: 11/6/1999
Station: 139 ft
RB pin: (none)
LB pin: (none)
HI: 107.04

STA	FS	BS	ELEV	NOTES
-20	2.66		104.38	EST
0	2.76		104.28	
6.5	2.35		104.69	
9	3.5		103.54	
12.6	4.93		102.11	
15	5.78		101.26	LEC
18	5.96		101.08	
20.8	6.11		100.93	REC
22.9	5.38		101.66	
24.9	4.69		102.35	
25.9	4.37		102.67	
45.9	4.27		102.77	EST

CS 6
Date: 11/6/1999
Station: 162 ft
RB pin: (none)
LB pin: (none)
HI: 107.04

STA	FS	BS	ELEV	NOTES
-20	2.24		104.80	EST
2	2.34		104.70	
3.3	3.04		104.00	
5.1	4.35		102.69	
7.1	4.92		102.12	
8.4	5.72		101.32	LEC
11.6	6		101.04	
15.3	5.65		101.39	REC
17.6	4.53		102.51	
19.6	3.19		103.85	
24	2.36		104.68	
27	3.85		103.19	
47	3.75		103.29	EST

CS 7
Date: 11/6/1999
Station: 196.5 ft
RB pin: (none)
LB pin: (none)
HI: 110.39

STA	FS	BS	ELEV	NOTES
	4.4			TP-1
		7.75		TP-1
-10	3.2		107.19	EST
0	3.45		106.94	
5.2	4.81		105.58	
7	5.63		104.76	
7.4	6.98		103.41	
9.8	8.54		101.85	LEC
13	8.97		101.42	
15	8.82		101.57	
16.5	8.69		101.70	REC
18	8.2		102.19	
19	7.81		102.58	
21	7.44		102.95	
24	6.74		103.65	
26	6.76		103.63	
46	6.66		103.73	EST

CS 8
Date: 11/6/1999
Station: 13 ft
RB pin: (none)
LB pin: (none)
HI: 107.04

STA	FS	BS	ELEV	NOTES
8	4.18		102.86	
11.2	7.58		99.46	
13.2	8.12		98.92	
16.6	10.13		96.91	
20.5	11.34		95.70	
21	11.64		95.40	
22	11.55		95.49	
24	11.14		95.90	
26	10.49		96.55	
29	8.93		98.11	
31.8	7.4		99.64	
32.4	4.96		102.08	

CS 9
Date: 11/6/1999
Station: 24.7 ft
RB pin: (none)
LB pin: (none)
HI: 107.04

STA	FS	BS	ELEV	NOTES
0	4.9		102.14	
4	4.78		102.26	
6.6	7.06		99.98	
8	7.19		99.85	
8.8	8.69		98.35	
12	9.62		97.42	
15	10.13		96.91	
19	10.55		96.49	
23	10.23		96.81	
27	9.07		97.97	
29.4	7.92		99.12	
31.7	5.12		101.92	
33.8	4.11		102.93	
37.8	2.78		104.26	

Appendix E. Raw subwatershed channel survey data.

Subwatershed: San Anselmo Creek above Wood Lane Creek confluence
Location: u/s Wood Lane Creek confluence, near 430 Bolinas-Fairfax Road, approx. at Al Jones Residence on Cascade Rd

Date(s) surveyed: 11/20/1999
Surveyors: Smeltzer
Ventura
Plunkett

Location of notes: CMC book pp. 68 - 73

Benchmarks: Yellow X on N edge Bolinas-Fairfax road surface between 434 and 430 Bolinas-Fairfax Road 100 ft

Long Profile Stationing: FIELD:arbitrary: STA 0.00 ft, d/s bkf thalweg
CALC: 242.9=0.00, u/s bkf thalweg

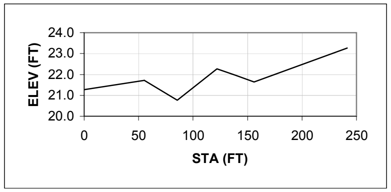
Data entered on: 12/2/1999
Data entered by: Smeltzer

Notes: 11/20/99 subsurface sediment sample at ~ STA 175 ft (50 ft)
11/20/99 surface sediment sample at ~ STA 190 ft - STA 150 ft (35-75 ft)

Long profile data:

	LP STA (ft)	CH BED ELEV (ft)	FP ELEV (ft)	NOTES	FIELD	
D/S	0	21.27	NA		242.9	
	55.3	21.72	NA	CS 1	187.6	0.008137
	85.4	20.77	NA	CS 2	157.5	-0.031561
	121.9	22.27	NA	CS 3	121	0.041096
	138.9	21.96	NA	CS 4	104	-0.018235
	155.9	21.64	NA	CS 5	87	-0.018824
U/S	241.4	23.26	NA		1.5	0.018947

REACH CH BED SLOPE = 0.008244
CS 1 - CS 5 CH BED SLOPE = -0.000795



Cross-section data:

CS 1
Date: 11/20/1999
Station: 55.3 ft
RB pin: (none)
LB pin: (none)
HI: 37.88 ft

STA	FS	BS	ELEV	NOTES
-8	-2.9		40.78	EST
-4	3.1		34.78	EST
0	9.1		28.78	EST
5.2	14.9		22.98	REC
8.2	15.72		22.16	
11.1	15.97		21.91	
15	16.04		21.84	
18	16.16		21.72	
21.7	15.76		22.12	
28	15.61		22.27	
29.2	15.46		22.42	
32.9	14.14		23.74	LEC
35.3	10.91		26.97	
37.6	8.74		29.14	
40.6	5.85		32.03	

CS 2
Date: 11/20/1999
Station: 85.4 ft
RB pin: (none)
LB pin: (none)
HI: 37.88 ft

STA	FS	BS	ELEV	NOTES
48	5.16		32.72	TOP LB FF
46.3	5.4		32.48	
44	5.9		31.98	RR
42	7.18		30.7	RR
38.5	9.69		28.19	RR
31	13.79		24.09	RR
26.5	15.92		21.96	LEC
24	16.92		20.96	
22.2	17.11		20.77	
19.4	16.83		21.05	
15.1	16.12		21.76	
12.2	15.23		22.65	
9.7	14.49		23.39	REC
6.9	12.84		25.04	
4.6	11.38		26.5	
0	6.65		31.23	
-5	1.65		36.23	EST
-15	-8.35		46.23	EST; TOP

CS 3
Date: 11/20/1999
Station: 121.9 ft
RB pin: (none)
LB pin: (none)
HI: 37.88 ft

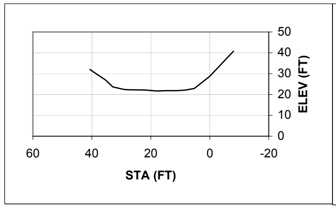
STA	FS	BS	ELEV	NOTES
62.5	4.5		33.38	
57.8	5.8		32.08	TOP LB
55.3	7.1		30.78	
51.5	11.71		26.17	
51.4	14		23.88	LEC
48	14.41		23.47	
46	15.11		22.77	
43	15.35		22.53	
41	15.61		22.27	
39	15.6		22.28	TH
37	15.6		22.28	
34.5	15.44		22.44	
31.5	15.22		22.66	
29	14.87		23.01	
27	14.75		23.13	
25	14.54		23.34	REC
22	13.51		24.37	
15.4	8.4		29.48	
11	3.48		34.4	
1	-2.52		40.4	EST

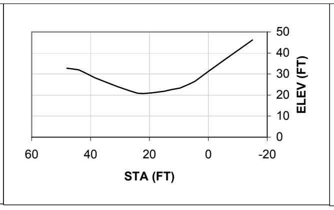
CS 4
Date: 11/20/1999
Station: 138.9 ft
RB pin: (none)
LB pin: (none)
HI: 37.88 ft

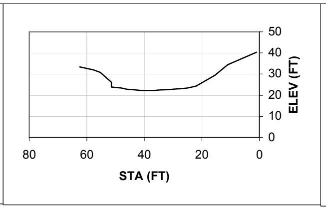
STA	FS	BS	ELEV	NOTES
10	0.61		37.27	
17	5.52		32.36	
18.4	9.16		28.72	
21.5	12.28		25.6	
24	13.32		24.56	
24.2	14.65		23.23	REC
28.4	14.97		22.91	
30.2	15.01		22.87	
32.7	15.1		22.78	
34.5	15.21		22.67	
36.5	15.23		22.65	
38.5	15.67		22.21	
40.5	15.92		21.96	
42.5	15.85		22.03	
44.5	15.65		22.23	
46.5	15.5		22.38	
48.5	15.21		22.67	
50	14.54		23.34	
52	13.76		24.12	
54	13.2		24.68	LEC
57.5	9.86		28.02	
63	6.86		31.02	
69	1.15		36.73	

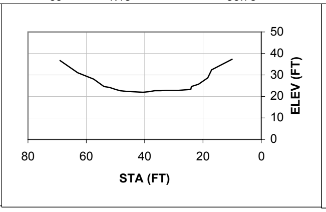
CS 5
Date: 11/20/1999
Station: 155.9 ft
RB pin: (none)
LB pin: (none)
HI: 37.88 ft

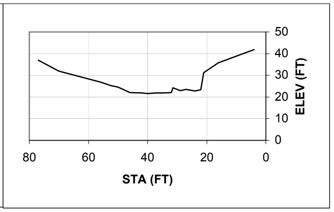
STA	FS	BS	ELEV	NOTES
4	-3.95		41.83	EST
16	2.05		35.83	
21	6.74		31.14	
22	14.48		23.4	REC
24	15.05		22.83	
27	14.3		23.58	
28.9	15		22.88	
31.4	13.69		24.19	
32	15.9		21.98	
34.5	15.98		21.9	
37	16		21.88	
40	16.24		21.64	
42	15.95		21.93	
46	15.81		22.07	
50	13.25		24.63	LEC
52.5	12.6		25.28	
56	10.95		26.93	
70	5.95		31.93	EST
77	0.95		36.93	EST









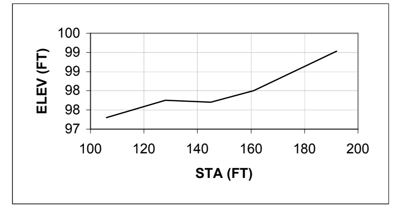


Appendix E. Raw subwatershed channel survey data.

Subwatershed:	Upper San Anselmo Creek, above Cascade Creek confluence
Location:	Marin County Open Space District Cascade Canyon Preserve
Date(s) surveyed:	11/3/1999
Surveyors:	Matt Smeltzer, David Dawdy
Location of notes:	pp. 33-39 1999 Corte Madera Creek Notebook
Benchmarks:	GLV nail in NW timber bridge abutment of bridge over Cascade Creek about 50 ft u/s of confluence with Upper San Anselmo Creek Elevation: 100 ft above M.S.L.
Long profile stationing:	0.00 ft equals nail in base of alder (d=1.2 ft) at LB Upper San Anselmo Creek and confluence of Cascade Creek increases along thalweg upstream
Data entered on:	11/18/1999
Data entered by:	Smeltzer
Notes:	Subsurface sediment sample at sta 97 ft Surface sediment sample between 100 ft and 190 ft

Long profile data: 11/3/1999

LP STA (ft)	CH ELEV (ft)	RB FP ELEV (ft)	NOTES
106	97.30	99.86	CS 1
128	97.75	100.41	CS 2
145	97.70	102.95	CS 3
161	98.00	103.60	CS 4
192	99.03	105.04	CS 5
REACH	CH BED SLOPE =	0.020116	
	RB FP SLOPE=	0.060233	



CS 1
Date: 11/3/1999
Station: 106 ft
RB pin: rebar stake on RB
LB pin: (none)
HI: 105.45

STA	FS	BS	ELEV	NOTES
		5.45		BM
65	1.19		104.26	
60	2.59		102.86	
54	3.65		101.80	
51	4.35		101.10	
40	4.68		100.77	EDGE RD
37	5.03		100.42	TOP LB
34	6.70		98.75	
33	8.92		96.53	LEW, LEC
32	8.15		97.30	
30	8.03		97.42	
28	8.04		97.41	
26	7.99		97.46	
24	7.82		97.63	REW, REC
23	7.04		98.41	
21	6.49		98.96	
17	5.59		99.86	
12	4.08		101.37	
7	3.47		101.98	
2	3.12		102.33	
0.7	3.06		102.39	TOP PIN 1
-4	2.77		102.68	
-10	1.75		103.70	
-16	-1.55		107.00	EST

CS 2
Date: 11/3/1999
Station: 128 ft
RB pin: rebar stake on RB
LB pin: (none)
HI: 105.45

STA	FS	BS	ELEV	NOTES
66	1.53		103.92	
64	2.85		102.60	
62	3.16		102.29	
54	3.44		102.01	EDGE RD
49.5	3.86		101.59	TOP LB
44.5	7.68		97.77	LEW, LEC
42	7.70		97.75	
40	7.70		97.75	
38	7.60		97.85	
36	7.40		98.05	REW,REC
31	5.04		100.41	
22	2.89		102.56	
10	2.11		103.34	
0.7	0.02		105.43	TOP PIN 2

CS 3
Date: 11/3/1999
Station: 145 ft
RB pin: rebar stake on RB
LB pin: (none)
HI: 106.95

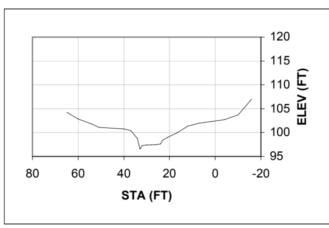
STA	FS	BS	ELEV	NOTES
		1.56		PIN 2
		6.95		BM
51	1.23		105.72	
49	2.76		104.19	
47	3.41		103.54	EDGE RD
45	3.77		103.18	
35	4.22		102.73	TOP LB
30	8.53		98.42	
28	8.85		98.10	TOE LB, LE
26	9.02		97.93	
24	9.25		97.70	
22	8.80		98.15	
21.6	8.79		98.16	TOE RB, R
20	8.10		98.85	
11	4.00		102.95	
2	3.09		103.86	
0.6	3.08		103.87	AT PIN 3
0.6	2.90		104.05	TOP PIN 3

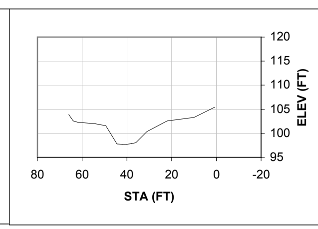
CS 4
Date: 11/3/1999
Station: 161 ft
RB pin: rebar stake on RB
LB pin: (none)
HI: 110.75

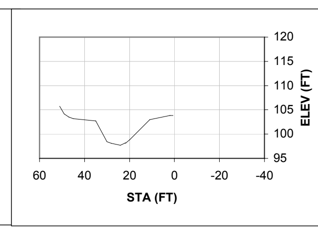
STA	FS	BS	ELEV	NOTES
		6.70		TOP PIN 3
0.5	6.24		104.51	TOP PIN 4
-17.5	3.17		107.58	EST
-11.5	5.17		105.58	
1	6.42		104.33	
6	7.15		103.60	TOP RB
10	12.15		98.60	TOE RB, R
13	12.75		98.00	
15	12.70		98.05	
17	12.53		98.22	
20	11.88		98.87	
22	11.56		99.19	TOE LB, LE
29	6.21		104.54	TOP LB
32	5.82		104.93	EDGE RD
36	5.43		105.32	
40	4.96		105.79	EDGE RD
44	0.78		109.97	

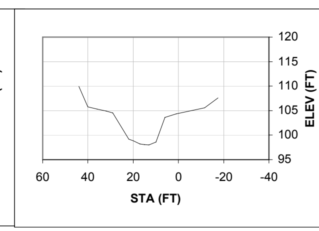
CS 5
Date: 11/3/1999
Station: 192 ft
RB pin: rebar stake on RB
LB pin: (none)
HI: 110.75

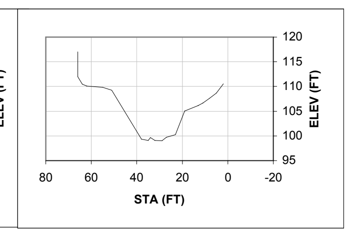
STA	FS	BS	ELEV	NOTES
	10.74		100.01	BM
0.5	-0.72		111.47	TOP PIN 5; EST
2	0.20		110.55	
5	2.11		108.64	
8	3.12		107.63	
11	4.12		106.63	
13	4.61		106.14	
19	5.71		105.04	TOP RB
23	10.50		100.25	TOE RB, REC; EST
27	11.04		99.71	
29	11.72		99.03	
32	11.68		99.07	
34	11.09		99.66	
35	11.68		99.07	
38	11.41		99.34	
51	1.50		109.25	TOE LB, LEC
55	0.90		109.85	TOP LB
62	0.65		110.10	EDGE RD
64	0.26		110.49	EDGE RD
66	-1.24		111.99	EST
66	-6.24		116.99	EST











Appendix E. Subwatershed channel survey data.

SUBWATERSHED: LARKSPUR CREEK
REACH CHANNEL BED SLOPE: 0.013 ft/ft
CROSS-SECTION CHANNELBED SLOPE: 0.005 ft/ft
REACH FLOODPLAIN SLOPE: na ft/ft
ARBITRARY BENCHMARK ELEVATION: 100 ft YELLOW X ON CANE ST BRIDGE

LONG PROFILE		**CROSS-SECTION** NUMBER 1 LP STA 34.7		**CROSS-SECTION** NUMBER 2 LP STA 53		**CROSS-SECTION** NUMBER 3 LP STA 75		**CROSS-SECTION** NUMBER 4 LP STA 98		**CROSS-SECTION** NUMBER 5 LP STA 127	
STA (FT)	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**
13.8	90.39	0.0	97.94	0.0	101.17	0.0	98.91	0.0	97.22	0.0	99.40
24.0	91.43	4.3	93.34	2.5	100.26	4.7	94.47	10.5	96.66	4.1	98.54
34.7	91.48	5.9	93.19	4.9	98.51	9.4	92.26	10.7	94.97	7.4	97.57
44.5	91.96	8.3	92.43	7.5	96.69	14.1	90.72	12.8	94.28	10.7	96.77
55.0	91.84	9.0	91.71	9.5	94.57	16.5	91.42	13.7	93.96	18.9	96.46
66.0	91.57	11.2	91.44	11.2	93.95	19.6	92.29	15.5	92.12	27.4	96.10
75.0	90.93	12.5	91.77	13.1	92.69	22.3	92.23	18.2	91.40	31.7	95.16
87.0	91.34	13.9	91.97	13.8	92.08	25.6	93.47	20.2	91.63	34.0	94.49
98.0	90.68	16.5	92.02	14.1	91.93	27.2	94.75	22.5	92.11	37.2	92.81
108.0	90.59	18.3	92.10	16.1	92.27	29.8	96.23	24.8	92.04	41.5	92.30
118.4	90.78	20.8	97.57	17.7	92.35			26.3	91.55	45.4	92.02
127.0	91.91	22.3	93.43	19.4	92.16			27.9	91.02	48.4	91.87
		23.7	94.16	21.0	91.81			29.3	90.68	49.0	93.33
		26.3	95.31	23.3	91.83			30.7	94.87	50.0	94.36
		29.7	96.40	25.6	91.98					51.3	96.10
		36.3	97.15	27.2	91.73					53.3	96.98
				28.2	93.34						
				32.5	95.41						
				35.1	96.43						
				39.0	97.05						

Appendix E. Subwatershed channel survey data.

SUBWATERSHED: TAMALPAIS CREEK
REACH CHANNEL BED SLOPE: NA ft/ft
CROSS-SECTION CHANNELBED SLOPE: 0.011 ft/ft
REACH FLOODPLAIN SLOPE: 0.021 ft/ft
ARBITRARY BENCHMARK ELEVATION: 100 ft C Manhole Cover N or Evergreen Rd Bridge, CL Evergreen Rd

LONG PROFILE		CROSS-SECTION		CROSS-SECTION		CROSS-SECTION		CROSS-SECTION		CROSS-SECTION		CROSS-SECTION	
		NUMBER 1		NUMBER 2		NUMBER 3		NUMBER 4		NUMBER 5		NUMBER 6	
		LP STA 0		LP STA 31		LP STA 70		LP STA 92		LP STA 114		LP STA 152	
STA (FT)	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**
		0.0	95.39	0.0	96.50	0.0	95.45	0.0	95.50	0.00	95.37	0	95.27
		12.6	93.28	11.5	96.10	3.1	95.11	1.7	91.26	7.00	88.57	3.9	91.4
		21.5	90.07	25.1	91.17	8.7	92.55	5.0	89.52	13.50	88.53	5.9	89.32
		25.5	87.85	27.3	88.64	10.4	88.76	8.4	89.31	17.00	88.57	8.1	89.02
		27.8	87.39	28.6	88.26	12.2	88.42	11.9	89.31	19.40	88.33	10.7	88.88
		32.2	87.22	30.4	88.10	15.9	88.25	15.0	88.28	21.00	88.49	12.2	88.96
		34.4	86.69	32.3	88.15	17.7	88.09	18.3	87.57	22.40	89.35	14.7	89
		36.0	93.47	39.1	88.23	20.4	87.86	19.9	92.36	25.60	90.03	18.4	89.56
		40.0	95.47	44.2	88.48	25.0	89.68	22.9	94.17	29.60	91.48	24.9	93.78
				45.7	90.03	29.4	96.02	28.7	96.77	32.20	92.87	28	93.64
				48.3	91.18	33.6	96.36	47.7	96.88	34.40	95.67	33.9	94.58
				51.0	92.85	41.9	96.78	53.7	97.16	37.00	96.77	40.1	95.91
				53.6	95.26	48.2	96.80	57.7	97.13	46.00	97.29	45.6	97.11
				58.0	98.57	53.6	96.64	63.7	97.88	59.00	97.46	51.6	98.55
						59.0	96.94			68.5	97.91		
										78.0	98.79		

Appendix E. Subwatershed channel survey data.

SUBWATERSHED: ROSS CREEK
REACH CHANNEL BED SLOPE: 0.009 ft/ft
CROSS-SECTION CHANNELBED SLOPE: 0.006 ft/ft
REACH FLOODPLAIN SLOPE: na ft/ft
ARBITRARY BENCHMARK ELEVATION: 100 ft Center of manhole at intersection of Shady Lane and Locust, near shady lane bridge

LONG PROFILE

STA (FT)	ELEV (FT)

CROSS-SECTION NUMBER 1 LP STA 160		CROSS-SECTION NUMBER 2 LP STA 178		CROSS-SECTION NUMBER 3 LP STA 213		CROSS-SECTION NUMBER 4 LP STA 238	
STA (FT)	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**
0.0	98.83	0.5	94.74	0.0	99.66	0.0	97.76
4.7	94.53	3.0	92.58	8.5	93.36	7.5	91.76
8.4	92.92	5.0	88.78	11.0	91.10	13.4	86.98
11.8	91.84	7.0	86.59	13.7	88.00	15.0	85.76
15.3	91.03	8.4	85.86	16.3	86.40	18.5	85.00
18.3	88.84	11.1	85.32	20.2	85.06	24.0	86.01
21.4	86.71	17.0	85.84	21.6	85.06	28.0	89.01
27.5	85.58	22.0	86.24	25.3	85.80	32.0	92.01
31.6	85.51	25.0	87.20	29.4	86.29	38.0	93.01
36.5	85.71	28.0	88.17	32.4	87.89	44.0	94.01
39.6	86.68	36.0	89.51	40.0	86.96		
43.4	87.13	42.5	92.28	44.0	90.51		
46.6	88.43	47.0	93.02	56.0	92.51		
48.2	89.18						
50.7	91.16						
52.8	93.10						
56.1	95.17						
61.0	97.02						

Appendix E. Subwatershed channel survey data.

