

# APPENDIX I

## PROGRAM WATBAL.6

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Water Balance Program to Compute Recharge to Groundwater  
using MONTHLY Rainfall Data and either Evaporation Data  
or a Relationship between Rainfall and Evapotranspiration

- allows for interception losses
- assumes linear relation between ratio EA/ET and  
soil moisture content (field capacity-wilting point)

### RAINFALL/EVAP DATA USED IN WATER BALANCE:

Name of Rainfall File : NUKUALOF.RAI  
Title of Rainfall Data : Monthly rain data: Nuku'alofa: Tongatapu: 1947-'  
  
Name of Evaporation File : TONGTAP1.EVA  
Title of Evaporation Data :  
Monthly evap (Penman):Tongatapu: (from Thompson, 1986)  
  
No. of Years of Record : 44  
First Year of Record : 1947  
Last Year of Record : 1990

### INPUT SOIL AND VEGETATION PARAMETERS

Maximum Interception Store (ISMAX) in mm = 90  
Initial Interception Store (IIS) in mm = 50  
Soil Moisture Zone Thickness(SMZ) in mm = 1000  
Field Capacity(FC)= .55  
Wilting Point(WP)= .4  
Initial Soil Moisture Content(ISMC) in mm = 500  
Deep Rooted Vegetation(eg Coconut Trees) Ratio(DRVR)= .3  
Ratio of these roots reaching water table(DRWT)= 0  
Crop Factor for Deep Rooted Vegetation(CROPPD)= .8  
Crop Factor for Shallow Rooted Vegetation(CROPPS)= 1

### YEAR 1947

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RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
118	164	90	500	46	32	50	532	0	0	136	0	+0.00
248	137	90	532	39	119	18	550	101	0	129	101	+0.41
94	139	90	550	46	-42	0	508	0	0	136	0	+0.00
73	108	73	508	24	-24	42	484	0	0	97	0	+0.00
84	89	84	484	3	-3	66	482	0	0	87	0	+0.00
74	77	74	482	2	-2	68	480	0	0	76	0	+0.00
142	85	85	480	0	52	70	532	0	0	85	0	+0.00
69	96	74	532	18	-18	18	514	0	0	92	0	+0.00
287	116	90	514	19	178	36	550	142	0	109	142	+0.50
115	144	90	550	51	-26	0	524	0	0	141	0	+0.00
32	152	32	524	93	-93	26	431	0	0	125	0	+0.00
272	154	90	431	12	170	119	550	50	0	102	50	+0.19
1608	1461	962		352				294	0	1314	294	+0.18

### YEAR 1948

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
230	164	90	550	70	70	0	550	70	0	160	70	+0.31
212	137	90	550	44	78	0	550	78	0	134	78	+0.37
112	139	90	550	46	-24	0	526	0	0	136	0	+0.00
225	108	90	526	14	121	24	550	97	0	104	97	+0.43
49	89	49	550	38	-38	0	512	0	0	87	0	+0.00
226	77	77	512	0	136	38	550	98	0	77	98	+0.44
28	85	41	550	41	-41	0	509	0	0	82	0	+0.00
23	96	23	509	50	-50	41	459	0	0	73	0	+0.00
120	116	90	459	10	20	91	479	0	0	100	0	+0.00
22	144	22	479	61	-61	71	419	0	0	83	0	+0.00
351	152	90	419	7	254	131	550	122	0	97	122	+0.35
168	154	90	550	60	18	0	550	18	0	150	18	+0.11
1766	1461	842		440				484	0	1282	484	+0.27

YEAR 1949

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
243	164	90	550	70	83	0	550	83	0	160	83	+0.34
217	137	90	550	44	83	0	550	83	0	134	83	+0.38
201	139	90	550	46	65	0	550	65	0	136	65	+0.32
210	108	90	550	17	103	0	550	103	0	107	103	+0.49
24	89	24	550	61	-61	0	489	0	0	85	0	+0.00
26	77	26	489	28	-28	61	460	0	0	54	0	+0.00
103	85	85	460	0	13	90	473	0	0	85	0	+0.00
203	96	90	473	3	115	77	550	39	0	93	39	+0.19
66	116	66	550	47	-47	0	503	0	0	113	0	+0.00
83	144	83	503	39	-39	47	464	0	0	122	0	+0.00
7	152	7	464	58	-58	86	406	0	0	65	0	+0.00
251	154	90	406	2	159	144	550	14	0	92	14	+0.06
1634	1461	831		416				387	0	1247	387	+0.24

YEAR 1950

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
249	164	90	550	70	89	0	550	89	0	160	89	+0.36
249	137	90	550	44	115	0	550	115	0	134	115	+0.46
334	139	90	550	46	198	0	550	198	0	136	198	+0.59
210	108	90	550	17	103	0	550	103	0	107	103	+0.49
17	89	17	550	68	-68	0	482	0	0	85	0	+0.00
67	77	67	482	5	-5	68	477	0	0	72	0	+0.00
259	85	85	477	0	169	73	550	96	0	85	96	+0.37
148	96	90	550	6	57	0	550	57	0	96	57	+0.39
155	116	90	550	24	41	0	550	41	0	114	41	+0.26
131	144	90	550	51	-10	0	540	0	0	141	0	+0.00
146	152	90	540	54	2	10	542	0	0	144	0	+0.00
132	154	90	542	57	-15	8	527	0	0	147	0	+0.00

2097 1461 979 442 699 0 1421 699 +0.33

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YEAR 1951

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RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
202	164	90	527	59	53	23	550	30	0	149	30	+0.15
564	137	90	550	44	430	0	550	430	0	134	430	+0.76
304	139	90	550	46	168	0	550	168	0	136	168	+0.55
104	108	90	550	17	-3	0	547	0	0	107	0	+0.00
127	89	89	547	0	37	3	550	34	0	89	34	+0.27
72	77	73	550	4	-4	0	546	0	0	77	0	+0.00
104	85	85	546	0	14	4	550	10	0	85	10	+0.10
26	96	31	550	61	-61	0	489	0	0	92	0	+0.00
187	116	90	489	14	83	61	550	21	0	104	21	+0.11
42	144	42	550	96	-96	0	454	0	0	138	0	+0.00
21	152	21	454	44	-44	96	410	0	0	65	0	+0.00
3	154	3	410	9	-9	140	401	0	0	12	0	+0.00

