

**DESIGN CALCULATION COVER SHEET**

PRELIMINARY \_\_\_\_\_ FINAL   X  


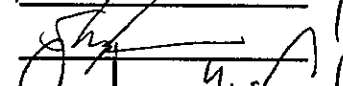
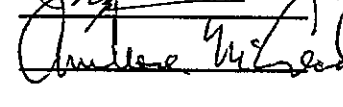
Client: Calaveras County Job No. 28018 2

Project: Rock Creek Solid Waste Facility


Purpose of Design Calculations: Stormwater Management

No. of Sheets/Attachments: 13

Computer Program Name: Excel

	<u>Name</u>	<u>Signature</u>	<u>Date</u>
Prepared By:	<u>Richard Wesenberg</u>		<u>3/8/95</u>
Checked By:	<u>Shawn Jenkins</u>		<u>3/8/95</u>
Approved By:	<u>Ambrose McCreedy</u>		<u>3/8/95</u>

**RECORD OF REVISIONS**

Rev. No.	Date	Reason for Revision	Revised by	Checked by	Approved by
0	8/26/94	Initial Calculation	RW		



**Harding Lawson Associates**  
 Engineering and Environmental Services  
 3247 Ramos Circle  
 Sacramento, CA 95827 - (916) 364-0793

ROCK CREEK SOLID WASTE FACILITY  
FINAL COVER HYDRAULIC CALCULATIONS

A	B	C	FLOW TO PERIMETER DITCHES										
			D	E	F	G	H	I	J	K			
1	BASIN ID	1W	1E	2N	2S	3N	3S	4N	4S	5N	5S		
2	TOTAL BASIN AREA, "A" (ACRES)	1.53	1.22	3.29	2.15	3.23	2.54	2.92	2.74	2.48	3.19		
3	OVERLAND LENGTH, (FEET)												
4	TOP LENGTH, "L <sub>t</sub> "	90.0	80.0	140.0	90.0	190.0	80.0	135.0	150.0	70.0	190.0		
5	SIDESLOPE LENGTH, "L <sub>s</sub> "	105.0	105.0	174.0	111.0	190.0	116.0	121.0	174.0	126.0	180.0		
6	BENCH LENGTH, "L <sub>b</sub> "	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0		
7	OVERLAND SLOPE, (%)												
8	TOP SLOPE, "S <sub>t</sub> "	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00		
9	SIDESLOPE SLOPE, "S <sub>s</sub> "	33.33	33.33	33.33	33.33	33.33	33.33	33.33	33.33	33.33	33.33		
10	BENCH SLOPE, "S <sub>b</sub> "	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00		
11	RATIONAL METHOD RUNOFF COEF., "C"	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70		
12	OVERLAND FLOW TIME OF CONCENTRATION, "t <sub>1</sub> " (MIN)	8.61	8.34	10.44	8.67	11.54	8.45	9.84	10.64	8.27	11.46		
13	LENGTH OF CHANNEL FLOW, "L <sub>2</sub> " (FEET)	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0		
14	SLOPE OF CHANNEL FLOW, "s <sub>2</sub> " (FT/FT)	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100		
15	MANNINGS "n"	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030		
16	ESTIMATED DEPTH OF FLOW, "y <sub>m</sub> " (FEET)	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50		
17	HYDRAULIC RADIUS, "R" (FEET)	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31		
18	CHANNEL FLOW, TIME OF CONCENTRATION, "t <sub>2</sub> " (MIN)	3.68	3.68	3.68	3.68	3.68	3.68	3.68	3.68	3.68	3.68		
19	TOTAL TIME OF CONCENTRATION, "T" (MIN)	12.29	12.02	14.12	12.35	15.22	12.13	13.52	14.32	11.95	15.14		
20	RAINFALL INTENSITY "i" 1000 <sup>y<sub>t</sub></sup> FREQUENCY OF RECURRENCE (IN/HR)	3.90	4.00	3.60	3.90	3.50	4.00	3.70	3.60	4.00	3.50		
21	TOTAL FLOW, "Q" (CFS)	4.17	3.41	8.30	5.87	7.92	7.11	7.57	6.91	6.95	7.81		
22	DEPTH OF FLOW, "Y" (FEET)	0.68	0.61	0.92	0.80	0.90	0.86	0.87	0.85	0.85	0.90		
23	VELOCITY, "V" (FPS)	2.61	2.52	3.17	2.85	3.13	3.05	3.16	3.02	3.03	3.12		
24													