SUBWATERSHED:	SORICH CREEK	
REACH CHANNEL BED SLOPE:	0.025 ft/ft	
CROSS-SECTION CHANNELBED SLOPE:	0.068 ft/ft	
REACH FLOODPLAIN SLOPE:	0.029 ft/ft	
ARBITRARY BENCHMARK ELEVATION:	100 ft	JERRY DRAPER'S BM MONUMENT AT CORNER OF PARCEL NO. 17722010

LONG PROFILE		**CROSS-SECTION**		**CROSS-SECTION**		**CROSS-SECTION**		**CROSS-SECTION**		**CROSS-SECTION**		**CROSS-SECTION**	
		NUMBER 1		NUMBER 2		NUMBER 3		NUMBER 4		NUMBER 5		NUMBER 6	
		LP STA 0		LP STA 39		LP STA 49		LP STA 59		LP STA 69		LP STA 96	
STA (FT)	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**
		0.0	88.67	0.0	89.19	0.0	89.19	0.0	89.60	0.0	89.79	0.0	89.46
		10.0	88.57	4.0	89.17	8.0	89.21	2.0	89.44	28.0	89.80	10.0	89.46
		12.0	88.21	7.0	88.04	9.0	88.50	3.0	89.13	29.0	89.75	12.0	88.29
		13.0	86.92	8.0	87.45	10.0	88.35	4.0	88.75	30.0	89.38	13.0	88.34
		14.0	86.10	9.0	87.13	11.0	88.17	5.0	88.50	31.0	88.97	14.0	88.25
		15.0	85.92	10.0	86.90	12.0	87.59	6.0	86.95	32.0	88.78	15.0	88.30
		16.0	85.83	11.0	86.55	13.0	87.36	7.0	87.67	33.0	88.54	16.0	88.41
		17.0	86.03	12.0	86.35	14.0	87.27	8.0	87.66	34.0	88.43	17.0	88.65
		18.0	86.38	13.0	86.44	15.0	87.78	9.0	87.68	35.0	88.38	18.0	88.84
		19.0	86.61	14.0	86.62	15.5	87.38	9.5	87.67	36.0	88.47	19.0	89.25
		20.0	86.93	15.0	87.44	16.0	88.50	10.0	88.56	37.0	88.42	20.0	89.62
		21.0	87.52	16.0	88.73	18.0	89.12	12.0	89.39	39.0	89.59	21.0	89.67
		24.0	88.65	18.0	89.09	28.0	89.19	22.0	89.49	49.0	89.59	49.0	89.66
		28.0	88.67	28.0	89.19								

Appendix E. Subwatershed channel survey data.

SUBWATERSHED: SLEEPY HOLLOW CREEK
REACH CHANNEL BED SLOPE: 0.013 ft/ft
CROSS-SECTION CHANNELBED SLOPE: 0.016 ft/ft
REACH FLOODPLAIN SLOPE: na ft/ft
ARBITRARY BENCHMARK ELEVATION: 100 ft Yellow paint spot on d/s edge of Caleta Rd bridge deck/sidewalk

LONG PROFILE		**CROSS-SECTION** NUMBER 1 LP STA 72		**CROSS-SECTION** NUMBER 2 LP STA 100		**CROSS-SECTION** NUMBER 3 LP STA 128	
STA (FT)	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**
3.0	82.36	0.0	94.43	0.0	91.74	0.0	98.28
4.0	82.34	10.0	89.93	1.0	91.19	6.5	93.28
11.0	82.35	13.0	88.13	3.0	88.44	8.5	92.71
18.0	82.56	15.0	87.67	4.0	88.01	10.5	91.12
24.0	82.56	17.0	86.35	5.0	87.62	12.5	90.04
29.0	82.45	19.0	84.65	8.0	87.29	14.5	89.68
37.0	82.79	20.0	83.65	11.0	86.50	16.5	89.35
57.0	82.93	22.0	83.51	13.0	85.78	18.5	89.19
62.0	83.19	24.0	83.59	14.0	84.42	20.5	87.42
67.0	83.10	26.0	83.48	15.0	84.06	24.5	84.90
72.0	83.06	28.0	83.45	17.0	83.87	26.5	84.44
78.0	83.12	30.0	83.28	19.0	83.64	28.5	84.34
83.0	83.28	32.0	83.06	21.0	83.31	30.5	84.14
90.0	83.18	34.0	83.01	23.0	83.03	32.5	84.00
95.0	83.17	36.0	83.45	25.0	83.20	36.5	83.85
100.0	83.01	40.0	87.49	27.0	83.14	38.5	83.86
107.0	83.09	42.0	87.79	29.0	83.66	40.5	83.78
112.0	83.38	44.0	88.65	30.4	84.16	42.5	83.91
116.0	83.71	47.0	89.55	36.0	88.90	44.5	84.20
122.0	83.83	62.0	92.55			46.5	84.81
128.0	83.95					48.5	85.94
						50.5	87.41
						51.5	87.74
						53.5	88.32
						55.5	91.20
						59.5	94.2

Appendix E. Subwatershed channel survey data.

SUBWATERSHED: FAIRFAX CREEK
SLOPE: ft/ft
CROSS-SECTION CHANNELBED SLOPE: 0.009 ft/ft
REACH FLOODPLAIN SLOPE: 0.005 ft/ft
ARBITRARY BENCHMARK ELEVATION: 100 ft Center Manhole Cover at corner of Wreden Ave and Park St

LONG PROFILE		**CROSS-SECTION**		**CROSS-SECTION**		**CROSS-SECTION**		**CROSS-SECTION**		**CROSS-SECTION**		**CROSS-SECTION**		**CROSS-SECTION**	
		NUMBER 1		NUMBER 2		NUMBER 3		NUMBER 4		NUMBER 5		NUMBER 6		NUMBER 7	
		LP STA 0		LP STA 31		LP STA 64		LP STA 99		LP STA 142		LP STA 176		LP STA 271	
STA (FT)	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**
		0.5	99.14	0.0	99.41	0.0	99.72	0.0	100.96	0.0	101.57	0.0	96.45	0.0	103.82
		2.7	98.49	8.0	96.33	5.4	99.00	2.0	99.18	4.7	99.69	3.3	96.01	2.0	102.37
		4.3	97.58	9.4	94.83	8.5	97.64	3.0	97.81	8.4	98.02	7.0	95.41	4.1	101.86
		6.2	96.43	12.5	89.84	11.0	94.10	5.6	93.86	12.0	95.92	10.5	94.63	8.9	100.84
		13.2	91.19	14.2	89.60	13.7	92.86	7.7	91.52	15.5	94.49	12.8	93.40	10.0	93.54
		21.0	90.03	18.8	89.97	14.9	90.17	8.2	90.24	18.9	93.19	16.2	92.28	12.1	91.29
		29.1	89.25	23.6	90.14	19.1	89.07	8.6	89.82	20.2	91.69	21.5	91.07	14.0	91.58
		32.3	88.76	30.3	90.01	24.2	89.70	10.1	89.75	24.6	91.73	25.5	90.15	16.1	91.42
		33.8	93.82	32.7	94.35	28.2	90.20	15.5	90.14	27.5	91.92	29.9	89.47	18.1	91.32
		36.0	95.12	38.9	97.77	32.7	91.48	20.0	90.85	30.4	91.78	33.2	88.51	20.1	91.36
		38.6	97.72	44.3	98.34	36.2	92.70	23.3	91.60	33.2	91.60	34.3	90.92	24.1	91.23
						41.3	95.22	27.8	92.12	36.1	91.48	36.2	94.63	26.1	91.24
						48.0	97.00	31.2	92.49	39.6	91.16	39.7	96.38	28.1	91.39
						52.0	97.79	37.1	92.47	43.2	90.79	42.0	97.20	30.0	91.74
								41.9	92.94	46.9	90.76	45.4	98.23	32.0	93.29
								46.4	93.28	51.5	90.92	49.0	98.87	35.0	94.42
								50.5	93.74	54.5	91.23			46.0	97.25
								55.4	94.92	57.4	91.97			56.0	98.44
								59.8	95.39	59.7	93.41			59.3	98.94
										63.3	93.96				
										67.2	94.70				
										72.0	95.54				

Appendix E. Subwatershed channel survey data.

SUBWATERSHED:	DEER PARK CREEK		
REACH CHANNEL BED SLOPE:	0.014	ft/ft	
CROSS-SECTION CHANNELBED SLOPE:	0.009	ft/ft	
REACH FLOODPLAIN SLOPE:	na	ft/ft	
ARBITRARY BENCHMARK ELEVATION:	100	ft	Yellow paint spot on u/s side Meerna Ave above Meerna culvert

LONG PROFILE

STA (FT)	ELEV (FT)
0.0	94.33
13.6	94.78
23.6	94.98
32.6	94.25
41.6	94.92
49.6	95.41
61.6	95.58
66.6	95.66
76.6	95.66
83.6	95.84
102.6	95.69
103.6	95.33
109.6	96.04
120.1	96.33
121.1	96.25
142.6	96.60
147.6	96.47
160.6	96.27
168.6	96.61
173.6	97.04
183.6	97.18
205.4	97.41
214.9	95.62
221.6	95.20
228.0	96.23
232.1	96.71
232.2	97.57

CROSS-SECTION		**CROSS-SECTION**		**CROSS-SECTION**		**CROSS-SECTION**		**CROSS-SECTION**		**CROSS-SECTION**	
NUMBER 1		NUMBER 2		NUMBER 3		NUMBER 4		NUMBER 5		NUMBER 6	
LP STA	66.6	LP STA	76.6	LP STA	103.6	LP STA	121.1	LP STA	147.6	LP STA	168.6
STA (FT)	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**
0.0	101.19	1.0	101.77	0.0	101.60	0	101.845	0.0	102.58	0	102.375
5.0	100.82	3.0	101.49	4.0	100.62	5.7	101.175	4.0	101.87	3.2	100.335
7.1	99.85	7.0	99.91	6.6	99.45	8.5	99.085	6.0	101.23	4.8	98.645
9.6	97.96	9.0	99.02	8.0	96.17	9.4	96.765	7.6	100.31	6.6	97.205
10.8	95.73	11.0	97.82	10.2	95.11	10.4	96.375	8.5	98.89	7.4	96.895
13.5	95.66	12.6	95.81	13.2	95.33	14.1	96.245	11.0	96.96	9.4	96.765
17.2	96.05	17.0	95.66	16.0	95.65	17.6	96.885	15.1	96.47	11.7	96.605
18.7	97.07	18.5	96.16	18.8	99.19	18.2	97.225	16.8	96.49	13.1	96.975
21.0	98.31	21.7	98.33	21.0	101.05	19.1	99.785	17.4	97.08	14.2	99.175
26.4	99.04	25.0	99.66	24.8	101.96	21.2	100.985	18.8	100.60	16.7	102.505
30.1	99.83	28.0	100.91	30.1	102.14	24.6	101.605	23.0	101.31		
34.3	100.48	35.0	100.97	34.4	101.99	29	101.775				
39.0	101.02										

Appendix E. Subwatershed channel survey data.

SUBWATERSHED: WOOD LANE CREEK
REACH CHANNEL BED SLOPE: 0.013 ft/ft
CROSS-SECTION CHANNELBED SLOPE: 0.008 ft/ft
REACH FLOODPLAIN SLOPE: na ft/ft
ARBITRARY BENCHMARK ELEVATION: 100 ft Yellow paint spot on u/s side Meerna Ave above Meerna Ave culvert

LONG PROFILE

STA (FT)	ELEV (FT)
0.0	99.06
3.3	98.03
9.3	95.88
13.0	95.40
14.0	95.12
21.0	95.76
24.7	96.49
28.0	97.72
38.0	100.19
41.0	100.22
64.0	100.49
84.0	100.65
111.0	101.00
139.0	101.08
162.0	101.04
196.5	101.42
230.0	101.89
260.0	102.60
290.0	102.97
330.0	103.77
360.0	103.69
390.0	104.18

CROSS-SECTION NUMBER 1 LP STA 41		**CROSS-SECTION** NUMBER 2 LP STA 64		**CROSS-SECTION** NUMBER 3 LP STA 84		**CROSS-SECTION** NUMBER 4 LP STA 111		**CROSS-SECTION** NUMBER 5 LP STA 139		**CROSS-SECTION** NUMBER 6 LP STA 162		**CROSS-SECTION** NUMBER 7 LP STA 196.5	
STA (FT)	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**
0	102.24	0.0	102.78	0.0	102.54	0.0	103.04	0.0	104.38	0.0	104.80	0.0	107.19
20	102.24	40.0	102.78	20.0	102.32	20.0	103.64	20.0	104.28	22.0	104.70	10.0	106.94
24	101.54	43.0	102.21	23.3	103.93	22.2	102.86	26.5	104.69	23.3	104.00	15.2	105.58
27.6	100.48	44.0	100.51	26.8	102.54	23.2	101.22	29.0	103.54	25.1	102.69	17.0	104.76
30.5	100.22	46.0	100.50	27.9	100.63	27.5	101.00	32.6	102.11	27.1	102.12	17.4	103.41
36	100.26	48.0	100.54	32.7	100.65	32.8	101.08	35.0	101.26	28.4	101.32	19.8	101.85
43.6	100.28	50.0	100.49	37.6	100.77	34.5	101.97	38.0	101.08	31.6	101.04	23.0	101.42
46.7	100.91	54.0	100.51	38.6	102.80	37.0	103.34	40.8	100.93	35.3	101.39	25.0	101.57
53	102.94	56.2	101.24	39.8	103.33	39.5	102.89	42.9	101.66	37.6	102.51	26.5	101.70
56.3	104.06	58.1	101.85	43.0	102.78	59.5	102.99	44.9	102.35	39.6	103.85	28.0	102.19
61	102.95	60.1	102.39	46.0	102.46			45.9	102.67	44.0	104.68	29.0	102.58
85	102.95	64.0	103.65	66.0	102.54			65.9	102.77	47.0	103.19	31.0	102.95
		69.0	102.43							67.0	103.29	34.0	103.65
		100.0	103.64									36.0	103.63
												56.0	103.73

Appendix E. Subwatershed channel survey data.

SUBWATERSHED: SAN ANSELMO CREEK (ABOVE WOOD LANE CREEK CONFLUENCE)
REACH CHANNEL BED SLOPE: 0.008 ft/ft
CROSS-SECTION CHANNELBED SLOPE: -0.000795 ft/ft
REACH FLOODPLAIN SLOPE: na ft/ft
ARBITRARY BENCHMARK ELEVATION: 100 ft Yellow X on N edge Bolinas-Fairfax road surface between 434 and 430 Bolinas-Fairfax Road

LONG PROFILE		CROSS-SECTION NUMBER 1 LP STA 55.3		CROSS-SECTION NUMBER 2 LP STA 85.4		CROSS-SECTION NUMBER 3 LP STA 121.9		CROSS-SECTION NUMBER 4 LP STA 138.9		CROSS-SECTION NUMBER 5 LP STA 155.9	
STA (FT)	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**
		0.0	32.03	0.0	32.72	0.0	33.38	0.0	36.73	0.0	36.93
		3.0	29.14	1.7	32.48	4.7	32.08	6.0	31.02	7.0	31.93
		5.3	26.97	4.0	31.98	7.2	30.78	11.5	28.02	21.0	26.93
		7.7	23.74	6.0	30.70	11.0	26.17	15.0	24.68	24.5	25.28
		11.4	22.42	9.5	28.19	11.1	23.88	17.0	24.12	27.0	24.63
		12.6	22.27	17.0	24.09	14.5	23.47	19.0	23.34	31.0	22.07
		18.9	22.12	21.5	21.96	16.5	22.77	20.5	22.67	35.0	21.93
		22.6	21.72	24.0	20.96	19.5	22.53	22.5	22.38	37.0	21.64
		25.6	21.84	25.8	20.77	21.5	22.27	24.5	22.23	40.0	21.88
		29.5	21.91	28.6	21.05	23.5	22.28	26.5	22.03	42.5	21.90
		32.4	22.16	32.9	21.76	25.5	22.28	28.5	21.96	45.0	21.98
		35.4	22.98	35.8	22.65	28.0	22.44	30.5	22.21	45.6	24.19
		40.6	28.78	38.3	23.39	31.0	22.66	32.5	22.65	48.1	22.88
		44.6	34.78	41.1	25.04	33.5	23.01	34.5	22.67	50.0	23.58
		48.6	40.78	43.4	26.50	35.5	23.13	36.3	22.78	53.0	22.83
				48.0	31.23	37.5	23.34	38.8	22.87	55.0	23.40
				53.0	36.23	40.5	24.37	40.6	22.91	56.0	31.14
				63.0	46.23	47.1	29.48	44.8	23.23	61.0	35.83
						51.5	34.40	45.0	24.56	73.0	41.83
						61.5	40.40	47.5	25.60		
								50.6	28.72		
								52.0	32.36		
								59.0	37.27		

Appendix E. Subwatershed channel survey data.

SUBWATERSHED: UPPER SAN ANSELMO CREEK
REACH CHANNEL BED SLOPE: ft/ft
CROSS-SECTION CHANNELBED SLOPE: 0.020 ft/ft
REACH FLOODPLAIN SLOPE: 0.060 ft/ft
ARBITRARY BENCHMARK ELEVATION: 100 ft — GLV nail in NW timber bridge abutment of bridge over Cascade Creek about 50 ft u/s of confluence with Upper San Anselmo Creek

LONG PROFILE		CROSS-SECTION NUMBER 1 LP STA 106		CROSS-SECTION NUMBER 2 LP STA 128		CROSS-SECTION NUMBER 3 LP STA 145		CROSS-SECTION NUMBER 4 LP STA 161		CROSS-SECTION NUMBER 5 LP STA 192	
STA (FT)	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**	**STA (FT)**	**ELEV (FT)**
		0.0	104.26	0.0	103.92	0.0	105.72	0.0	109.97	0.0	111.99
		5.0	102.86	2.0	102.60	2.0	104.19	4.0	105.79	0.0	116.99
		11.0	101.80	4.0	102.29	4.0	103.54	8.0	105.32	2.0	110.49
		14.0	101.10	12.0	102.01	6.0	103.18	12.0	104.93	4.0	110.10
		25.0	100.77	16.5	101.59	16.0	102.73	15.0	104.54	11.0	109.85
		28.0	100.42	21.5	97.77	21.0	98.42	22.0	99.19	15.0	109.25
		31.0	98.75	24.0	97.75	23.0	98.10	24.0	98.87	28.0	99.34
		32.0	96.53	26.0	97.75	25.0	97.93	27.0	98.22	31.0	99.07
		33.0	97.30	28.0	97.85	27.0	97.70	29.0	98.05	32.0	99.66
		35.0	97.42	30.0	98.05	29.0	98.15	31.0	98.00	34.0	99.07
		37.0	97.41	35.0	100.41	29.4	98.16	34.0	98.60	37.0	99.03
		39.0	97.46	44.0	102.56	31.0	98.85	38.0	103.60	39.0	99.71
		41.0	97.63	56.0	103.34	40.0	102.95	43.0	104.33	43.0	100.25
		42.0	98.41	65.3	105.43	49.0	103.86	55.5	105.58	47.0	105.04
		44.0	98.96			50.4	103.87	61.5	107.58	53.0	106.14
		48.0	99.86							55.0	106.63
		53.0	101.37							58.0	107.63
		58.0	101.98							61.0	108.64
		63.0	102.33							64.0	110.55
		64.3	102.39								
		69.0	102.68								
		75.0	103.70								
		81.0	107.00								

Appendix F. Surface sediment size distribution data.

	1 Larkspur Creek	2 Tamalpais Creek	3 Ross Creek	4 Sorich Creek	5 Sleepy Hollow Creek	6 Fairfax Creek	7 Deer Park Creek	8 Wood Lane Creek	9 San Anselmo Creek	10 Upper San Anselmo Creek
					PERCENT FINER THAN (%)					
720 mm										
512 mm			98.7							99.7
360 mm			98.7							98.4
256 mm			98.7							94.6
180 mm			98.7						98.1	87.1
128 mm		99.7	98.7				99.7		95.3	75.7
90 mm		97.2	97.4	99.6	99.4		98.6	98.7	91.6	61.8
64 mm	98.9	90.1	88.8	92.8	98.2	99.4	96.2	95.1	76.1	49.5
45 mm	92.8	70.4	66.5	75.7	92.7	89.4	85.5	84.6	55.9	33.8
32 mm	82.0	50.3	40.6	53.6	76.9	60.5	67.6	66.6	35.1	26.5
22.5 mm	63.1	29.6	24.0	34.0	50.5	35.3	48.6	49.6	18.6	18.9
16 mm	47.5	17.6	16.3	22.6	33.4	18.2	28.6	34.2	8.1	12.0
11.2 mm	26.0	9.6	8.0	14.5	15.8	10.3	18.6	20.1	4.7	8.2
8 mm	11.9	3.7	0.0	8.9	0.0	0.3	8.3	11.6	2.5	4.1

Appendix F. Raw surface sediment size distribution data.

Number	1.1
Date	11/2/1999
SWO	Larkspur
LP station	35-50 ft
Counter	Smeltzer
Recorder	Plunkett
n =	111
Entered	12/6/1999
Notes COMP	0.5 C; 0.5 F
SAMP	0.5 C; 0.5 F
	D/S 0.5 CS 2 BAR

	size		number	% finer than
>=	**512**	mm		100
>=	**360**	mm		100
>=	**256**	mm		100
>=	**180**	mm		100
>=	**128**	mm		100
>=	**90**	mm		100
>=	**64**	mm		100
>=	**45**	mm	6	95
>=	**32**	mm	18	81
>=	**22.5**	mm	29	58
>=	**16**	mm	17	45
>=	**11.2**	mm	26	24
>=	**8**	mm	15	13
<	**8**	mm	16	0
		n =	111	
		n =	127	
		%<8 =	12.6 %	

Number	1.2
Date	11/2/1999
SWO	Larkspur
LP station	80-95 ft
Counter	Smeltzer
Recorder	Plunkett
n =	113
Entered	12/6/1999
Notes COMP	0.7 F; 0.3 C
SAMP	0.7 F; 0.3 C

	size		number	% finer than
>=	**512**	mm		100
>=	**360**	mm		100
>=	**256**	mm		100
>=	**180**	mm		100
>=	**128**	mm		100
>=	**90**	mm		100
>=	**64**	mm		100
>=	**45**	mm	1	99
>=	**32**	mm	8	93
>=	**22.5**	mm	20	79
>=	**16**	mm	27	59
>=	**11.2**	mm	35	34
>=	**8**	mm	22	18
<	**8**	mm	24	0
		n =	113	
		n =	137	
		%<8 =	17.5 %	

Number	1.3
Date	11/2/1999
SWO	Larkspur
LP station	5_30 ft
Counter	Smeltzer
Recorder	Plunkett
n =	108
Entered	12/6/1999
Notes COMP	0.7 C; 0.3 F
SAMP	0.7 C; 0.3 F

	size		number	% finer than
>=	**512**	mm		100
>=	**360**	mm		100
>=	**256**	mm		100
>=	**180**	mm		100
>=	**128**	mm		100
>=	**90**	mm		100
>=	**64**	mm	4	96
>=	**45**	mm	16	82
>=	**32**	mm	15	69
>=	**22.5**	mm	22	50
>=	**16**	mm	15	36
>=	**11.2**	mm	20	19
>=	**8**	mm	16	4
<	**8**	mm	5	0
		n =	108	
		n =	113	
		%<8 =	4.4 %	

Number	CUMULATIVE
Date	
SWO	
LP station	5_95 ft
Counter	
Recorder	
n =	332
Entered	
Notes	

	size		number	% finer than
>=	**512**	mm		100
>=	**360**	mm	0	100
>=	**256**	mm	0	100
>=	**180**	mm	0	100
>=	**128**	mm	0	100
>=	**90**	mm	0	100
>=	**64**	mm	4	99
>=	**45**	mm	23	93
>=	**32**	mm	41	82
>=	**22.5**	mm	71	63
>=	**16**	mm	59	47
>=	**11.2**	mm	81	26
>=	**8**	mm	53	12
<	**8**	mm	45	0
		n =	332	
		n =	377	
		%<8 =	11.9 %	

Appendix F. Raw surface sediment size distribution data.

