

TABLE -2

LIST SHOWING OVERALL POSITION OF THE  
RAIN GAUGES EXISTING IN THE CATCHMENT

Sr.No from U/S to D/S	Rain Gauge Station	Whether Station lies in the catchment	Sub- catch- ment No.	Data Collected for the period	Length of Record (Years)
1 *	Lahore	No	-	1945-1975	31
2 *	Sahiwal	Yes	44	1945-1967	21
3 *	Multan	No	-	1934-1975	31
4	Pandoke	Yes	1	1953-1975	23
5	Kasur	Yes			
6	Bhamba	Yes		1953-1975	23
7	Gandian	Yes	6	1953-1975	23
8	Khudian	Yes	8	1953-1975	23
9	Vehn	Yes		1953-1975	23
10	Pattoki	Yes	20	1953-1975	23
11	Jajjal	Yes	12	1953-1975	23
12	Shahbore	Yes	33	-	-
13	Kalasan	Yes		-	-
14	Depalpur	Yes	31	1953-1975	22
15	Dhulliana	Yes	14	1953-1975	23
16	Tahar	Yes		1953-1975	28
17	Kalewal	No		1953-1975	22
18	Jalleke	No		1953-1975	23
19	Najbat	No		1953-1975	19
20	Warsin	No		1953-1975	19
21	Tibbi	No		1953-1975	19
22	Jamlera	No		1953-1975	19
23	Joya	No		1953-1975 1962-1964	22
24	Ratta Tibba	No		1953-1975 1962-1964	22
25	Nurpur	Yes	41	1953-1975	22
26	Mall	No		1953-1975	23
27	Pakpattan	Yes	43	1936-1975	40
28	Renala	Yes	23	-	-
29	Gamber	Yes		-	-
30	Mir Shonki	Yes	33	-	-

\* These three stations are maintained by the Meteorological Department.

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1	2	3	4	5	6
31	Okara	Yes		-	-
32	Siwan Shah	Yes		1953-1975	23
33	Budhewala	Yes	45	-	-
34	Billuwala	Yes	46	1936-1975	40
35	Chichawatni	Yes	62	1948-1975	22
36	Shujabad	Yes	87	1965-1975 1947-1964	29
37	Billiwala	Yes	82	1965-1975 1948-1964	25
38	Qutabpur	Yes	75	1965-1975 1957-1964	19
39	Rashida	Yes	78	1965-1975 1948-1964	28
40	Kokar Hatta	Yes		1965-1975 1948-1964	27
41	Khanewal	Yes		1947-1964	18
42	Jaim Jhal	Yes		1965-1975 1948-1964	23
43	Wanwala	Yes	75	1965-1975 1957-1964	19
44	Sechanwala	Yes	64	1964-1975 1957-1964	19
45	Vehriwala	No		-	-
46	Sidhnai	No		1965-1975 1947-1964	29
47	Akil	No		1948-1975	23
48	Lodhran	No		1968-1975	8
49	Jandiali	Yes		1965-1975 1948-1964	23
50	Okanwala	Yes		1965-1975 1948-1964	23
51	Nangewali	Yes	51	1936-1975	40
52	Chhal	Yes	67	1948-1975	23
53	Amrana (Pind Rasul)	Yes		1948-1975	23
54	Lunda	Yes		1965-1975 1948-1964	23

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<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>
55	Dulwan	Yes	62	1948-1975	23
56	Jodhpur	Yes		1965-1975 1948-1964	21
57	Mamba	Yes		1965-1975 1948-1964	22
58	Garkana	Yes		1965-1975 1947-1964	29
59	Kachakhu	Yes		1965-1975 1948-1964	23
60	Kahrar	No		1968-1975	8
61	Sadda	No		1968-1975	8
62	Basantpur	No		1968-1975	8
63	Patti	No		1969-1975	6
64	Kabirwala	Yes		1947-1964	18

TABLE -3

LIST OF SELECTED RAIN-GAUGE STATIONS

Sr.No U/S to D/S	Rain Gauge Station	Whether Station lies in the catchment	Sub- catch- ment No	Data collected for the period	Length of Record (years)
1	Lahore	No	-	1945 to 75	31
2	Pandoke	Yes	1	1953 to 75	23
3	Gandian	Yes	6	1953 to 75	23
4	Khudian	Yes	8	1953 to 75	23
5	Jajjal	Yes	12	1953 to 75	23
6	Pattoki	Yes	20	1953 to 75	23
7	Dhulliana	Yes	14	1953 to 74	23
8	Renala	Yes	23	1948 to 75	28
9	Depalpur	Yes	31	1953 to 75	23
10	Shahbore	Yes	33	1948 to 75	28
11	Mirshank	Yes	33	1948 to 75	28
12	Pakpattan	Yes	43	1936 to 75	40
13	Nurpur	Yes	41	1953 to 75	23
14	Sahiwal	Yes	44	1948 to 75	40
15	Budhwala	Yes	45	1955 to 75	21
16	Dilluwala	Yes	46	1936 to 75	40
17	Chichawatni	Yes	62	1945 to 75	27
18	Nagwali	Yes	51	1936 to 75	40
19	Dulwan	Yes	62	1948 to 75	28
20	Sechanwala	Yes	64	1936 to 75	40
21	Chhab	Yes	67	1948 to 75	28
22	Wanwala	Yes	75	1936 to 75	40
23	Rashida	Yes	78	1948 to 75	28
24	Qutabpur	Yes	75	1936 to 75	40
25	Billiwala	Yes	82	1948 to 75	28
26	Multan	No	-	1945 to 75	31
27	Shujabad	Yes	87	1947 to 75	29

TABLE -7

FREQUENCY FACTORS (K) FOR PEARSONIAN TYPE III DISTRIBUTION

Flood Dura- tion Days	Skew Co- effi- cient g	Probability of Exceedance : Per Cent										
		99.9	99	95	90	70	50	30	10	5	1	0.1
0	0.00	-3.09	-2.33	-1.64	-1.28	-0.52	0.00	0.52	1.28	1.64	2.33	3.09
1	-0.04	-3.15	-2.36	-1.65	-1.28	-0.52	0.01	0.53	1.27	1.63	2.30	3.03
3	-0.12	-3.26	-2.42	-1.67	-1.29	-0.51	0.02	0.54	1.26	1.60	2.24	2.92
10	-0.23	-3.42	-2.50	-1.70	-1.30	-0.50	0.03	0.55	1.25	1.57	2.16	2.77
30	-0.32	-3.55	-2.56	-1.72	-1.31	-0.49	0.05	0.56	1.23	1.54	2.09	2.68
90	-0.37	-3.63	-2.60	-1.73	-1.32	-0.48	0.06	0.57	1.22	1.52	2.05	2.58
365	-0.40	-3.67	-2.62	-1.74	-1.32	-0.48	0.06	0.57	1.22	1.51	2.03	2.54

0.1    1    5    10    30    50    70    90    95    99    99.9

Probability of Non-exceedance: Per cent

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TABLE - 8

ESTIMATED POINT RAINFALL FOR VARIOUS FRE-  
QUENCIES BY LOGARITHMIC FREQUENCY DISTRIBUTION

Return Period (Years)	Point Rainfall (inches)			Point Rainfall (inches)			Point Rainfall (inches)		
	1 day	2 days	3 days	1 day	2 days	3 days	1 day	2 days	3 days
	<u>LAHORE</u>			<u>PANDOKI</u>			<u>GANDIAN</u>		
2	2.779	3.689	3.931	2.903	3.659	4.095	2.292	2.947	3.373
5	4.314	5.899	6.351	4.267	5.604	6.116	3.283	4.523	5.363
10	5.418	7.523	7.981	5.208	6.990	7.404	3.954	5.648	6.688
25	6.804	9.593	10.144	6.358	8.718	9.048	4.763	7.052	8.434
50	8.190	11.692	11.692	7.478	10.435	10.435	5.452	8.449	9.523
100	9.350	13.467	13.967	8.396	11.866	11.866	6.175	9.613	11.489
	<u>KHUDIAN</u>			<u>JAJJAL</u>			<u>PATTOKI</u>		
2	2.649	3.255	3.659	2.698	3.506	3.791	2.592	3.112	3.425
5	3.654	4.459	5.042	3.725	4.882	5.165	3.643	4.739	5.133
10	4.317	5.248	5.873	4.403	5.795	5.985	4.346	5.893	6.223
25	5.099	6.176	6.894	5.204	6.878	6.986	5.184	7.328	7.619
50	5.840	7.052	7.498	5.963	7.908	7.908	5.984	8.751	8.751
100	6.434	7.753	8.537	6.571	8.737	8.737	6.630	9.932	9.978
	<u>DULLIANA</u>			<u>RENALI</u>			<u>DIPALPUR</u>		
2	1.928	2.510	2.722	2.291	2.734	2.906	1.977	2.346	2.487
5	2.990	3.813	4.255	3.373	4.546	4.880	3.047	3.738	4.031
10	3.752	4.735	5.263	4.121	5.916	6.247	3.812	4.758	5.074
25	4.709	5.880	6.580	5.035	7.699	8.095	4.769	6.056	6.461
50	5.665	7.014	7.396	5.926	9.539	9.539	5.723	7.371	7.371
100	6.665	7.955	8.862	6.658	11.118	11.437	6.520	8.481	8.916
	<u>SHAHBORE</u>			<u>MIR SHANK</u>			<u>PAKPATTAN</u>		
2	1.922	2.267	2.332	1.914	2.253	2.415	1.853	2.156	2.156
5	3.144	3.792	3.966	3.135	3.757	3.941	3.250	3.976	4.291
10	4.058	4.950	5.108	4.047	4.896	4.976	4.349	5.459	5.863
25	5.237	6.461	6.661	5.226	6.381	6.381	5.818	7.496	8.136
50	6.446	8.026	8.026	6.434	7.916	7.916	7.374	9.703	9.703
100	7.476	9.372	9.490	7.464	9.234	9.234	8.734	11.667	12.594

Return Period (years)	Point Rainfall (inches)			Point Rainfall (inches)			Point Rainfall (inches)		
	1 day	2 days	3 days	1 day	2 days	3 days	1 day	2 days	3 days
	<u>NURPUR</u>			<u>SAHIWAL</u>			<u>BUDHWALA</u>		
2	2.419	2.702	2.791	2.084	2.368	2.460	1.852	2.003	2.152
5	3.661	4.055	4.184	4.147	3.910	5.123	3.080	3.476	3.841
10	4.537	5.004	5.074	5.924	7.165	7.265	4.008	4.625	5.061
25	5.623	6.174	6.213	8.461	10.456	10.484	5.215	6.155	6.761
50	6.697	7.327	7.327	11.310	14.221	14.221	6.462	7.766	7.869
100	7.587	8.279	8.279	13.915	17.715	17.715	7.531	9.169	9.948
	<u>DILLUWALA</u>			<u>CHICHAWATNI</u>			<u>NAGWALI</u>		
2	1.979	2.229	2.395	1.294	1.483	1.599	1.531	1.780	1.911
5	3.180	3.709	4.044	2.358	2.811	3.106	2.399	2.907	3.184
10	4.065	4.829	5.190	3.218	3.914	4.260	3.028	3.748	4.060
25	5.197	6.286	6.744	4.391	5.451	5.937	3.821	4.832	5.240
50	6.348	7.792	7.792	5.655	7.138	7.138	4.618	5.942	5.989
100	7.322	9.083	9.563	6.775	8.653	9.242	5.287	6.888	7.363
	<u>DULWAN</u>			<u>SECHANWALA</u>			<u>CHHAB</u>		
2	1.338	1.495	1.557	1.588	1.768	1.890	1.420	1.519	1.585
5	2.571	3.009	3.177	2.489	2.906	3.132	2.236	2.541	2.720
10	3.606	4.322	4.461	3.141	3.758	3.984	2.828	3.317	3.518
25	5.057	6.208	6.371	3.964	4.860	5.129	3.578	4.330	4.609
50	6.661	8.337	8.337	4.791	5.992	5.992	4.333	5.380	5.380
100	8.108	10.290	10.290	5.486	6.958	7.182	4.968	6.281	6.606
	<u>WANWALA</u>			<u>RASHIDA</u>			<u>QUTABPUR</u>		
2	1.235	1.343	1.478	1.314	1.484	1.534	1.233	1.380	1.441
5	1.920	2.118	2.353	2.068	2.543	2.612	2.078	2.392	2.490
10	2.413	2.682	2.935	2.616	3.362	3.366	2.724	3.181	3.229
25	3.032	3.397	3.703	3.309	4.444	4.444	3.570	4.229	4.244
50	3.652	4.116	4.182	4.007	5.577	5.577	4.450	5.333	5.333
100	4.171	4.722	5.047	4.593	6.560	6.560	5.207	6.294	6.294
	<u>BILLIWALA</u>			<u>MULTAN</u>			<u>SHUJABAD</u>		
2	0.887	0.978	1.047	1.208	1.346	1.436	0.806	0.858	0.933
5	1.452	1.660	1.836	1.878	2.118	2.308	1.810	2.040	2.324
10	1.875	2.184	2.398	2.361	2.678	2.894	2.752	3.195	3.588
25	2.420	2.873	3.175	2.968	3.386	3.669	4.185	5.004	5.661
50	2.979	3.591	3.678	3.575	4.098	4.155	5.886	7.210	7.210
100	3.456	4.211	4.616	4.083	4.697	5.035	7.510	9.358	10.399