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1756 1461 794 395 694 0 1189 694 +0.39

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YEAR 1952

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RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
582	164	90	401	0	492	149	550	342	0	90	342	+0.59
443	137	90	550	44	309	0	550	309	0	134	309	+0.70
289	139	90	550	46	153	0	550	153	0	136	153	+0.53
126	108	90	550	17	19	0	550	19	0	107	19	+0.15
25	89	25	550	60	-60	0	490	0	0	85	0	+0.00
153	77	77	490	0	63	60	550	3	0	77	3	+0.02
164	85	85	550	0	87	0	550	87	0	85	87	+0.53
130	96	90	550	6	39	0	550	39	0	96	39	+0.30
100	116	90	550	24	-14	0	536	0	0	114	0	+0.00
21	144	21	536	104	-104	14	431	0	0	125	0	+0.00
119	152	90	431	12	17	119	448	0	0	102	0	+0.00
154	154	90	448	19	45	102	493	0	0	109	0	+0.00

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2306 1461 928 333 952 0 1261 952 +0.41

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YEAR 1953

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RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
128	164	90	493	43	-5	57	488	0	0	133	0	+0.00
198	137	90	488	26	82	62	550	20	0	116	20	+0.10
193	139	90	550	46	57	0	550	57	0	136	57	+0.30
288	108	90	550	17	181	0	550	181	0	107	181	+0.63
69	89	69	550	19	-19	0	531	0	0	88	0	+0.00
116	77	77	531	0	26	19	550	7	0	77	7	+0.06
49	85	62	550	22	-22	0	528	0	0	84	0	+0.00
36	96	36	528	48	-48	22	480	0	0	84	0	+0.00

23	116	23	480	47	-47	70	433	0	0	70	0	+0.00
39	144	39	433	22	-22	117	411	0	0	61	0	+0.00
72	152	72	411	6	-6	139	406	0	0	78	0	+0.00
115	154	90	406	2	23	144	428	0	0	92	0	+0.00
1326	1461	828		297				265	0	1125	265	+0.20

YEAR 1954

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
110	164	90	428	13	7	122	435	0	0	103	0	+0.00
218	137	90	435	10	118	115	550	3	0	100	3	+0.01
114	139	90	550	46	-22	0	528	0	0	136	0	+0.00
450	108	90	528	14	346	22	550	324	0	104	324	+0.72
65	89	65	550	23	-23	0	527	0	0	88	0	+0.00
242	77	77	527	0	152	23	550	129	0	77	129	+0.53
38	85	51	550	32	-32	0	518	0	0	83	0	+0.00
133	96	90	518	4	39	32	550	7	0	94	7	+0.05
302	116	90	550	24	188	0	550	188	0	114	188	+0.62
133	144	90	550	51	-8	0	542	0	0	141	0	+0.00
49	152	49	542	92	-92	8	450	0	0	141	0	+0.00
581	154	90	450	20	471	100	550	371	0	110	371	+0.64
2435	1461	962		330				1021	0	1292	1021	+0.42

YEAR 1955

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
197	164	90	550	70	37	0	550	37	0	160	37	+0.19
83	137	83	550	51	-51	0	499	0	0	134	0	+0.00
388	139	90	499	30	268	51	550	217	0	120	217	+0.56
78	108	78	550	28	-28	0	522	0	0	106	0	+0.00
61	89	61	522	21	-21	28	500	0	0	82	0	+0.00
64	77	64	500	8	-8	50	492	0	0	72	0	+0.00
122	85	85	492	0	32	58	524	0	0	85	0	+0.00
122	96	90	524	5	32	26	550	7	0	95	7	+0.05
38	116	38	550	73	-73	0	477	0	0	111	0	+0.00
103	144	90	477	26	-13	73	464	0	0	116	0	+0.00
289	152	90	464	25	174	86	550	88	0	115	88	+0.30
220	154	90	550	60	70	0	550	70	0	150	70	+0.32
1765	1461	949		397				419	0	1346	419	+0.24

YEAR 1956

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
259	164	90	550	70	99	0	550	99	0	160	99	+0.38
342	137	90	550	44	208	0	550	208	0	134	208	+0.61
340	139	90	550	46	204	0	550	204	0	136	204	+0.60

334	108	90	550	17	227	0	550	227	0	107	227	+0.68
153	89	89	550	0	63	0	550	63	0	89	63	+0.41
27	77	28	550	46	-46	0	504	0	0	74	0	+0.00
190	85	85	504	0	100	46	550	54	0	85	54	+0.28
86	96	90	550	6	-5	0	545	0	0	96	0	+0.00
133	116	90	545	24	19	5	550	15	0	114	15	+0.11
274	144	90	550	51	133	0	550	133	0	141	133	+0.49
150	152	90	550	58	2	0	550	2	0	148	2	+0.01
6	154	6	550	139	-139	0	411	0	0	145	0	+0.00
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2294	1461	928		500				1005	0	1428	1005	+0.44
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YEAR 1957