Number	2.1	Number	2.2	Number	CUMULATIVE
Date	12/6/1999	Date	12/6/1999	Date	12/6/1999
SWO	Tamalpais	SWO	Tamalpais	SWO	Tamalpais
LP station	5 _ 30 ft	LP station	60-90 ft	LP station	5_90 ft
Counter	Smeltzer	Counter	Plunkett	Counter	
Recorder	Plunkett	Recorder	Smeltzer	Recorder	
n =	166	n =	146	n =	312
Entered	12/6/1999	Entered	12/6/1999	Entered	12/6/1999
Notes COMP	1.0 C	Notes COMP	0.85 C	Notes	
SAMP	1.0 C	SAMP	1.0 C		

	size		number	% finer than		size		number	% finer than		size		number	% finer than
>=	**512**	mm		100	>=	**512**	mm		100	>=	**512**	mm	0	100
>=	**360**	mm		100	>=	**360**	mm		100	>=	**360**	mm	0	100
>=	**256**	mm		100	>=	**256**	mm		100	>=	**256**	mm	0	100
>=	**180**	mm		100	>=	**180**	mm		100	>=	**180**	mm	0	100
>=	**128**	mm	1	99	>=	**128**	mm		100	>=	**128**	mm	1	100
>=	**90**	mm	6	96	>=	**90**	mm	2	99	>=	**90**	mm	8	97
>=	**64**	mm	16	87	>=	**64**	mm	7	94	>=	**64**	mm	23	90
>=	**45**	mm	44	61	>=	**45**	mm	20	81	>=	**45**	mm	64	70
>=	**32**	mm	35	41	>=	**32**	mm	30	61	>=	**32**	mm	65	50
>=	**22.5**	mm	26	26	>=	**22.5**	mm	41	33	>=	**22.5**	mm	67	30
>=	**16**	mm	12	20	>=	**16**	mm	27	15	>=	**16**	mm	39	18
>=	**11.2**	mm	13	12	>=	**11.2**	mm	13	7	>=	**11.2**	mm	26	10
>=	**8**	mm	13	5	>=	**8**	mm	6	3	>=	**8**	mm	19	4
<	**8**	mm	8	0	<	**8**	mm	4	0	<	**8**	mm	12	0
		n =	166				n =	146				n =	312	
		n =	174				n =	150				n =	324	
		%<8 =	4.6	%			%<8 =	2.7	%			%<8 =	3.7	%

Appendix F. Raw surface sediment size distribution data.

Number	3.1	
Date	6/5/1999	
SWO	Ross Creek	
LP station	160-178	ft
Counter	Lili	
Recorder	Steve	
n =	161	
Entered	12/6/1999	
Notes	COMP SAMP <8 mm under-represented	

	size		number	% finer than
>=	**512**	mm	4	98
>=	**360**	mm		98
>=	**256**	mm		98
>=	**180**	mm		98
>=	**128**	mm		98
>=	**90**	mm	2	96
>=	**64**	mm	21	83
>=	**45**	mm	39	59
>=	**32**	mm	36	37
>=	**22.5**	mm	20	24
>=	**16**	mm	11	17
>=	**11.2**	mm	9	12
>=	**8**	mm	19	0
<	**8**	mm		0
		n =	161	
		n =	161	
		%<8 =	0.0	%

Number	3.2	
Date	6/5/1999	
SWO	Ross Creek	
LP station	160-178	ft
Counter	Steve	
Recorder	Lili	
n =	152	
Entered	12/6/1999	
Notes	COMP SAMP <8 mm under-represented	

	size		number	% finer than
>=	**512**	mm		100
>=	**360**	mm		100
>=	**256**	mm		100
>=	**180**	mm		100
>=	**128**	mm		100
>=	**90**	mm	2	99
>=	**64**	mm	6	95
>=	**45**	mm	31	74
>=	**32**	mm	45	45
>=	**22.5**	mm	32	24
>=	**16**	mm	13	15
>=	**11.2**	mm	17	4
>=	**8**	mm	6	0
<	**8**	mm		0
		n =	152	
		n =	152	
		%<8 =	0.0	%

Number	CUMULATIVE	
Date	6/5/1999	
SWO	Ross Creek	
LP station	160-178	ft
Counter		
Recorder		
n =	313	
Entered		
Notes	COMP SAMP <8 mm under-represented	

	size		number	% finer than
>=	**512**	mm	4	99
>=	**360**	mm	0	99
>=	**256**	mm	0	99
>=	**180**	mm	0	99
>=	**128**	mm	0	99
>=	**90**	mm	4	97
>=	**64**	mm	27	89
>=	**45**	mm	70	66
>=	**32**	mm	81	41
>=	**22.5**	mm	52	24
>=	**16**	mm	24	16
>=	**11.2**	mm	26	8
>=	**8**	mm	25	0
<	**8**	mm	0	0
		n =	313	
		n =	313	
		%<8 =	0.0	%

Appendix F. Raw surface sediment size distribution data.

Number		4	
Date		11/13/1999	
SWO		Sorich	
LP station		5-25	ft
Counter		Smeltzer	
Recorder		Smeltzer	
n =		214	
Entered		12/6/1999	
Notes	COMP	1.0 C	
	SAMP	1.0 C	

	size		number	% finer than	
>=	**512**	mm		100	
>=	**360**	mm		100	
>=	**256**	mm		100	
>=	**180**	mm		100	
>=	**128**	mm		100	
>=	**90**	mm	1	100	
>=	**64**	mm	16	93	
>=	**45**	mm	40	76	
>=	**32**	mm	52	54	
>=	**22.5**	mm	46	34	
>=	**16**	mm	27	23	D_{84} =
>=	**11.2**	mm	19	14	D_{50} =
>=	**8**	mm	13	9	D_{16} =
<	**8**	mm	21	0	
		n =	214		
		n =	235		
		%<8 =	8.9	%	

Appendix F. Raw surface sediment size distribution data.

Number	5.1		Number	5.2	
Date	10/10/1999		Date	10/10/1999	
SWO	Sleepy Hollow		SWO	Sleepy Hollow	
LP station	105-128 ft		LP station	105-128 ft	
Counter	Charlie		Counter	Charlotte	
Recorder	Charlotte		Recorder	Charlie	
n =	155		n =	174	
Entered	12/6/1999		Entered	12/6/99 MWS	
Notes	COMP SAMP <8 mm under-represented		Notes	COMP SAMP <8 mm under-represented	

	size		number	% finer than
>=	**512**	mm		100
>=	**360**	mm		100
>=	**256**	mm		100
>=	**180**	mm		100
>=	**128**	mm		100
>=	**90**	mm		100
>=	**64**	mm		100
>=	**45**	mm	6	96
>=	**32**	mm	23	81
>=	**22.5**	mm	44	53
>=	**16**	mm	31	33
>=	**11.2**	mm	31	13
>=	**8**	mm	20	0
<	**8**	mm		0
		n =	155	
		n =	155	
		%<8 =	0.0 %	

	size		number	% finer than
>=	**512**	mm		100
>=	**360**	mm		100
>=	**256**	mm		100
>=	**180**	mm		100
>=	**128**	mm		100
>=	**90**	mm	2	99
>=	**64**	mm	4	97
>=	**45**	mm	12	90
>=	**32**	mm	29	73
>=	**22.5**	mm	43	48
>=	**16**	mm	25	34
>=	**11.2**	mm	27	18
>=	**8**	mm	32	0
<	**8**	mm		0
		n =	174	
		n =	174	
		%<8 =	0.0 %	

Number	CUMULATIVE
Date	10/10/1999
SWO	Sleepy Hollow
LP station	105-128 ft
Counter	
Recorder	
n =	329
Entered	
Notes	COMP SAMP <8 mm under-represented

	size		number	% finer than
>=	**512**	mm	0	100
>=	**360**	mm	0	100
>=	**256**	mm	0	100
>=	**180**	mm	0	100
>=	**128**	mm	0	100
>=	**90**	mm	2	99
>=	**64**	mm	4	98
>=	**45**	mm	18	93
>=	**32**	mm	52	77
>=	**22.5**	mm	87	50
>=	**16**	mm	56	33
>=	**11.2**	mm	58	16
>=	**8**	mm	52	0
<	**8**	mm	0	0
		n =	329	
		n =	329	
		%<8 =	0.0 %	

Appendix F. Raw surface sediment size distribution data.

Number	6.1	
Date	6/12/1999	
SWO	Fairfax Creek	
LP station	-5-15	ft
Counter	Charlie	
Recorder	Barry	
n =	103	
Entered	12/6/1999	MWS
Notes	COMP	
	SAMP	
	<8 mm under-represented	

	size		number	% finer than
>=	**512**	mm		100
>=	**360**	mm		100
>=	**256**	mm		100
>=	**180**	mm		100
>=	**128**	mm		100
>=	**90**	mm		100
>=	**64**	mm		100
>=	**45**	mm	3	97
>=	**32**	mm	19	79
>=	**22.5**	mm	14	65
>=	**16**	mm	29	37
>=	**11.2**	mm	17	20
>=	**8**	mm	21	0
<	**8**	mm		0
		n =	103	
		n =	103	
		%<8 =	0.0	%

Number	6.2	
Date	6/12/1999	
SWO	Fairfax Creek	
LP station	20-30	ft
Counter	Barry	
Recorder	Charlie	
n =	102	
Entered	12/6/1999	MWS
Notes	COMP	
	SAMP	
	<8 mm under-represented	

	size		number	% finer than
>=	**512**	mm		100
>=	**360**	mm		100
>=	**256**	mm		100
>=	**180**	mm		100
>=	**128**	mm		100
>=	**90**	mm		100
>=	**64**	mm	2	98
>=	**45**	mm	15	83
>=	**32**	mm	31	53
>=	**22.5**	mm	29	25
>=	**16**	mm	14	11
>=	**11.2**	mm	4	7
>=	**8**	mm	7	0
<	**8**	mm		0
		n =	102	
		n =	102	
		%<8 =	0.0	%

Number	6.3	
Date	11/5/1999	
SWO	Fairfax Creek	
LP station	140-160	ft
Counter		
Recorder		
n =	123	
Entered		
Notes	COMP	
	SAMP	
	ON BED	

	size		number	% finer than
>=	**512**	mm		100
>=	**360**	mm		100
>=	**256**	mm		100
>=	**180**	mm		100
>=	**128**	mm		100
>=	**90**	mm		100
>=	**64**	mm		100
>=	**45**	mm	15	88
>=	**32**	mm	45	52
>=	**22.5**	mm	40	19
>=	**16**	mm	13	9
>=	**11.2**	mm	5	5
>=	**8**	mm	5	1
<	**8**	mm	1	0
		n =	123	
		n =	124	
		%<8 =	0.8	%

Number	CUMULATIVE	
Date		
SWO	Fairfax Creek	
LP station	-5-160	ft
Counter		
Recorder		
n =	328	
Entered		
Notes	COMP	
	SAMP	
	<8 mm under-represented	

	size		number	% finer than
>=	**512**	mm	0	100
>=	**360**	mm	0	100
>=	**256**	mm	0	100
>=	**180**	mm	0	100
>=	**128**	mm	0	100
>=	**90**	mm	0	100
>=	**64**	mm	2	99
>=	**45**	mm	33	89
>=	**32**	mm	95	60
>=	**22.5**	mm	83	35
>=	**16**	mm	56	18
>=	**11.2**	mm	26	10
>=	**8**	mm	33	0
<	**8**	mm	1	0
		n =	328	
		n =	329	
		%<8 =	0.3	%

Appendix F. Raw surface sediment size distribution data.

Number	7.1	Number	7.2	Number	CUMULATIVE
Date	10/9/1999	Date	11/5/1999	Date	
SWO	Deer Park Ck	SWO	Deer Park Ck	SWO	Deer Park
LP station	47-62 ft	LP station	168-188 ft	LP station	47-188 ft
Counter	Smeltzer	Counter	Smeltzer	Counter	
Recorder	Smeltzer	Recorder	Plunkett	Recorder	
n =	96	n =	170	n =	266
Entered	12/6/1999	Entered	12/6/1999	Entered	
Notes	COMP SAMP	Notes	COMP SAMP	Notes	COMP SAMP

	size		number	% finer than		size		number	% finer than		size		number	% finer than
>=	**512**	mm		100	>=	**512**	mm		100	>=	**512**	mm	0	100
>=	**360**	mm		100	>=	**360**	mm		100	>=	**360**	mm	0	100
>=	**256**	mm		100	>=	**256**	mm		100	>=	**256**	mm	0	100
>=	**180**	mm		100	>=	**180**	mm		100	>=	**180**	mm	0	100
>=	**128**	mm		100	>=	**128**	mm	1	99	>=	**128**	mm	1	100
>=	**90**	mm		100	>=	**90**	mm	3	98	>=	**90**	mm	3	99
>=	**64**	mm	1	99	>=	**64**	mm	6	95	>=	**64**	mm	7	96
>=	**45**	mm	4	95	>=	**45**	mm	27	81	>=	**45**	mm	31	86
>=	**32**	mm	16	79	>=	**32**	mm	36	62	>=	**32**	mm	52	68
>=	**22.5**	mm	23	56	>=	**22.5**	mm	32	45	>=	**22.5**	mm	55	49
>=	**16**	mm	26	30	>=	**16**	mm	32	28	>=	**16**	mm	58	29
>=	**11.2**	mm	13	17	>=	**11.2**	mm	16	19	>=	**11.2**	mm	29	19
>=	**8**	mm	13	4	>=	**8**	mm	17	11	>=	**8**	mm	30	8
<	**8**	mm	4	0	<	**8**	mm	20	0	<	**8**	mm	24	0
		n =	96				n =	170				n =	266	
		n =	100				n =	190				n =	290	
		%<8 =	4.0	%			%<8 =	10.5	%			%<8 =	8.3	%

Appendix F. Raw surface sediment size distribution data.

Number	8.1	Number	8.2	Number	CUMULATIVE
Date	11/6/1999	Date	11/6/1999	Date	
SWO	Wood Lane	SWO	Wood Lane	SWO	Wood Lane
LP station	65-140 ft	LP station	140-180 ft	LP station	65-180 ft
Counter	Smeltzer	Counter	Smeltzer	Counter	
Recorder	Smeltzer	Recorder	Smeltzer	Recorder	
n =	219	n =	125	n =	344
Entered	12/6/1999	Entered	12/6/1999	Entered	
Notes	COMP SAMP	Notes	COMP SAMP	Notes	COMP SAMP

	size		number	% finer than		size		number	% finer than		size		number	% finer than
>=	**512**	mm		100	>=	**512**	mm		100	>=	**512**	mm	0	100
>=	**360**	mm		100	>=	**360**	mm		100	>=	**360**	mm	0	100
>=	**256**	mm		100	>=	**256**	mm		100	>=	**256**	mm	0	100
>=	**180**	mm		100	>=	**180**	mm		100	>=	**180**	mm	0	100
>=	**128**	mm		100	>=	**128**	mm		100	>=	**128**	mm	0	100
>=	**90**	mm	3	99	>=	**90**	mm	2	99	>=	**90**	mm	5	99
>=	**64**	mm	6	96	>=	**64**	mm	8	93	>=	**64**	mm	14	95
>=	**45**	mm	14	91	>=	**45**	mm	27	73	>=	**45**	mm	41	85
>=	**32**	mm	48	72	>=	**32**	mm	22	57	>=	**32**	mm	70	67
>=	**22.5**	mm	42	55	>=	**22.5**	mm	24	39	>=	**22.5**	mm	66	50
>=	**16**	mm	41	39	>=	**16**	mm	19	26	>=	**16**	mm	60	34
>=	**11.2**	mm	42	22	>=	**11.2**	mm	13	16	>=	**11.2**	mm	55	20
>=	**8**	mm	23	13	>=	**8**	mm	10	9	>=	**8**	mm	33	12
<	**8**	mm	33	0	<	**8**	mm	12	0	<	**8**	mm	45	0
		n =	219				n =	125				n =	344	
		n =	252				n =	137				n =	389	
		%<8 =	13.1	%			%<8 =	8.8	%			%<8 =	11.6	%

Appendix F. Raw surface sediment size distribution data.

Number	9	
Date	11/20/1999	
SWO	San Anselmo	
LP station	35-75	ft
Counter	Plunkett	
Recorder	Plunkett	
n =	314	
Entered	12/6/1999	
Notes	COMP SAMP	

	size		number	% finer than
>=	**512**	mm		100
>=	**360**	mm		100
>=	**256**	mm		100
>=	**180**	mm	6	98
>=	**128**	mm	9	95
>=	**90**	mm	12	92
>=	**64**	mm	50	76
>=	**45**	mm	65	56
>=	**32**	mm	67	35
>=	**22.5**	mm	53	19
>=	**16**	mm	34	8
>=	**11.2**	mm	11	5
>=	**8**	mm	7	2
<	**8**	mm	8	0
		n =	314	
		n =	322	
		%<8 =	2.5	%

Appendix F. Raw surface sediment size distribution data.

Number	10.1	Number	10.2	Number	10.3	Number	CUMULATIVE
Date	11/3/1999	Date	11/3/1999	Date	11/3/1999	Date	
SWO	Upper San Anselmo Ck	SWO	Upper San Anselmo Ck	SWO	Upper San Anselmo Ck	SWO	
LP station	100-130 ft	LP station	130-160 ft	LP station	160-190 ft	LP station	100-190 ft
Counter	Smeltzer	Counter	Smeltzer	Counter	Smeltzer	Counter	
Recorder	Dawdy	Recorder	Dawdy	Recorder	Dawdy	Recorder	
n =	111	n =	98	n =	95	n =	304
Entered	12/6/1999	Entered	12/6/1999	Entered	12/6/1999	Entered	
Notes COMP	1.0 C	Notes COMP	1.0 C	Notes COMP	1.0 C	Notes COMP	
SAMP	1.0 C	SAMP	1.0 C	SAMP	1.0 C	SAMP	

	size		10.1 number	10.1 % finer than	10.2 number	10.2 % finer than	10.3 number	10.3 % finer than	Cumulative number	Cumulative % finer than
>=	**512**	mm		100		100	1	99	1	100
>=	**360**	mm		100	1	99	3	96	4	98
>=	**256**	mm	2	98	1	98	9	87	12	95
>=	**180**	mm	4	95	7	91	13	74	24	87
>=	**128**	mm	13	83	9	82	14	60	36	76
>=	**90**	mm	10	75	18	65	16	45	44	62
>=	**64**	mm	19	58	13	52	7	38	39	50
>=	**45**	mm	22	39	15	37	13	25	50	34
>=	**32**	mm	10	30	9	28	4	21	23	26
>=	**22.5**	mm	5	25	13	16	6	15	24	19
>=	**16**	mm	12	15	7	9	3	12	22	12
>=	**11.2**	mm	6	10	3	6	3	9	12	8
>=	**8**	mm	8	3	2	4	3	6	13	4
<	**8**	mm	3	0	4	0	6	0	13	0
		n =	111		98		95		304	
		n =	114		102		101		317	
		%<8 =	2.6 %		3.9 %		5.9 %		4.1 %	

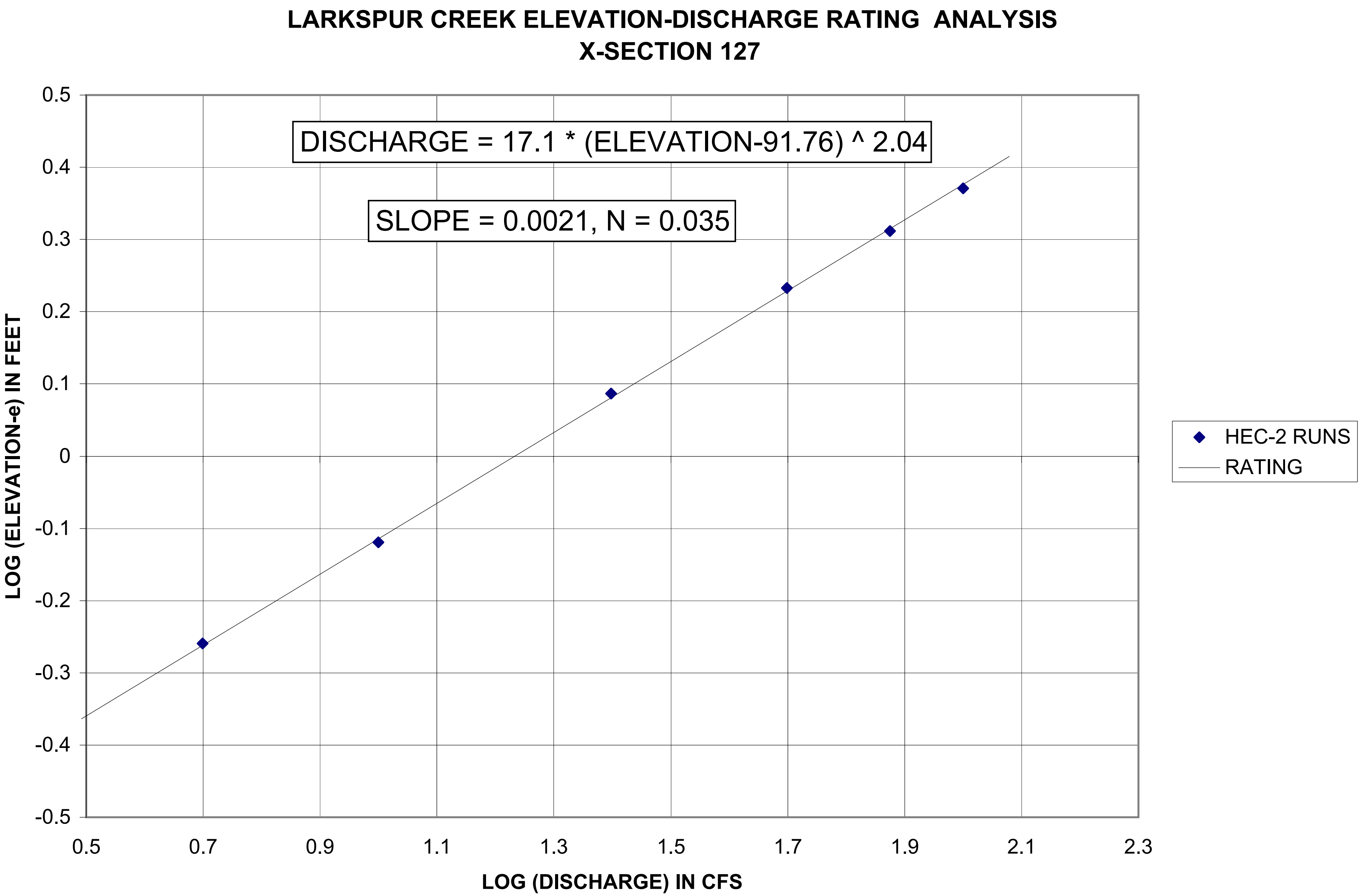
Appendix G. Subsurface sediment size distribution data.