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TABLE - 9

ACCUMULATIVE AREA RAINFALL DISTRIBUTION  
(5-10-and-50 year Storm Frequency)

Sub-catch- ment No.	5 year Storm Frequency			10 year Storm Frequency			50 year Storm Frequency		
	Accumulative Area Rainfall Distribu- tion (inches)			Accumulative Area Rainfall Distribu- tion (inches)			Accumulative Area Rainfall Distribu- tion (inches)		
	24 hrs	48 hrs	72 hrs	24 hrs	48 hrs	72 hrs	24 hrs	48 hrs	72 hrs
1	2	3	4	5	6	7	8	9	10
1	4.10	5.40	5.90	5.10	6.50	7.15	7.30	9.92	9.92
2	3.70	4.80	5.50	4.70	6.00	6.60	5.96	8.60	9.30
3	3.80	4.60	5.20	4.40	5.50	6.00	6.30	8.15	8.31
4	3.45	4.50	5.20	4.40	5.50	6.40	5.64	7.96	8.81
5	3.30	4.50	5.35	3.95	5.65	6.69	5.54	8.45	9.52
6	3.45	4.60	5.20	3.98	5.70	6.55	5.58	8.48	9.41
7	3.65	4.75	5.15	4.35	5.89	6.22	5.98	8.75	8.47
8	3.65	4.65	5.10	4.35	5.79	5.98	5.89	7.45	7.61
9	3.65	4.75	5.15	4.35	5.89	5.98	5.98	8.75	8.75
10	3.65	4.70	5.05	4.20	5.35	5.70	5.89	7.72	7.72
11	2.99	3.80	4.25	3.75	4.73	5.26	5.66	7.01	7.40
12	3.40	4.50	4.85	4.10	5.25	5.60	5.86	7.61	7.61
13	3.45	4.40	4.80	4.15	5.35	5.70	5.73	7.29	7.40
14	2.90	3.80	4.25	3.75	4.73	5.26	5.66	7.01	7.40
15	3.15	4.20	4.55	4.00	5.20	5.45	5.72	7.23	7.46
16	2.90	3.80	4.25	3.75	4.73	5.26	5.66	7.01	7.40
17	2.90	3.80	4.25	3.75	4.73	5.26	5.66	7.01	7.40
18	3.00	3.80	4.25	3.75	4.73	5.26	5.66	7.01	7.40
19	3.30	3.75	4.20	3.95	4.80	5.30	5.78	7.83	7.83
20	3.50	4.65	4.95	4.10	5.70	6.12	5.90	8.68	8.68
21	3.40	4.60	4.95	4.10	5.90	6.11	5.93	9.54	9.54
22	3.30	4.30	4.60	4.00	5.60	5.92	5.87	8.93	8.93
23	3.35	4.50	4.85	4.12	5.90	6.15	5.91	9.38	9.38
24	3.05	3.75	4.05	3.81	4.76	5.07	5.74	7.40	7.40
25	3.05	3.75	4.05	3.81	4.76	5.07	5.74	7.40	7.40
26	3.08	3.75	4.00	3.85	4.80	5.08	5.94	7.48	7.48
27	3.15	3.75	3.95	4.06	4.95	5.11	6.44	7.96	7.96
28	3.15	3.80	3.95	4.06	4.95	5.11	6.37	8.25	8.25
29	3.15	3.80	3.95	4.05	4.92	5.05	6.45	8.03	8.03
30	3.10	3.75	3.95	4.05	4.90	4.98	6.36	7.92	7.92
31	3.05	3.75	4.06	4.00	4.95	5.40	5.95	7.56	7.56



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1	2	3	4	5	6	7	8	9	10
32	3.15	3.78	3.95	4.05	4.90	4.98	6.43	7.92	7.92
33	3.14	3.78	3.95	4.06	4.93	5.08	6.44	7.99	7.99
34	3.15	3.80	4.10	4.05	4.90	4.98	6.57	7.62	7.62
35	3.14	3.76	3.94	4.05	4.90	4.98	6.43	7.92	7.92
36	3.25	3.80	4.00	4.05	4.90	4.98	6.43	7.92	7.92
37	3.90	4.65	4.85	5.70	6.50	6.70	9.61	11.91	11.91
38	3.65	4.00	4.15	4.54	5.00	5.00	6.70	7.33	7.33
39	3.49	3.90	4.25	4.46	5.06	5.28	7.30	8.59	8.59
40	3.45	3.65	4.30	4.48	5.25	5.61	6.06	7.43	7.43
41	3.65	4.00	4.15	4.39	4.93	5.05	6.64	7.44	7.44
42	3.35	3.75	4.00	4.22	4.78	5.06	6.56	7.59	7.59
43	3.40	4.00	4.25	4.19	4.90	5.15	6.86	7.73	7.73
44	3.45	3.96	4.27	4.96	5.83	6.18	9.95	12.00	12.00
45	3.30	3.75	4.00	4.30	5.00	5.39	7.18	8.72	8.72
46	3.05	3.70	4.05	4.05	4.81	5.17	6.35	7.79	7.79
47	3.05	3.70	4.05	4.04	4.79	5.16	6.36	7.79	7.79
48	3.10	3.50	3.85	4.02	4.66	5.10	6.46	7.76	7.85
49	2.74	3.26	3.62	3.63	4.40	4.70	5.38	6.75	6.75
50	2.40	2.90	3.20	3.03	3.75	4.06	5.62	5.94	5.99
51	2.40	2.90	3.20	3.03	3.75	4.06	4.62	5.94	5.99
52	2.40	2.90	3.20	3.03	3.75	4.06	4.62	5.94	5.99
53	2.40	2.90	3.20	3.03	3.75	4.06	4.62	5.94	5.99
54	2.40	2.85	3.15	3.03	3.75	4.06	4.62	5.94	5.99
55	2.50	2.90	2.90	3.16	3.86	4.19	5.80	7.30	7.30
56	2.40	2.90	3.10	3.03	3.75	4.06	4.62	5.94	5.94
57	2.25	2.55	2.75	2.83	3.32	3.52	4.33	5.38	5.38
58	2.25	2.55	2.75	2.83	3.32	3.52	4.33	5.38	5.38

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1	2	3	4	5	6	7	8	9	10
59	2.55	3.00	3.15	3.53	4.22	4.37	6.48	8.11	8.11
60	2.55	3.00	3.15	3.46	4.13	4.28	6.31	7.90	7.90
61	2.40	2.75	2.90	3.07	3.62	3.80	4.82	6.01	6.01
62	2.40	2.90	3.10	3.19	3.83	4.05	5.83	7.33	7.33
63	2.40	2.90	3.10	3.12	3.76	3.99	4.79	5.99	5.99
64	2.40	2.90	3.10	3.12	3.76	3.99	4.75	5.98	5.98
65	2.25	2.55	2.75	2.83	3.32	3.52	4.33	5.38	5.38
66	2.30	2.75	2.95	2.94	3.48	3.69	4.49	5.60	5.60
67	2.35	2.70	2.85	3.04	3.59	3.77	4.88	6.10	6.10
68	2.25	2.55	2.75	2.83	3.32	3.52	4.33	5.38	5.38
69	2.25	2.55	2.75	2.83	3.32	3.52	4.33	5.38	5.38
70	2.15	2.45	2.65	2.72	3.15	3.36	4.20	5.26	5.26
71	2.05	2.35	2.55	2.66	2.96	3.28	4.08	4.91	4.91
72	2.24	2.54	2.72	2.72	3.16	3.37	5.20	5.14	5.14
73	2.00	2.30	2.50	2.55	3.05	3.19	3.87	4.89	4.89
74	1.90	2.10	2.35	2.51	2.83	3.07	3.81	4.42	4.42
75	2.00	2.25	2.45	2.53	2.88	3.05	3.93	4.55	4.55
76	2.10	2.40	2.50	2.57	2.97	3.11	4.06	4.95	4.95
77	2.10	2.40	2.40	2.72	3.18	3.23	4.45	5.33	5.33
78	2.30	2.85	2.90	2.66	3.31	3.37	4.18	5.56	5.56
79	1.80	2.20	2.30	2.27	2.75	2.89	3.55	4.54	4.54
80	2.05	2.40	2.50	2.73	3.18	3.30	4.51	5.47	5.47
81	2.05	2.35	2.45	2.42	2.82	2.97	4.77	5.74	5.74
82	1.55	1.90	2.10	2.28	2.63	2.91	4.06	4.89	4.89
83	1.60	1.90	2.20	2.51	2.91	3.26	4.96	6.06	7.07
84	1.80	2.05	2.35	2.75	3.19	3.59	5.89	7.21	7.21
85	1.80	2.05	2.35	2.75	3.19	3.59	5.89	7.21	7.21
86	1.80	2.05	2.35	2.75	3.19	3.59	5.89	7.21	7.21
87	1.80	2.05	2.35	2.75	3.19	3.59	5.89	7.21	7.21

TABLE-10HYDROLOGIC SOIL GROUPS

<u>GROUP-A</u>	<u>GROUP-B</u>	<u>GROUP-C</u>	<u>GROUP-D</u>
(Low runoff potential). Soils having high infiltration rates even when thoroughly wetted and consisting chiefly of deep, well-to-excessively-drained sands or gravels. These soils have a high rate of water transmission.	Soils having moderate infiltration rates when thoroughly wetted and consisting chiefly of moderately deep to deep, moderately well to well-drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission.	Soils having slow infiltration rates when thoroughly wetted and consisting chiefly of soils with a layer that impedes downward movement of water, or soils with moderately fine to fine texture. These soils have a slow rate of water transmission.	(High runoff potential). Soils having very slow infiltration rates when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These have a very slow rate of water transmission.

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TABLE-11

RUNOFF CURVE NUMBERS (CN) FOR HYDROLOGICSOIL COVER COMPLEXES(For Watershed Condition AMC-II and  $I_a=0.2S$ )

Land use or cover	Treat- ment or practice	Hydrologic condition for infil- tration	Hydrologic soil group			
			A	B	C	D
1	2	3	4			
Fallow	SR		77	86	91	94
Row crops	SR	Poor	72	81	88	91
	SR	Good	67	78	85	89
	C	Poor	70	79	84	88
	C	Good	65	75	82	86
	C&T	Poor	66	74	80	82
	C&T	Good	62	71	78	81
Small grain	SR	Poor	65	76	84	88
	SR	Good	63	75	83	87
	C	Poor	63	74	82	85
	C	Good	61	73	81	84
	C&T	Poor	61	72	79	82
	C&T	Good	59	70	78	81
Close-seeded Legumes <sup>(1)</sup> or Rotation meadow	SR	Poor	66	77	85	89
	SR	Good	58	72	81	85
	C	Poor	64	75	83	85
	C	Good	55	69	78	83
	C&T	Poor	63	73	80	83
	C&T	Good	51	67	76	80
Pasture or range		Poor	68	79	86	89
		Fair	49	69	79	84
		Good	39	61	74	80
	C	Poor	47	67	81	88
	C	Fair	25	59	75	83
	C	Good	6	35	70	79
Meadow (Permanent)		Good	30	58	71	78
		Poor	45	66	77	83

TABLE-11

1	2	3	4			
Woods (farm	Fair	Fair	36	60	73	77
Woodlots).		Good	25	55	70	77
Farmsteads			59	74	82	86
Roads (dirt) <sup>(2)</sup>	(hard surface) <sup>(2)</sup>		72	82	87	89
1. Close drilled or broad-cast			74	84	90	92
2. Including right -of-way						

SR = Straight row

C = Contoured.

T = Terraced

C&T= Contoured and terraced.