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
401	164	90	411	5	306	139	550	167	0	95	167	+0.42
447	137	90	550	44	313	0	550	313	0	134	313	+0.70
131	139	90	550	46	-5	0	545	0	0	136	0	+0.00
48	108	48	545	54	-54	5	490	0	0	102	0	+0.00
74	89	74	490	9	-9	60	482	0	0	83	0	+0.00
242	77	77	482	0	152	68	550	84	0	77	84	+0.35
69	85	82	550	3	-3	0	547	0	0	85	0	+0.00
147	96	90	547	6	51	3	550	49	0	96	49	+0.33
94	116	90	550	24	-20	0	530	0	0	114	0	+0.00
47	144	47	530	79	-79	20	451	0	0	126	0	+0.00
62	152	62	451	29	-29	99	422	0	0	91	0	+0.00
70	154	70	422	12	-12	128	410	0	0	82	0	+0.00
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1832	1461	910		310				612	0	1220	612	+0.33
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YEAR 1958

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
31	164	31	410	9	-9	140	402	0	0	40	0	+0.00
306	137	90	402	1	215	148	550	67	0	91	67	+0.22
269	139	90	550	46	133	0	550	133	0	136	133	+0.49
138	108	90	550	17	31	0	550	31	0	107	31	+0.23
38	89	38	550	48	-48	0	502	0	0	86	0	+0.00
7	77	7	502	45	-45	48	457	0	0	52	0	+0.00
118	85	85	457	0	28	93	485	0	0	85	0	+0.00
116	96	90	485	3	28	65	513	0	0	93	0	+0.00
56	116	56	513	43	-43	37	471	0	0	99	0	+0.00
337	144	90	471	24	223	79	550	144	0	114	144	+0.43
138	152	90	550	58	-10	0	540	0	0	148	0	+0.00
77	154	77	540	67	-67	10	472	0	0	144	0	+0.00
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1631	1461	834		360				375	0	1194	375	+0.23
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YEAR 1959

RAIN	ET	EI	SMC1	ES	XCESS	SMDEF	SMC2	GWR	TL	EA	NETR	RECHARGE
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(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	RATIO
203	164	90	472	34	79	78	550	2	0	124	2		+0.01
61	137	61	550	71	-71	0	479	0	0	132	0		+0.00
366	139	90	479	24	252	71	550	180	0	114	180		+0.49
118	108	90	550	17	11	0	550	11	0	107	11		+0.09
114	89	89	550	0	24	0	550	24	0	89	24		+0.21
84	77	77	550	0	0	0	550	0	0	77	0		+0.00
56	85	64	550	20	-20	0	530	0	0	84	0		+0.00
273	96	90	530	5	178	20	550	158	0	95	158		+0.58
184	116	90	550	24	70	0	550	70	0	114	70		+0.38
192	144	90	550	51	51	0	550	51	0	141	51		+0.27
41	152	41	550	104	-104	0	446	0	0	145	0		+0.00
106	154	90	446	18	-2	104	443	0	0	108	0		+0.00
1798	1461	962		369				496	0	1331	496		+0.28

YEAR 1960

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
70	164	70	443	26	-26	107	418	0	0	96	0	+0.00
323	137	90	418	5	228	132	550	96	0	95	96	+0.30
469	139	90	550	46	333	0	550	333	0	136	333	+0.71
194	108	90	550	17	87	0	550	87	0	107	87	+0.45
101	89	89	550	0	11	0	550	11	0	89	11	+0.11
163	77	77	550	0	74	0	550	74	0	77	74	+0.45
102	85	85	550	0	25	0	550	25	0	85	25	+0.25
34	96	39	550	54	-54	0	496	0	0	93	0	+0.00
54	116	54	496	37	-37	54	459	0	0	91	0	+0.00
133	144	90	459	20	23	91	482	0	0	110	0	+0.00
207	152	90	482	32	85	68	550	17	0	122	17	+0.08
231	154	90	550	60	81	0	550	81	0	150	81	+0.35
2081	1461	954		297				724	0	1251	724	+0.35

YEAR 1961

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
372	164	90	550	70	212	0	550	212	0	160	212	+0.57
228	137	90	550	44	94	0	550	94	0	134	94	+0.41
242	139	90	550	46	106	0	550	106	0	136	106	+0.44
112	108	90	550	17	5	0	550	5	0	107	5	+0.05
47	89	47	550	39	-39	0	511	0	0	86	0	+0.00
58	77	58	511	13	-13	39	497	0	0	71	0	+0.00
83	85	83	497	1	-1	53	496	0	0	84	0	+0.00
152	96	90	496	4	58	54	550	5	0	94	5	+0.03
89	116	89	550	25	-25	0	525	0	0	114	0	+0.00
65	144	65	525	62	-62	25	463	0	0	127	0	+0.00
202	152	90	463	24	88	87	550	0	0	114	0	+0.00
66	154	66	550	83	-83	0	467	0	0	149	0	+0.00
1716	1461	948		428				422	0	1376	422	+0.25

YEAR 1962

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
382	164	90	467	31	261	83	550	178	0	121	178	+0.47
188	137	90	550	44	54	0	550	54	0	134	54	+0.29
263	139	90	550	46	127	0	550	127	0	136	127	+0.48
111	108	90	550	17	4	0	550	4	0	107	4	+0.04
139	89	89	550	0	49	0	550	49	0	89	49	+0.35
75	77	76	550	1	-1	0	549	0	0	77	0	+0.00
85	85	85	549	0	0	1	549	0	0	85	0	+0.00
53	96	53	549	40	-40	1	509	0	0	93	0	+0.00
41	116	41	509	51	-51	41	458	0	0	92	0	+0.00
70	144	70	458	27	-27	92	431	0	0	97	0	+0.00
116	152	90	431	12	14	119	445	0	0	102	0	+0.00
242	154	90	445	18	134	105	550	29	0	108	29	+0.12
1765	1461	954		287				441	0	1241	441	+0.25