	1 Larkspur Creek	2 Tamalpais Creek	3 Ross Creek	4 Sorich Creek	5 Sleepy Hollow Creek	6 Fairfax Creek	7 Deer Park Creek	8 Wood Lane Creek	9 San Anselmo Creek	10 Upper San Anselmo Creek
	PERCENT FINER THAN (%)									
128 mm										
64 mm		97.2	97.4	94.1		99.7	95.9	90.6	78.7	83.4
32 mm	86.3	78.6	79.7	70.1	88.5	77.6	74.3	64.5	67.0	69.2
16 mm	65.9	52.7	59.7	50.5	67.1	54.1	58.2	49.3	48.9	51.5
8 mm	46.1	37.8	44.5	38.1	48.7	38.0	50.8	37.9	35.7	40.4
4 mm	34.5	25.8	34.1	30.0	36.6	24.4	41.1	29.9	25.5	32.1
2 mm	23.9	17.3	26.1	22.3	26.9	13.6	31.4	22.5	18.4	22.4
1 mm	15.2	13.2	18.8	14.0	17.2	7.8	22.6	14.6	13.0	11.8
0.589 mm	10.1	11.8	12.2	8.2	9.5	3.2	16.5	9.3	8.8	6.8
0.295 mm	4.3	6.8	3.6	3.1	2.2	2.3	3.7	3.5	2.9	2.9
0.208 mm	2.7	4.6	1.7	1.8	1.1	1.4	2.7	2.3	1.7	1.9

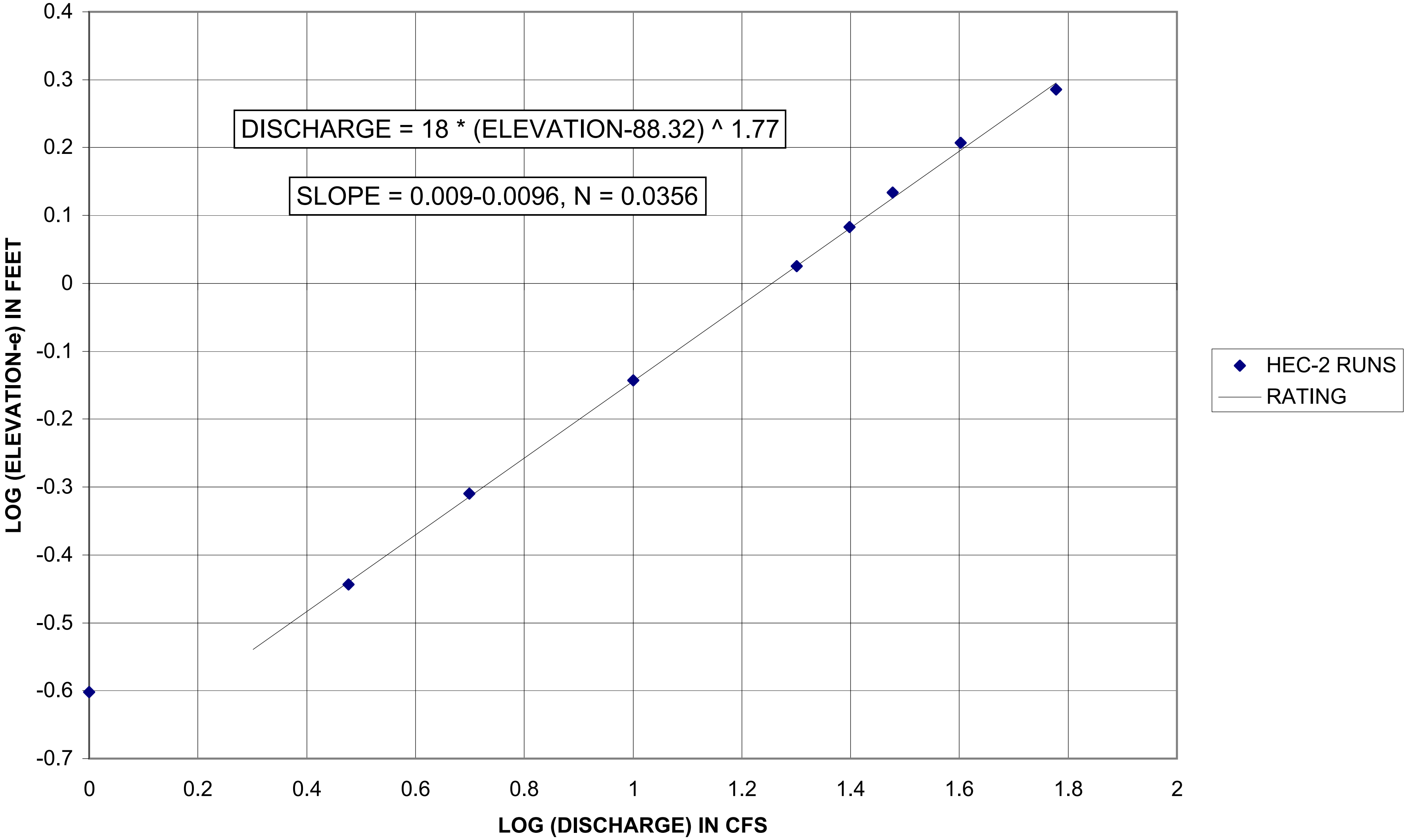
Appendix G. Raw subsurface sediment size distribution data.

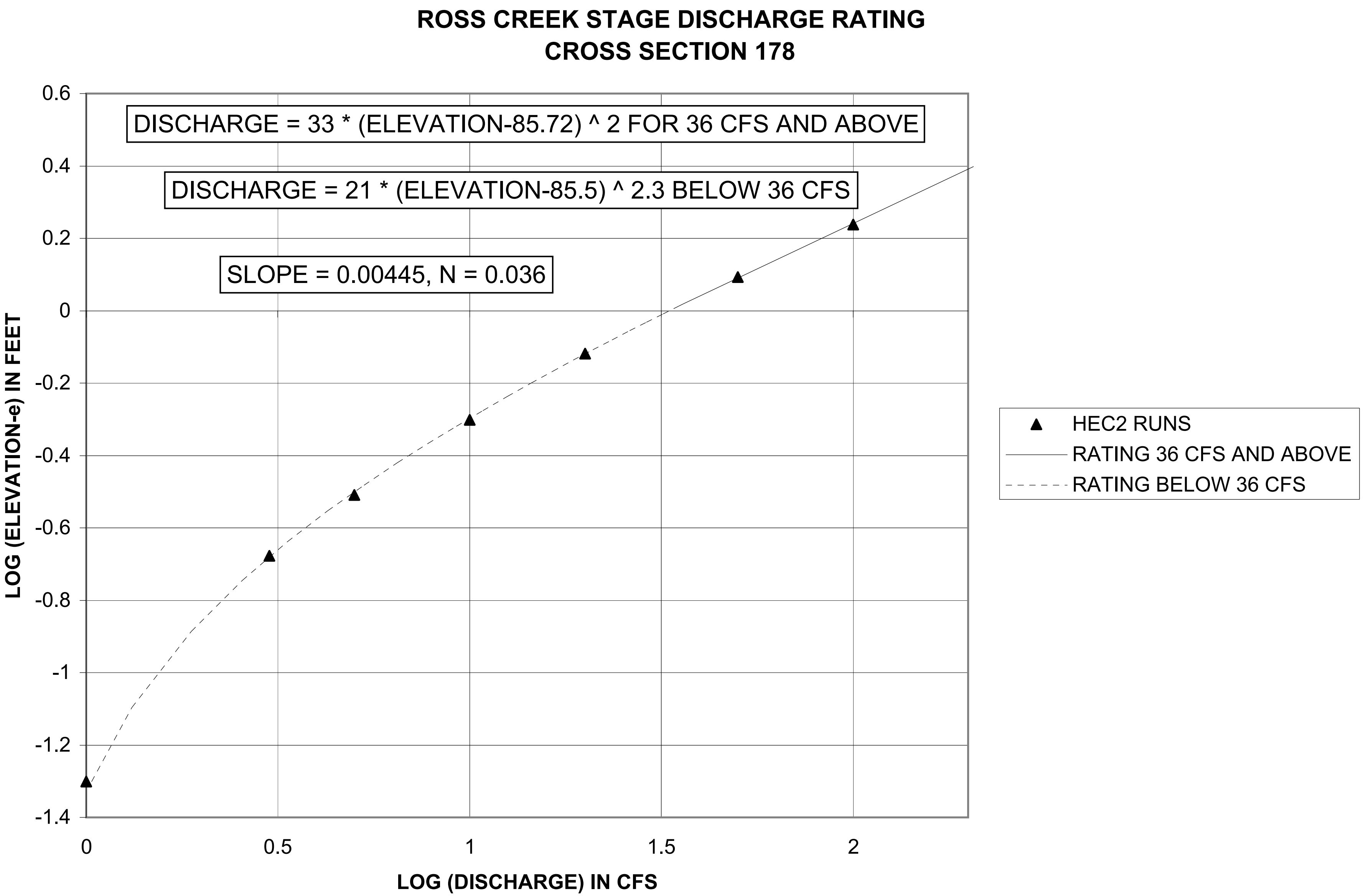
Wood Lane Creek			**103.5 gm**		**tare**		**#**									
											%		100 %			
>=	128 mm						0	>=	128	0.0 gm	0.0 %	128	100.0 %			
>=	64 mm	1581.0	742.1				2	>=	64	2116.1 gm	9.4 %	64	90.6 %			
>=	32 mm	1473.5	1473.6	1221.9	1408.8	818.5	5	>=	32	5878.8 gm	26.1 %	32	64.5 %	55.9		
>=	16 mm	1475.7	1571.6	699.1			3	>=	16	3435.9 gm	15.3 %	16	49.3 %	16.8		
>=	8 mm	733.1	1055.4	763.3	431.1		4	>=	8	2568.9 gm	11.4 %	8	37.9 %			
>=	4 mm	1223.3	778.5				2	>=	4	1794.8 gm	8.0 %	4	29.9 %			
>=	2 mm	1070.7	808.2				2	>=	2	1671.9 gm	7.4 %	2	22.5 %			
>=	1 mm	1013.2	968.7				2	>=	1	1774.9 gm	7.9 %	1	14.6 %	1.2		
>=	0.589 mm	633.4	776.5				2	>=	0.589	1202.9 gm	5.3 %	0.589	9.3 %			
>=	0.295 mm	582.1	911.0				2	>=	0.295	1286.1 gm	5.7 %	0.295	3.5 %			
>=	0.208 mm	209.8	275.4				2	>=	0.208	278.2 gm	1.2 %	0.208	2.3 %			
<	0.208 mm	272.2	455.0				2	<	0.208	520.2 gm	2.3 %	0.208	0.0 %		D_{84} =	55.9 mm
								total mass		22528.7 gm					D_{50} =	16.8 mm
										49.7 lb					D_{16} =	1.2 mm
Fairfax Creek			**103.5 gm**		**tare**		**#**									
											%		100 %			
>=	128 mm						0	>=	128	0.0 gm	0.0 %	128	100.0 %			
>=	64 mm	159.3					1	>=	64	55.8 gm	0.3 %	64	99.7 %			
>=	32 mm	1574.5	1537	1094.6			3	>=	32	3895.6 gm	22.0 %	32	77.6 %	41.2		
>=	16 mm	1566.3	1590.3	1318.2			3	>=	16	4164.3 gm	23.6 %	16	54.1 %			
>=	8 mm	1615.5	1071.3	453.4			3	>=	8	2829.7 gm	16.0 %	8	38.0 %	14.0		
>=	4 mm	1491.1	1123				2	>=	4	2407.1 gm	13.6 %	4	24.4 %			
>=	2 mm	1240	888.1				2	>=	2	1921.1 gm	10.9 %	2	13.6 %	2.5		
>=	1 mm	831.4	395				2	>=	1	1019.4 gm	5.8 %	1	7.8 %			
>=	0.589 mm	306.2	718.2				2	>=	0.589	817.4 gm	4.6 %	0.589	3.2 %			
>=	0.295 mm	142.4	216.4				2	>=	0.295	151.8 gm	0.9 %	0.295	2.3 %			
>=	0.208 mm	142.4	216.4				2	>=	0.208	151.8 gm	0.9 %	0.208	1.4 %			
<	0.208 mm	171.9	289				2	<	0.208	253.9 gm	1.4 %	0.208	0.0 %		D_{84} =	41.2 mm
								total mass		17667.9 gm					D_{50} =	14.0 mm
										39.0 lb					D_{16} =	2.5 mm
San Anselmo Creek			**103.1 gm**		**tare**		**#**									
											%		100 %			
>=	128 mm						0	>=	128	0.0 gm	0.0 %	128	100.0 %			
>=	64 mm	1600.2	1161.6	724.9	1373.6		4	>=	64	4447.9 gm	21.3 %	64	78.7 %	80.0		
>=	32 mm	1306.2	1336.7				2	>=	32	2436.7 gm	11.7 %	32	67.0 %			
>=	16 mm	1502.2	1446.2	1142.1			3	>=	16	3781.2 gm	18.1 %	16	48.9 %	17.0		
>=	8 mm	1472.1	252.6	1105.4	321		4	>=	8	2738.7 gm	13.1 %	8	35.7 %			
>=	4 mm	1397.9	944.2				2	>=	4	2135.9 gm	10.2 %	4	25.5 %			
>=	2 mm	990.8	690.6				2	>=	2	1475.2 gm	7.1 %	2	18.4 %			
>=	1 mm	635.6	706.2				2	>=	1	1135.6 gm	5.4 %	1	13.0 %	1.6		
>=	0.589 mm	478.5	606.4				2	>=	0.589	878.7 gm	4.2 %	0.589	8.8 %			
>=	0.295 mm	596.3	839.2				2	>=	0.295	1229.3 gm	5.9 %	0.295	2.9 %			
>=	0.208 mm	213.3	249				2	>=	0.208	256.1 gm	1.2 %	0.208	1.7 %			
<	0.208 mm	231.9	321.1				2	<	0.208	346.8 gm	1.7 %	0.208	0.0 %		D_{84} =	80.0 mm
								total mass		20862.1 gm					D_{50} =	17.0 mm
										46.0 lb					D_{16} =	1.6 mm
Tamalpais Creek			**102.9 gm**		**tare**		**#**									
											%		100 %			
>=	128 mm						0	>=	128	0.0 gm	0.0 %	128	100.0 %			
>=	64 mm	700.9					1	>=	64	598.0 gm	2.8 %	64	97.2 %			
>=	32 mm	1508.5	1509.1	1178.5			3	>=	32	3887.4 gm	18.5 %	32	78.6 %	41.3		
>=	16 mm	1423.1	1542	1505.8	1383		4	>=	16	5442.3 gm	25.9 %	16	52.7 %			
>=	8 mm	1302.9	1115.3	354	777.4		4	>=	8	3138.0 gm	14.9 %	8	37.8 %	14.6		
>=	4 mm	1488.7	1235.8				2	>=	4	2518.7 gm	12.0 %	4	25.8 %			
>=	2 mm	1072.6	918.7				2	>=	2	1785.5 gm	8.5 %	2	17.3 %			
>=	1 mm	553.6	511.7				2	>=	1	859.5 gm	4.1 %	1	13.2 %	1.7		
>=	0.589 mm	250.1	248.6				2	>=	0.589	292.9 gm	1.4 %	0.589	11.8 %			
>=	0.295 mm	610	635.7				2	>=	0.295	1039.9 gm	5.0 %	0.295	6.8 %			
>=	0.208 mm	321.8	352.3				2	>=	0.208	468.3 gm	2.2 %	0.208	4.6 %			
<	0.208 mm	508	658.8				2	<	0.208	961.0 gm	4.6 %	0.208	0.0 %		D_{84} =	41.3 mm
								total mass		20991.5 gm					D_{50} =	14.6 mm
										46.3 lb					D_{16} =	1.7 mm
Ross Creek			**102.9 gm**		**tare**		**#**									
											%		100 %			
>=	128 mm						0	>=	128	0.0 gm	0.0 %	128	100.0 %			
>=	64 mm	593					1	>=	64	490.1 gm	2.6 %	64	97.4 %			
>=	32 mm	1537	1590	543			3	>=	32	3361.3 gm	17.8 %	32	79.7 %	39.8		
>=	16 mm	1406.5	1440.1	1237.6			3	>=	16	3775.5 gm	19.9 %	16	59.7 %			
>=	8 mm	1600.9	312.8	541.9	834.1		4	>=	8	2878.1 gm	15.2 %	8	44.5 %	10.9		
>=	4 mm	1413.5	772.1				2	>=	4	1979.8 gm	10.5 %	4	34.1 %			
>=	2 mm	1261.5	453.6				2	>=	2	1509.3 gm	8.0 %	2	26.1 %			
>=	1 mm	1177	408.3				2	>=	1	1379.5 gm	7.3 %	1	18.8 %			
>=	0.589 mm	1068	386.8				2	>=	0.589	1249.0 gm	6.6 %	0.589	12.2 %	0.8		
>=	0.295 mm	1332.3	506.2				2	>=	0.295	1632.7 gm	8.6 %	0.295	3.6 %			
>=	0.208 mm	350.9	211.2				2	>=	0.208	356.3 gm	1.9 %	0.208	1.7 %		D_{84} =	39.8 mm
<	0.208 mm	305.1	222.6				2	<	0.208	321.9 gm	1.7 %	0.208	0.0 %		D_{50} =	10.9 mm
								total mass		18933.5 gm					D_{16} =	0.8 mm
										41.8 lb						