**ROCK CREEK SOLID WASTE FACILITY  
FINAL COVER HYDRAULIC CALCULATIONS**

	FLOW TO PERIMETER DITCHES										
	L	M	N	O	P	Q	R	S	T	U	V
1											
2	6N	6S	7N	7S	8N	8S	9W	9E	10W	10E	BASIN ID
3	0.95	2.10	0.78	2.04	2.26	1.79	1.44	1.51	1.16	1.37	TOTAL BASIN AREA, "A" (ACRES)
4											OVERLAND LENGTH, (FEET)
5	100.0	135.0	60.0	80.0	0.0	0.0	0.0	0.0	0.0	0.0	TOP LENGTH, "L1" (FEET)
6	90.0	120.0	90.0	120.0	158.0	148.0	148.0	200.0	168.0	168.0	SIDE SLOPE LENGTH, "L5" (FEET)
7	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	BENCH LENGTH, "Lb" (FEET)
8											OVERLAND SLOPE, (%)
9	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	TOP SLOPE, "S1" (%)
10	33.33	33.33	33.33	33.33	33.33	33.33	33.33	33.33	33.33	33.33	SIDE SLOPE SLOPE, "S5" (%)
11	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	BENCH SLOPE, "Sb" (%)
12	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	RATIONAL METHOD RUNOFF COEF., "C" (%)
13	8.69	9.83	7.57	8.49	4.39	4.30	4.30	4.74	4.48	4.48	OVERLAND FLOW TIME OF CONCENTRATION, "t1", (MIN)
14	0.0	500.0	0.0	500.0	580.0	500.0	500.0	500.0	350.0	400.0	LENGTH OF CHANNEL FLOW, "L2", (FEET)
15	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	SLOPE OF CHANNEL FLOW, "s2", (FT/FT)
16	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	MANNINGS "n"
17	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	ESTIMATED DEPTH OF FLOW, "y", (FEET)
18	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	HYDRAULIC RADIUS, "R", (FEET)
19	0.00	3.68	0.00	3.68	4.27	3.68	3.68	3.68	3.68	2.94	CHANNEL FLOW, TIME OF CONCENTRATION, "t2", (MIN)
20	8.69	13.51	7.57	12.18	8.66	7.98	7.98	8.42	7.06	7.42	TOTAL TIME OF CONCENTRATION, "T", (MIN)
21	4.80	3.70	5.10	4.00	4.80	5.00	5.00	4.90	5.50	5.10	RAINFALL INTENSITY "i", 1000yr. FREQUENCY OF RECURRENCE, (IN/HR)
22	3.19	5.44	2.78	5.70	7.60	6.26	5.05	5.16	4.48	4.89	TOTAL FLOW, "Q", (CFS)
23	0.58	0.75	0.55	0.78	0.88	0.81	0.73	0.73	0.69	0.72	DEPTH OF FLOW, "y", (FEET)
24	2.52	2.90	2.39	2.88	3.15	2.95	2.79	2.89	2.74	2.77	VELOCITY, "V", (FPS)

**ROCK CREEK SOLID WASTE FACILITY  
FINAL COVER HYDRAULIC CALCULATIONS**

	A	B	C	D	E	F	G	H	I	J	K
25											
26											
27	<b>OVERSIDE DRAINS</b>										
28											
29	WATERSHED	1W & 1E		2N & 2S		3N & 3S		4N & 4S		5N & 5S	
30	BASIN AREA (ACRES)	2.75		5.44		5.77		5.67		5.67	
31	TIME OF CONCENTRATION, "T" (max.), (IN/HR)	12.29		14.12		15.22		14.32		15.14	
32	RAINFALL INTENSITY "i", 1000yr. FREQUENCY OF RECURRENCE, (IN/HR)	3.90		3.60		3.50		3.60		3.50	
33	CMP CULVERT, DESIGN FLOW, "Q", (CFS)	7.50		13.71		14.13		14.28		13.89	
34	CULVERT SLOPE (FT/FT)	0.3333		0.3333		0.3333		0.3333		0.3333	
35	MANNINGS "n"	0.024		0.024		0.024		0.024		0.024	
36	MINIMUM REQUIRED PIPE DIAMETER, d, (INCHES)	13.4		16.8		17.0		17.1		16.9	
37	INPUT DESIGN CULVERT DIAMETER, (INCHES)	18		18		18		18		18	
38	REFERENCE "CHOW" APPENDIX A										
39	$(AR^{2/3})/d^{8/3}$	0.0712		0.1301		0.1341		0.1355		0.1318	
40	INPUT $Y_n/d @ (AR^{2/3})/d$	0.3248		0.4506		0.4586		0.4613		0.4540	
41	NORMAL DEPTH, $Y_n$ , (FEET)	0.49		0.68		0.69		0.69		0.68	
42	REFERENCE "KING" (TABLE 8-10)										
43	$Q/d^{5/2}=K'c$	2.7214		4.9766		5.1291		5.1805		5.0410	
44	INPUT $Y_c/d$	0.7074		0.9156		0.9233		0.9257		0.9190	
45	CRITICAL DEPTH, $Y_c$ , (FEET)	1.06		1.37		1.38		1.39		1.38	
46	REFERENCE "CHOW" APPENDIX A										
47	INPUT $A/d^2 @ Y_n/d$ (see above)	0.2211		0.3434		0.3513		0.3540		0.3468	
48	WATER AREA, "A", AT $Y_n$ , (SF)	0.50		0.77		0.79		0.80		0.78	
49	VELOCITY, "V", (FPS)	15.07		17.75		17.88		17.92		17.80	