Note: Reproduced from U.S.Bureau of Reclamation

'Design of Small Dams'

TABLE -12

CURVE NUMBERS (CN) AND CONSTANTS  
(FOR THE CASE  $I_a = 0.2 S$ )

CN for con- dition-II	CN for condition I	S values inches	Curve starts where P=inches	CN for con- dition-II	CN for condition I	S values inches	Curve starts where P=inches		
1	2	3	4	1	2	3	4		
100	100	100	0	0.0	61	41	78	6.39	1.28
99	97	100	.101	.02	60	40	78	6.67	1.33
98	94	99	.204	.04	59	39	77	6.95	1.39
97	91	99	.309	.06	58	38	76	7.24	1.45
96	89	99	.417	.08	57	37	75	7.54	1.51
95	87	98	.526	.11	56	36	75	7.86	1.57
94	85	98	.638	.13	55	35	74	8.18	1.64
93	83	98	.753	.15	54	34	73	8.52	1.70
92	81	97	.870	.17	53	33	72	8.87	1.77
91	80	97	.989	.22	52	32	71	9.23	1.85
90	78	96	1.11	.22	51	31	70	9.61	1.92
89	76	96	1.24	.25	50	31	70	10.0	2.00
88	75	95	1.36	.27	49	30	69	10.4	2.08
87	73	95	1.49	.30	48	29	68	10.8	2.16
86	72	94	1.63	.33	47	28	67	11.3	22.26
85	70	94	1.76	.35	46	27	66	11.7	2.34
84	68	93	1.90	.38	45	26	65	12.2	2.44
83	67	93	2.05	.41	44	25	64	12.7	2.54
82	66	92	2.20	.44	43	25	63	13.2	2.64
81	64	92	2.34	.47	42	24	62	13.8	2.76
80	63	91	2.50	.50	41	23	61	14.4	2.88
79	62	91	2.66	.53	40	22	60	15.0	3.00
78	60	90	2.82	.56	39	21	59	15.6	3.12
77	59	89	2.99	.60	38	21	58	16.3	3.26
76	58	89	3.16	.63	37	20	57	17.0	3.40
75	57	88	3.33	.67	36	19	56	17.8	3.56
74	55	88	3.51	.70	35	18	55	18.6	3.72
73	54	87	3.70	.74	34	18	54	19.4	3.88
72	53	86	3.89	.78	33	17	53	20.3	4.06

TABLE-12

1	2	3	4	5	1	2	3	4	5
71	53	86	3.89	.82	32	16	52	21.2	4.24
70	51	85	4.28	.86	31	16	51	22.2	4.44
69	50	84	4.49	.90	30	15	50	23.3	4.66
68	48	84	4.70	.94	25	12	43	30.0	6.00
67	47	83	4.92	.98	20	9	37	40.0	8.00
66	46	82	5.15	1.03	15	6	30	56.7	11.34
65	45	82	5.38	1.08	10	4	22	90.0	18.00
64	44	81	5.62	1.12	5	2	13	190.0	38.00
63	43	80	5.87	1.17	0	0	0	in- finity	in- finity
62	42	79	6.13	1.23					

Note Reproduced from U.S. Bureau of Reclamation

'Design of Small Dams.'

TABLE - 13

AREA RAINFALL DISTRIBUTION AND DIRECT RUN-OFF (5,10, & 50 YEAR RECURRENCE PERIOD )

(Soil Complex Method)

Sub-catchment No	Phase (Salinity Waterlogging & Sand Dunes) % Area	Hydrologic Con- dition for infiltration	Hydrologic Soil Group	5 Years Storm distribution			10 Years Storm distribution			50 Years Storm distribution		
				Storm Run-off (inches)			Storm Run-off (inches)			Storm Run-off (inches)		
				1	2	3	1	2	3	1	2	3
				day	days	days	day	days	days	day	days	days
1	2	3	4	5	6	7	8	9	10	11	12	13
1	SSS20 WL 10	Good	B	0.35	0.30	0	0.75	0.38	0.03	1.82	1.31	0
2	SSS WL25	Good	B	0.25	0.20	0.05	0.55	0.30	0.02	1.12	1.28	0.02
3	SSS WL20	Good	B	0.23	0.06	0.02	0.54	0.20	0.04	1.30	0.65	0
4	SSS WL30	Good	B	0.20	0.15	0.03	0.35	0.40	0.15	1.00	1.10	0.08
5	-	Good	B	0.17	0.25	0.09	0.34	0.60	0.20	0.95	1.45	0.17
6	-	Good	B	0.20	0.22	0.02	0.35	0.65	0.12	1.00	1.45	0.13
7	SSS WL20	Good	B	0.23	0.18	0	0.50	0.55	0.03	1.12	1.35	0
8	SSS WL30	Good	B	0.23	0.13	0	0.50	0.40	0	1.10	0.43	0
9	-	Good	B	0.23	0.18	0	0.50	0.50	0	1.12	1.35	0
10	-	Good	B	0.23	0.15	0	0.40	0.23	0	1.10	0.64	0
11	-	Good	B	0.10	0	0	0.27	0.20	0.05	1.02	0.31	0
12	-	Good	B	0.18	0.18	0	0.38	0.23	0	1.09	0.57	0
13	-	Good	B	0.26	0.11	0	0.39	0.26	0	1.04	0.42	0
14	-	Good	B	0.10	0.10	0	0.27	0.16	0.05	1.02	0.31	0
15	-	Good	B	0.15	0.15	0	0.35	0.30	0	1.04	0.40	0
16	-	Good	B	0.10	0.10	0	0.27	0.16	0.05	1.02	0.31	0
17	-	Good	B	0.10	0.10	0	0.27	0.16	0.05	1.02	0.31	0
18	-	Good	B	0.10	0.08	0	0.27	0.16	0.05	1.62	0.31	0
19	-	Good	B	0.17	0	0	0.34	0.60	0.05	1.05	0.75	0
20	SSS15	Good	B	0.20	0.21	0	0.38	0.50	0	1.10	1.36	0
21	SSS5	Good	B	0.19	0.75	0	0.38	0.70	0	1.11	2.00	0
22	-	Good	B	0.17	0.13	0	0.35	0.50	0	1.90	1.54	0



## Barkat, Mashhadi &amp; Maqsood

TABLE-13

1	2	3	4	5	6	7	8	9	10	11	12	13
23	-	Good	B	0.18	0.22	0	0.38	0.67	0	1.10	1.90	0
24	-	Good	B	0.11	0.03	0	0.29	0.15	0	1.04	0.50	0
25	-	Good	B	0.11	0.03	0	0.29	0.15	0	1.04	0.50	0
26	-	Good	B	0.11	0.03	0	0.29	0.15	0	1.08	0.49	0
27	-	Good	B	0.15	0.02	0	0.36	0.13	0	1.37	0.40	0
28	SSS50	Poor	B	0.20	0.05	0	0.55	0.20	0	1.72	0.84	0
29	-	Good	B	0.15	0.02	0	0.36	0.13	0	1.37	0.45	0
30	-	Good	B	0.14	0.02	0	0.36	0.13	0	1.32	0.42	0
31	-	Good	B	0.11	0.03	0	0.35	0.12	0	1.12	0.48	0
32	-	Good	B	0.15	0.02	0	0.36	0.13	0	1.37	0.42	0
33	-	Good	B	0.15	0.02	0	0.36	0.13	0	1.37	0.42	0
34	-	Poor	B	0.20	0.05	0	0.55	0.20	0	1.83	0.25	0
35	-	Good	B	0.15	0.02	0	0.36	0.13	0	1.37	0.39	0
36	-	Good	B	0.16	0.01	0	0.36	0.13	0	1.37	0.39	0
37	-	Good	B	0.30	0.05	0	1.00	0.10	0	3.28	1.00	0
38	-	Good	B	0.23	0	0	0.70	0	0	1.50	0.05	0
39	-	Good	B	0.20	0	0	0.50	0	0	1.82	0.28	0
40	-	Good	B	0.20	0	0.02	0.51	0.07	0	1.17	0.32	0
41	-	Good	B	0.20	0	0	0.49	0.01	0	1.48	0.67	0
42	-	Good	B	0.18	0	0	0.43	0.01	0	1.45	0.15	0
43	-	Good	B	0.18	0	0	0.40	0.03	0	1.60	0.08	0
44	-	Good	B	0.20	0	0	0.65	0.12	0	3.40	1.07	0
45	-	Good	B	0.17	0	0	0.44	0.01	0	1.78	0.42	0
46	-	Good	B	0.11	0.02	0	0.36	0.07	0	1.30	0.35	0
47	-	Good	B	0.11	0.02	0	0.35	0.01	0	1.30	0.35	0
48	-	Good	B	0.14	0	0	0.33	0.01	0	1.37	0.30	0
49	-	Good	B	0.05	0	0	0.13	0.07	0	0.62	0.30	0
50	-	Good	B	0	0	0	0.10	0.01	0	0.55	0.30	0
51	-	Good	B	0	0	0	0.10	0.04	0	0.55	0.30	0
52	-	Good	B	0	0	0	0.10	0.04	0	0.55	0.30	0
53	-	Good	B	0	0	0	0.10	0.04	0	0.55	0.30	0
54	-	Good	B	0	0	0	0.10	0.04	0	0.55	0.30	0
55	SSS25	Good	B	0.12	0	0	0.13	0.03	0	1.42	0.63	0
56	SD5	Good	B	0	0	0	0.10	0.04	0	0.55	0.30	0
57	-	Good	B	0	0	0	0.03	0	0	0.46	0.15	0
58	SD5	Good	B	0	0	0	0.03	0	0	0.46	0.15	0
59	-	Good	B	0	0	0	0.01	0.03	0	1.38	0.49	0
60	-	Good	B	0	0	0	0.20	0.03	0	1.30	0.44	0

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61	-	Good	B	0	0	0	0.13	0.03	0	0.62	0.26	0
62	SD5	Good	B	0	0	0	0.16	0.03	0	1.08	0.40	0
63	SD5	Good	B	0	0	0	0.14	0.03	0	0.59	0.27	0
64	SD50	Good	B	0	0	0	0.16	0.03	0	0.58	0.28	0
65	-	Good	B	0	0	0	0.03	0	0	0.46	0.15	0
66	SD20	Good	B	0	0	0	0.10	0.01	0	0.50	0.18	0
67	SD50	Good	B	0	0	0	0.12	0.01	0	0.65	0.27	0
68	-	Good	B	0	0	0	0.03	0	0	0.46	0.15	0
69	SD50	Good	B	0	0	0	0.03	0	0	0.46	0.15	0
70	SD50	Good	B	0	0	0	0.01	0	0	0.40	0.16	0
71	SD5	Good	B	0	0	0	0	0	0	0.36	0.18	0
72	SD	Good	B	0	0	0	0.03	0	0	0.46	0.15	0
73	SD25	Good	B	0	0	0	0.02	0	0	0.30	0.13	0
74	SD5	Good	B	0	0	0	0.01	0	0	0.28	0	0
75	SD20	Good	B	0	0	0	0.02	0	0	0.31	0	0
76	SD20	Good	B	0	0	0	0.02	0	0	0.35	0.09	0
77	-	Good	B	0	0	0	0.03	0.01	0	0.48	0.09	0
78	SD50	Good	B	0	0	0	0.02	0.02	0	0.38	0.32	0
	WL5											
79	-	Good	B	0	0	0	0	0	0	0.20	0.11	0
80	-	Good	B	0	0	0	0.03	0	0	0.51	0.10	0
81	-	Good	B	0	0	0	0	0	0	0.60	0.10	0
82	SSS20	Good	B	0	0	0	0.01	0	0	0.35	0.17	0
83	-	Good	B	0	0	0	0.02	0	0	0.68	0.18	0
84	-	Good	B	0	0	0	0.02	0	0	1.10	0.30	0
85	-	Good	B	0	0	0	0.02	0	0	1.10	0.30	0
86	-	Good	B	0	0	0	0.02	0	0	1.10	0.30	0
87	SSS10	Good	B	0	0	0	0.02	0	0	1.10	0.03	0

SSS = Severely Saline Lands or Spots

WL = Water Logged Land

SD = Sand Dunes

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TABLE-14

PEAK RUNOFF FOR CONTRIBUTORY DRAINAGE SUB-CATCHMENTS (5,10 & 50 YEARS RECURRENCE PERIODS)  
(Triangular Unit Hydrograph Method)

Sub-catchment No.	Drainage Area (A) (Sq. Miles)	$T_C = \frac{D}{11.9 L^3} \cdot 385$ (Hrs)	$T_P = \frac{D}{2} + 0.6 T_C$ (Hrs)	$T_b = 2.67 T_P$ (Hrs)	$Q_p = \frac{484 A X O}{T_P}$ (Cusecs)	5 Years Peak Discharge (Cusecs)	Runoff Factor (Cs./Sq.Mile)	10 Years Peak Discharge (Cusecs)	Runoff Factor (Cs./Sq.Mile)	50 Years Peak Discharge (Cusecs)	Runoff Factor (Cs./Sq.Mile)
1	2	3	4	5	6	7	8	9	10	11	12
1	256	39.30	35.42	94.57	3498	1775	6.9	3100	12.1	8400	32.8
2	97	17.55	22.53	60.16	2084	595	6.1	1146	11.8	3560	36.7
3	58	29.51	29.70	79.30	945	230	4.0	575	9.9	350	23.3
4	20	3.80	14.28	38.13	678	136	6.8	271	13.6	678	33.9
5	48	18.60	23.16	61.84	1003	305	6.4	736	15.3	1845	38.4
6	49	33.17	31.90	85.17	743	262	5.4	668	13.6	1545	31.5
7*	33	13.25	19.95	53.27	291	72	2.2	188	5.7	487	14.8
8	85	29.07	29.44	78.60	1397	350	4.1	925	10.9	1780	20.9
9	9	6.96	16.17	43.17	269	62	6.9	153	17.0	392	43.6
10	33	21.16	24.69	65.92	647	170	5.2	265	8.0	725	22.0
11*	4	7.82	16.69	44.56	116	12	2.9	31	7.8	118	29.5
12	81	43.60	38.16	101.89	1027	303	3.7	475	5.9	1325	16.4
13*a	116	26.24	27.74	74.07	2024	570	4.9	906	7.8	2300	19.8
13 b	42	13.96	20.38	54.41	997	259	6.2	389	9.3	1150	27.4
14*	7	5.65	15.39	41.09	220	22	3.2	59	8.4	225	32.1
15*	39	22.87	25.72	68.75	734	155	4.0	355	9.1	775	19.9
16*	35	23.21	25.92	69.21	654	96	2.7	180	5.1	685	19.6
17*	31	13.81	20.28	54.15	740	105	3.4	210	6.8	755	24.4
18	19	24.63	26.78	71.50	343	44	2.3	104	5.5	364	19.2
19	24	16.11	21.66	57.83	539	91	3.8	400	16.7	585	24.4
20	149	31.69	31.01	82.80	2326	750	5.0	1640	11.0	4579	30.7
21	43	16.86	22.12	59.06	941	296	6.7	775	18.0	2260	52.5
22	18	10.63	18.38	49.07	474	81	4.5	275	15.3	850	47.2

\* Contribution from these sub-catchment will discharge into inlets already existing at B.S.Link.