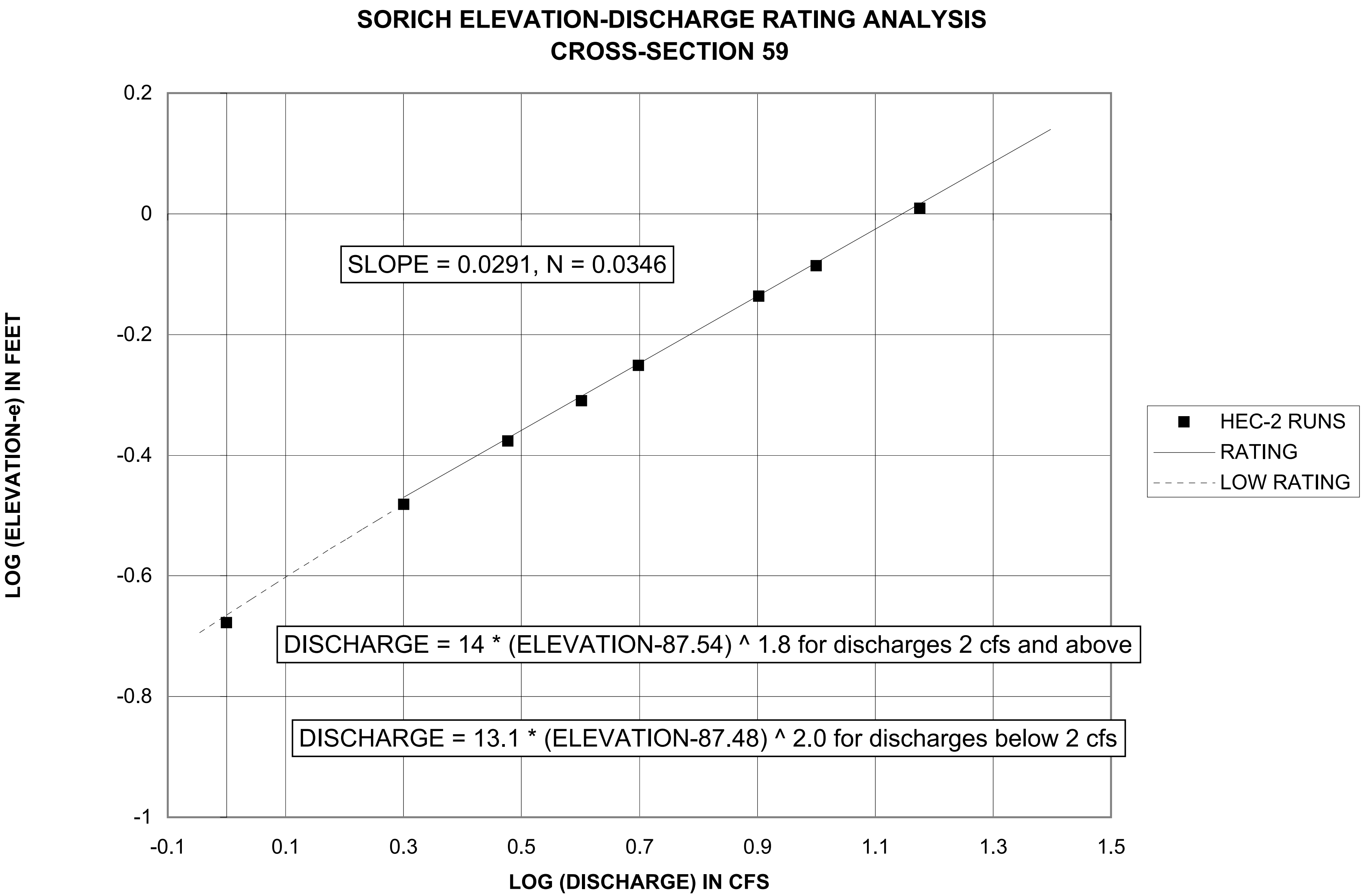
Larkspur Creek		**102.9 gm**	**tare**				**#**									
											%		100 %			
>=	128 mm						0	>=	128	0.0 gm	0.0 %	128	100.0 %			
>=	64 mm						0	>=	64	0.0 gm	0.0 %	64	100.0 %			
>=	32 mm	1422.1	1089.1				2	>=	32	2305.4 gm	13.7 %	32	86.3 %			
>=	16 mm	1407.8	1046.5	1287.6			3	>=	16	3433.2 gm	20.4 %	16	65.9 %	30.2		
>=	8 mm	1490.4	922.4	1209			3	>=	8	3313.1 gm	19.7 %	8	46.1 %	9.6		
>=	4 mm	1520.9	649.3				2	>=	4	1964.4 gm	11.7 %	4	34.5 %			
>=	2 mm	1240.7	747.9				2	>=	2	1782.8 gm	10.6 %	2	23.9 %			
>=	1 mm	1556.1					1	>=	1	1453.2 gm	8.6 %	1	15.2 %	1.1		
>=	0.589 mm	965					1	>=	0.589	862.1 gm	5.1 %	0.589	10.1 %			
>=	0.295 mm	1073.3					1	>=	0.295	970.4 gm	5.8 %	0.295	4.3 %			
>=	0.208 mm	370.3					1	>=	0.208	267.4 gm	1.6 %	0.208	2.7 %			
<	0.208 mm	558.5					1	<	0.208	455.6 gm	2.7 %	0.208	0.0 %		D_{84} =	30.2 mm
								total mass		16807.6 gm					D_{50} =	9.6 mm
										37.1 lb					D_{16} =	1.1 mm
Sorich Creek		**102.9 gm**	**tare**				**#**									
											%		100 %			
>=	128 mm						0	>=	128	0.0 gm	0.0 %	128	100.0 %			
>=	64 mm	1405.5					1	>=	64	1302.6 gm	5.9 %	64	94.1 %			
>=	32 mm	1544.5	1542.6	1445.2	1212		4	>=	32	5332.7 gm	24.1 %	32	70.1 %	50.5		
>=	16 mm	1577.2	1486	1589.6			3	>=	16	4344.1 gm	19.6 %	16	50.5 %			
>=	8 mm	531.2	1488	681.4	447.9		4	>=	8	2736.9 gm	12.3 %	8	38.1 %	15.7		
>=	4 mm	1164.8	830.4				2	>=	4	1789.4 gm	8.1 %	4	30.0 %			
>=	2 mm	1219	701.1				2	>=	2	1714.3 gm	7.7 %	2	22.3 %			
>=	1 mm	1355	688.7				2	>=	1	1837.9 gm	8.3 %	1	14.0 %	1.2		
>=	0.589 mm	998	490.3				2	>=	0.589	1282.5 gm	5.8 %	0.589	8.2 %			
>=	0.295 mm	913.3	424.7				2	>=	0.295	1132.2 gm	5.1 %	0.295	3.1 %			
>=	0.208 mm	310.9	190.9				2	>=	0.208	296.0 gm	1.3 %	0.208	1.8 %			
<	0.208 mm	368	236				2	<	0.208	398.2 gm	1.8 %	0.208	0.0 %		D_{84} =	50.5 mm
								total mass		22166.8 gm					D_{50} =	15.7 mm
										48.9 lb					D_{16} =	1.2 mm
Deer Park		**103 gm**	**tare**				**#**									
											%		100 %			
>=	128 mm						0	>=	128	0.0 gm	0.0 %	128	100.0 %			
>=	64 mm	1297.7					1	>=	64	1194.7 gm	4.1 %	64	95.9 %			
>=	32 mm	1525.1	1526	1585	1418.7	802.7	5	>=	32	6342.5 gm	21.6 %	32	74.3 %	46.3		
>=	16 mm	1520.5	1360.3	1085.2	1184		4	>=	16	4738.0 gm	16.1 %	16	58.2 %			
>=	8 mm	541	1181.6	771.4			3	>=	8	2185.0 gm	7.4 %	8	50.8 %			
>=	4 mm	1252.7	1375	510.6			3	>=	4	2829.3 gm	9.6 %	4	41.1 %	7.7		
>=	2 mm	1322.4	1208.2	644			3	>=	2	2865.6 gm	9.8 %	2	31.4 %			
>=	1 mm	1276.7	1508.1				2	>=	1	2578.8 gm	8.8 %	1	22.6 %			
>=	0.589 mm	959.1	1053.2				2	>=	0.589	1806.3 gm	6.1 %	0.589	16.5 %			
>=	0.295 mm	1214.6	739.4	1416.9	794.9		4	>=	0.295	3753.8 gm	12.8 %	0.295	3.7 %	0.6		
>=	0.208 mm	292.5	200.8				2	>=	0.208	287.3 gm	1.0 %	0.208	2.7 %			
<	0.208 mm	513.8	484				2	<	0.208	791.8 gm	2.7 %	0.208	0.0 %		D_{84} =	46.3 mm
								total mass		29373.1 gm					D_{50} =	7.7 mm
										64.8 lb					D_{16} =	0.6 mm
Upper San Anselmo		**102.9 gm**	**tare**				**#**									
											%		100 %			
>=	128 mm						0	>=	128	0.0 gm	0.0 %	128	100.0 %			
>=	64 mm	1441.9	1402.7	1077.4			3	>=	64	3613.3 gm	16.6 %	64	83.4 %	66.3		
>=	32 mm	1607.6	1553.6	246.8			3	>=	32	3099.3 gm	14.2 %	32	69.2 %			
>=	16 mm	1442.5	1447.5	1268			3	>=	16	3849.3 gm	17.7 %	16	51.5 %			
>=	8 mm	1225	498.3	1011.1			3	>=	8	2425.7 gm	11.1 %	8	40.4 %			
>=	4 mm	1297.9	721.2				2	>=	4	1813.3 gm	8.3 %	4	32.1 %			
>=	2 mm	1364.8	954.1				2	>=	2	2113.1 gm	9.7 %	2	22.4 %			
>=	1 mm	1156	1353.6				2	>=	1	2303.8 gm	10.6 %	1	11.8 %	1.4		
>=	0.589 mm	1189.5					1	>=	0.589	1086.6 gm	5.0 %	0.589	6.8 %			
>=	0.295 mm	946.1					1	>=	0.295	843.2 gm	3.9 %	0.295	2.9 %			
>=	0.208 mm	315.8					1	>=	0.208	212.9 gm	1.0 %	0.208	1.9 %			
<	0.208 mm	525.3					1	<	0.208	422.4 gm	1.9 %	0.208	0.0 %		D_{84} =	66.3 mm
								total mass		21782.9 gm					D_{50} =	mm
										48.1 lb					D_{16} =	1.4 mm
Sleepy Hollow Ck		**102.8 gm**	**tare**				**#**									
											%		100 %			
>=	128 mm						0	>=	128	0.0 gm	0.0 %	128	100.0 %			
>=	64 mm						0	>=	64	0.0 gm	0.0 %	64	100.0 %			
>=	32 mm	1586	1363.3				2	>=	32	2743.7 gm	11.5 %	32	88.5 %			
>=	16 mm	1556.2	1559	1199.2	1235.1		4	>=	16	5138.3 gm	21.5 %	16	67.1 %	28.6		
>=	8 mm	965.6	1508.8	1446.2	285.8	711.5	5	>=	8	4403.9 gm	18.4 %	8	48.7 %	8.6		
>=	4 mm	1282.7	532.6	1400.4			3	>=	4	2907.3 gm	12.1 %	4	36.6 %			
>=	2 mm	1309.2	1196				2	>=	2	2299.6 gm	9.6 %	2	26.9 %			
>=	1 mm	1301.7	1238.2				2	>=	1	2334.3 gm	9.7 %	1	17.2 %			
>=	0.589 mm	1047.6	1000.8				2	>=	0.589	1842.8 gm	7.7 %	0.589	9.5 %	0.9		
>=	0.295 mm	1001.2	948.6				2	>=	0.295	1744.2 gm	7.3 %	0.295	2.2 %			
>=	0.208 mm	244	232.7				2	>=	0.208	271.1 gm	1.1 %	0.208	1.1 %			
<	0.208 mm	235.4	231.1				2	<	0.208	260.9 gm	1.1 %	0.208	0.0 %		D_{84} =	28.6 mm
								total mass		23946.1 gm					D_{50} =	8.6 mm
										52.8 lb					D_{16} =	0.9 mm

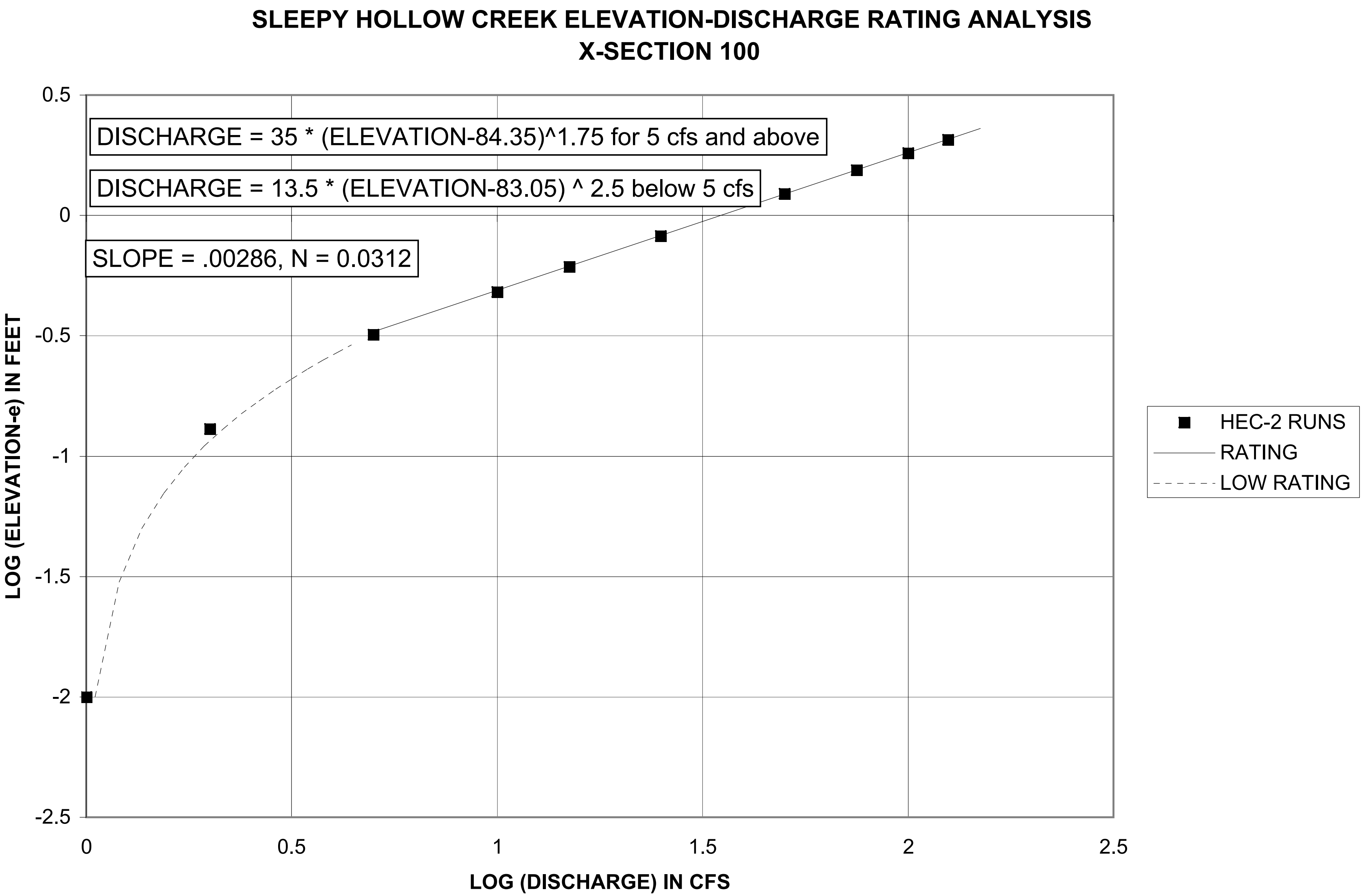

LARKSPUR CREEK ELEVATION-DISCHARGE RATING ANALYSIS
X-SECTION 127
DISCHARGE = 17.1 * (ELEVATION-91.76) ^ 2.04
SLOPE = 0.0021, N = 0.035
LOG (ELEVATION-e) IN FEET
LOG (DISCHARGE) IN CFS
HEC-2 RUNS
RATING
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
0.5
0.7
0.9
1.1
1.3
1.5
1.7
1.9
2.1
2.3

TAMALPAIS CREEK ELEVATION-DISCHARGE RATING ANALYSIS
X-SECTION 114

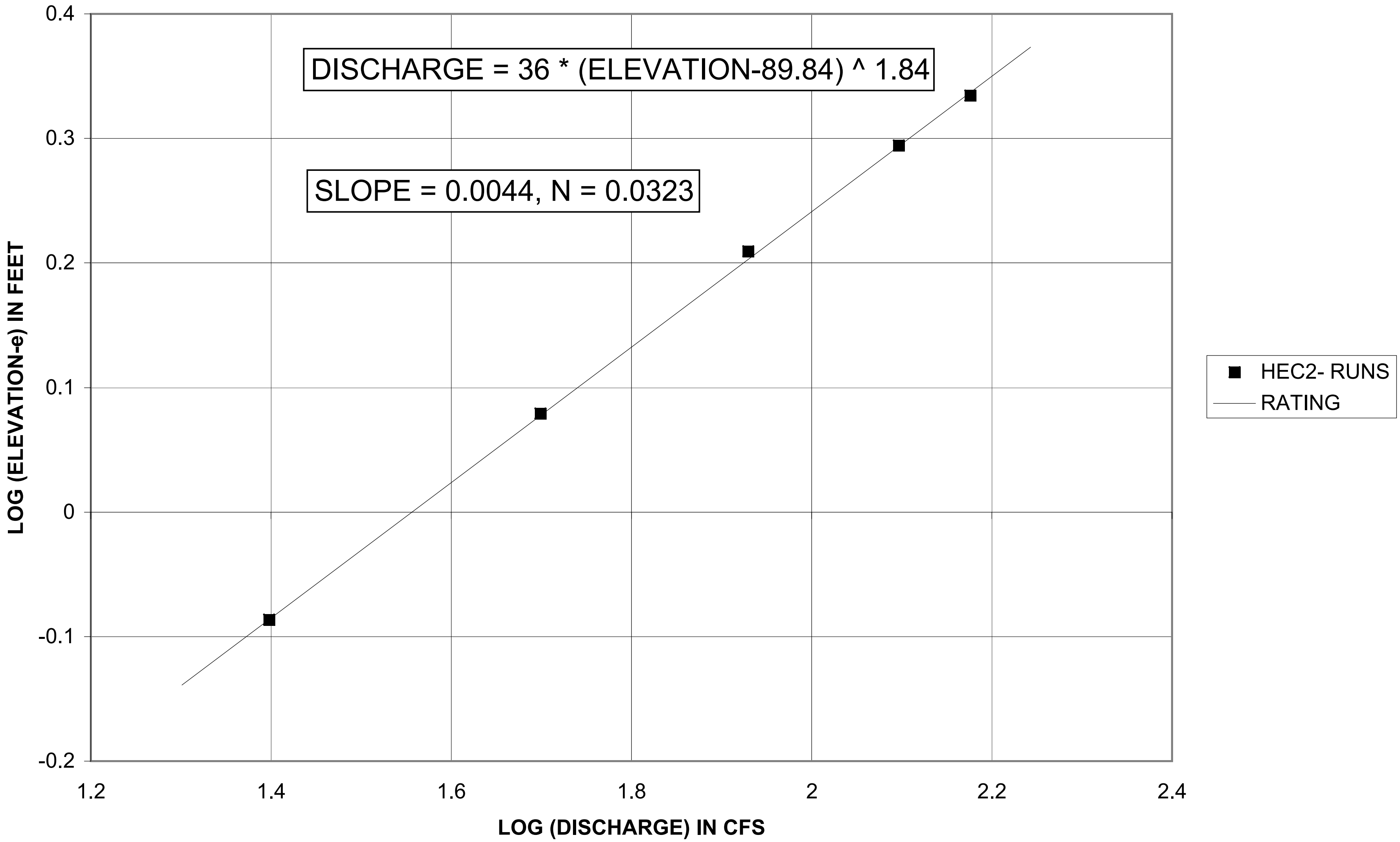


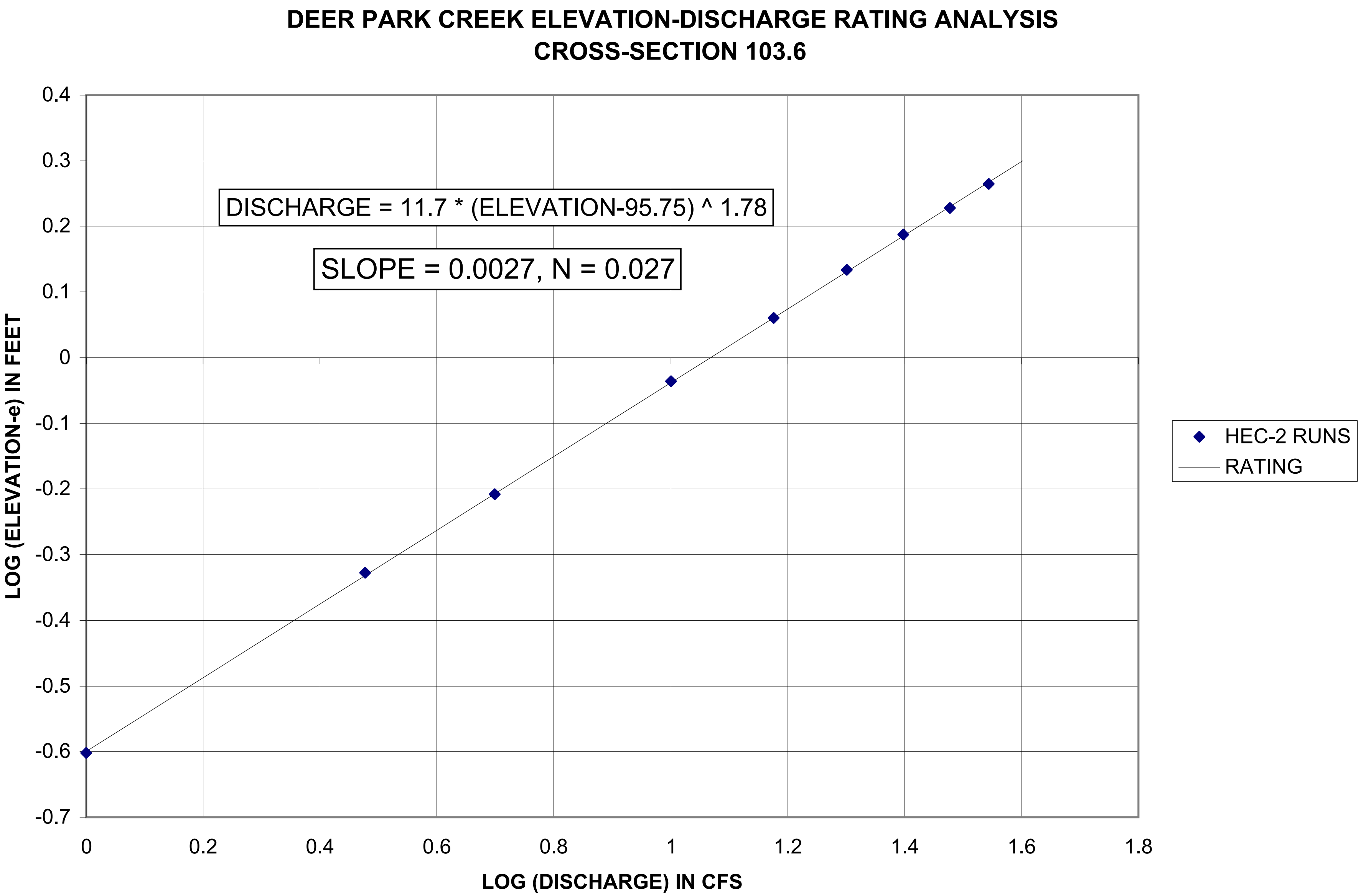

ROSS CREEK STAGE DISCHARGE RATING
CROSS SECTION 178
DISCHARGE = 33 * (ELEVATION-85.72) ^ 2 FOR 36 CFS AND ABOVE
DISCHARGE = 21 * (ELEVATION-85.5) ^ 2.3 BELOW 36 CFS
SLOPE = 0.00445, N = 0.036
LOG (ELEVATION-e) IN FEET
LOG (DISCHARGE) IN CFS
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2
-1.4
0
0.5
1
1.5
2
HEC2 RUNS
RATING 36 CFS AND ABOVE
RATING BELOW 36 CFS


SORICH ELEVATION-DISCHARGE RATING ANALYSIS
CROSS-SECTION 59
SLOPE = 0.0291, N = 0.0346
DISCHARGE = 14 * (ELEVATION-87.54) ^ 1.8 for discharges 2 cfs and above
DISCHARGE = 13.1 * (ELEVATION-87.48) ^ 2.0 for discharges below 2 cfs
HEC-2 RUNS
RATING
LOW RATING
LOG (ELEVATION-e) IN FEET
LOG (DISCHARGE) IN CFS
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-0.1
0.1
0.3
0.5
0.7
0.9
1.1
1.3
1.5

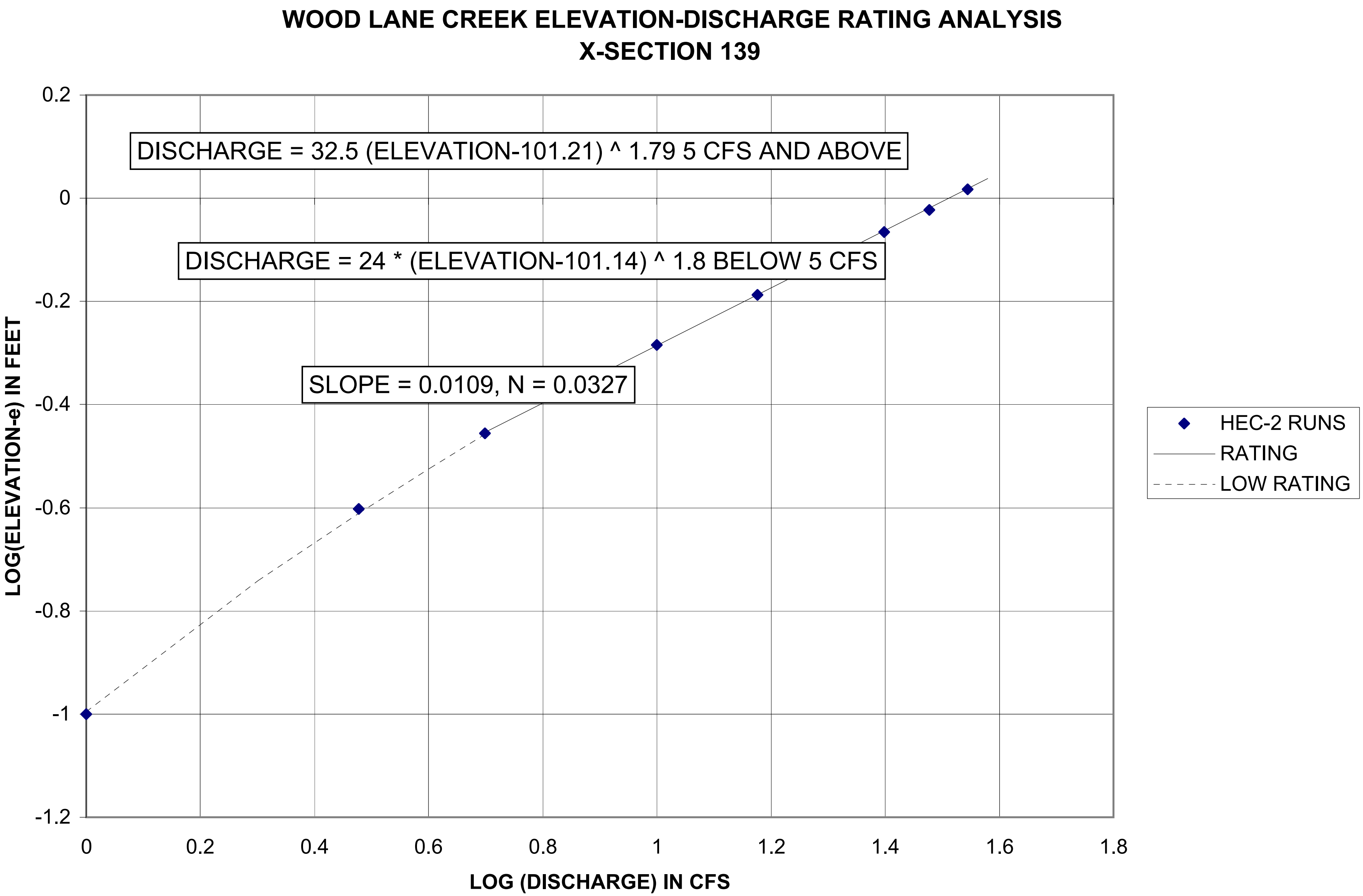

SLEEPY HOLLOW CREEK ELEVATION-DISCHARGE RATING ANALYSIS
X-SECTION 100
DISCHARGE = 35 * (ELEVATION-84.35)^1.75 for 5 cfs and above
DISCHARGE = 13.5 * (ELEVATION-83.05) ^ 2.5 below 5 cfs
SLOPE = .00286, N = 0.0312
LOG (ELEVATION-e) IN FEET
LOG (DISCHARGE) IN CFS
HEC-2 RUNS
RATING
LOW RATING
0.5
0
-0.5
-1
-1.5
-2
-2.5
0
0.5
1
1.5
2
2.5