YEAR 1963

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
145	164	90	550	70	-15	0	535	0	0	160	0	+0.00
147	137	90	535	40	17	15	550	3	0	130	3	+0.02
227	139	90	550	46	91	0	550	91	0	136	91	+0.40
69	108	69	550	37	-37	0	513	0	0	106	0	+0.00
203	89	89	513	0	113	37	550	76	0	89	76	+0.38
102	77	77	550	0	13	0	550	13	0	77	13	+0.13
60	85	73	550	11	-11	0	539	0	0	84	0	+0.00
150	96	90	539	5	55	11	550	44	0	95	44	+0.29
107	116	90	550	24	-7	0	543	0	0	114	0	+0.00
135	144	90	543	48	-3	7	539	0	0	138	0	+0.00
11	152	11	539	123	-123	11	416	0	0	134	0	+0.00
24	154	24	416	13	-13	134	403	0	0	37	0	+0.00
1380	1461	883		418				226	0	1301	226	+0.16

YEAR 1964

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
99	164	90	403	1	8	147	411	0	0	91	0	+0.00
288	137	90	411	3	195	139	550	55	0	93	55	+0.19
280	139	90	550	46	144	0	550	144	0	136	144	+0.51
141	108	90	550	17	34	0	550	34	0	107	34	+0.24
117	89	89	550	0	27	0	550	27	0	89	27	+0.23
8	77	9	550	64	-64	0	486	0	0	73	0	+0.00
256	85	85	486	0	166	64	550	102	0	85	102	+0.40
102	96	90	550	6	11	0	550	11	0	96	11	+0.11
191	116	90	550	24	77	0	550	77	0	114	77	+0.40
105	144	90	550	51	-36	0	514	0	0	141	0	+0.00
255	152	90	514	44	121	36	550	85	0	134	85	+0.33

215	154	90	550	60	65	0	550	65	0	150	65	+0.30
2057	1461	993		317				600	0	1310	600	+0.29

YEAR 1965

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
397	164	90	550	70	237	0	550	237	0	160	237	+0.60
289	137	90	550	44	155	0	550	155	0	134	155	+0.54
211	139	90	550	46	75	0	550	75	0	136	75	+0.36
40	108	40	550	64	-64	0	486	0	0	104	0	+0.00
210	89	89	486	0	120	64	550	56	0	89	56	+0.27
31	77	32	550	42	-42	0	508	0	0	74	0	+0.00
67	85	67	508	12	-12	42	496	0	0	79	0	+0.00
131	96	90	496	4	37	54	533	0	0	94	0	+0.00
76	116	76	533	33	-33	17	500	0	0	109	0	+0.00
129	144	90	500	34	5	50	505	0	0	124	0	+0.00
178	152	90	505	41	47	45	550	2	0	131	2	+0.01
17	154	17	550	129	-129	0	421	0	0	146	0	+0.00
1776	1461	861		518				525	0	1379	525	+0.30

YEAR 1966

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
85	164	85	421	11	-11	129	411	0	0	96	0	+0.00
95	137	90	411	3	2	139	413	0	0	93	0	+0.00
84	139	84	413	4	-4	137	408	0	0	88	0	+0.00
458	108	90	408	1	367	142	550	225	0	91	225	+0.49
63	89	63	550	24	-24	0	526	0	0	87	0	+0.00
45	77	45	526	25	-25	24	500	0	0	70	0	+0.00
52	85	52	500	21	-21	50	480	0	0	73	0	+0.00
46	96	46	480	25	-25	70	455	0	0	71	0	+0.00
181	116	90	455	9	82	95	537	0	0	99	0	+0.00
180	144	90	537	46	44	13	550	30	0	136	30	+0.17
29	152	29	550	116	-116	0	434	0	0	145	0	+0.00
159	154	90	434	14	55	116	490	0	0	104	0	+0.00
1477	1461	854		299				256	0	1153	256	+0.17

YEAR 1967

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
189	164	90	490	42	57	60	547	0	0	132	0	+0.00
105	137	90	547	43	-28	3	519	0	0	133	0	+0.00
243	139	90	519	36	117	31	550	85	0	126	85	+0.35
203	108	90	550	17	96	0	550	96	0	107	96	+0.47
55	89	55	550	32	-32	0	518	0	0	87	0	+0.00
25	77	25	518	38	-38	32	480	0	0	63	0	+0.00



63	85	63	480	11	-11	70	469	0	0	74	0	+0.00
32	96	32	469	28	-28	81	441	0	0	60	0	+0.00
152	116	90	441	7	55	109	496	0	0	97	0	+0.00
147	144	90	496	33	24	54	521	0	0	123	0	+0.00
25	152	25	521	96	-96	29	425	0	0	121	0	+0.00
15	154	15	425	21	-21	125	403	0	0	36	0	+0.00

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1254	1461	755		404				181	0	1159	181	+0.14
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YEAR 1968

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RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
527	164	90	403	1	436	147	550	289	0	91	289	+0.55
244	137	90	550	44	110	0	550	110	0	134	110	+0.45
296	139	90	550	46	160	0	550	160	0	136	160	+0.54
96	108	90	550	17	-11	0	539	0	0	107	0	+0.00
59	89	59	539	26	-26	11	513	0	0	85	0	+0.00
85	77	77	513	0	0	37	513	0	0	77	0	+0.00
27	85	35	513	35	-35	37	478	0	0	70	0	+0.00
204	96	90	478	3	111	72	550	39	0	93	39	+0.19
92	116	90	550	24	-22	0	528	0	0	114	0	+0.00
93	144	90	528	43	-40	22	487	0	0	133	0	+0.00
26	152	26	487	69	-69	63	418	0	0	95	0	+0.00
51	154	51	418	12	-12	132	407	0	0	63	0	+0.00

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1800	1461	878		322				597	0	1200	597	+0.33
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YEAR 1969