\*\* $Q_p$  in Col. 6 represents the runoff with 1" excess rainfall, taken for the Unit Hydrograph.

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TABLE -14

1	2	3	4	5	6	7	8	9	10	11	12
23	49	14.18	20.50	54.74	1157	340	6.9	925	18.9	2600	53.1
24	7	14.23	20.54	54.84	165	18	2.6	48	6.9	172	24.6
25	18	19.25	23.55	62.80	370	41	2.3	107	5.9	385	21.4
26	40	19.40	23.64	63.12	819	90	2.3	237	5.9	885	22.1
27	7	14.40	20.64	55.11	164	25	3.5	59	8.4	225	32.1
28	54	15.99	21.59	57.65	1210	242	4.5	666	12.3	2083	38.6
29	7	18.64	17.18	45.87	197	30	4.2	71	10.1	270	38.6
30	33	19.79	23.87	63.73	669	94	2.8	241	7.3	883	26.8
31	428	39.95	35.97	96.04	5759	684	1.6	2230	5.2	2500	17.5
32	24	11.57	18.94	50.57	613	92	3.8	221	9.2	840	35.0
33	80	35.82	33.49	89.42	1156	180	2.3	455	5.7	1740	21.8
34	3	9.22	17.53	46.81	83	17	5.5	46	15.3	152	50.7
35	38	12.70	19.62	52.39	937	141	3.7	337	18.9	1285	33.8
36	5	4.66	14.86	39.68	163	26	5.2	59	11.8	223	44.6
37	40	15.37	21.22	56.66	912	274	6.8	912	22.8	2993	74.8
38	13	8.07	16.84	44.96	374	86	6.6	262	20.2	560	43.1
39	13	17.57	22.54	60.18	279	56	4.3	140	10.8	508	39.1
40	20	9.82	17.89	47.77	541	108	5.4	276	13.8	633	31.7
41	50	21.50	24.90	66.48	972	194	3.9	476	9.5	1438	28.8
42	25	13.81	20.29	54.17	596	107	4.3	256	10.2	865	34.6
43	168	51.74	42.04	112.25	1934	348	2.1	774	4.6	3200	19.1
44	35	15.51	21.30	56.87	795	158	4.5	517	14.8	2705	77.3
45	54	22.51	25.32	67.60	1032	176	3.3	454	8.4	1840	34.1
46	15	16.99	22.19	56.25	327	36	2.4	118	7.9	425	28.3
47	30	9.04	17.42	46.51	834	92	3.1	292	9.7	1084	36.1
48	34	8.62	17.17	45.84	958	134	3.0	316	9.3	1313	38.6
49	25	14.89	20.3	55.88	578	29	1.2	75	3.0	358	14.3
50	6	4.96	14.98	40.00	194	0	0	19	3.2	107	17.8
51	12	8.95	17.37	46.38	334	0	0	33	2.8	184	15.3
52	9	14.71	20.83	55.62	209	0	0	20	2.2	115	12.8
53	9	6.61	15.97	42.64	273	0	0	27	3.0	150	16.7
54	9	12.05	19.23	51.34	227	0	0	23	2.6	125	13.9
55	328	39.30	35.58	95.00	4462	0	0	625	1.9	5250	16.0

TABLE - 14

1	2	3	4	5	6	7	8	9	10	11	12
56	26	13.21	19.93	53.21	631	0	0	63	1.7	347	13.3
57*	4	4.36	14.59	38.96	134	0	0	4	1.0	61	15.3
58*	54	3.75	14.25	38.05	136	0	0	4	1.0	63	15.8
59	78	22.49	34.49	92.09	1095	0	0	52	0.7	1690	21.7
60*	27	13.51	20.10	53.67	650	13	0.5	130	4.8	845	31.3
61*	33	14.23	20.53	54.82	778	0	0	101	3.1	482	14.6
62	354	45.22	39.13	104.48	4379	87	0.3	750	2.1	5275	14.9
63	38	20.55	24.33	64.96	756	0	0	106	2.8	446	11.7
64	48	26.43	27.86	74.39	834	0	0	136	2.2	517	10.8
65	7	6.04	15.62	41.71	217	0	0	7	1.0	100	14.3
66	22	14.99	20.99	56.04	507	0	0	51	2.3	254	11.6
67	75	19.52	23.71	63.31	1531	0	0	184	2.5	995	13.3
68	5	27.05	28.23	75.37	86	0	0	3	0.6	41	8.2
69	10	4.62	14.77	39.44	328	0	0	10	1.0	151	15.1
70	19	8.96	17.97	46.38	529	0	0	5	0.3	212	11.2
71	27	17.46	22.47	59.99	582	0	0	0	0.0	209	7.7
72	231	32.35	31.40	83.84	3561	0	0	17	0.1	1760	7.6
73	74	22.89	25.73	68.70	1392	0	0	71	1.0	422	5.7
74	21	13.18	19.90	53.13	511	0	0	14	0.7	143	6.8
75	160	11.00	18.60	49.66	4163	0	0	83	0.5	1291	8.1
76	122	13.50	20.10	53.67	530	0	0	11	0.5	185	8.4
77	44	16.50	21.90	58.47	972	0	0	29	0.7	467	10.6
78	566	57.21	46.32	123.67	5914	0	0	212	0.4	3500	6.2
79	143	32.84	31.70	84.64	2183	0	0	0	0.0	475	3.3
80	70	22.21	25.32	67.60	1338	0	0	40	0.6	700	10.0
81	56	20.38	27.23	72.70	995	0	0	0	0.0	597	10.7
82	267	33.30	31.98	85.39	4041	0	0	40	0.2	1490	5.6
83	22	24.00	26.64	71.13	400	0	0	8	0.4	280	12.7
84	19	19.49	23.69	63.25	388	0	0	8	0.4	427	22.5
85	23	18.09	22.85	61.01	487	0	0	10	0.4	536	23.3
86	17	15.27	21.16	56.50	389	0	0	8	0.5	428	25.2
87	74	38.00	34.80	92.52	1029	0	0	21	0.3	1225	16.6

\* Contribution from these sub-catchments will discharge into inlets already existing at S.M.Link.

Paper No.433

TABLE-15

## SUKH BEAS MAIN DRAIN

ROUTED DISCHARGES WITH PANDOKI DRAINAGE  
SYSTEM OUTFALLING INTO SUKH BEAS

Reach R.D. (thousand feet)	Length of Reach (thou- sand feet)	Dis - charge (Cs.)	Loss in Reach QA= 0.0133LQ <sup>1.5625</sup>	Accumu- lative Losses Col.4+ 5 of previous Reach	Actual Dis- charge Col.3-5 (Cs)	Design Dis- charge (Cs)	Adopted Designed Discharge (Cs.)
1	2	3	4	5	6	7	8
1113 to 1043	70	1705	61	-	1705	1800	1807
1043 to 1027	16	1861	16	61	1800	1800	1807
1027 to 979	48	2140	55	77	2063	2109	2104
979 to 976	3	2226	3	132	2094	2109	2104
976 to 928	48	2244	55	135	2109	2109	2104
928 to 919	9	2417	10	190	2227	2444	2437
919 to 892	27	2609	31	200	2409	2444	2437
892 to 868	24	2582	33	231	2351	2444	2437
868 to 848	20	2574	19	264	2310	2444	2454
848 to 816	32	2727	38	283	2444	2444	2454
816 to 801	15	2699	37	321	2378	2444	2454
801 to 777	24	2893	4	358	2535	2535	2547
777 to 730	47	2784	49	362	2422	2535	2547
730 to 720	10	2903	11	411	2481	2535	2547
720 to 681	39	2828	41	422	2406	2535	2547
681 to 676	5	2800	5	463	2337	2535	2547
676 to 666	10	2688	11	468	2220	2535	2547
666 to 655	11	2841	11	479	2362	2535	2547
655 to 631	24	2633	24	490	2143	2535	2547
631 to 621	10	2650	10	514	2136	2535	2547
621 to 601	20	2662	21	524	2138	2535	2547
601 to 590	11	2629	10	545	2084	2535	2547
590 to 550	40	2716	40	555	2161	2535	2547
550 to 537	13	2749	13	595	2154	2535	2547
537 to 501	36	2749	36	608	2141	2535	2547
501 to 496	5	2616	5	644	1972	2535	2547

TABLE-15

1	2	3	4	5	6	7	8
496 to 490	6	2657	6	649	2008	2535	2547
490 to 487	3	2670	3	655	2015	2535	2547
487 to 469	18	2672	18	658	2014	2535	2547
469 to 455	14	2773	14	676	2097	2535	2547
455 to 445	10	2796	10	600	2106	2535	2547
445 to 425	20	1601	10	700	1981	2535	2547
425 to 419	6	1730	6	719	2011	2535	2547
419 to 414	5	2769	5	725	2044	2535	2547
414 to 398	16	2816	16	730	2086	2535	2547
398 to 380	18	2777	18	746	2031	2535	2547
380 to 374	6	2746	6	764	1982	2535	2547
374 to 352	20	2694	20	770	1924	2535	2547
352 to 342	10	2735	10	790	1945	2535	2547
342 to 306	36	2708	35	800	1908	2535	2547
306 to 289	17	2656	16	835	1821	2535	2547
289 to 247	42	2637	38	851	1786	2535	2547
247 to 211	36	2626	24	889	1737	2535	2547
211 to 000	211	2593	190	913	1680	2535	2550

Paper No.433

TABLE-16

SUKH BEAS MAIN DRAIN

ROUTED DISCHARGES WITH PANDOKI DRAINAGE SYSTEM DIVERTED  
STRAIGHT TO SUTLEJ RIVER D/S OF FEROTZEPUR HEADWORKS

Tribu- tary Drain No.	Catch- ment No.	Reach	R. D.	Length thou- sand feet	Discha- rge cusecs	Discharge excluding losses (cusecs)	Adopted Q (cusecs)
1	2	3		4	5	6	7
1	2	1053+000	to 997+000	56	595	595	600
2	4	997+000	to 989+000	8	652	622	600
3	5	989+000	to 939+000	50	949	889	1200
4	6	939+000	to 929+000	10	1224	1157	1200
5	8	929+000	to 899+000	30	1424	1332	1400
6	10	899+000	to 868+000	31	1542	1428	1400
7	9	869+000	to 851+000	17	1542	1428	1400
8	12	851+000	to 815+000	36	1772	1621	1600
9	18	815+000	to 801+000	14	1820	1660	1600
10	13b	801+000	to 776+000	25	1833	1660	1600
11	19	776+000	to 730+000	46	1747	1641	1600
12	20	730+000	to 720+000	10	2160	1992	2000
13	21	720+000	to 682+000	38	2021	1992	2000
14	25	682+000	to 676+000	6	2046	1815	2000
15	22	676+000	to 666+000	10	2027	1900	2000
16	23	666+000	to 655+000	11	2124	1847	2000
17	24	655+000	to 631+000	24	1925	1783	2000
18	26	631+000	to 621+000	10	1913	1723	2000
19	27	621+000	to 601+000	20	1881	1671	2000
20	28	601+000	to 591+000	10	2000	1790	2000
21	29	591+000	to 551+000	40	1930	1673	2000
22	30	551+000	to 537+000	14	1930	1679	2000
23	31	537+000	to 503+000	34	2062	1830	2000
24	32	503+000	to 497+000	6	2051	1750	2000
25	34	497+000	to 491+000	6	2217	1910	2000
26	33	491+000	to 487+000	4	2092	1782	2000
27	35	487+000	to 469+000	18	2158	1843	2000
28	36	469+000	to 455+000	14	2064	1748	2000
29	37	455+000	to 445+000	10	2042	1671	2000
30	38	445+000	to 425+000	20	2097	1713	2000