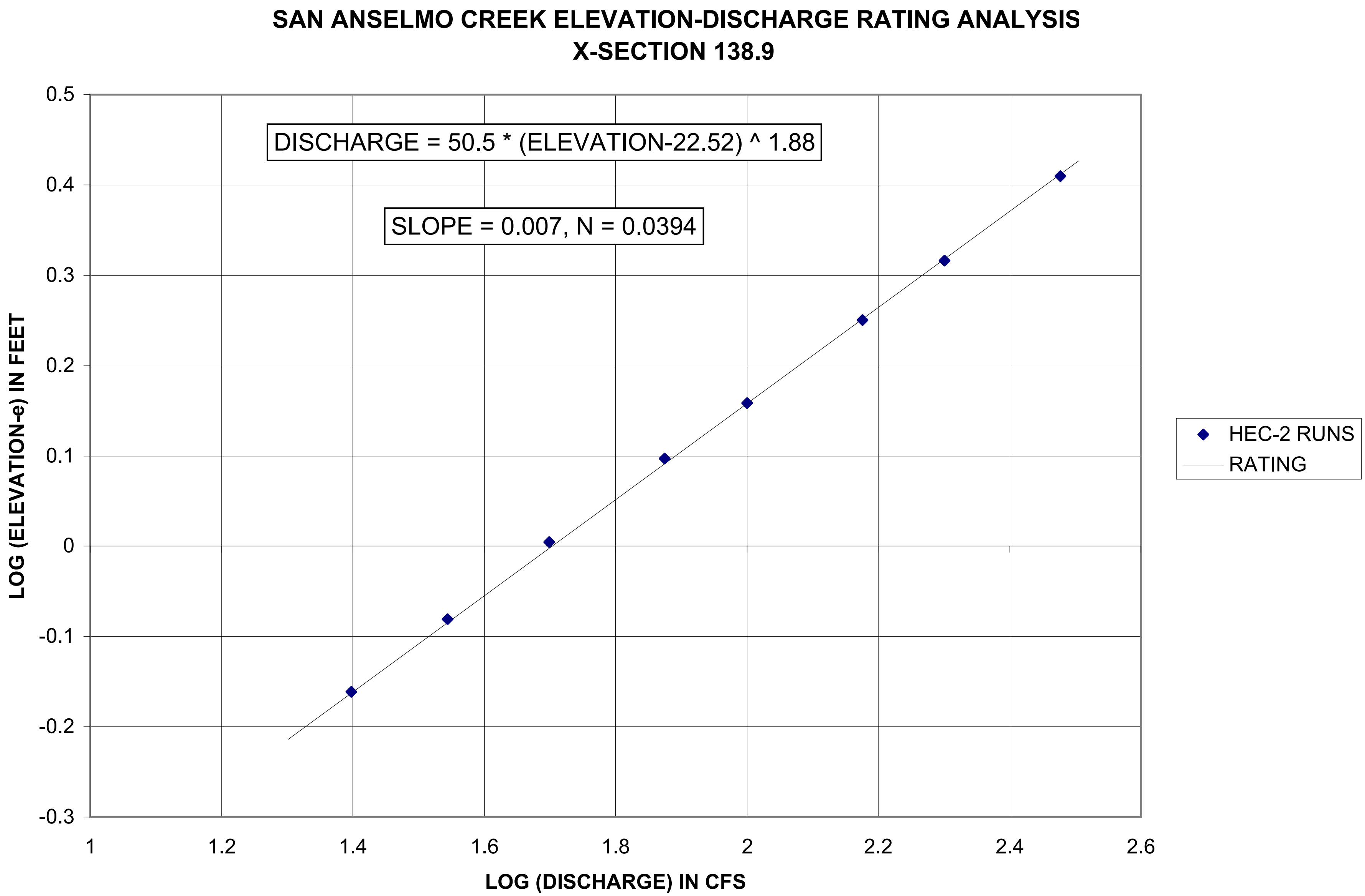
FAIRFAX CREEK ELEVATION-DISCHARGE RATING ANALYSIS
CROSS-SECTION 64

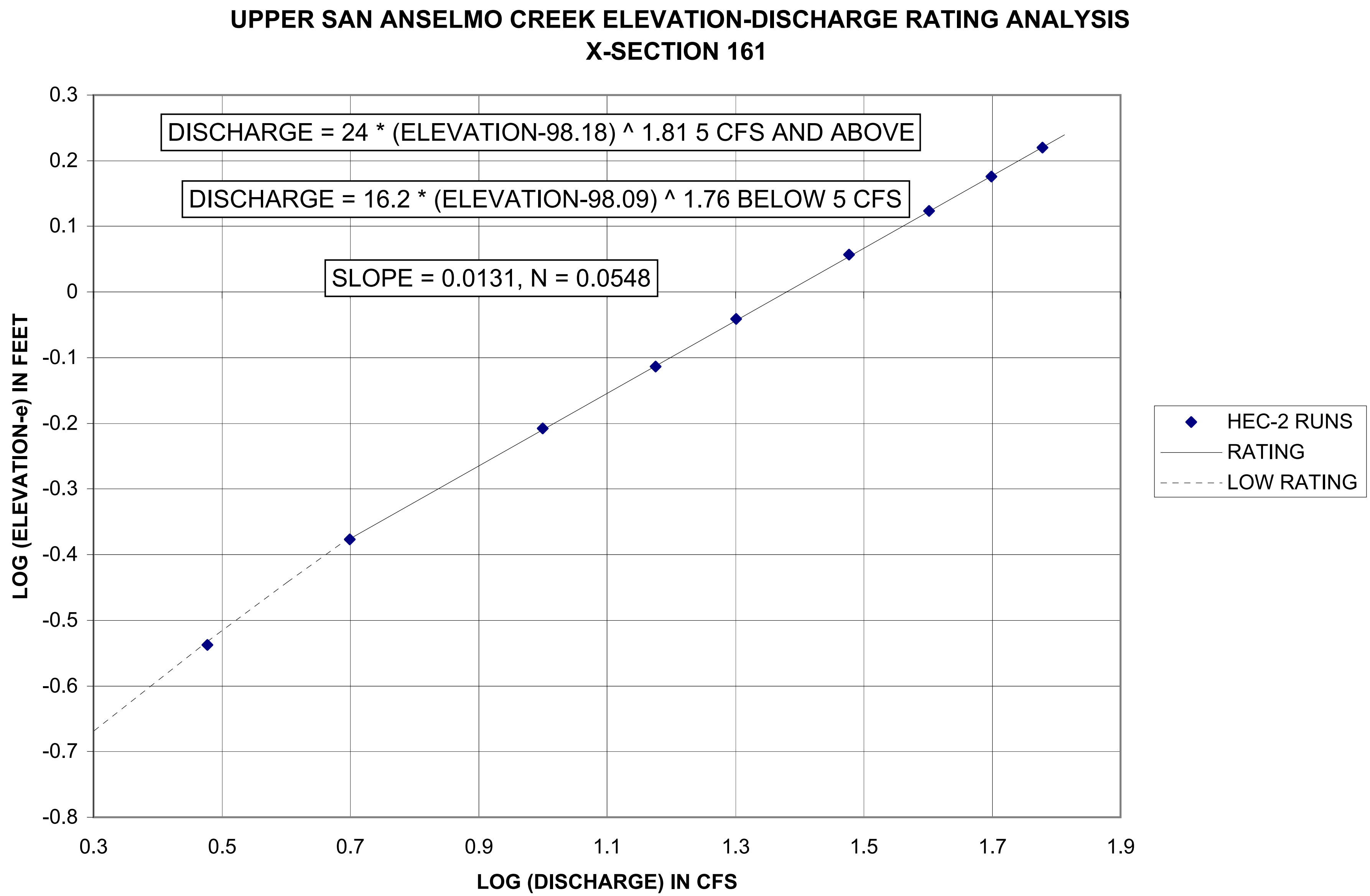




DEER PARK CREEK ELEVATION-DISCHARGE RATING ANALYSIS
CROSS-SECTION 103.6
DISCHARGE = 11.7 * (ELEVATION-95.75) ^ 1.78
SLOPE = 0.0027, N = 0.027
LOG (ELEVATION-e) IN FEET
LOG (DISCHARGE) IN CFS
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
-0.7
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
HEC-2 RUNS
RATING


WOOD LANE CREEK ELEVATION-DISCHARGE RATING ANALYSIS
X-SECTION 139
DISCHARGE = 32.5 (ELEVATION-101.21) ^ 1.79 5 CFS AND ABOVE
DISCHARGE = 24 * (ELEVATION-101.14) ^ 1.8 BELOW 5 CFS
SLOPE = 0.0109, N = 0.0327
LOG(ELEVATION-e) IN FEET
LOG (DISCHARGE) IN CFS
HEC-2 RUNS
RATING
LOW RATING
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8


SAN ANSELMO CREEK ELEVATION-DISCHARGE RATING ANALYSIS
X-SECTION 138.9
DISCHARGE = 50.5 * (ELEVATION-22.52) ^ 1.88
SLOPE = 0.007, N = 0.0394
LOG (ELEVATION-e) IN FEET
LOG (DISCHARGE) IN CFS
HEC-2 RUNS
RATING
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
1
1.2
1.4
1.6
1.8
2
2.2
2.4
2.6


UPPER SAN ANSELMO CREEK ELEVATION-DISCHARGE RATING ANALYSIS
X-SECTION 161
DISCHARGE = 24 * (ELEVATION-98.18) ^ 1.81 5 CFS AND ABOVE
DISCHARGE = 16.2 * (ELEVATION-98.09) ^ 1.76 BELOW 5 CFS
SLOPE = 0.0131, N = 0.0548
LOG (ELEVATION-e) IN FEET
LOG (DISCHARGE) IN CFS
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
-0.7
-0.8
0.3
0.5
0.7
0.9
1.1
1.3
1.5
1.7
1.9
HEC-2 RUNS
RATING
LOW RATING

Appendix I. Partial bibliography of historical maps, photographs, and other accounts.

Maps

Allardt, G. F. 1871. Map no. 7 of salt marsh and tide lands situate in Marin County : state of California, S[an] F[rancisco] : Schmidt Label & Lith. Co., Scale [1:15,840]. 20 chains to the in.
[UCB Bancroft G4363.M2G46 1871 .A4 Case XD *c2 copies]

Allardt, G. F. 1871. Sale map no. 8 of salt marsh and tide lands situate in the county of Marin : state of California, F.C. Hafenrichter, draughtsman. S[an] F[rancisco] : G.T. Brown & Co. Lith., Scale [ca. 1:16,000].
[UCB Bancroft G4363.M2G46 1871 .A5 Case XD]

*Austin, H. 1864? Surveyor's report on grading White's Hill : [Marin County, Calif.] Scale [ca. 1:3,960].
UCB Bancroft G4363.M2 svar .P6 no.14 Case C

*Lawson, Andrew C. 1913. Tamalpais quadrangle, California : areal geology, geology by Andrew C.Lawson assisted at various times by students of the University of California. Ed. of Sept. 1913. [Washington] : U.S. Geological Survey, Scale 1:62,500.
[UCB Earth Sci G4363.M2C5 1913 .L3 Case D]

Mapa de Marin County : Calif.. [184-?]. Scale [ca. 1:146,700].
[UCB Earth Sci G4363.M2 1840 .M3 Case D]

Marin County. 1923. [Berkeley, Calif.: California Historical Survey Commission, 1923]. Scale [ca. 1:633,600].
[UCB Earth Sci JS451.C2 A5 1923]

Marin County Planning Commission. Terrain : [Marin County, Calif.]. [San Rafael, Calif. : Marin County Planning Commission, between 1960 and 1968]. Scale [ca. 1:48,000].
[UCB Earth Sci G4363.M2C28 1960 .M3 Case B]

Marin County Planning Commission. Vegetation : [Marin County, Calif.]. [San Rafael, Calif. : Marin County Planning Commission, between 1960 and 1968]. Scale [ca. 1:48,000].
[UCB Earth Sci G4363.M2D2 1960 .M3 Case B]

*Messner, Rodney E. 1936. Map of Marin County, California / Rodney E. Messner, County Surveyor. [San Rafael, Calif. : Marin County Surveyor]. Scale [ca. 1:47,000].
[UCD Shields MAP G4363.M2 1936 .M3 Map Coll]

Northwestern Realty Company. 192? Map of Marin Heights : Marin County, California / for sale by Northwestern Realty Company. Scale [ca. 1:2,470].
[UCB Bancroft G4363.M2 svar .P6 no.22 Case XB]

** Asterisk denotes materials not reviewed during this study*

Official map of Marin County. 1898. Scale [ca. 1:45,000].
[UCB Bancroft G4363.M2 1898 .O3 Rolled]

Ownership map of portion of Marin County showing northern and western boundaries of Marin Municipal Water District: Supplement to "The Sentinel," San Rafael, August 17, 1915. San Rafael, [Calif.] : The Sentinel, 1917. Scale [ca. 1:63,360].
[UCB Bancroft G4363.M2 svar .P6 no.3 Case XB]

Portion of Section 33, Township 1 N., Range 6 W., M.D.M. : Marin County, Calif.]. [189-?]. Scale [1:3,960].
[UCB Bancroft G4363.M2 svar .P6 no.13 Case XB]

Progressive Map Service. 192? Map of Marin County. Compiled, published and copyrighted by Progressive Map Service, Fresno, Calif. Scale [ca. 1:126,720].
[UCB Bancroft G4363.M2 1920 .P7 Case X *c2 copies]

Progressive Map Service. 1926. Map of Marin County : data obtained from government & private sources. compiled, published and copyrighted by Progressive Map Service, Fresno, Calif. Scale [ca. 1:132,000].
[UCB Earth Sci G4363.M2 1926 .P7 Case D]

Punnett Brothers. Map of salt marsh & tide lands : Marin County. Drawn by Punnett Bros. S[an] F[rancisco] ; Punnett Bros., [between 1901 and 1906]. Scale [1:15,840].
[UCB Bancroft G4363.M2G46 1906 .P8 Case XB]

Punnett Brothers. Map of Sonoma & Marin Counties, Cal. S[an] F[rancisco] : Punnett Brothers, c1908. Scale [ca. 1:129,000].
[UCB Earth Sci G4363.M2 1908 .P8 Case B]

Rancho Corte Madera de Novato y sus alrededores. [184-?]. Scale [ca. 1:100,000].
[UCB Bancroft G4363.M2 svar .P6 no.16 Case XB]

Ranchos and public lands in Marin and Sonoma counties, C.C. Tracy, U.S. Deputy Surveyor. Nov. 2, 1860. Scale [1:63,360]. 80 chs. to the in.
[UCB Bancroft Land Case Map F-266]

Ranchos in northern Marin and southern Sonoma counties. [1870?]. Scale [ca. 1:141,000].
[UCB Bancroft G9990.C3.no.128a Case A]

Ranchos in southern Marin County, California. [1870?]. Scale [ca. 1:95,040].
[UCB Bancroft G9990.C3 no.128b Case A;
UCB Earth Sci G4363.M2G465 1870 .R32 Case D]

** Asterisk denotes materials not reviewed during this study*

*Rodgers, A. F. 1862. Map of a part of the coast from Tomales Bay to Salmon Creek, California. Surveyed by A.F. Rodgers, Assistant, and D. Kerr, Aid, U.S. C[oast] S[urvey]. Scale 1:10,000. Series title: Topographic survey of the coasts of the United States; no. 883.
[UCB Earth Sci G3700 svar .U5 no.T:883 Case B]

Surveyor General of the United States. The above amendment to Sec.33, township no.1 north, range no.6 west, Mount Diablo Meridian : is strictly conformable to the compiled field notes of the surveys thereof ... U.S. Surveyor General's Office, San... 1895, copy 1899. Scale [ca. 1:12,900].
[UCB Bancroft G4363.M2 svar .P6 no.12 Case XB]

El Terreno qe. de solicita : [in the vicinity of Mt. Tamalpais, Marin Co., Calif.]. [18--]. Scale [ca. 1:136,000].
[UCB Bancroft Land Case Map B-417]

United States. Coast and Geodetic Survey. 1894? Map of Tamal Pais Peninsula : [Marin County, Calif.] / compiled from surveys of the U.S. Coast Survey. [copy 1894?]. Scale 1:10,000.
[UCB Earth Sci G4363.M2 1894 .U5 Case B no.1-3]

URS Company. 1978. Marin County hydrology / prepared by: URS Company. [Sacramento, Calif.]: California Dept. of Food & Agriculture. Scale [1:250,000].
[UCB Earth Sci G4363.M2C3 1977 .U5 Case D]

URS Company. 1978. Marin County soils / prepared by: URS Company. [Sacramento, Calif.]: California Dept. of Food & Agriculture. Scale [1:250,000].
[UCB Earth Sci G4363.M2J3 1977 .U5 Case D]

URS Company. Marin County vegetation / prepared by: URS Company. [Sacramento, Calif.]: California Dept. of Food & Agriculture. Scale [1:250,000].
[UCB Earth Sci G4363.M2D2 1977 .U5 Case D]

Van Dorn, A. 1860. Map of the County of Marin : State of California / compiled in 1860 by A. Van Dorn. Scale [ca. 1:63,360].
[UCB Bancroft G4363.M2 svar .P6 no.1 Rolled]

*W.B. Walkup and Co. Map of Marin County, California : showing roads, county roads, railroads, stations, cities, school districts, school houses, ranchos, political townships, tide land surveys, tracts, subdivisions, property owners,… San Francisco, Calif. Scale [1:31,680]. 1 inch = 1/2 mile.
[UCD Shields MAP G4363.M2 1911 .W3 Map Coll: Old Map]

Wieland, F. [1887?] Map of Marin County, California : drawn for A.D. Bell & E. Heymans / by F. Wieland. [San Francisco] : Bell & Heymans, c1887 ([San Francisco] :MacCabe & Co., zinco.). Scale [1:253,440]. 4 miles to 1 in.
[UCB Bancroft G4363.M2 1887 .W5 Case XB]

** Asterisk denotes materials not reviewed during this study*

Terreno que se solicita del Canada de Tamales, Canada de Baulines y Punta de Reyes : Marin Co. [184-?]. Scale [ca. 1:141,500].
[UCB Bancroft Land Case Map B-890]
[UCB Earth Sci G4361.G465 svar .L3 B-890 Case D]

Diseno del Rancho San Jose: Marin Co. [1860?]. Scale [ca. 1:181,560].
[UCB Bancroft Land Case Map A-87]
[UCB Earth Sci G4361.G465 svar .L3 A-87 Case D]

Historical Accounts

*Bingham, Helen. 1906?. In Tamal land / by Helen Bingham. San Francisco, Calif.: Calkins Publishing House, c1906.
[UCB Bancroft F868.M3 B6]

*Brown, Bliss. 1940. The old Limekilns of Marin County. *In:* California Historical Society quarterly. San Francisco, 1940. v. 19, no. 4, p. 317-322.
[UCB Bancroft F856.C257.v.19:4]

*Dillon, Barbara. 1967. A bibliography of Marin County history, sixteenth century of 1940; a preliminary contribution.
[UCB Bancroft Z1262 M3D5 1900z]

*Donnelly, Florence. 1963. Early days in Marin; a picture review. San Rafael, Calif, Marin County Savings and Loan Association, 1963.
[UCB Bancroft F868.M3M36.1963]

*Donnelly, Florence. 195? Marin - past and present. [San Rafael? Calif.] San Rafael Chamber of Commerce & Marin Visitors Bureau [195-?].
[UCB Bancroft F868.M3D7]

*Fairley, Lincoln. 1984. A bibliography of Mount Tamalpais history / compiled by Lincoln Fairley. 2nd rev., March 1984. San Francisco : Mt. Tamalpais History Project, 1984.
[UCB Bancroft pf Z1262.M3 F3 1984]

*Garza, Juan Jose de la. 1981. Memoria sobre el origen de la Villa de Marin / por Juan Jose de la Garza. Ed. facsimilar. Monterrey : Universidad Autonoma de Nuevo Leon, Direccion General de Investigaciones Humanisticas, 1981. Series title: Actas. Serie Documentos ; 16.
[UCB Bancroft f F1316 .A29 no.16]

*History of Marin County, California : including its geography, geology, topography and climatography... Petaluma, Calif. : C. B. Veronda, 1972.
[UCI Main Lib F868.M3 H67 1972 SpCol RHR]
[UCD Shields F868.M3 H67 1972]

** Asterisk denotes materials not reviewed during this study*

Alley, Bowen & Co. 1880. History of Marin County, California : including its geography, geology, topography and climatography ; together with ... a record of the Mexican grants ... names of ... pioneers ... a complete political history ... San Francisco, CA. Series title: California county and regional histories reel 8, book 1802.
[UCB Bancroft x F868.M3H6 c2 copies]

*Kent, William. 1929. Reminiscences of outdoor life / by William Kent ; with a foreword by Stewart Edward White. San Francisco, CA: A.M. Robertson, 1929.
[UCB Bancroft F595.K47]

*Mason, Jack. 1967. Ben's auto stage, a romantic footnote to the history of West Marin. Drawings by Kent DeWolfe. [Point Reyes Station, Calif., 1967].
[UCB Bancroft F868.M3M48]

*Mason, Jack. 1971? Early Marin, by Jack Mason, in collaboration with Helen Van Cleave Park. Petaluma, Calif., House of Printing, c1971.
[UCB Bancroft F868.M3M482]

*Mason, Jack. 1976. Earthquake bay : a history of Tomales Bay, California / by Jack Mason. Inverness, CA: North Shore Books.
[UCB Bancroft F868.M3M4824]
[UCB EnvDesign F868.M3 M34]

*Mason, Jack. 1975. The making of Marin,1850-1975; in collaboration with Helen Van Cleave Park; written under the auspices of the Marin County Historical Society. Inverness, CA: North Shore Books.
[UCB Bancroft F868.M3M483]

*Rothwell, Bertha Stedman. 1959. Pioneering in Marin County.
[UCB Bancroft BANC MSS 71/76 c]

*Wise, Nancy. 1985? Marin's natural assets: an historic look at Marin County. San Rafael, CA : Marin Conservation League, c1985.
[UCB BioSci F868.M3 W571 1985]

*Marin County bibliography. Compiled by Regina Jimenez. San Rafael, CA: Marin County Civic Center Library, 1976.
[UCB Bancroft pf Z1262.M3 M3]

*Goerke, E.B. and R.A. Cowan. 1983. The Pacheco site (Marin-152) and the Middle Horizon in Central California; with Ann Ramenofsky and Lee Spencer. Los Angeles: Institute of Archaeology, University of California, Los Angeles. Series title: MAPOM papers ; no. 5. Series title: Journal of New World Archaeology ; v.6, no. 1.
[UCB Bancroft pf E78.C15 G6 1983]

** Asterisk denotes materials not reviewed during this study*

APPENDIX J
METHODOLOGY FOR ASSESSMENT OF THE SUITABILITY OF CANDIDATE SITES FOR IMPLEMENTATION OF INFILTRATION ENHANCEMENT MEASURES

Background

Land use changes within a watershed that decrease retention and infiltration of rainfall can alter streamflow patterns, degrade water quality, and disturb fluvial processes. These physical impacts can result in habitat changes and loss of fish populations (EPA 1997). Section 2 of this report describes the physical impacts of decreased retention and infiltration resulting from historical land use changes within the Corte Madera Creek watershed. The fishery resources condition report (Rich 2000) describes degraded habitat conditions and sparse fish populations that are partially a result of decreased retention and infiltration of rainfall.