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RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
177	164	90	407	3	84	143	490	0	0	93	0	+0.00
296	137	90	490	27	179	60	550	120	0	117	120	+0.40
348	139	90	550	46	212	0	550	212	0	136	212	+0.61
85	108	85	550	22	-22	0	528	0	0	107	0	+0.00
22	89	22	528	54	-54	22	474	0	0	76	0	+0.00
43	77	43	474	16	-16	76	459	0	0	59	0	+0.00
136	85	85	459	0	46	91	505	0	0	85	0	+0.00
17	96	22	505	49	-49	45	456	0	0	71	0	+0.00
132	116	90	456	9	33	94	489	0	0	99	0	+0.00
50	144	50	489	52	-52	61	437	0	0	102	0	+0.00
52	152	52	437	23	-23	113	414	0	0	75	0	+0.00
5	154	5	414	13	-13	136	401	0	0	18	0	+0.00

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1363	1461	724		313				332	0	1037	332	+0.24
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YEAR 1970

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RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
179	164	90	401	0	89	149	489	0	0	90	0	+0.00

373	137	90	489	26	257	61	550	196	0	116	196	+0.53
137	139	90	550	46	1	0	550	1	0	136	1	+0.01
110	108	90	550	17	3	0	550	3	0	107	3	+0.03
96	89	89	550	0	6	0	550	6	0	89	6	+0.06
83	77	77	550	0	0	0	550	0	0	77	0	+0.00
63	85	70	550	14	-14	0	536	0	0	84	0	+0.00
57	96	57	536	33	-33	14	503	0	0	90	0	+0.00
41	116	41	503	48	-48	47	454	0	0	89	0	+0.00
373	144	90	454	18	265	96	550	169	0	108	169	+0.45
106	152	90	550	58	-42	0	508	0	0	148	0	+0.00
352	154	90	508	43	219	42	550	177	0	133	177	+0.50
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1970	1461	964		305				552	0	1269	552	+0.28
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YEAR 1971

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
187	164	90	550	70	27	0	550	27	0	160	27	+0.15
210	137	90	550	44	76	0	550	76	0	134	76	+0.36
248	139	90	550	46	112	0	550	112	0	136	112	+0.45
176	108	90	550	17	69	0	550	69	0	107	69	+0.39
188	89	89	550	0	98	0	550	98	0	89	98	+0.52
36	77	37	550	38	-38	0	512	0	0	75	0	+0.00
18	85	18	512	47	-47	38	465	0	0	65	0	+0.00
112	96	90	465	2	20	85	485	0	0	92	0	+0.00
198	116	90	485	14	94	65	550	29	0	104	29	+0.15
131	144	90	550	51	-10	0	540	0	0	141	0	+0.00
368	152	90	540	54	224	10	550	214	0	144	214	+0.58
783	154	90	550	60	633	0	550	633	0	150	633	+0.81
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2655	1461	954		443				1258	0	1397	1258	+0.47
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YEAR 1972

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
197	164	90	550	70	37	0	550	37	0	160	37	+0.19
162	137	90	550	44	28	0	550	28	0	134	28	+0.17
326	139	90	550	46	190	0	550	190	0	136	190	+0.58
124	108	90	550	17	17	0	550	17	0	107	17	+0.14
166	89	89	550	0	76	0	550	76	0	89	76	+0.46
151	77	77	550	0	62	0	550	62	0	77	62	+0.41
160	85	85	550	0	83	0	550	83	0	85	83	+0.52
209	96	90	550	6	118	0	550	118	0	96	118	+0.57
341	116	90	550	24	227	0	550	227	0	114	227	+0.66
340	144	90	550	51	199	0	550	199	0	141	199	+0.59
33	152	33	550	112	-112	0	438	0	0	145	0	+0.00
167	154	90	438	15	62	112	500	0	0	105	0	+0.00
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2376	1461	1004		385				1037	0	1389	1037	+0.44
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YEAR 1973

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
35	164	35	500	81	-81	50	419	0	0	116	0	+0.00
256	137	90	419	6	160	131	550	29	0	96	29	+0.12
205	139	90	550	46	69	0	550	69	0	136	69	+0.34
303	108	90	550	17	196	0	550	196	0	107	196	+0.65
37	89	37	550	49	-49	0	501	0	0	86	0	+0.00
103	77	77	501	0	13	49	514	0	0	77	0	+0.00
108	85	85	514	0	31	36	545	0	0	85	0	+0.00
25	96	30	545	60	-60	5	485	0	0	90	0	+0.00
207	116	90	485	14	103	65	550	38	0	104	38	+0.18
112	144	90	550	51	-29	0	521	0	0	141	0	+0.00
343	152	90	521	47	206	29	550	177	0	137	177	+0.52
294	154	90	550	60	144	0	550	144	0	150	144	+0.49
2028	1461	894		430				654	0	1324	654	+0.32

YEAR 1974

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
243	164	90	550	70	83	0	550	83	0	160	83	+0.34
462	137	90	550	44	328	0	550	328	0	134	328	+0.71
279	139	90	550	46	143	0	550	143	0	136	143	+0.51
346	108	90	550	17	239	0	550	239	0	107	239	+0.69
78	89	78	550	10	-10	0	540	0	0	88	0	+0.00
115	77	77	540	0	25	10	550	15	0	77	15	+0.13
67	85	80	550	5	-5	0	545	0	0	85	0	+0.00
90	96	90	545	5	-5	5	540	0	0	95	0	+0.00
196	116	90	540	23	83	10	550	73	0	113	73	+0.37
452	144	90	550	51	311	0	550	311	0	141	311	+0.69
151	152	90	550	58	3	0	550	3	0	148	3	+0.02
74	154	74	550	75	-75	0	475	0	0	149	0	+0.00
2553	1461	1029		404				1195	0	1433	1195	+0.47