**ROCK CREEK SOLID WASTE FACILITY  
FINAL COVER HYDRAULIC CALCULATIONS**

	L	M	N	O	P	Q	R	S	T	U	V
25											
26											
27											
28											
29	6N & 6S		7N & 7S		8N & 8S		9W & 9E		1&9		
30	3.05		2.81		4.05		5.69		8.23		
31	13.51		12.18		8.66		12.52		12.61		
32	3.70		4.00		4.80		3.90		3.90		
33	7.90		7.88		13.61		15.54		22.46		
34	0.3333		0.3333		0.3333		0.3333		0.3333		
35	0.024		0.024		0.024		0.024		0.024		
36	13.7		13.7		16.8		17.6		20.2		
37	18		18		18		18		18		
38											
39	0.0750		0.0747		0.1292		0.1475		0.2131		
40	0.3335		0.3328		0.4489		0.4843		0.6072		
41	0.50		0.50		0.67		0.73		0.91		
42											
43	2.8676		2.8582		4.9406		5.6409		8.1513		
44	0.7262		0.7250		0.9137		0.9442		0.9852		
45	1.09		1.09		1.37		1.42		1.48		
46											
47	0.2293		0.2286		0.3417		0.377		0.4991		
48	0.52		0.51		0.77		0.85		1.12		
49	15.32		15.31		17.71		18.33		20.00		

OVERSIDE DRAINS

WATERSHED  
BASIN AREA (ACRES)  
TIME OF CONCENTRATION,  
<sup>h</sup>T<sup>m</sup> (max.), (IN/HR)  
RAINFALL INTENSITY "I",  
1000Yr. FREQUENCY OF  
RECURRENCE, (IN/HR)  
CMP CULVERT, DESIGN  
FLOW, "Q", (CFS)  
CUL VERT SLOPE (FT/FT)  
MANNINGS "n"  
MINIMUM REQUIRED PIPE  
DIAMETER, d, (INCHES)  
INPUT DESIGN CUL VERT  
DIAMETER, (INCHES)  
REFERENCE "CHOW"  
APPENDIX A  
(AR-2/3)/d<sup>8/3</sup>  
INPUT Y<sub>m</sub>/d @ (AR-2/3)/d  
NORMAL DEPTH, Y<sub>n</sub>, (FEET)  
REFERENCE "KING"  
(TABLE 8-10)  
Q/d<sup>5/2</sup>=Kc  
INPUT Y<sub>c</sub>/d  
CRITICAL DEPTH, Y<sub>c</sub>, (FEET)  
REFERENCE "CHOW"  
APPENDIX A  
INPUT A/d<sup>2</sup> @ Y<sub>m</sub>/d  
(see above)  
WATER AREA, "A", AT Y<sub>n</sub>, (SF)  
VELOCITY, "V", (FPS)



PROJECT ROCK CREEK SOLID WASTE FACILITY

SUBJECT HYDRAULIC CALC'S TABLE - BACKUP

SAMPLE RUN: BASIN I.D.: 9W

→ FLOW TO PERIMETER DITCHES ←

R3: BASIN AREA = 1.44 ACRES

OVERLAND LENGTH:

R5: TOP LENGTH,  $L_T = 0$  NO FLAT SLOPES ALL SIDES SLOPE AND BERM.

R6: SIDESLOPE LENGTH,  $L_S = 148.0'$  CORRECTED FOR 3:1 SLOPE \* 1.0541

R7: BENCH LENGTH,  $L_B = 10'$  CONTRIBUTING AREA OF BENCH @ 3%.

OVERLAND SLOPE:

R9: TOP SLOPE,  $S_T = 3.0\%$  NOT APPLICABLE, NO LENGTH

R10: SIDESLOPE SLOPE,  $S_S = 33.33\%$  (3:1)

R11: BENCH SLOPE,  $S_B = 3.0\%$

R12: RATIONAL METHOD RUNOFF COEF.,  $C = 0.70$

R13: OVERLAND FLOW TIME OF CONTRIBUTION,  $T_0 = T_T + T_S + T_B$

$$(1) T_0 = \frac{1.8(1.1 - C)L_0^{1/2}}{S_0^{1/3}}$$

(1) REFERENCES: FAA (U.S. DEPT. OF TRANSPORTATION, 1975)

$$T_T = \frac{1.8(1.1 - 0.70) * 0}{0^{1/3}} = 0 \quad T_T = 0 \text{ MIN}$$

$$T_S = \frac{1.8(1.1 - 0.70) * (148')^{1/2}}{(33.33)^{1/3}} = 2.72 \text{ MIN}$$

$$T_B = \frac{1.8(1.1 - 0.70) * (10')^{1/2}}{(3.0)^{1/3}} = 1.58 \text{ MIN}$$

$$T_0 = 2.72 + 1.58 = 4.30 \text{ MIN}$$

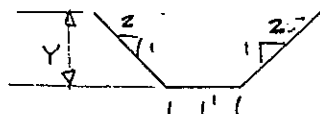
R14: LENGTH OF CHANNEL FLOW,  $L_2 = 500'$