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TABLE-16

<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>
31	39	425+000 to 419+000	6	2100	1714	2000
32	40	419+000 to 412+000	7	2094	1704	2000
33	41	412+000 to 398+000	14	2054	1660	2000
34	44	398+000 to 380+000	18	1979	1584	2000
35	42	380+000 to 374+000	6	1997	1557	2000
36	43	374+000 to 352+000	22	2028	1570	2000
37	45	352+000 to 342+000	10	2028	1564	2000
38	46	342+000 to 307+000	35	1972	1500	2000
39	47	307+000 to 289+000	18	1954	1460	2000
40	48	289+000 to 247+000	36	1965	1424	2000
41	49	247+000 to 0+000	247	1755	1078	2000

TABLE-17

COMPARISON OF ROUTED DISCHARGES  
IN SUKH BEAS MAIN DRAIN

Reach RD(1000 Ft)		Reach Length (1000 feet)	Contri- buting catch- ment Nos.	Triangular Unit Hydro- graph for storm du- ration of 24 hours (Adopted Method)	SCS Empirical Formula $Q=CM^{5/6}$	Triangular Unit Hydro- graph with expected Unit-time Duration. $D=2T_c^{0.5}$
Head	Tail					
PANDOKI	DIVERSION		1,3	1775+225= 2000	2030+280= 2310	1930+560= 2490
1053	997	56	2	595	905	797
997	989	8	4	622	735	930
989	939	50	5	889	794	1254
939	929	10	6	1157	959	1513
929	899	30	8	1332	1662	1833
899	868	31	10	1428	1662	1774
868	851	17	9	1428	1790	1701
851	815	36	12	1621	2323	1975
815	801	14	18	1660	2421	1967
801	776	25	13b	1660	2421	2003
776	730	46	19	1641	2302	2003
730	720	10	20	1992	2440	2492
720	682	38	21	1992	2440	2492

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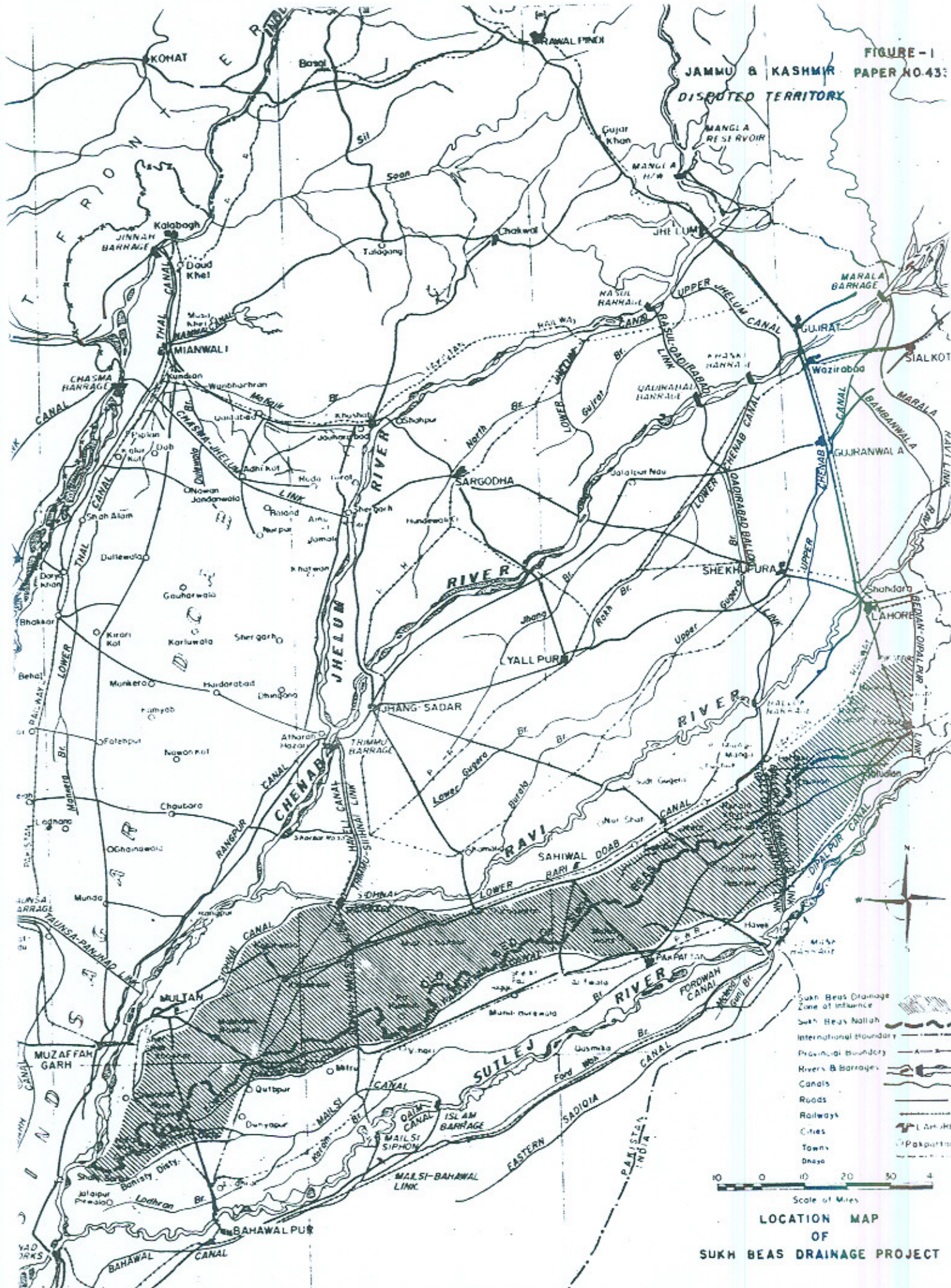
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JAMMU & KASHMIR  
DISPUTED TERRITORY




LOCATION MAP  
OF  
SUKH BEAS DRAINAGE PROJECT

FIGURE - 2  
PAPER NO.433



**LEGEND**

- INTERNATIONAL BOUNDARY NOT NOW IN DISPUTE.
- - - - - DISPUTED INTERNATIONAL BOUNDARY OR INTERNAL BOUNDARY.
- ..... KASHMIR CEASE FIRE LINE.
-  BARRAGES.

SUKH BEAS DRAINAGE PROJECT  
PLAN SHOWING OLD BED OF BEAS RIVER  
WITH RESPECT TO INDUS RIVER SYSTEM







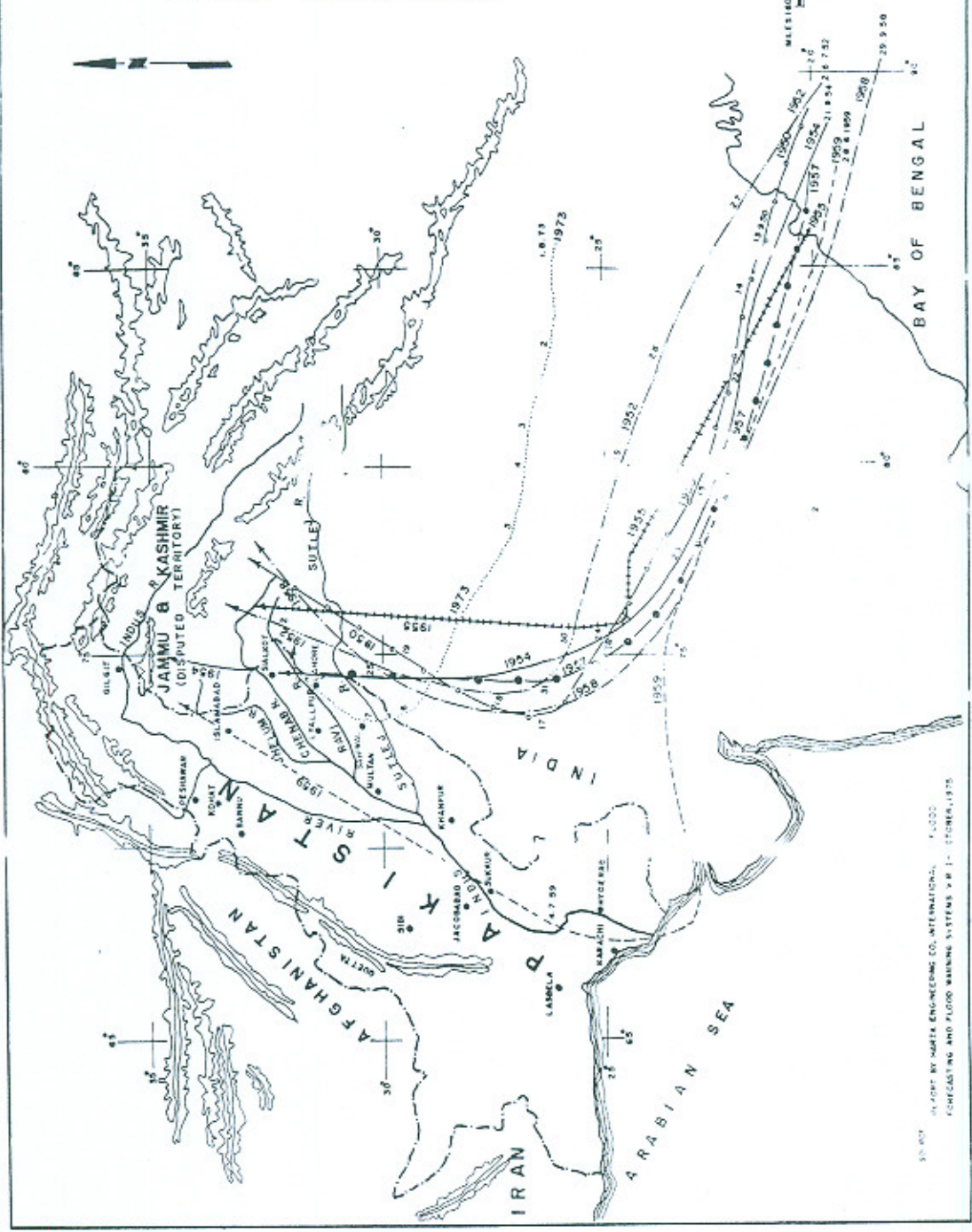
SUKH BEAS DRAINAGE PROJECT  
SUB CATCHMENTS  
SELECTED RAIN-GAUGE STATIONS  
THEISSEN POLYGONS  
SHEET 2092

LEGEND

- International Boundary
- Mountains
- City
- River

STORM TRACKS

- 1950
- 1952
- 1954
- 1955
- 1957
- 1958
- 1959
- 1973



SUKH BEAS DRAINAGE PROJECT  
TRACKS OF MONSOON DEPRESSIONS  
THAT CAUSED FLOODS IN PAKISTAN

PREPARED BY WATER ENGINEERING CO. INTERNATIONAL, PUNJAB  
FORECASTING AND FLOOD WARNING SYSTEMS, P.M. 1-1, STORMS, 1975



SON BEAS DRAINAGE PROJECT  
 PROJECT AREA  
 LANDFORMS AND SOILS



Legend

- 1. Contour Interval
- 2. Contour Line
- 3. Spot Elevation
- 4. Contour Line Break
- 5. Contour Line Extension

Masses

- 1. Shaded Mass
- 2. Shaded Mass
- 3. Shaded Mass
- 4. Shaded Mass
- 5. Shaded Mass

Feature Classification

- 1. Public Boundary of Land in Fee Owner Possession
- 2. Public Boundary of Water in Ownership of State
- 3. Public Boundary of Water in Ownership of State
- 4. Public Boundary of Water in Ownership of State
- 5. Public Boundary of Water in Ownership of State

Feature Classification (Surface Material)

- 1. Clay Surface
- 2. Shaded Mass
- 3. Shaded Mass
- 4. Shaded Mass
- 5. Shaded Mass