Implementing measures on a watershed wide basis to significantly increase on-site retention and infiltration of rainfall would help reduce runoff, lower peak flows in the alluvial network, and help to sustain baseflow during the dry season. The resulting benefits would be improved habitat conditions and, hopefully, increased fish populations. The Bay Area Stormwater Management Agencies Association, which includes MCSPPP, has prepared a document (BASMAA 1999) describing various approaches to increasing retention and infiltration through porous pavement, swales, and other measures. However, retention and infiltration may not be appropriate or effective at all locations due to hydrogeologic conditions or other site constraints. To aid property owners and local municipalities in determining the suitability of a particular site for increased infiltration measures, a screening methodology is presented that should be considered before implementing any specific measure.

Description of Methodology

Soils occurring within the Corte Madera Creek watershed, as mapped, and described in the soil survey of Marin County (USDA/SCS 1978), were evaluated for compatibility with on-site retention and infiltration measures. Most soils were determined to be incompatible due to shallow depth to bedrock, shallow depth to water table, low permeability, or some other limiting factor. Those soils that potentially could be compatible with on-site retention and infiltration included the soil types listed below and delineated in Figure J-1.

- 105 Blucher-Cole complex;
- 202 Urban land-Xerorthents complex;
- 203 Xerorthents, fill; and,
- 204 Xerorthents-Urban land complex.

Sites that lie within the potentially compatible soils areas should be further evaluated for suitability for on-site retention and infiltration measures. The evaluation should consider the following limiting factors:

- Depth to bedrock;

- Depth to the water table;
- Slope stability;
- Proximity to stream channels; and,
- Proximity to basements, underground vaults, retaining walls, or other potentially problematic structures.

Evaluation of these limiting factors should follow these steps:

1. Field check for visual evidence of seasonal high ground-water (mottled soil, wetland vegetation), shallow soils (e.g., bedrock outcrops). If there is evidence of shallow bedrock or a seasonal high ground-water table, then the site should be eliminated from further consideration.

2. Field check for proximity to steep slopes, creek banks or underground structures that would be adversely effected by increase infiltration. If steep slopes, creek banks, or underground structures are identified, then the site should eliminated from further consideration.

3. Drill a 5-foot deep hole, at least 4-6 inches in diameter. During drilling, take soil samples every 1 to 2 feet and place in bags for later examination if needed. Check for impermeable soils, such as tight, clayey soils. Log the soils. Install a 2 to 4-inch plastic perforated pipe-casing with top and bottom caps and backfill with pea-gravel and a cement or clay surface seal. Monitor depth to ground-water during the wet season to check for high ground-water. If clayey soils are present, or if depth to ground-water during the wet season approaches to within about 2 feet of the ground surface, then the site should be eliminated from consideration.

If, after the above steps are completed, no limiting factors are found to occur, then the site should be considered suitable for implementing on-site retention and infiltration measures. It is recommended that the results of the above evaluation be submitted to a licensed engineer or geologist for verification before any measures are implemented.

Possible Candidate Sites for On-Site Retention and Infiltration Measures

The following possible candidate sites lie within the area of compatible soils and could be considered following the above-described methodology:

I. Proposed paved parking lot at San Domenico School, San Anselmo;
II. Possible re-construction of parking lot at Fair-Anselm Plaza, Fairfax;
III. Proposed paved area at the former Ross Hospital; and,
IV. Possible paving of lumberyard at Fairfax Lumber, Fairfax.

References Cited

EPA 1997. Urbanization and Streams: Studies of Hydrologic Impacts. EPA document number 841-R-97-009.

BASMAA 1999. Design Guidance Manual for Stormwater Quality Protection, 1999 Edition.

Rich, A.A. 2000. Fishery Resources Conditions of the Corte Madera Creek Watershed, Marin County California.

USDA/SCS 1978. Soil Survey of Marin County California.

SOILS WITH POTENTIAL COMPATIBILITY WITH ON-SITE RETENTION AND INFILTRATION MEASURES

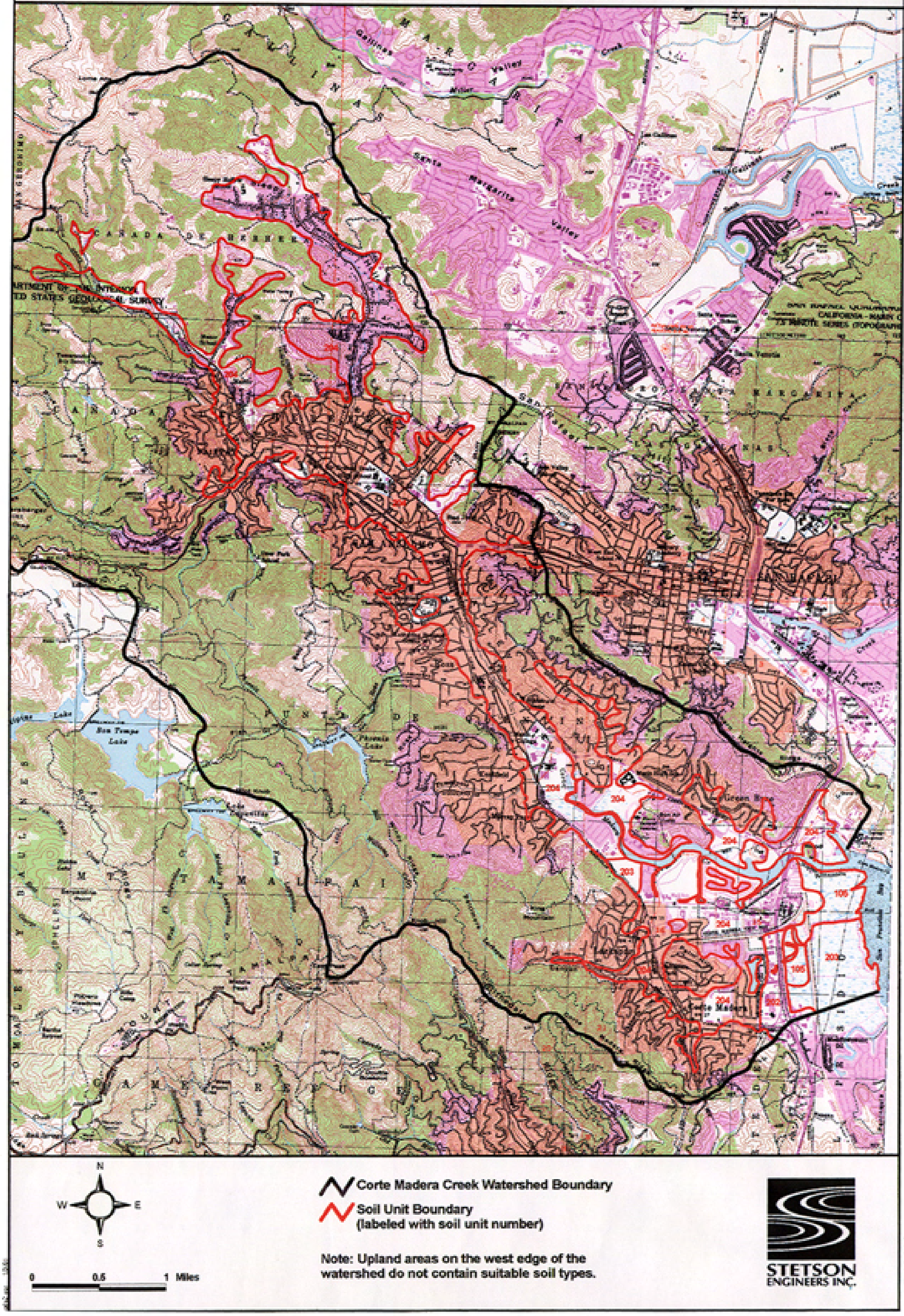


FIGURE J-1

APPENDIX K
CONCEPTUAL STREAMBANK STABILIZATION MEASURES FOR A HYPOTHETICAL CASE STUDY

Background

Corte Madera Creek's alluvial channel network became moderately to deeply entrenched in the Holocene valley fill between about 1850 and about 1910. The current channel bed elevation varies between 10 and 20 ft below the abandoned floodplain surface. Observed post-entrenchment channel widening is a natural geomorphic recovery process (Schumm 1999) that can be expected to continue until the channel is wide enough to support an active floodplain. Channel widening is evidenced by chronic channel bank erosion and episodic bank slump failures common throughout the watershed. As a result, a large percentage of the residential, commercial, and municipal property owners bordering the channel network have constructed various bank reinforcement structures. However, by precluding channel widening, bank protection works generally prevent the ongoing natural recovery of the riparian and aquatic habitat. It is a recommendation of this study that projects intended to improve habitat should seek opportunities, where possible, to increase active channel width.

However, as discussed elsewhere, existing residential and commercial structures and associated near-channel land uses (primarily residential back yard lawns and gardens) prevent floodplain restoration or construction at all but a small percentage of the length of the channel network. In instances where existing structures and land uses prevent increasing the active channel width, attempts to reduce bank erosion should employ appropriate streambank stabilization measures that, among other things, do not further reduce existing active channel width. In general, existing channel banks are over-steepened as a result of channel entrenchment. Attempts to reduce bank erosion on steep banks will require less desirable bank treatments (e.g., rock gabions) that support little, if any, riparian vegetation and habitat value. Therefore, projects that consider reducing channel bank slope in order to use more desirable bank treatments (e.g., willow walls and vegetated rock rip-rap) are superior both in long-term stability and ecological value. Reducing channel bank slope without reducing active channel width would require excavation along the top of the terrace bank, which may conflict with existing land uses at many sites. For example, to reduce a typical oversteepened channel bank (bank height 10 ft, slope 80%) to a 1:1 slope would require an excavation 8.2 feet into the top of the bank.

Recommendation

A recommendation of this study is that any future streambank stabilization projects, as far as feasible, will satisfy the following general requirements:

- Floodplain restoration/construction at the site(s) is prevented by existing structures and associated land uses;
- The project does not reduce active channel width (measured from the toe of left bank to the toe of right bank); and,
- The project is part of an integrated streambank stabilization design (as defined below).

An integrated streambank stabilization design will satisfy, at a minimum, the following requirements:

- The project boundaries encompass all of the channel banks (and associated properties) affected by the project, with boundaries defined where possible by existing hydraulic constraints (e.g., bridges);
- The project, if applicable, considers alternative schemes for optimizing the allocation of the various preferred bank treatments (defined below) and channel bank slope reduction along both channel banks in the project reach, and selects the preferred alternative according to ecological, cost, construction feasibility, permitting, and landowner participation and consensus;
- The project retains existing native riparian trees to the extent possible;
- The project employs preferred bank treatments according to existing or post-project channel bank slope (as defined below);
- The project seeks opportunities to reduce the slope of channel banks (by excavating into the top of the bank) in order to use more preferred bank treatments;
- The project does not seek to further reinforce banks stabilized at the toe by existing natural bedrock;
- The project considers the feasibility of removing any existing bank stabilization structures that are not preferred (as defined below); and
- The project prevents elimination of existing physical aquatic habitat features and considers use of anchored small woody debris, where appropriate, to improve aquatic habitat in the project reach;

Typical preferred bank stabilization methods in low to moderate hydraulic energy dissipation zones are as follows:

Steep bank slope (60-90 percent):	Rock gabions; or, Log crib walls.
Moderate bank slope (40-60 percent):	Willow walls with anchored core log at toe of slope; or, Vegetated rock rip-rap below 5-year flood stage with anchored core log at toe of slope, and vegetated filter fabric above 5-year flood stage.
Gradual bank slope (10-40 percent):	Willow walls; or, No stabilization required, remove exotic vegetation and revegetate.

Typical preferred methods in high hydraulic energy dissipation zones are as follows:

Steep bank slope (60-90 percent):	Rock gabions.
Moderate bank slope (40-60 percent):	Vegetated rock rip-rap with revetments at toe of slope.

Gradual bank slope (10-40 percent):	Vegetated rock rip-rap with revetments at toe of slope.

Description of Measures

The following are recommended integrated bio-technical streambank stabilization measures for a hypothetical site where near-channel residential and commercial structures and land uses prevent extensive floodplain restoration/construction.

Site Selection

We selected a hypothetical site, approximately 270-ft long, bounded on the upstream and downstream side by existing bridges (Figure K-1). There are existing bank stabilization structures at the site, including a sackcrete wall along the right bank between Cross-section 7 and 8, and vertical flood walls along the right bank between Cross-sections 8 and 9 and along the left bank between Cross-sections 5-9. There is bedrock exposed in the bed and at the toe of the left bank slope between Cross-sections 1 and 2. There are 3 residential properties and 1 commercial property bounding the channel in the project reach.

Project Objectives

The project objectives are to prepare an integrated streambank stabilization plan for the project reach following the recommendations outlined above in this appendix.

Design Methods

We reviewed existing conditions in the reach and prepared 9 Cross-sections referenced to an arbitrary datum to describe channel conditions and overlay recommended design modifications. Figure K-2 shows the recommended bank stabilization measures for Cross-section 3 that typifies the steep, eroding channel banks in the straight between Cross-section 1 and Cross-section 4. Recommended bank treatments include vegetated rip-rap below the 5-year flood stage and anchored toe core-logs along portions of the sub-reach where bank slope can be reduced to about 40-50 percent by excavation into the top of bank (by permission of participating land owners). Vegetated fabric can be used above the 5-year flood stage. Placement of anchored submerged small woody debris under existing cut banks at and near Cross-section 3 is recommended. Terraced rock gabions would be required in the majority of the sub-reach in the absence of these permissions. Rock gabions are also recommended in the hydraulic expansion zone immediately downstream from the bridge. Existing bedrock reinforcement at the toe of the left bank between Cross-section 1 and Cross-section 2 precludes the need for toe reinforcement. Removal of overburden and bank slope reduction is recommended above the bedrock toe reinforcement. Without permission of the landowner, rock gabions are recommended.

Figure K-2 also shows recommended bank treatments at Cross-section 5 that typifies the sub-reach between Cross-section 4 and Cross-section 7. Removal of the floodwall along the left bank is recommended. With landowner permission, excavation into the top of the left bank will be required to achieve moderate bank slopes appropriate for vegetated rock rip-rap bank treatments. The existing land use on the left bank is a commercial storage lot for building materials. The recommended excavated area is presently used only for stockpiling gravel. Buried revetments are specified at the toe of the left bank slope. The right bank in this sub-reach has a gradual slope and low hydraulic energy. Therefore, only exotic vegetation removal and revegetation is recommended (Figure K-2).

Figure K-2 also shows recommended bank treatments for Cross-section 8, near the downstream end of the project reach. Similar to Cross-section 5, removal of the existing flood wall and slope reduction by excavating into the top of the left bank is recommended. The existing land use is the same storage lot. A number of existing redwood trees along the top of the left bank, maximum dbh 1.2 ft, can be removed and transplanted. There are no other current uses of the land on the top of the left bank to be excavated area. Due to the high hydraulic energy dissipation required at the left bank, vegetated rock rip-rap is recommended for the entire 45 percent finished left bank slope, and anchored rock revetments with small woody debris are recommended at the toe. The left bank treatment will transition into steeper rock gabions, or retention of the existing floodwall between Cross-section 8 and Cross-section 9 to allow hydraulic contraction immediately upstream of the bridge. It is recommended that existing bank treatments at the right bank be preserved, in order to preserve a large existing redwood rooted near the top of the bank (Figure K-2).

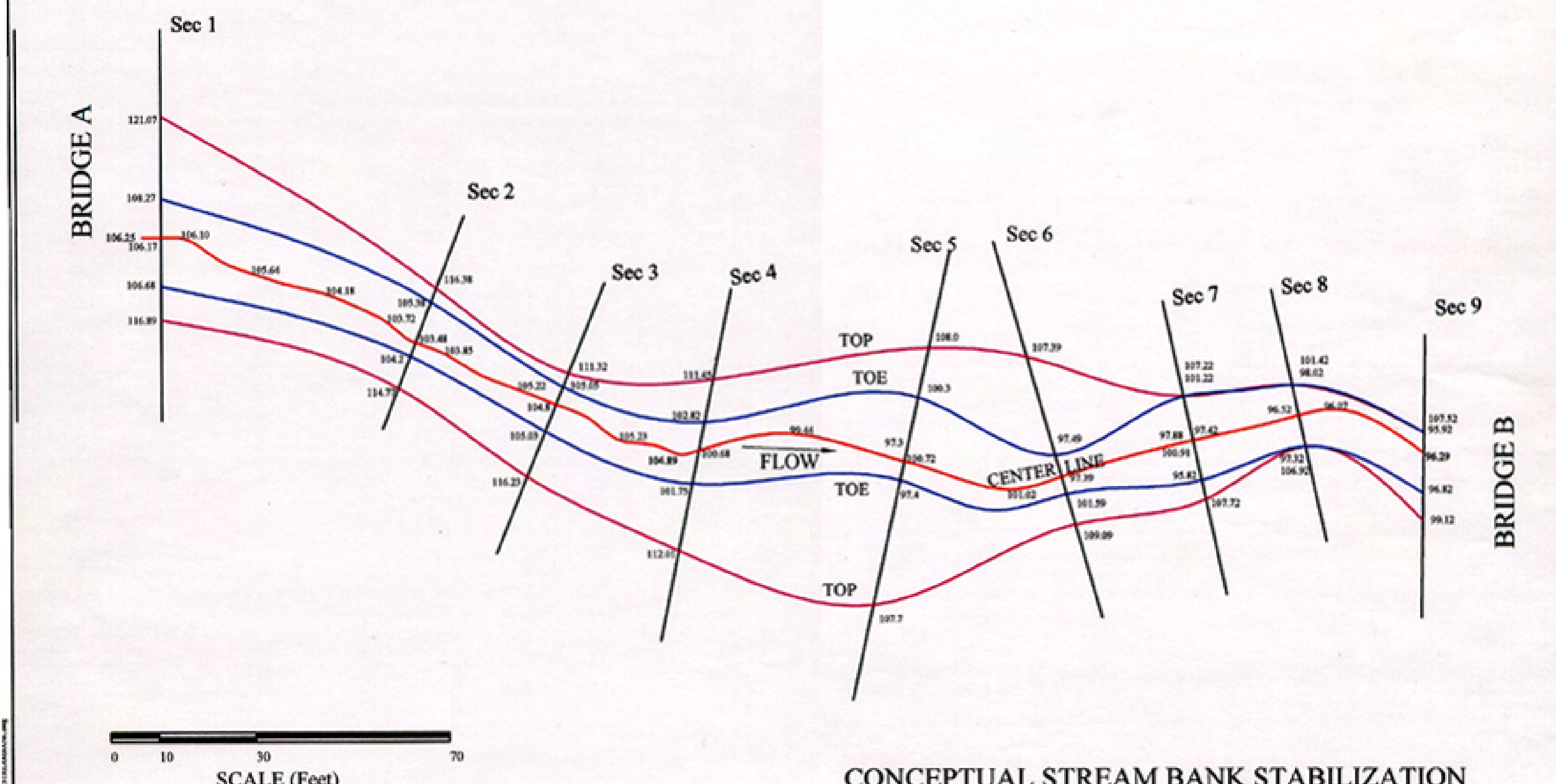
Design Considerations

This hypothetical case study demonstrates a typical constraint in the Corte Madera Creek watershed. Over-steepened channel banks in moderate and high energy dissipation zones can often not be reliably reinforced with preferred bank treatments (e.g., willow walls, core logs, vegetated bio-fabric, and limited vegetated rock rip-rap) without reducing channel bank slope. Reducing channel bank slope without reducing active channel width (a high priority) entails excavation into the top of the bank (typically 6-9 ft). Although these modifications would allow cooperating land owners to improve the ecological integrity of their banks while building stabilization structures that are more stable and less expensive in the long-run, reducing effective lot size is economically undesirable. The potential for establishing a fund for purchasing an flooding or riparian easement of some sort that would compensate participating land owners for allowing these bank treatments should be examined.

This hypothetical case study emphasizes the necessity of integrating bank stabilization projects so that the project boundaries encompass all of the channel banks (and associated properties) affected by the project, with boundaries defined where possible by existing hydraulic constraints (e.g., bridges). Optimal allocation of bank treatments often does not respect arbitrary property boundary delineations, and deleterious upstream and downstream impacts of ad-hoc projects often outweigh the benefits. Only through effective project boundary and project objectives definition, and cooperation among affected property owners, can sustainable, ecologically beneficial bank stabilization measures be put in place. Through such cooperation is also an opportunity to innovate mechanisms for cost-sharing and public subsidies. Such a cooperative effort could be pursued as a watershed demonstration project.

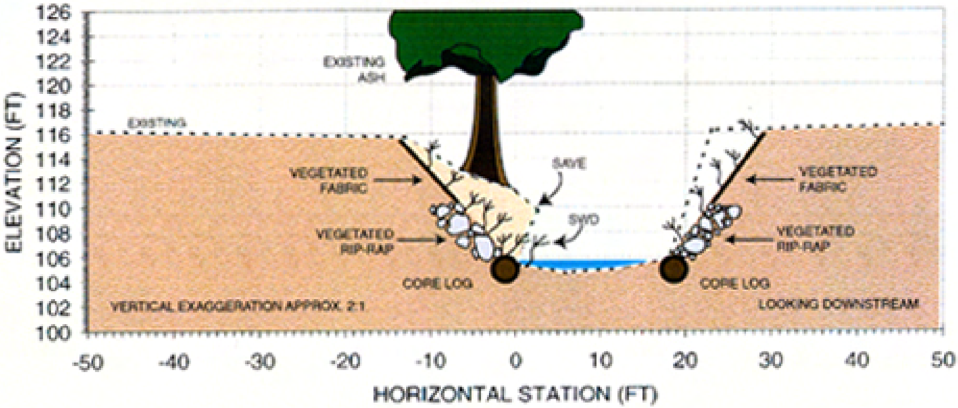
References Cited

Schumm, S.A. 1999. Causes and Controls of Channel Incision. *In*: S.E. Darby and A. Simon, eds., *Incised River Channels: Processes, Forms, Engineering and Management.* Chichester, UK: John Wiley & Sons.