R15: SLOPE OF CHANNEL FLOW,  $S_2 = 0.01 \text{ FT/FT}$

R16: MANNINGS COEF.,  $n = 0.03$

R17: ESTIMATED DEPTH OF FLOW,  $Y = 0.5 \text{ FEET}$  (TO DETERMINE  $V$ )

R18: HYDRAULIC RADIUS,  $R'$ :



$$R = \frac{(11 + 2(Y))Y}{11 + 2Y\sqrt{1+2^2}} \quad \text{WHERE } Y = 0.5'$$

( TYPICAL CHANNEL SECTION )



PROJECT ROCK CREEK SOLID WASTE FACILITY  
SUBJECT HYDRAULIC CALC'S TABLE - BACK UP

$$R = \frac{(1 + 2(0.5))0.5}{1 + 2(0.5)\sqrt{5}} = 0.31$$

R19: CHANNEL FLOW TIME OF CONCENTRATION,  $T_2 = \frac{L}{V}$  <sup>(2)</sup>

(2) REFERENCE: INTRO. TO HYDROLOGY 2<sup>ND</sup> EDITION, 1977  
(VISSMAN, KNAPP, LEWIS, HARBOSCH)

WHERE  $V = \frac{1.486}{n} R^{2/3} S^{1/2}$  (MANNING'S)

$$V = \frac{1.486}{0.03} (0.31)^{2/3} (0.01)^{1/2} = 2.26 \text{ FPS.}$$

$$T_2 = 500' / 2.26 \text{ FPS} * 1/60 = 3.68 \text{ MIN} \quad \checkmark$$

R20: TOTAL TIME OF CONCENTRATION,  $T = T_0 + T_2$

$$T = 4.30 + 3.68 = 7.98 \text{ MIN} \quad \checkmark$$

R21: RAINFALL INTENSITY,  $i$  @ 1000 yr FREQUENCY OF OCCURRENCE <sup>(3)</sup>

(3) REFERENCE: IDF CURVES FOR 1962-1974, HOGAN DAM STATION 820 4018 1  
CALIFORNIA COUNTY, CA. SEC. 31, T4N, R11E MOUNT DIABLO  
BASE AND MEDIUM LAT. 38.155, LONG. 120.814, ELEV 749

$$\text{@ } T = 7.98 \text{ MIN, } i_{1000} \approx 5.0 \text{ IN/HR}$$

R22: TOTAL FLOW,  $Q = CIA$

$$Q_{1000} = 0.70 * 5.0 * 1.44 = 5.05 \text{ CFS} \quad \checkmark$$

R23: DEPTH OF FLOW,  $Y$

$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$$

WHERE  $A = (1 + 2Y)Y$

$$R = \frac{(1 + 2Y)Y}{1 + 2Y\sqrt{5}}$$



PROJECT ROCK CREEK SOLID WASTE FACILITY  
SUBJECT HYDRAULIC CALC'S TABLE - BACKUP

$$5.05 = \frac{1.486}{0.03} * (1+24)Y * \left( \frac{(1+24)Y}{1+24\sqrt{5}} \right)^{2/3} (0.01)^{1/2}$$

SOLVE FOR Y TRIAL AND ERROR

$$1.0195 = (1+24)Y * \left( \frac{(1+24)Y}{1+24\sqrt{5}} \right)^{2/3}$$

$\boxed{Y = 0.734 \quad ZHS = 1.019 \text{ OKAY}}$

R24: VELOCITY,  $V = \frac{Q}{A}$

$V = \frac{5.05 \text{ CFS}}{(1+2(0.734))0.734} = 2.79 \text{ FPS}$

→ OVERSIDE DRAINS ←

R30: BASIN AREA:  $A = A_{RW} + A_{RE} + A_{IW} + A_{IE}$

CONTRIBUTION TO OVERSIDE DRAIN FROM AREA 1.

$\boxed{A = 1.44 + 1.51 + 1.53 + 1.22 = 5.70 \text{ SF}} \text{ ACRES}$

R31: TIME OF CONCENTRATION:  $T_{MAX} =$  TIME OF CONCENTRATION (MAX.) FOR BASIN AREA 1 PLUS THE TIME OF CONCENTRATION THROUGH PIPE.