YEAR 1975

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
203	164	90	475	35	78	75	550	3	0	125	3	+0.02
83	137	83	550	51	-51	0	499	0	0	134	0	+0.00
174	139	90	499	30	54	51	550	3	0	120	3	+0.02
163	108	90	550	17	56	0	550	56	0	107	56	+0.34
140	89	89	550	0	50	0	550	50	0	89	50	+0.36
135	77	77	550	0	46	0	550	46	0	77	46	+0.34
95	85	85	550	0	18	0	550	18	0	85	18	+0.19
160	96	90	550	6	69	0	550	69	0	96	69	+0.43
84	116	84	550	30	-30	0	520	0	0	114	0	+0.00
133	144	90	520	41	2	30	522	0	0	131	0	+0.00
322	152	90	522	48	184	28	550	157	0	138	157	+0.49
54	154	54	550	94	-94	0	456	0	0	148	0	+0.00
1746	1461	1012		351				402	0	1363	402	+0.23

YEAR 1976

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
252	164	90	456	26	136	94	550	42	0	116	42	+0.17
371	137	90	550	44	237	0	550	237	0	134	237	+0.64
231	139	90	550	46	95	0	550	95	0	136	95	+0.41
365	108	90	550	17	258	0	550	258	0	107	258	+0.71
94	89	89	550	0	4	0	550	4	0	89	4	+0.04
50	77	51	550	24	-24	0	526	0	0	75	0	+0.00
61	85	61	526	19	-19	24	507	0	0	80	0	+0.00
59	96	59	507	25	-25	43	482	0	0	84	0	+0.00
212	116	90	482	13	109	68	550	41	0	103	41	+0.19
129	144	90	550	51	-12	0	538	0	0	141	0	+0.00
246	152	90	538	54	102	12	550	91	0	144	91	+0.37
46	154	46	550	102	-102	0	448	0	0	148	0	+0.00
2116	1461	936		421				767	0	1357	767	+0.36

YEAR 1977

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
377	164	90	448	22	265	102	550	163	0	112	163	+0.43
284	137	90	550	44	150	0	550	150	0	134	150	+0.53
266	139	90	550	46	130	0	550	130	0	136	130	+0.49
43	108	43	550	61	-61	0	489	0	0	104	0	+0.00
46	89	46	489	24	-24	61	465	0	0	70	0	+0.00
17	77	17	465	24	-24	85	441	0	0	41	0	+0.00
73	85	73	441	3	-3	109	437	0	0	76	0	+0.00
130	96	90	437	1	39	113	476	0	0	91	0	+0.00
56	116	56	476	29	-29	74	447	0	0	85	0	+0.00
17	144	17	447	38	-38	103	410	0	0	55	0	+0.00
6	152	6	410	9	-9	140	401	0	0	15	0	+0.00
48	154	48	401	1	-1	149	400	0	0	49	0	+0.00
1363	1461	666		302				443	0	968	443	+0.32

YEAR 1978

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
40	164	40	400	0	-0	150	400	0	0	40	0	+0.00
151	137	90	400	0	61	150	461	0	0	90	0	+0.00
214	139	90	461	19	105	89	550	16	0	109	16	+0.08
248	108	90	550	17	141	0	550	141	0	107	141	+0.57
204	89	89	550	0	114	0	550	114	0	89	114	+0.56
46	77	47	550	28	-28	0	522	0	0	75	0	+0.00
82	85	82	522	2	-2	28	520	0	0	84	0	+0.00
250	96	90	520	4	156	30	550	125	0	94	125	+0.50
102	116	90	550	24	-12	0	538	0	0	114	0	+0.00

272	144	90	538	47	135	12	550	123	0	137	123	+0.45
229	152	90	550	58	81	0	550	81	0	148	81	+0.35
92	154	90	550	60	-58	0	492	0	0	150	0	+0.00
1930	1461	978		260				600	0	1238	600	+0.31

YEAR 1979

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
115	164	90	492	43	-18	58	474	0	0	133	0	+0.00
77	137	77	474	28	-28	76	446	0	0	105	0	+0.00
261	139	90	446	14	157	104	550	53	0	104	53	+0.20
183	108	90	550	17	76	0	550	76	0	107	76	+0.42
208	89	89	550	0	118	0	550	118	0	89	118	+0.57
243	77	77	550	0	154	0	550	154	0	77	154	+0.63
75	85	85	550	0	0	0	550	0	0	85	0	+0.00
237	96	90	550	6	144	0	550	144	0	96	144	+0.61
271	116	90	550	24	157	0	550	157	0	114	157	+0.58
60	144	60	550	79	-79	0	471	0	0	139	0	+0.00
133	152	90	471	28	15	79	486	0	0	118	0	+0.00
159	154	90	486	35	34	64	521	0	0	125	0	+0.00
2022	1461	1018		273				702	0	1291	702	+0.35

YEAR 1980

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
139	164	90	521	56	-7	29	514	0	0	146	0	+0.00
123	137	90	514	34	-1	36	513	0	0	124	0	+0.00
291	139	90	513	35	166	37	550	129	0	125	129	+0.44
267	108	90	550	17	160	0	550	160	0	107	160	+0.60
45	89	45	550	41	-41	0	509	0	0	86	0	+0.00
111	77	77	509	0	21	41	530	0	0	77	0	+0.00
144	85	85	530	0	67	20	550	47	0	85	47	+0.32
161	96	90	550	6	70	0	550	70	0	96	70	+0.44
189	116	90	550	24	75	0	550	75	0	114	75	+0.39
399	144	90	550	51	258	0	550	258	0	141	258	+0.65
114	152	90	550	58	-34	0	516	0	0	148	0	+0.00
143	154	90	516	46	7	34	522	0	0	136	0	+0.00
2126	1461	1017		368				739	0	1385	739	+0.35

YEAR 1981

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
60	164	60	522	80	-80	28	443	0	0	140	0	+0.00
98	137	90	443	13	-5	107	438	0	0	103	0	+0.00
118	139	90	438	12	16	112	454	0	0	102	0	+0.00
72	108	72	454	12	-12	96	442	0	0	84	0	+0.00