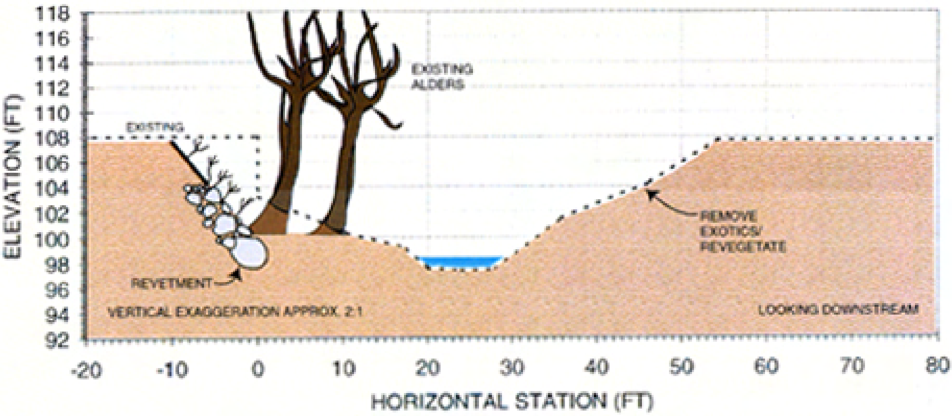


CONCEPTUAL STREAM BANK STABILIZATION
SITE PLAN

CONCEPTUAL STREAMBANK STABILIZATION
CROSS-SECTION 3



CONCEPTUAL STREAMBANK STABILIZATION
CROSS-SECTION 5



CONCEPTUAL STREAMBANK STABILIZATION
CROSS-SECTION 8

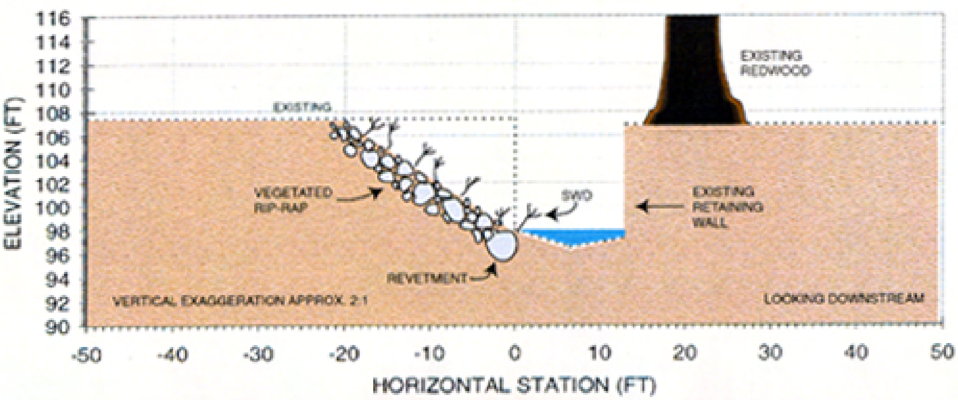


FIGURE K-2

APPENDIX L
CONCEPTUAL FLOODPLAIN RESTORATION MEASURES FOR A HYPOTHETICAL CASE STUDY

Background

Corte Madera Creek's alluvial channel network became moderately to deeply entrenched in the Holocene valley fill between about 1850 and about 1910, abandoning its pre-entrenchment floodplain. The current channel bed elevation varies between 10 and 20 ft below the abandoned floodplain surface. Throughout the majority of the alluvial channel network, the former floodplain is overtopped only by rare floods, exceeding 50-year and 100-year events. By contrast, an active floodplain is overtopped every 1-5 years. Section 2 of this report attributes channel entrenchment to the effects of historical land use changes in the watershed during the middle and late 1800s. Section 2 also describes loss of riparian habitat and changes in the aquatic habitat due to channel entrenchment.

Observed post-entrenchment channel widening is a natural geomorphic recovery process (Schumm 1999) that can be expected to continue until the channel is wide enough to support an active floodplain. Channel widening is evidenced by chronic channel bank erosion and episodic bank slump failures common throughout the watershed. As a result, a large percentage of the residential, commercial, and municipal property owners bordering the channel network have constructed various bank reinforcement structures. However, by precluding channel widening, bank protection works generally prevent the ongoing natural recovery of the riparian and aquatic habitat.

Recommendation

A recommendation of this study is that projects intended to improve aquatic and riparian habitat and habitat-supporting processes and/or flood control should seek opportunities, where possible, to increase active channel width by:

- eliminating existing bank protection works; and,
- constructing active floodplains flanking the existing channel.

Opportunities for Floodplain Construction

Technically, "floodplain restoration" would entail channel modifications designed to reintroduce frequent flooding onto the former floodplain surface (terrace). This is technically infeasible in the Corte Madera Creek watershed where the former floodplain surface is almost entirely urbanized. Any project intended to introduce an active floodplain to the channel network would therefore entail constructing a new floodplain surface at a design elevation about 4-6 feet above the existing channel bed. The constructed floodplain surface would therefore be about 5-15 feet below the former floodplain surface. Such a "floodplain construction" project would increase the active channel width without increasing frequency of flooding on adjacent properties. In fact, by increasing channel capacity, floodplain construction would locally reduce flooding frequency on the former floodplain.

Opportunities for large-scale floodplain construction in the watershed are limited, as nearly all of the properties adjoining the alluvial channel network have structures constructed close to the channel banks (i.e., within 20-50 ft). Associated land uses, primarily back yard lawns, dominate the narrow strip of the former floodplain remaining along the channel network. There are also limitations on floodplain construction imposed by existing bridge spans upstream and downstream of any given site. In instances where existing structures and land uses prevent increasing the active channel width, attempts to reduce bank erosion should employ appropriate streambank stabilization measures that, among other things, do not further reduce existing active channel width. Appendix K presents recommended streambank stabilization measures for a hypothetical site where near-channel residential and commercial structures and land uses prevent extensive floodplain restoration/construction.

Although nearly all of the properties adjoining the channel network have structures or associated land uses close to the channel banks, there are a number of potential opportunities for large-scale floodplain construction (i.e., constructed floodplain length greater than 500 ft and width greater than 40 ft):

- schools;
- parks and recreation sites;
- parking lots;
- commercial storage yards (lumber yards, etc.);
- redundant streets and off-street parking bordering the channel; and
- clusters of adjacent residential properties without constructions near the channel.

Floodplain construction projects would directly increase functional riparian habitat and improve aquatic habitat benefiting anadromous fish at the project site. It would be necessary to complete a number of projects throughout the watershed in order to substantially increase riparian habitat and improve aquatic habitat enough to anticipate increased salmonid populations. Selection of potential sites, and determining project objectives at each site, should be guided by an understanding of factors limiting the current salmonid population, including potential fish barriers, water quality, summer low-flow, temperature, food, cover, spawning habitat, rearing habitat, etc. Also, the impacts of floodplain construction on the existing riparian habitat should be considered (i.e., removal of existing vegetation on the terrace bank during excavation for floodplain construction).

This study presents a conceptual demonstration floodplain restoration/construction project design for a hypothetical site in the watershed with sufficient undeveloped land adjacent to the channel to construct a floodplain of maximum width 150 ft. In general, the cost of floodplain construction is high, with approximate excavation and hauling costs of about 3-5 dollars per square foot of constructed floodplain. The estimated excavation and hauling cost for the hypothetical case study (Figure L-2) is about $550,000.

Description of Measures

Site Selection

Opportunities and limitations for site selection are described above. We selected a hypothetical case where there is sufficient undeveloped land adjacent to the channel to construct a floodplain along approximately 1,000 ft of the channel with maximum width of about 150 ft (Figure L-2). The hypothetical site is in the middle portion of the watershed, downstream from important summer low-flow season aquatic habitat for the steelhead trout in the upper reaches of the watershed, as identified by Rich (2000).

Project Objectives

We selected the following project objectives for this hypothetical case study:

- Construct an active floodplain that overtops during a 2-year flood and to a depth of no more than 1.5 ft above the active floodplain surface during a 5-year flood;
- Reduce water surface elevation of the 10-year flood by 1 ft;
- Reduce average shear stress on the bed for 2-year, 5-year, and 10-year floods by 50 percent; and,
- Do not cause adverse impacts to water surface elevations and channel bed stability and habitat upstream and downstream from the project boundaries;

Design Measures

We assembled 16 typical cross-sections describing current channel conditions at the site along the project reach, sufficient to build a HEC-RAS hydraulic model of the site. We selected a bankfull elevation profile along the reach based on field indicators, approximately 3.9-4.1 ft above the thalweg elevation profile, to serve as the initial design active floodplain surface elevation. We created design cross-sections simulating excavation of the right bank down to the design active floodplain elevation. We ran 2-year, 5-year, and 10-year floods (discharges determined by apportioning the respective discharges for the Ross gage by drainage area at the site), for pre-project and initial post-project channel geometry. In an iterative process, we edited the active floodplain surface elevation and floodplain width until project objectives were met. Representative existing and design cross-sections (shown on Figure L-2) are shown in Figure L-3.

Design Considerations

The hypothetical case study demonstrates that it is feasible to construct a floodplain that would reduce water surface elevations during the 10-year flood by 1 ft, and reduce shear stress on the bed for a range of flood discharges by more than 50 percent. The case study also emphasizes the necessity to consider possible upstream and downstream impacts of such a project. In particular, project boundaries should be defined as the total extent of project-induced hydraulic change, and cooperation between candidate sites and upstream and downstream properties may be necessary for project success. For example, reduction of water surface elevation at the project site would induce similar reductions extending several hundred feet upstream from the project boundary.

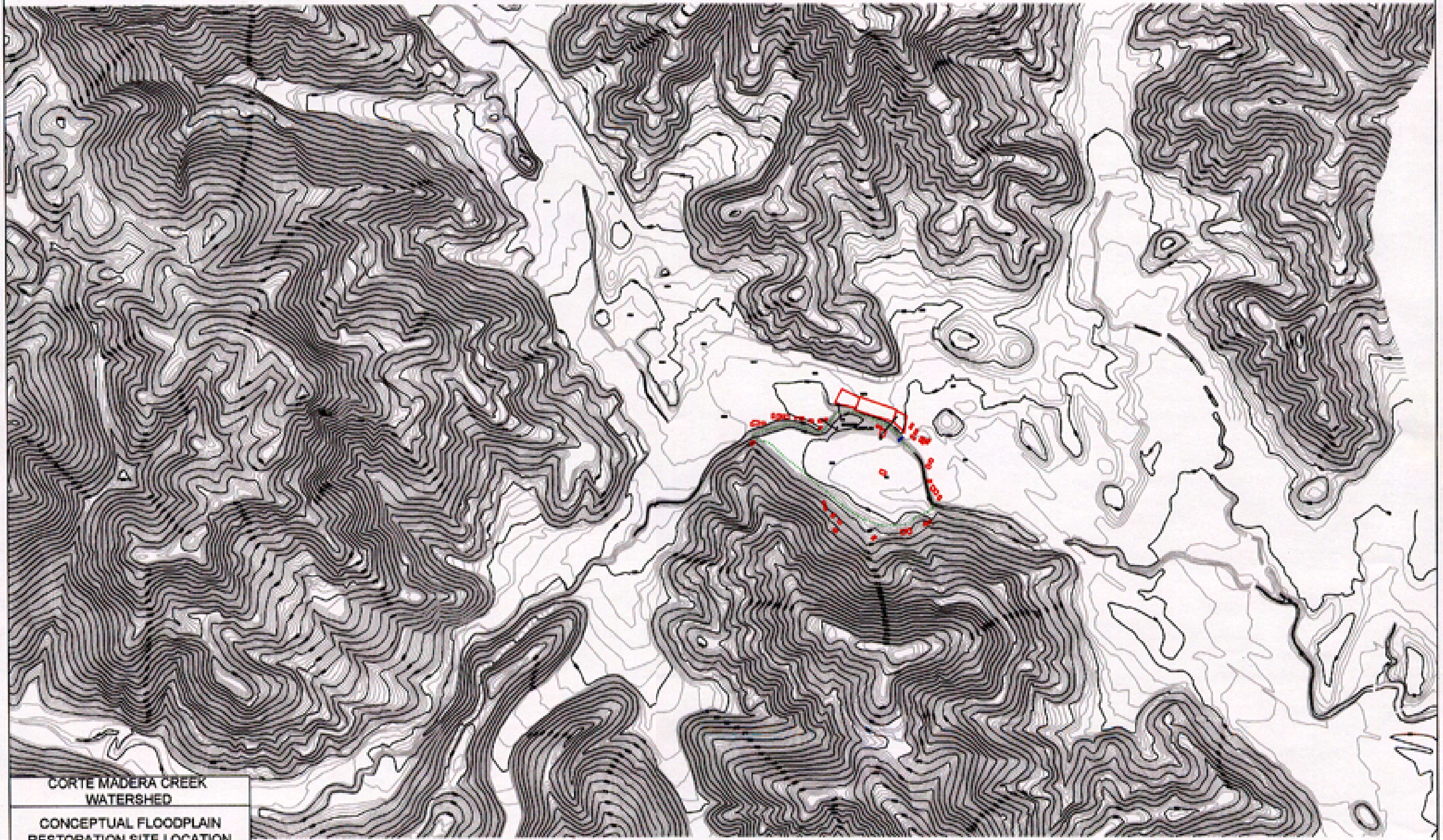
This, in turn, may cause increased flow velocities and local increases on bed and bank shear stress that would offset apparent shear stress reductions predicted by the 1-dimensional model. In some cases, bedrock or concrete structures upstream from the project boundary would prevent channel bed elevation changes, but bank stability upstream from the project boundary may be of concern. Extending the constructed floodplain excavation along the right bank upstream from the project boundaries reflected in Figure L-2 would help offset the effect of local increases in velocity. In general, the upstream and downstream boundaries of constructed floodplains would ideally be situated at natural or infrastructural hydraulic control points, such as existing bridges, check dams, etc.

References Cited

Rich, A.A. 2000. Fishery Resources Conditions of the Corte Madera Creek Watershed, Marin County California.

Schumm, S.A. 1999. Causes and Controls of Channel Incision. *In*: S.E. Darby and A. Simon, eds., *Incised River Channels: Processes, Forms, Engineering and Management.* Chichester, UK: John Wiley & Sons.

FIGURE L-1

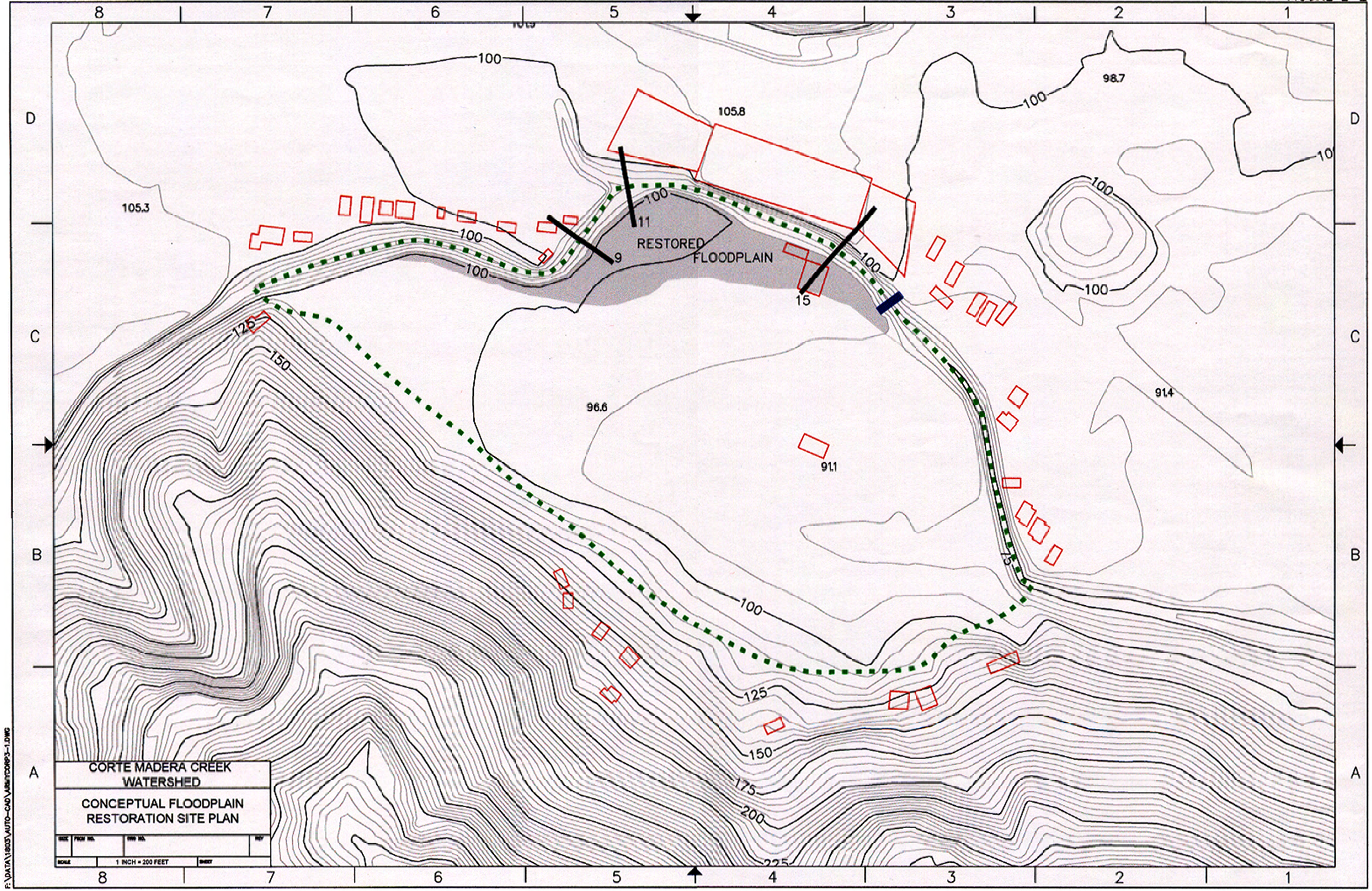


CORTE MADERA CREEK
WATERSHED

CONCEPTUAL FLOODPLAIN
RESTORATION SITE LOCATION

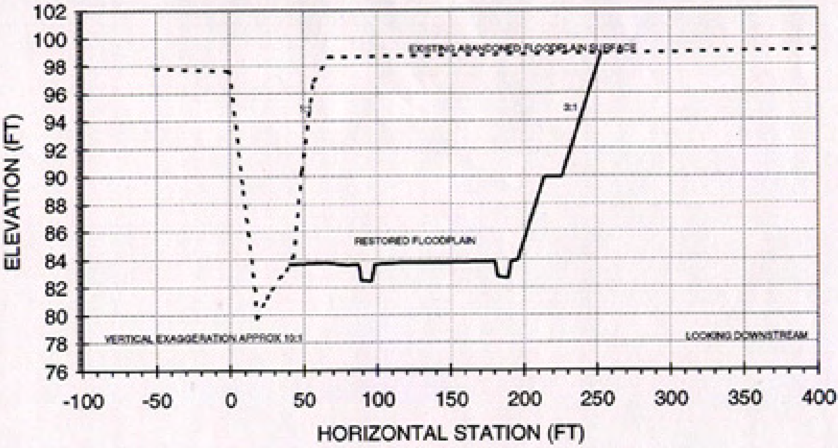
1 INCH = 1000 FEET

FIGURE L-2

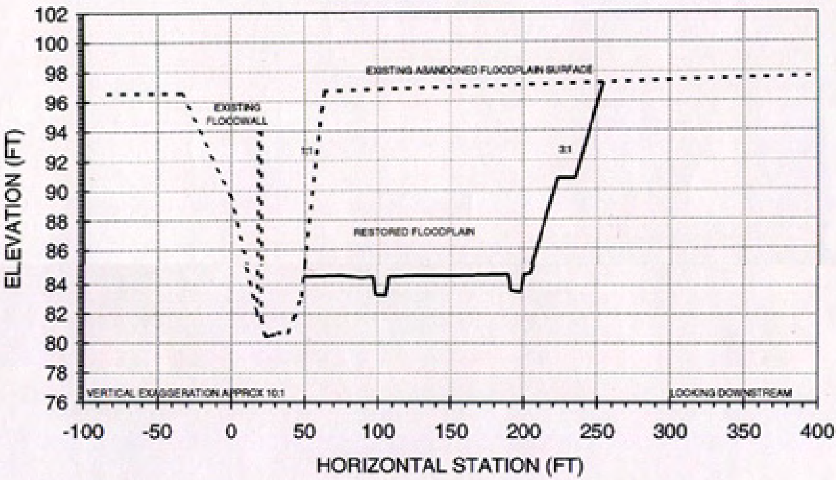


100
105.8
98.7
105.3
11
RESTORED
FLOODPLAIN
9
15
125
150
96.6
91.4
91.1
125
150
175
200
225
CORTE MADERA CREEK WATERSHED
CONCEPTUAL FLOODPLAIN RESTORATION SITE PLAN
1 INCH = 200 FEET

CONCEPTUAL FLOODPLAIN RESTORATION
CROSS-SECTION 9



CONCEPTUAL FLOODPLAIN RESTORATION
CROSS-SECTION 11



CONCEPTUAL FLOODPLAIN RESTORATION
CROSS-SECTION 15

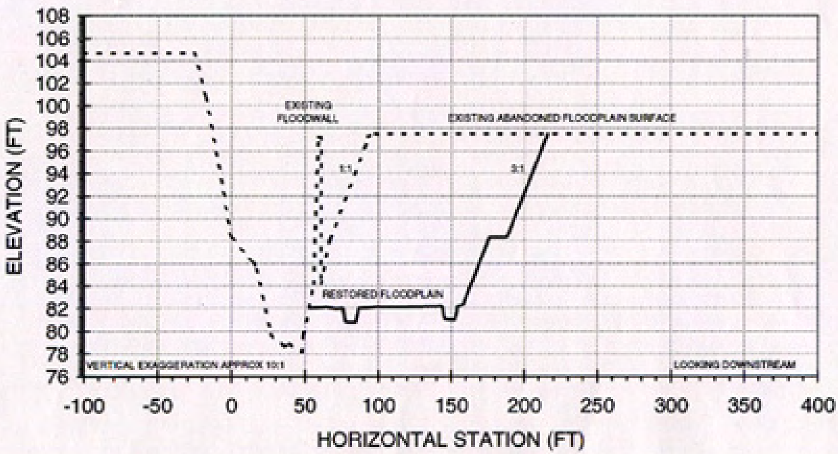


FIGURE L-3. Conceptual Floodplain Restoration, Typical Cross-Sections