$T_{MAX} = 12.29 + \frac{200'(1.0541)}{15.20 \text{ FPS}} * \frac{1 \text{ MIN}}{60 \text{ SEC}} = 12.52 \text{ MIN} = 13.12 \text{ MIN}$

R32: RAINFALL INTENSITY,  $i = 4.0$   
 $i = 3.8 \text{ in/hr}$

$V = \frac{Q}{A} = \frac{7.5 \text{ CFS}}{(\frac{1.5}{2})^2 \pi} = 4.2 \text{ FPS}$

R33: CMP CULVERT DESIGN FLOW,  $Q_{1000} = CiA$

$\boxed{Q_{1000} = 0.70(4.0)(5.70) = 15.94 \text{ CFS} = 15.14 \text{ CFS}}$   
 $0.7 * 3.8 * 5.69 =$

R34: CULVERT SLOPE,  $S_c = 0.3333 \text{ FT/FT}$  (3:1)

R35: MANNINGS COEF.,  $n = 0.024$

R36: MINIMUM ROAD PIPE DIAMETER @ 1/2 FULL,  $d$

WHERE:  $A = \frac{1}{2} \left( \frac{\pi D^2}{4} \right) = \frac{\pi D^2}{8}$

$P = \frac{1}{2} \pi D = \frac{\pi D}{2}$



PROJECT ROCK CREEK SOLID WASTE FACILITY  
SUBJECT HYDRAULIC CALC'S TABLE-BACKUP

$$R = \frac{A}{P} = \frac{\pi D^2}{48} \div \frac{\pi D}{2} = \frac{D}{4}$$

$$Q = \frac{1.486}{n} AR^{2/3} S^{1/2}$$

$$15.14 = \frac{1.486}{0.024} * \left(\frac{\pi D^2}{8}\right) * \left(\frac{D}{4}\right)^{2/3} (0.3333)^{1/2}$$

$$0.4225 * 0.4459 = \frac{\pi}{8} D^2 * \left(\frac{1}{4}\right)^{2/3} D^{2/3}$$

$$2.7114 = D^{8/3}$$

$$D_{1/2 \text{ FULL}} = 1.48' = 17.8''$$

$$D_{1/2 \text{ FULL}} = 1.45' = 17.4''$$

R37: INPUT DESIGN CULVERT DIAMETER,  $D = 18''$

$$R39: \frac{AR^{2/3}}{D^{8/3}} = \frac{Qn}{1.486 S^{1/2}} * \frac{1}{D^{8/3}}$$

$$\frac{AR^{2/3}}{D^{8/3}} = \frac{15.14(0.024)}{1.486(0.3333)^{1/2}} * \frac{1}{(1.5)^{8/3}} = 0.1513 = 0.1436$$

R40: INPUT  $Y_n/D$  @  $AR^{2/3}/D^{8/3}$  (4)

(4) REFERENCE: OPEN-CHANNEL HYDRAULICS, CHOW, 1959  
MCGRAW-HILL CIVIL ENGINEERING SERIES.  
APPENDIX A. GEOMETRIC ELEMENTS FOR CIRCULAR  
CHANNEL SECTIONS., PAGES 625-627

$$\text{@ } \frac{AR^{2/3}}{D^{8/3}} \Rightarrow \frac{Y_n}{d} = 0.4915 = 0.4769$$

R41: NORMAL DEPTH,  $Y_n$

$$\frac{Y_n}{D} = 0.4915 \quad Y_n = 0.74' = 0.72'$$

R43:  $\frac{Q}{D^{5/2}} = K'_c$

$$K'_c = \frac{15.14}{(1.5)^{5/2}} = 5.7850$$

$$\frac{15.14}{(1.5)^{5/2}} = 5.4941$$



PROJECT Basin Closure Solid Waste Facility  
SUBJECT HYDRAULIC CALC'S TABLE - BACKUP

R44: INPUT  $Y_c/D$  <sup>(5)</sup>

(5) REFERENCE: HANDBOOK OF HYDRAULICS, SIXTH EDITION, 1976  
BRATER AND KING, TABLE 8-10 FOR DETERMINING  
THE DISCHARGE Q OF A CIRCULAR CHANNEL FLOWING  
PART FULL WHEN FLOW IS AT CRITICAL DEPTH  
PAGE 8-60.

$$\boxed{@ K'_c = 5.7856 \Rightarrow Y_c/D = 0.9492} = Y_c/D = 0.9492$$

R45: CRITICAL DEPTH,  $Y_c$  :

$$\boxed{\frac{Y_c}{D} = 0.9492 \quad Y_c = 0.9492(1.5) = 1.42'} = 1.403'$$

A47: INPUT  $A/D^2$  @  $Y_n/D$  <sup>(4)</sup>

$$\boxed{@ Y_n/D = 0.4915 \Rightarrow A/D^2 = 0.3842}$$

$$\frac{Y_n}{D} = .4769$$

$$A/D^2 = 0.3687$$

A48: WATER AREA, A @  $Y_n$  :

$$\boxed{\frac{A}{D^2} = 0.3842 \Rightarrow A = 0.3842(1.5)^2 = 0.865F} = 0.8295F$$

A49: VELOCITY, V :