102	89	89	442	0	12	108	454	0	0	89	0	+0.00
94	77	77	454	0	5	96	459	0	0	77	0	+0.00
23	85	36	459	18	-18	91	441	0	0	54	0	+0.00
56	96	56	441	10	-10	109	431	0	0	66	0	+0.00
66	116	66	431	10	-10	119	421	0	0	76	0	+0.00
54	144	54	421	12	-12	129	409	0	0	66	0	+0.00
90	152	90	409	4	-4	141	406	0	0	94	0	+0.00
41	154	41	406	4	-4	144	402	0	0	45	0	+0.00

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874	1461	821		174				0	0	995	0	+0.00
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YEAR 1982

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RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
386	164	90	402	1	295	148	550	147	0	91	147	+0.38
238	137	90	550	44	104	0	550	104	0	134	104	+0.44
253	139	90	550	46	117	0	550	117	0	136	117	+0.46
136	108	90	550	17	29	0	550	29	0	107	29	+0.21
241	89	89	550	0	151	0	550	151	0	89	151	+0.63
58	77	59	550	17	-17	0	533	0	0	76	0	+0.00
87	85	85	533	0	0	17	533	0	0	85	0	+0.00
149	96	90	533	5	56	17	550	39	0	95	39	+0.26
75	116	75	550	39	-39	0	511	0	0	114	0	+0.00
34	144	34	511	77	-77	39	435	0	0	111	0	+0.00
19	152	19	435	29	-29	115	406	0	0	48	0	+0.00
57	154	57	406	4	-4	144	402	0	0	61	0	+0.00

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1733	1461	868		278				587	0	1146	587	+0.34
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YEAR 1983

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RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
37	164	37	402	2	-2	148	400	0	0	39	0	+0.00
102	137	90	400	0	12	150	412	0	0	90	0	+0.00
73	139	73	412	5	-5	138	407	0	0	78	0	+0.00
9	108	9	407	4	-4	143	403	0	0	13	0	+0.00
26	89	26	403	1	-1	147	402	0	0	27	0	+0.00
69	77	69	402	0	-0	148	402	0	0	69	0	+0.00
118	85	85	402	0	28	148	430	0	0	85	0	+0.00
66	96	71	430	5	-5	120	425	0	0	76	0	+0.00
41	116	41	425	12	-12	125	413	0	0	53	0	+0.00
108	144	90	413	4	14	137	427	0	0	94	0	+0.00
24	152	24	427	21	-21	123	405	0	0	45	0	+0.00
165	154	90	405	2	73	145	478	0	0	92	0	+0.00

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838	1461	705		57				0	0	762	0	+0.00
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YEAR 1984

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RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
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222	164	90	478	36	96	72	550	24	0	126	24	+0.11
217	137	90	550	44	83	0	550	83	0	134	83	+0.38
71	139	71	550	64	-64	0	486	0	0	135	0	+0.00
126	108	90	486	10	26	64	512	0	0	100	0	+0.00
26	89	26	512	44	-44	38	468	0	0	70	0	+0.00
75	77	75	468	1	-1	82	467	0	0	76	0	+0.00
70	85	70	467	6	-6	83	461	0	0	76	0	+0.00
41	96	41	461	21	-21	89	440	0	0	62	0	+0.00
142	116	90	440	6	46	110	485	0	0	96	0	+0.00
64	144	64	485	43	-43	65	443	0	0	107	0	+0.00
80	152	80	443	19	-19	107	423	0	0	99	0	+0.00
177	154	90	423	9	78	127	501	0	0	99	0	+0.00
1311	1461	877		304				107	0	1181	107	+0.08

YEAR 1985

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
97	164	90	501	47	-40	49	461	0	0	137	0	+0.00
162	137	90	461	18	54	89	515	0	0	108	0	+0.00
212	139	90	515	35	87	35	550	52	0	125	52	+0.24
54	108	54	550	51	-51	0	499	0	0	105	0	+0.00
102	89	89	499	0	12	51	511	0	0	89	0	+0.00
140	77	77	511	0	51	39	550	12	0	77	12	+0.09
56	85	69	550	15	-15	0	535	0	0	84	0	+0.00
27	96	27	535	58	-58	15	477	0	0	85	0	+0.00
28	116	28	477	42	-42	73	434	0	0	70	0	+0.00
53	144	53	434	20	-20	116	415	0	0	73	0	+0.00
3	152	3	415	14	-14	135	401	0	0	17	0	+0.00
429	154	90	401	0	339	149	550	190	0	90	190	+0.44
1363	1461	760		300				254	0	1060	254	+0.19

YEAR 1986

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
12	164	12	550	143	-143	0	407	0	0	155	0	+0.00
69	137	69	407	3	-3	143	404	0	0	72	0	+0.00
113	139	90	404	1	22	146	426	0	0	91	0	+0.00
285	108	90	426	3	192	124	550	68	0	93	68	+0.24
118	89	89	550	0	28	0	550	28	0	89	28	+0.24
215	77	77	550	0	126	0	550	126	0	77	126	+0.59
62	85	75	550	9	-9	0	541	0	0	84	0	+0.00
98	96	90	541	5	3	9	543	0	0	95	0	+0.00
16	116	16	543	90	-90	7	454	0	0	106	0	+0.00
57	144	57	454	29	-29	96	424	0	0	86	0	+0.00
25	152	25	424	19	-19	126	405	0	0	44	0	+0.00
199	154	90	405	2	107	145	512	0	0	92	0	+0.00
1269	1461	780		305				222	0	1085	222	+0.17

YEAR 1987

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
57	164	57	512	75	-75	38	437	0	0	132	0	+0.00
204	137	90	437	11	103	113	540	0	0	101	0	+0.00
169	139	90	540	43	36	10	550	26	0	133	26	+0.15
17	108	17	550	86	-86	0	464	0	0	103	0	+0.00
85	89	85	464	2	-2	86	463	0	0	87	0	+0.00
35	77	35	463	17	-17	87	446	0	0	52	0	+0.00
54	85	54	446	9	-9	104	437	0	0	63	0	+0.00
17	96	17	437	18	-18	113	419	0	0	35	0	+0.00
25	116	25	419	11	-11	131	408	0	0	36	0	+0.00
40	144	40	408	5	-5	142	403	0	0	45	0	+0.00
41	152	41	403	2	-2	147	401	0	0	43	0	+0.00
157	154	90	401	0	67	149	468	0	0	90	0	+0.00
901	1461	641		278				26	0	919	26	+0.03