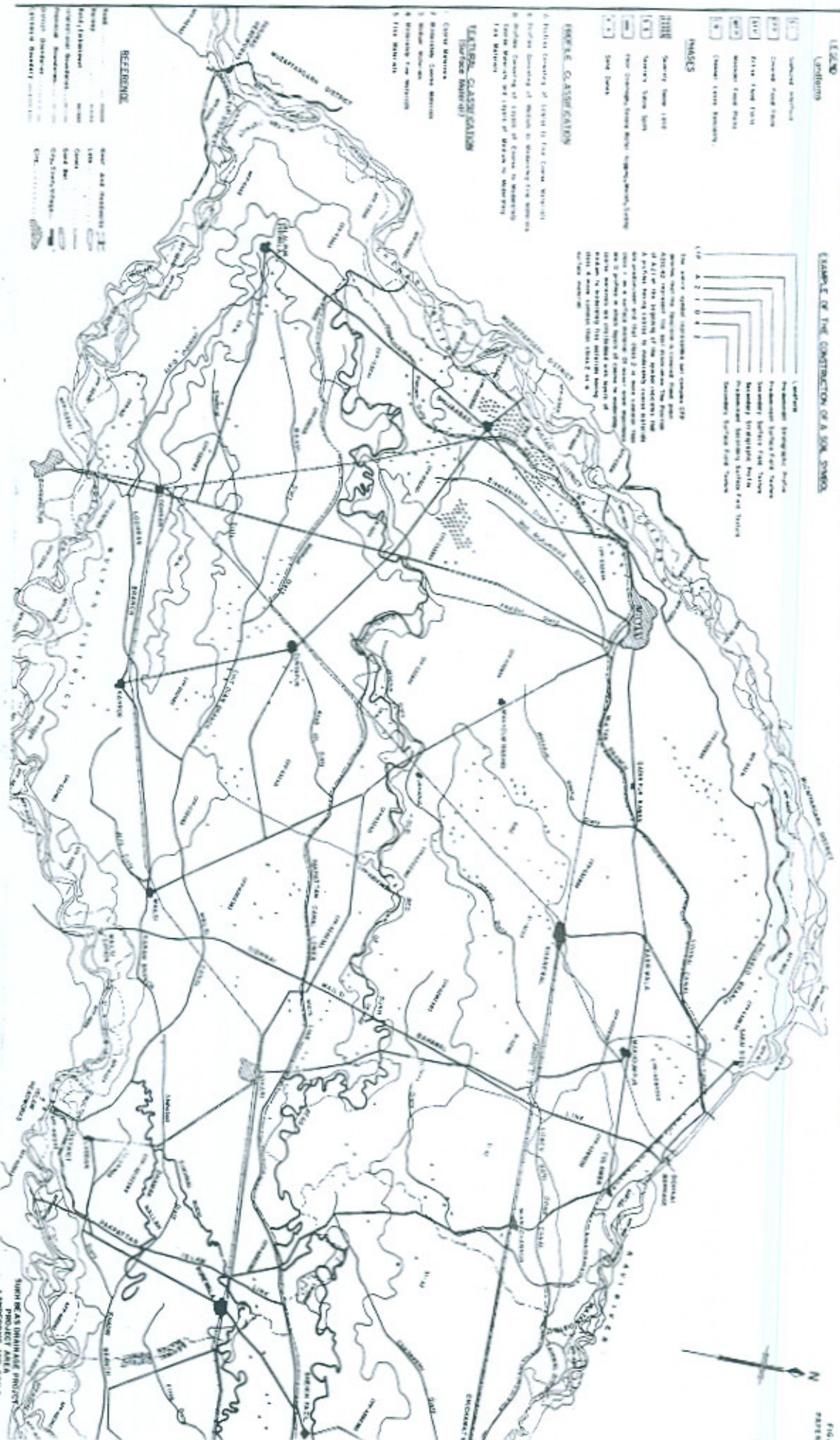
Reference

- 1. Contour Interval
- 2. Contour Line
- 3. Spot Elevation
- 4. Contour Line Break
- 5. Contour Line Extension
- 6. Shaded Mass
- 7. Shaded Mass
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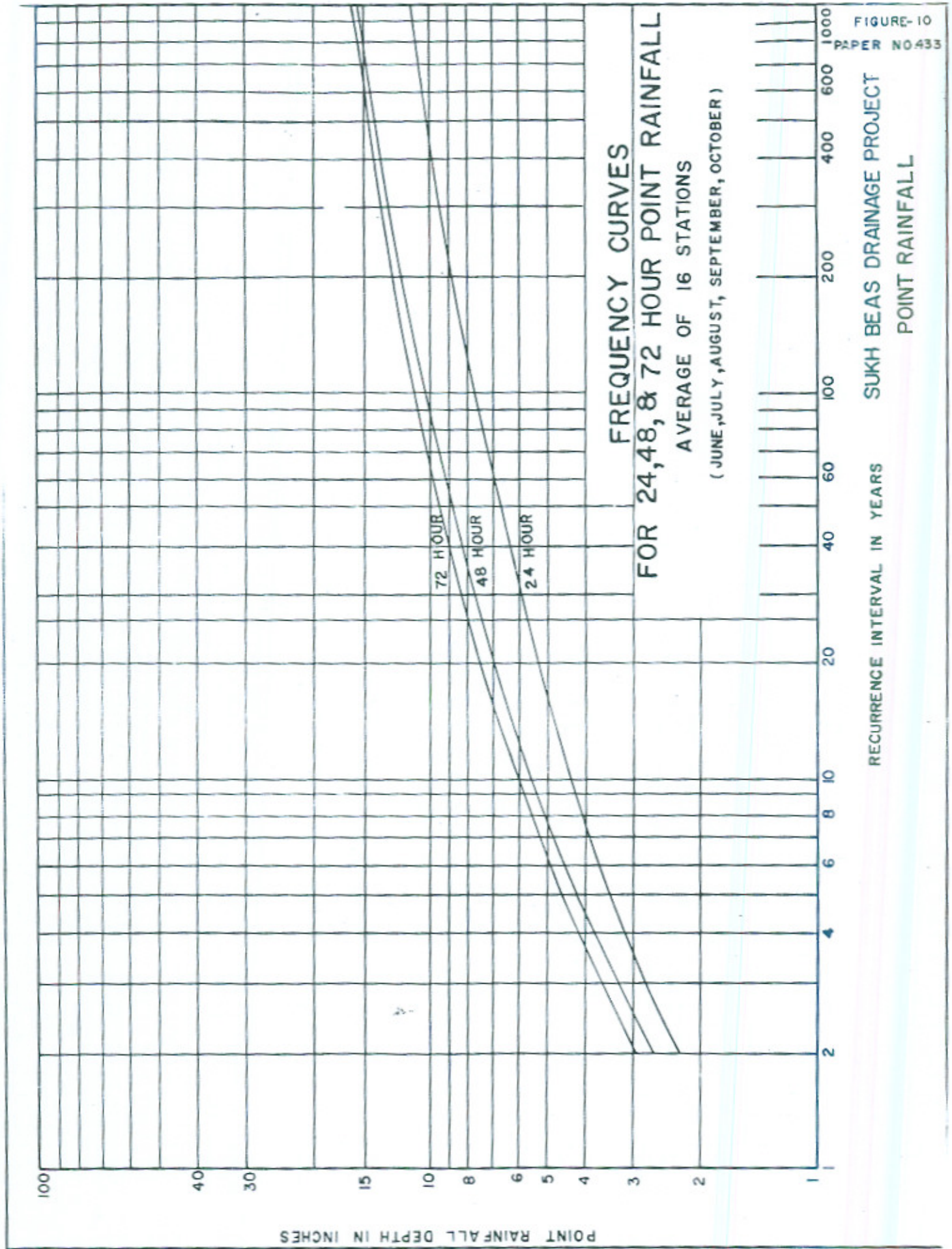
EXAMPLE OF THE CONSTRUCTION OF A SOIL SURVEY

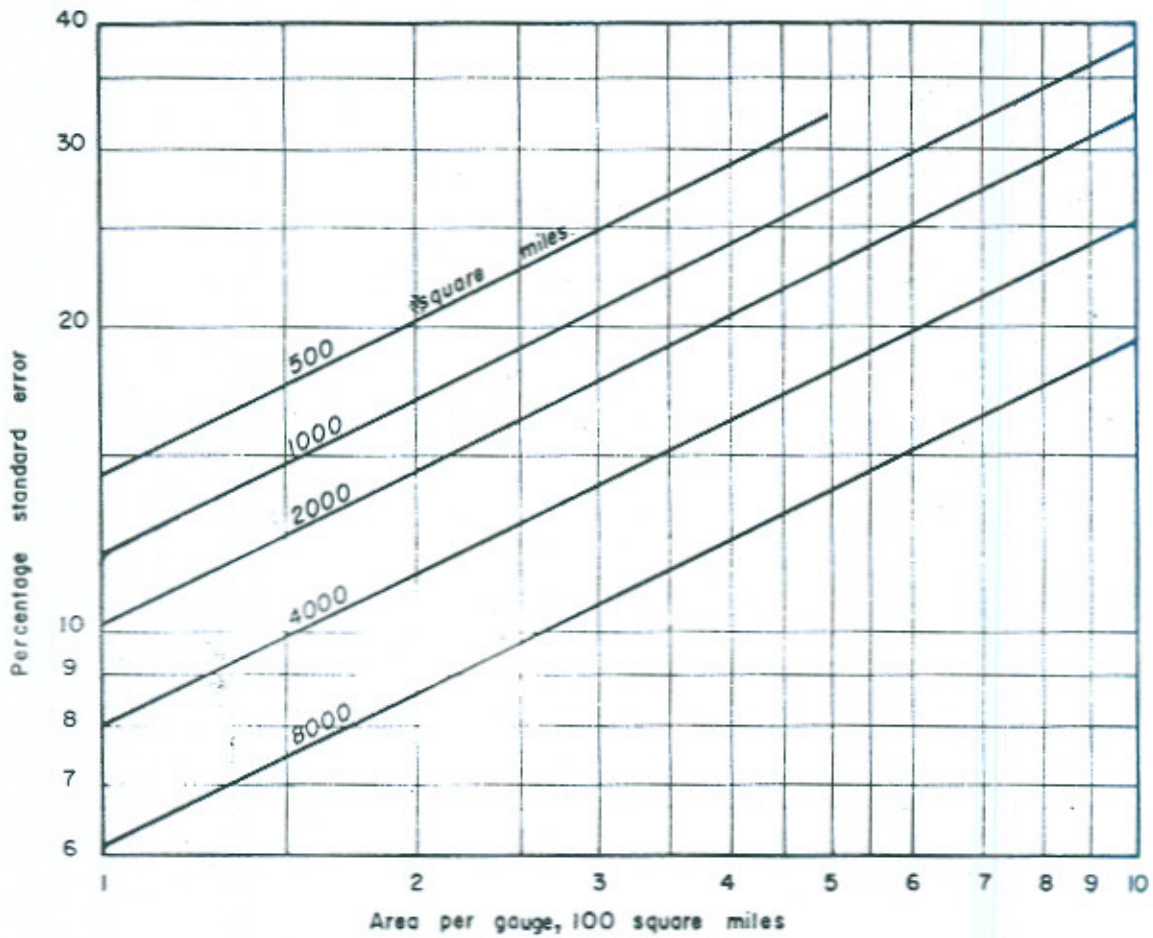


The above symbols represent the various features and masses shown on the map. The shaded masses represent the various soil masses shown on the map. The contour lines represent the various contour lines shown on the map. The spot elevations represent the various spot elevations shown on the map. The feature classifications represent the various feature classifications shown on the map. The reference symbols represent the various reference symbols shown on the map.



SOIL SURVEY PROJECT AREA



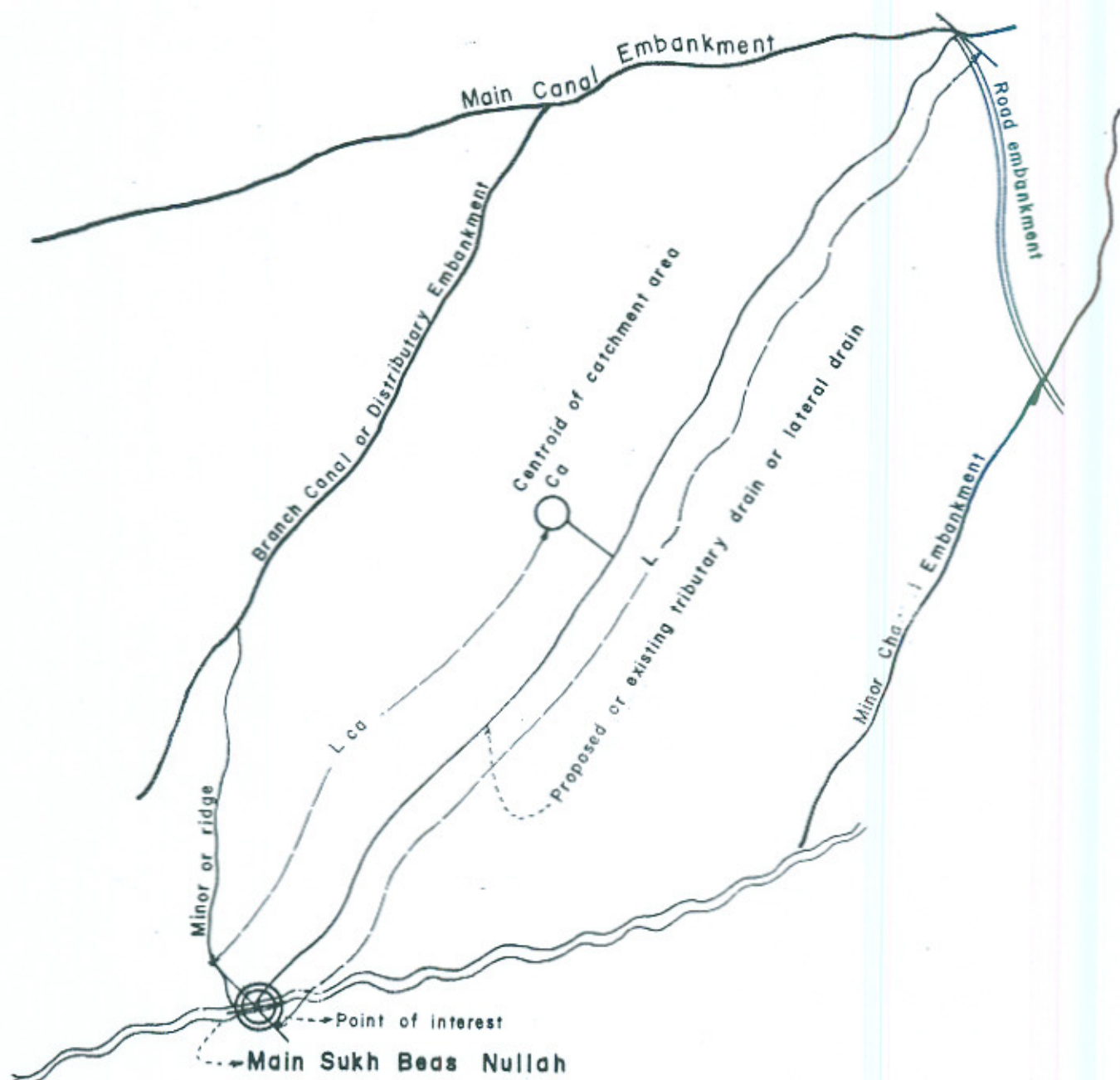


RAIN-GAUGE NETWORK AND PERCENTAGE STANDARD ERROR.