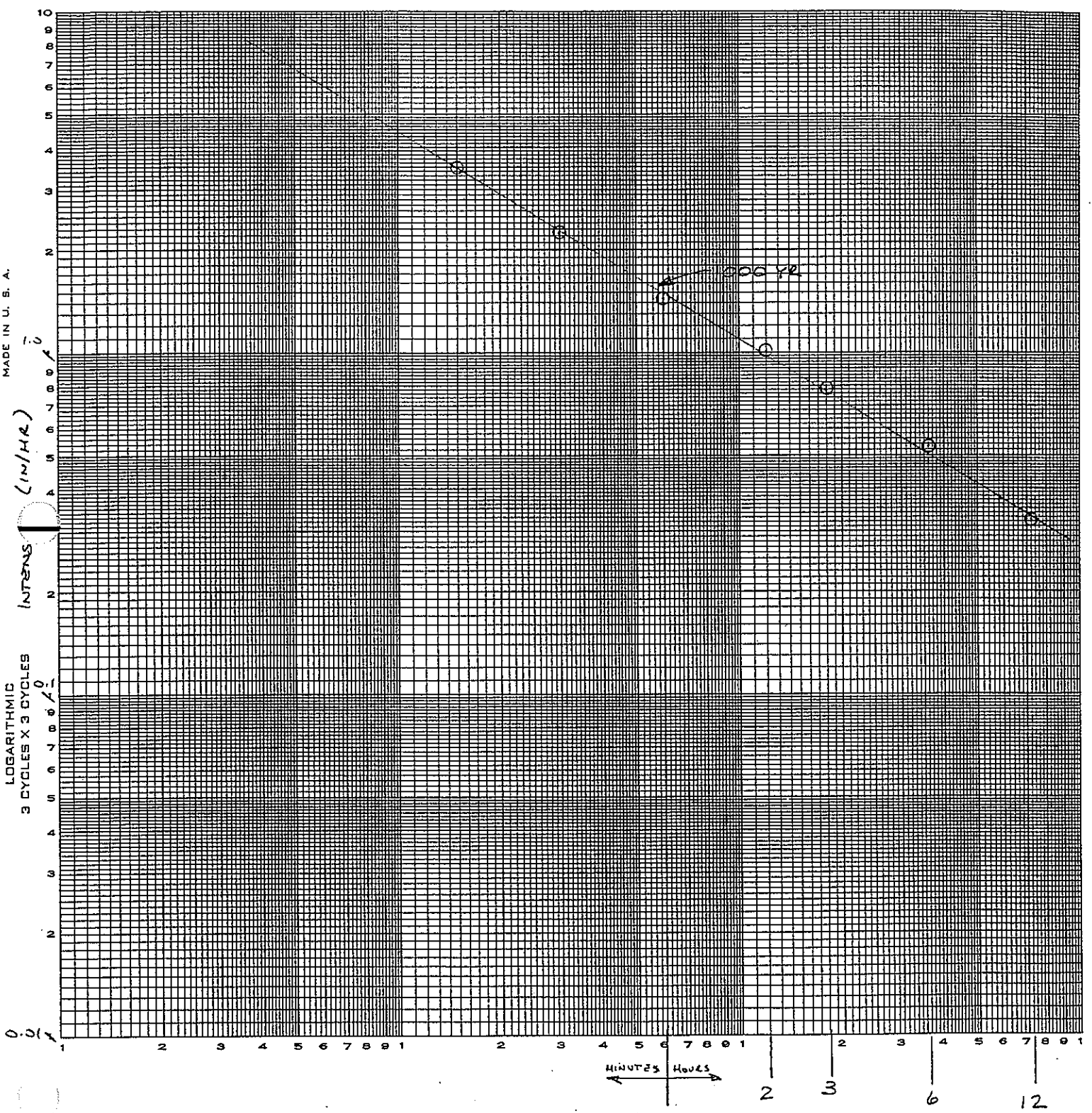
$$\boxed{V = Q/A = 15.94 \text{ cfs} / 0.86 = 18.44 \text{ FPS}} \quad V = \frac{15.14}{0.829} = 18.25 \text{ FPS}$$

IDF CURVE FOR 1962-1974  
 HOGAN DAM STATION B20  
 SEC. 4018, CALAVERAS COUNTY, CA

EUGENE DIEZIGEN CO.  
 MADE IN U. S. A.

NO. 341-L33 DIEZIGEN GRAPH PAPER  
 LOGARITHMIC  
 3 CYCLES X 3 CYCLES

INTENS (IN/HR)