(Reproduced from "Hydrology for Engineers" by Linsley, Kohler & Paulhus.)

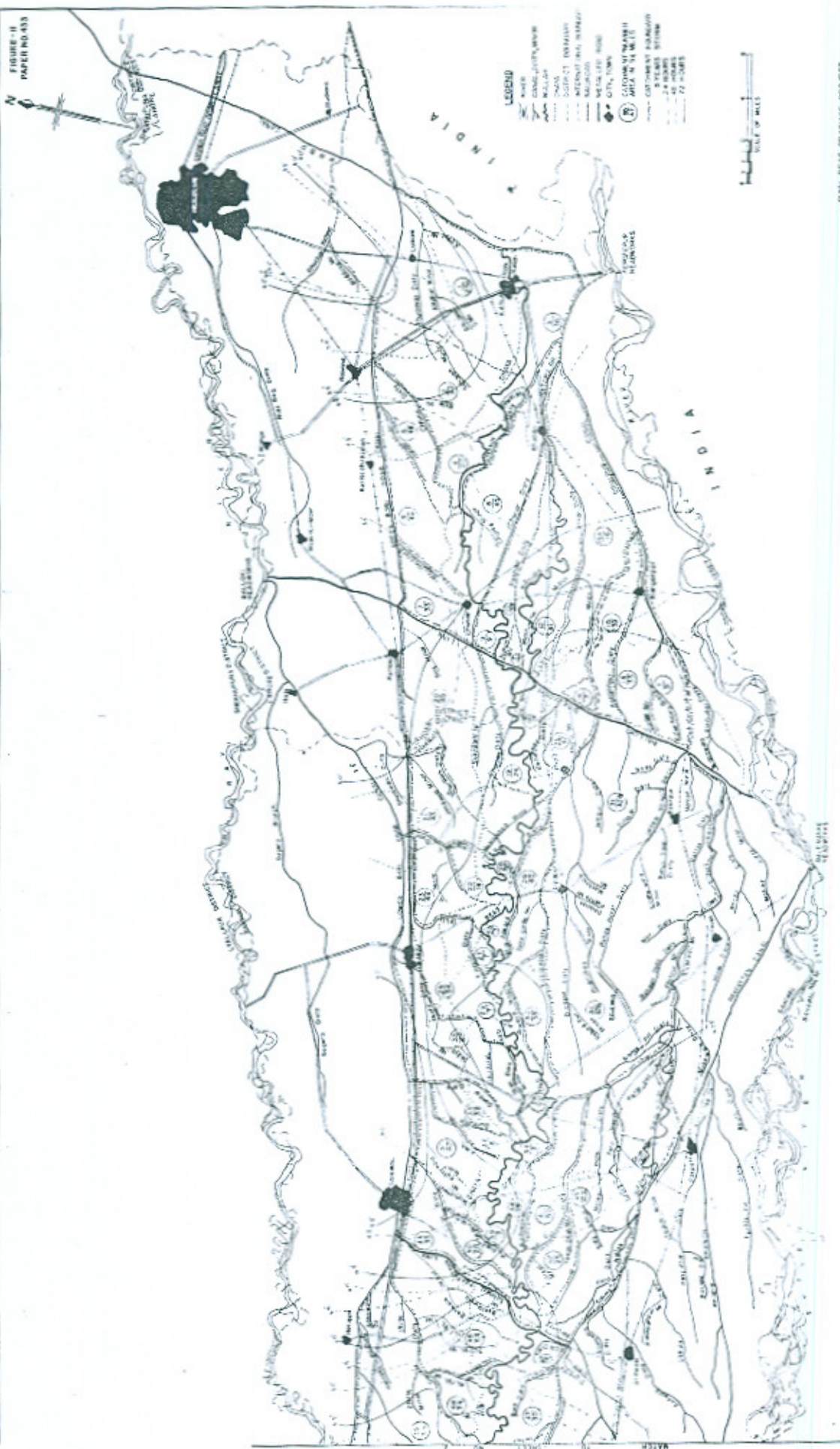
SUKH BEAS DRAINAGE PROJECT  
RAIN-GAUGE NETWORK  
AND  
PERCENTAGE STANDARD

PERCENTAGE STANDARD



TYPICAL SUB CATCHMENT AREA

SUKH BEAS DRAINAGE PROJECT  
TYPICAL SUB CATCHMENT AREA



SANY BHAS DRAINAGE PROJECT  
GENERAL MAP  
3-YEAR RETURN PERIOD  
1961-62





SAN BLAS CHANNEL PROJECT  
 GENERAL MAP  
 5-YEAR RETURN PERIOD  
 1961 (REV.)

FIGURE 2  
 LAFM NO. 455



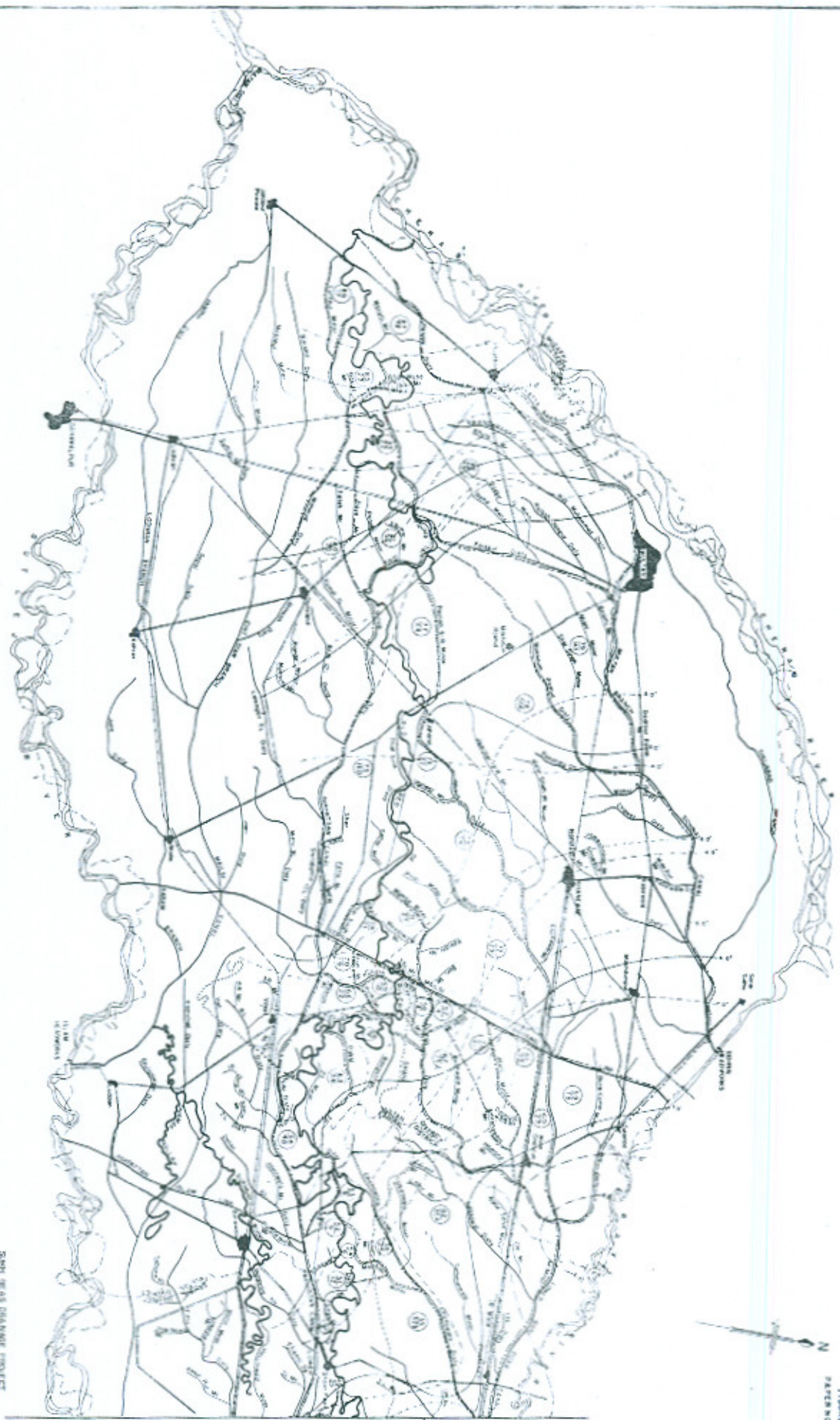
50-YEAR RETURN PERIOD  
 FLOOD DISCHARGE PRODUCT  
 ISOMETRIC MAP

FIG. 13  
 PAPER NO. 433

**LEGEND**  
 --- RIVER  
 --- CANAL (STY. 1000)  
 --- DAM  
 --- EMBANKMENT  
 --- DRAINAGE  
 --- WETLANDS  
 --- CITY TOWN  
 ● SETTLEMENT NAME  
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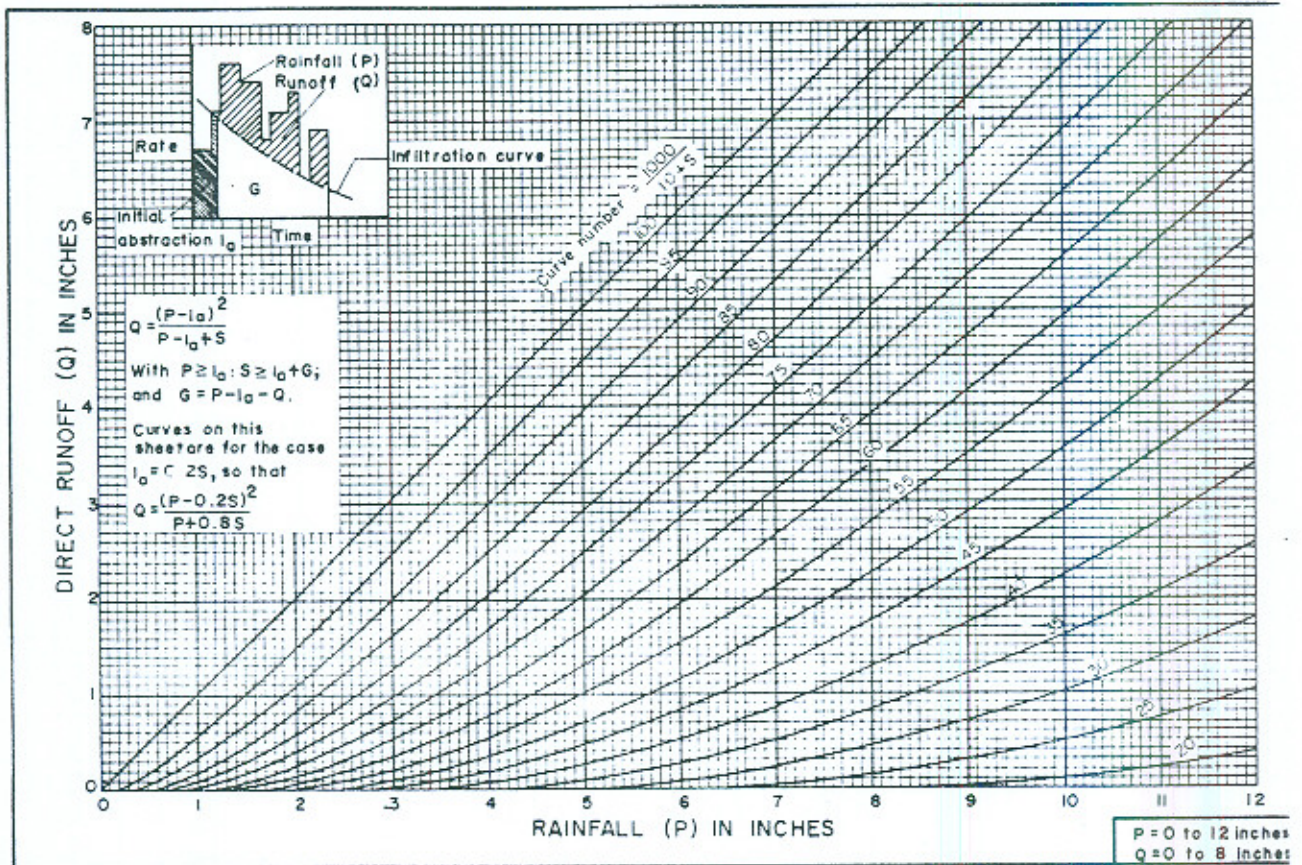