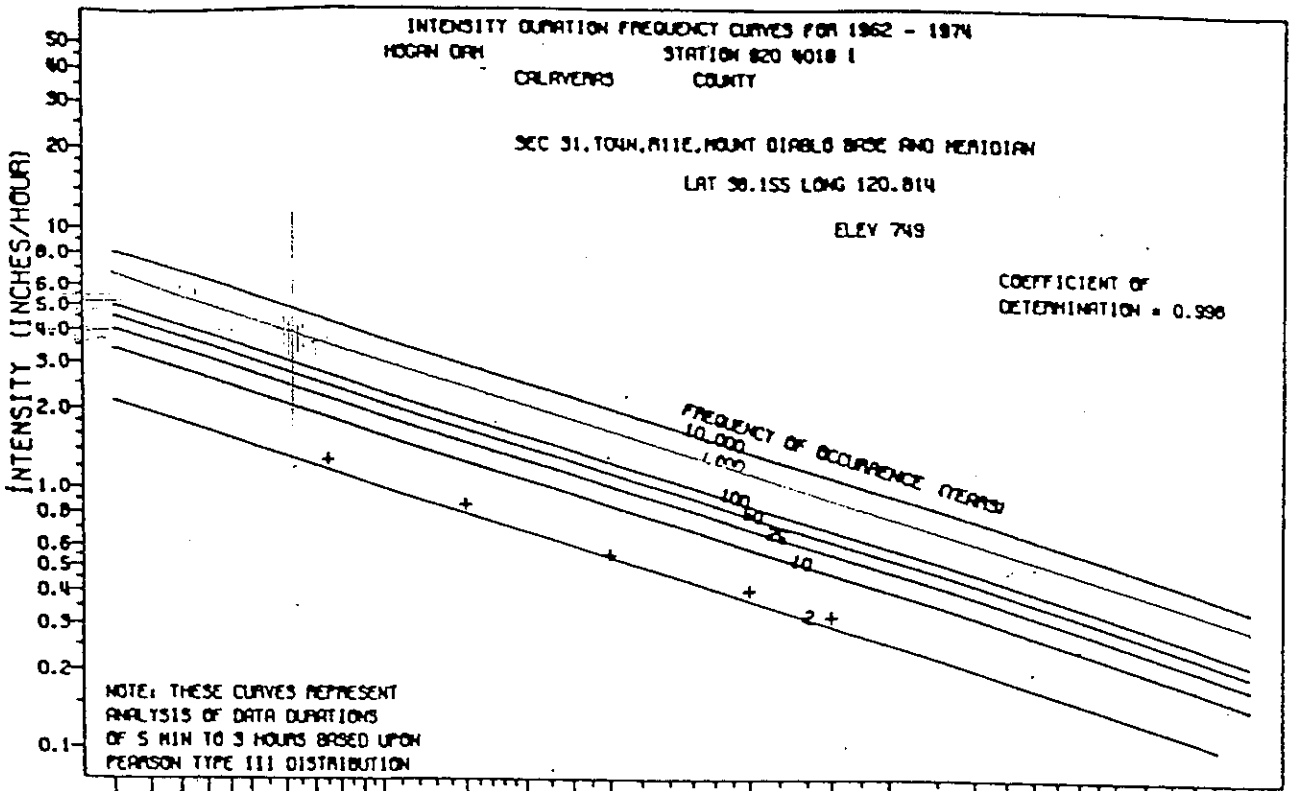
DURATION

INTENSITY DURATION FREQUENCY CURVES FOR 1962 - 1974  
HOGAN CREEK CALYERAS COUNTY

SEC 31, TOWN, R11E, MOUNT Diablo BRIDGE AND MERIDIAN  
LAT 38.155 LONG 120.814  
ELEV 749

COEFFICIENT OF DETERMINATION = 0.996

INTENSITY (INCHES/HOUR)



NOTE: THESE CURVES REPRESENT ANALYSIS OF DATA DURATIONS OF 5 MIN TO 3 HOURS BASED UPON PEARSON TYPE III DISTRIBUTION

MINUTES + HOURS DURATION

SHORT DURATION PRECIPITATION DEPTH-DUR-N-FREQUENCY TABLE

STATION NO. BSN ORDER SUB B20 4018 01 HOGAN DAM  
 STATION NAME  
 ELEV (FT) 749  
 TWP 04N  
 R11E  
 R31E  
 SEC 31  
 LOT 11E  
 B+M 380918  
 LATITUDE 1204850  
 LONGITUDE CAL  
 COUNTY CODE CAL  
 AREA CODE B05A0  
 CONTRACTOR CODE 50C2