SAN FRANCISCO DISTRICT PROJECT  
ISOTHERMAL MAP  
50-YEAR RETURN PERIOD



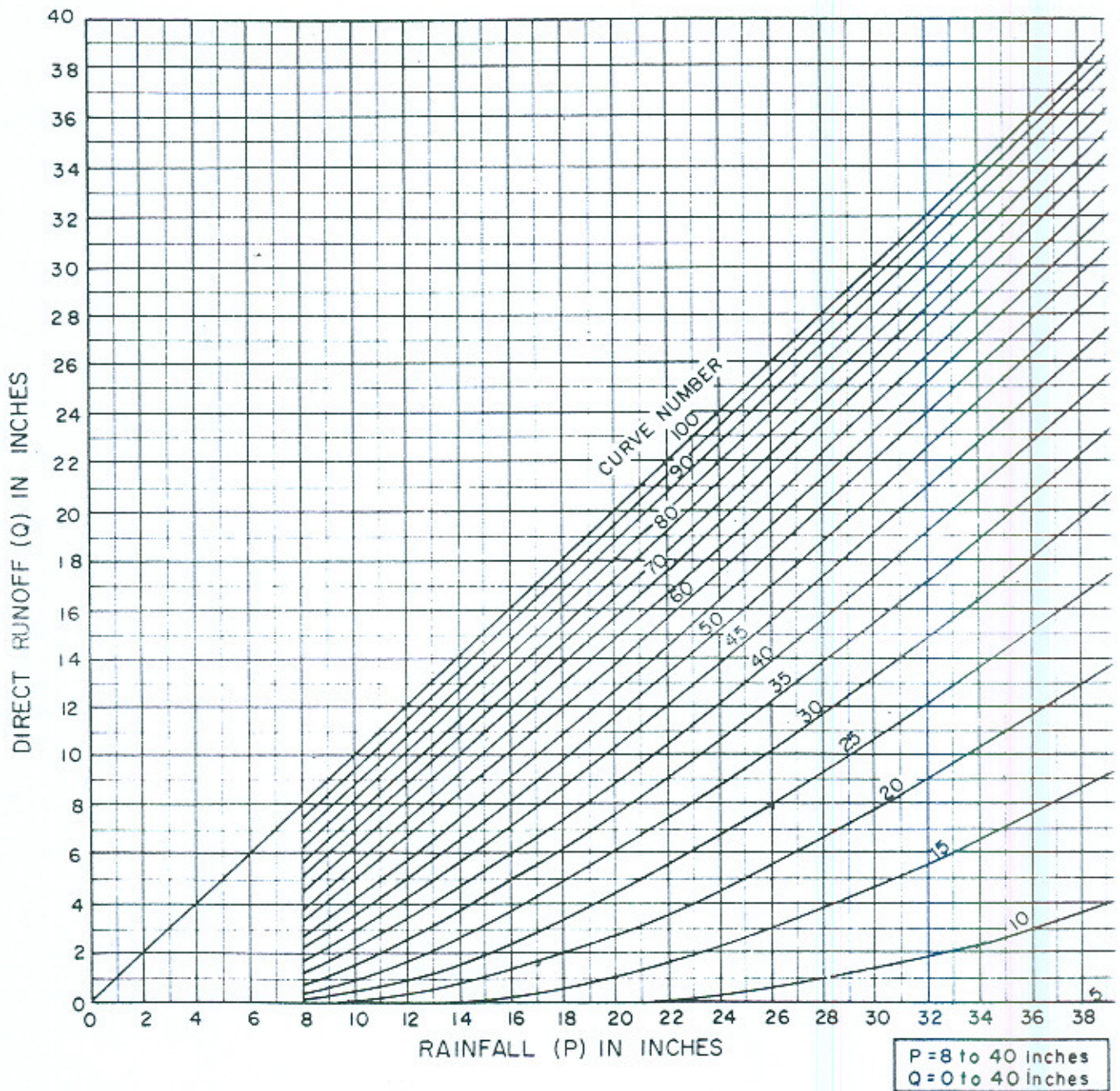
WATCH TO SHEET NO 1

FIGURE 14  
PATERSONS



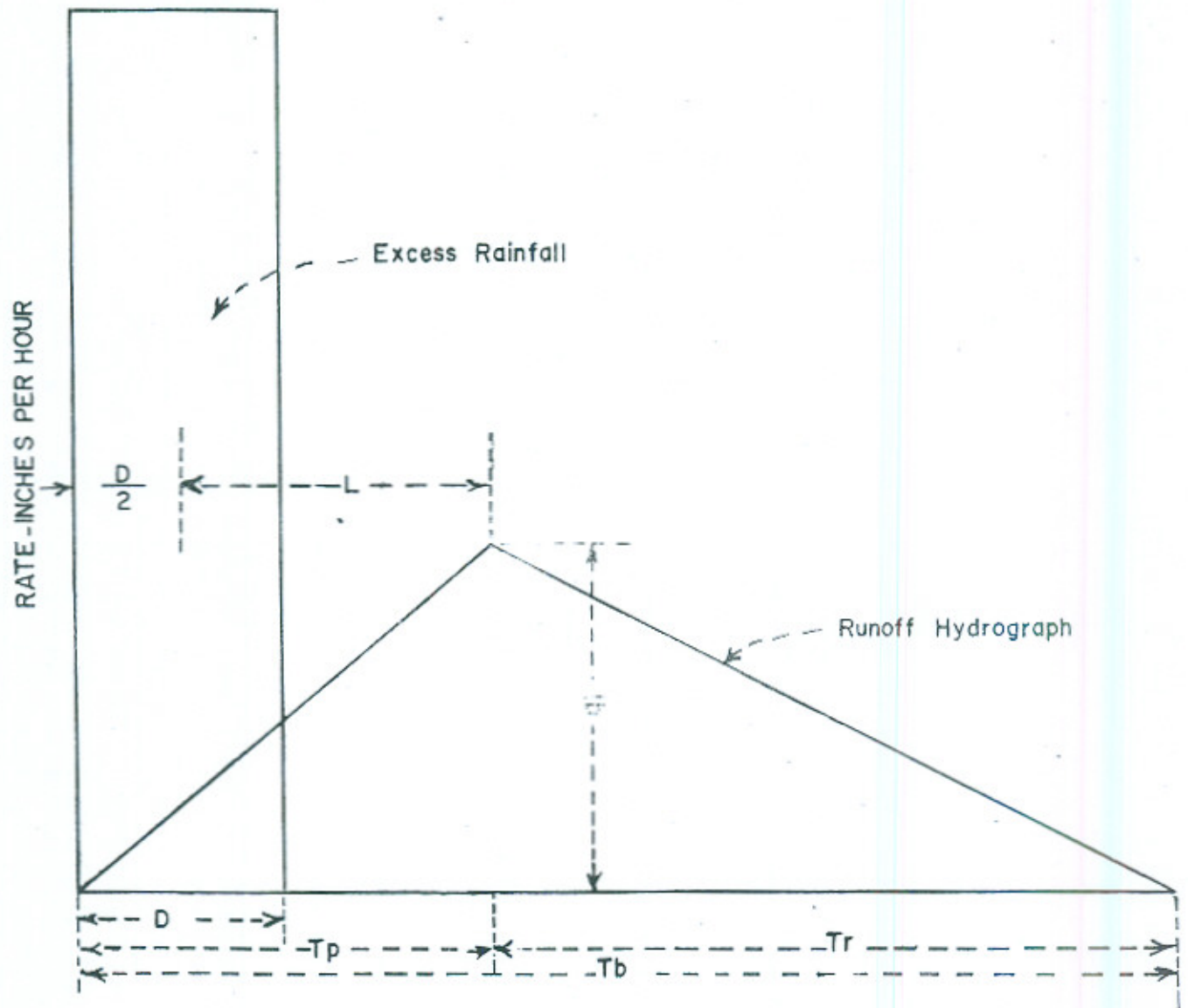
Solution of runoff equation,  $Q = \frac{(P - 0.2S)^2}{P + 0.8S}$  (Sheet 1 of 2) U.S. Soil Conservation Service 288-D-2549

SUKH BEAS DRAINAGE PROJECT  
CHART FOR ESTIMATING DIRECT RUNOFF

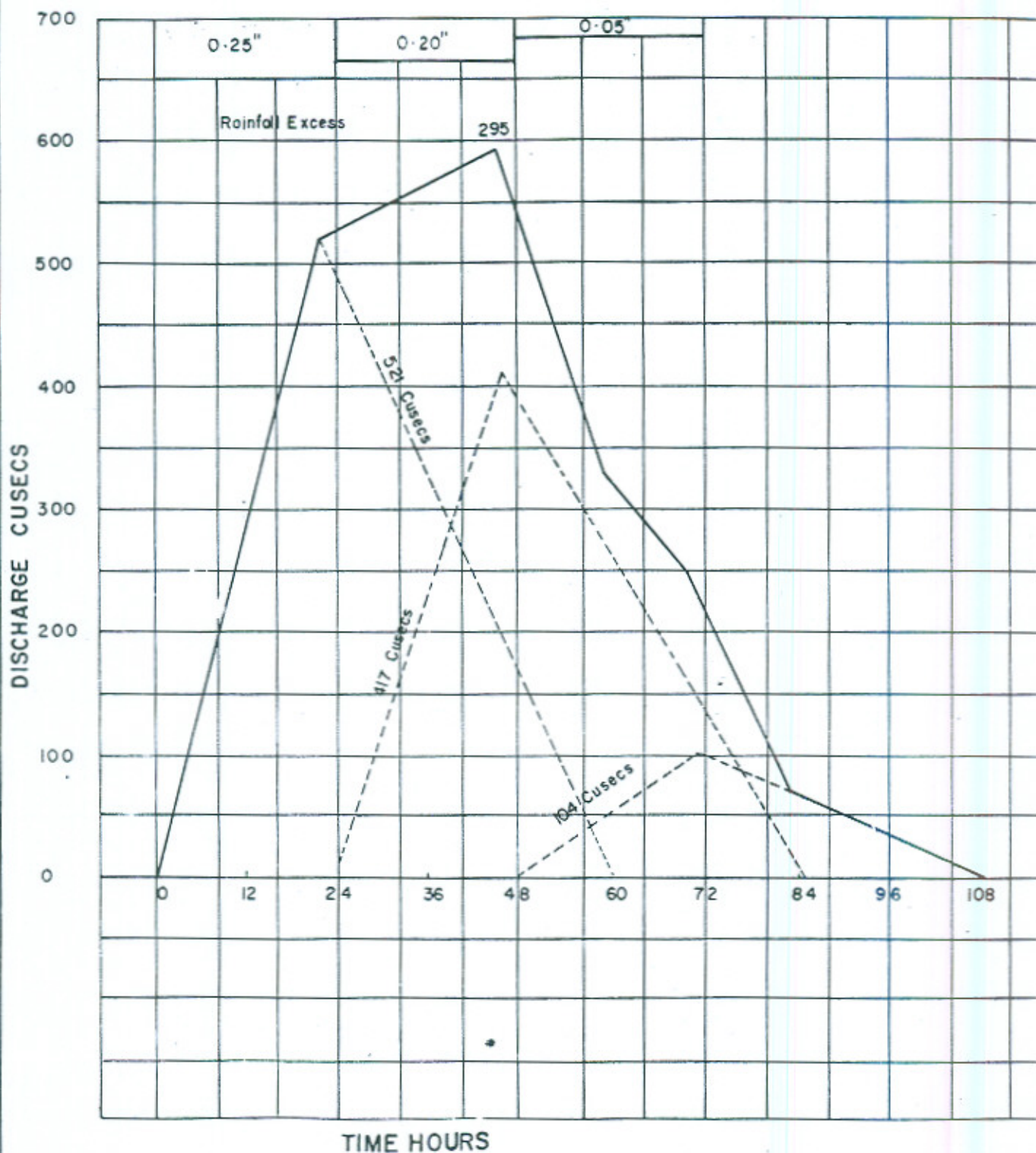


Solution of runoff equation,  $Q = \frac{(P - 0.2S)^2}{P + 0.8S}$  (Sheet 2 of 2) (U.S. Soil Conservation Service.) 288 D-2549

SUKH BEAS DRAINAGE PROJECT  
CHART FOR ESTIMATING DIRECT RUNO



SUKH BEAS DRAINAGE PROJECT  
TRIANGULAR HYDROGRAPH



SUKH BEAS DRAINAGE PROJECT  
PEAK HYDROGRAPH SUB CATCHMENT  
STORM WITH 5 YEAR RETURN PERIOD