MAXIMUM PRECIPITATION FOR INDICATED DURATION D-DAYS H-HOURS

RETURN PERIOD IN YEARS	5M	10M	15M	30M	1H	2H	3H	6H	12H	24H	F-YR
2	.00	.00	.31	.40	.52	.73	.85	1.16	1.52	1.97	18.95
5	.00	.00	.42	.54	.69	.97	1.14	1.55	2.03	2.64	23.99
10	.00	.00	.49	.63	.80	1.13	1.32	1.80	2.36	3.06	26.90
20	.00	.00	.55	.71	.91	1.28	1.50	2.03	2.67	3.46	29.45
25	.00	.00	.57	.73	.94	1.32	1.55	2.10	2.76	3.58	30.22
40	.00	.00	.58	.75	.96	1.35	1.58	2.14	2.81	3.64	31.77
50	.00	.00	.63	.81	1.04	1.46	1.71	2.32	3.05	3.96	32.48
100	.00	.00	.69	.89	1.13	1.59	1.87	2.53	3.33	4.32	34.60
200	.00	.00	.74	.96	1.22	1.72	2.02	2.74	3.60	4.67	36.61
1000	.00	.00	.87	1.12	1.43	2.02	2.36	3.20	4.20	5.45	40.96
10000	.00	.00	1.04	1.34	1.71	2.42	2.83	3.84	5.04	6.54	46.67
PMP	.00	.00	2.04	2.64	3.37	4.75	5.56	7.54	9.91	12.86	104.20
MEAN	.000	.000	.334	.431	.551	.777	.909	1.234	1.620	2.103	19.422
COR.	.000	.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
CALCULATED SKEW	.000	.000	1.425	.992	.785	.728	.124	-.178	-.504	-.251	-.320
REGIONAL SKEW	.000	.000	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	.500
SKEW USED	.000	.000	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	.500
KURTOSIS	.000	.000	5.108	4.116	4.421	4.219	3.183	2.727	3.647	3.674	3.501
RECORD YEAR	0	0	17	17	17	17	17	17	17	17	19
RECORD MAXIMUM	.000	.000	1978	1964	1964	1964	1964	1963	1967	1967	1967
NORMALIZED MAX	.000	.000	.750	.880	.970	1.260	1.320	1.720	2.310	3.250	29.600
CALC. COEF. VAR	.000	.000	.528	.477	.328	.262	.269	.256	.237	.308	1.605
REGN. COEF. VAR	.000	.000	.341	.341	.341	.341	.341	.341	.341	.341	.291
USED COEF. VAR	.000	.000	.341	.341	.341	.341	.341	.341	.341	.341	.291
MEAN/A	.0000	.0000	.0172	.0222	.0284	.0400	.0468	.0635	.0834	.1083	1.0000
RP10/A	.0000	.0000	.0251	.0324	.0414	.0583	.0652	.0926	.1216	.1578	1.3850
RP25/A	.0000	.0000	.0293	.0378	.0484	.0682	.0798	.1083	.1422	.1846	1.5559
RP50/A	.0000	.0000	.0324	.0418	.0534	.0753	.0880	.1195	.1569	.2037	1.6725
RP100/A	.0000	.0000	.0353	.0456	.0582	.0821	.0960	.1304	.1712	.2222	1.7815
RP1000/A	.0000	.0000	.0446	.0576	.0736	.1038	.1214	.1647	.2163	.2808	2.1090
RP10000/A	.0000	.0000	.0535	.0690	.0882	.1244	.1455	.1975	.2593	.3366	2.4030
PMP/A	.0000	.0000	.1052	.1358	.1735	.2447	.2861	.3884	.5101	.6621	5.3650

PEARSON TYPE III DISTRIBUTION USED  
 PROBABLE MAXIMUM PRECIPITATION ESTIMATE BASED ON 15 STANDARD DEVIATIONS  
 WHERE N IS SMALL RESULTS ARE NOT DEPENDABLE

RUN DATE 86/08/20

SHORT DURATION PRECIPITATION (IN)

STATION NO.  
BSN ORDER SUB  
B20 4018 01

STATION NAME  
HOGAN DAM

ELEV (FT)  
749

TWP  
04N

SEC LOT  
11E

RNG  
31

LATITUDE  
M 380918

LONGITUDE  
M 1204850

COUNTY CODE  
CAL 803A0

AREAL CODE  
5002

CONTRACTOR  
5002

DURATION  
M=MINUTES, H=HOURS, D=DAYS, C YR=CALENDAR YEAR, W YR=WATER YEAR, F YR=FISCAL YEAR

YEAR	5M	10M	15M	30M	1H	2H	3H	6H	12H	24H	F-YR
1962	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	19.74
1963	.00	.00	.39	.61	.72	1.00	1.28	1.72	1.87	3.06	22.32
1964	.00	.00	.72	.88	.97	1.26	1.32	1.41	1.42	1.84	15.21
1965	.00	.00	.31	.37	.58	.72	.78	1.12	1.45	1.97	22.65
1966	.00	.00	.22	.27	.54	.75	.98	1.34	1.78	2.02	15.19
1967	.00	.00	.32	.56	.57	.64	.98	1.68	2.31	3.25	29.60
1968	.00	.00	.15	.22	.32	.44	.82	.94	1.83	2.10	14.56
1969	.00	.00	.27	.33	.44	.86	1.10	1.48	2.07	2.48	29.48
1970	.00	.00	.22	.28	.45	.87	1.10	1.63	2.07	2.50	18.43
1971	.00	.00	.26	.42	.53	.78	.94	1.30	1.50	2.57	18.50
1972	.00	.00	.28	.37	.51	.58	.71	1.17	1.80	2.78	13.49
1973	.00	.00	.39	.50	.56	.76	.78	.90	1.29	1.74	24.48
1974	.00	.00	.28	.34	.44	.71	.97	1.25	1.85	2.03	21.82
1975	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	18.48
1976	.00	.00	.10	.12	.24	.43	.43	.79	.90	.90	9.73
1977	.00	.00	.25	.35	.66	.58	.62	.64	.85	.85	5.35
1978	.00	.00	.75	.85	.87	.88	.92	.96	1.36	1.66	27.52
1979	.00	.00	.27	.32	.49	.59	.73	1.17	1.70	1.88	19.28
1980	.00	.00	.50	.54	.68	1.08	1.28	1.47	1.92	2.12	23.18