YEAR 1988

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
280	164	90	468	31	159	82	550	76	0	121	76	+0.27
242	137	90	550	44	108	0	550	108	0	134	108	+0.45
114	139	90	550	46	-22	0	528	0	0	136	0	+0.00
215	108	90	528	14	111	22	550	89	0	104	89	+0.41
69	89	69	550	19	-19	0	531	0	0	88	0	+0.00
32	77	32	531	37	-37	19	494	0	0	69	0	+0.00
101	85	85	494	0	11	56	505	0	0	85	0	+0.00
46	96	51	505	30	-30	45	476	0	0	81	0	+0.00
313	116	90	476	12	211	74	550	136	0	102	136	+0.44
114	144	90	550	51	-27	0	523	0	0	141	0	+0.00
26	152	26	523	97	-97	27	426	0	0	123	0	+0.00
209	154	90	426	10	109	124	535	0	0	100	0	+0.00
1761	1461	893		392				409	0	1285	409	+0.23

YEAR 1989

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
143	164	90	535	62	-9	15	525	0	0	152	0	+0.00
726	137	90	525	37	599	25	550	574	0	127	574	+0.79
168	139	90	550	46	32	0	550	32	0	136	32	+0.19
153	108	90	550	17	46	0	550	46	0	107	46	+0.30
221	89	89	550	0	131	0	550	131	0	89	131	+0.59
47	77	48	550	27	-27	0	523	0	0	75	0	+0.00
131	85	85	523	0	41	27	550	14	0	85	14	+0.10
55	96	60	550	34	-34	0	516	0	0	94	0	+0.00
95	116	90	516	19	-14	34	502	0	0	109	0	+0.00
140	144	90	502	35	15	48	518	0	0	125	0	+0.00
173	152	90	518	46	37	32	550	5	0	136	5	+0.03
111	154	90	550	60	-39	0	511	0	0	150	0	+0.00



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 2163 1461 1002            383                            802    0 1385 802    +0.37  
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YEAR 1990  
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RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
220	164	90	511	51	79	39	550	39	0	141	39	+0.18
58	137	58	550	74	-74	0	476	0	0	132	0	+0.00
116	139	90	476	23	3	74	478	0	0	113	0	+0.00
122	108	90	478	9	23	72	502	0	0	99	0	+0.00
191	89	89	502	0	101	48	550	53	0	89	53	+0.28
104	77	77	550	0	15	0	550	15	0	77	15	+0.14
194	85	85	550	0	117	0	550	117	0	85	117	+0.60
192	96	90	550	6	101	0	550	101	0	96	101	+0.53
175	116	90	550	24	61	0	550	61	0	114	61	+0.35
25	144	25	550	112	-112	0	438	0	0	137	0	+0.00
223	152	90	438	15	118	112	550	6	0	105	6	+0.03
229	154	90	550	60	79	0	550	79	0	150	79	+0.34

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 1849 1461 964            375                            471    0 1339 471    +0.25  
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44 YEAR AVERAGES  
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1770 1461 893            348                            528    0 1242 528    +0.30

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 2163 1461 %1002                    383                    802           0 1385   802           +0.37  
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YEAR 1990  
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RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
220	164	90	511	51	79	39	550	39	0	141	39	+0.18
58	137	58	550	74	-74	0	476	0	0	132	0	+0.00
116	139	90	476	23	3	74	478	0	0	113	0	+0.00
122	108	90	478	9	23	72	502	0	0	99	0	+0.00
191	89	89	502	0	101	48	550	53	0	89	53	+0.28
104	77	77	550	0	15	0	550	15	0	77	15	+0.14
194	85	85	550	0	117	0	550	117	0	85	117	+0.60
192	96	90	550	6	101	0	550	101	0	96	101	+0.53
175	116	90	550	24	61	0	550	61	0	114	61	+0.35
25	144	25	550	112	-112	0	438	0	0	137	0	+0.00
223	152	90	438	15	118	112	550	6	0	105	6	+0.03
229	154	90	550	60	79	0	550	79	0	150	79	+0.34
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1849	1461	964		375				471	0	1339	471	+0.25
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44 YEAR AVERAGES  
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1770 1461 893                    348                    528           0 1242   528           +0.30

Monthly recharge (mm) on Tongatapu for period 1947-90

Year	J	F	M	A	M	J	J	A	S	O	N	D	Annual Recharge	Annual Rainfall
1947	0	101	0	0	0	0	0	0	142	0	0	50	294	1608
1948	70	78	0	97	0	98	0	0	0	0	122	18	484	1766
1949	83	83	65	103	0	0	0	39	0	0	0	14	387	1634
1950	89	115	198	103	0	0	96	57	41	0	0	0	699	2097
1951	30	430	168	0	34	0	10	0	21	0	0	0	694	1756
1952	342	309	153	19	0	3	87	39	0	0	0	0	952	2246
1953	0	20	57	181	0	7	0	0	0	0	0	0	265	1316
1954	0	3	0	324	0	129	0	7	188	0	0	371	1021	2435
1955	37	0	217	0	0	0	0	7	0	0	88	70	419	1765
1956	99	208	204	227	63	0	54	0	15	133	2	0	1005	2294
1957	167	313	0	0	0	84	0	49	0	0	0	0	612	1832
1958	0	67	133	31	0	0	0	0	0	144	0	0	375	1631
1959	2	0	180	11	24	0	0	158	70	51	0	0	496	898
1960	0	96	333	87	11	74	25	0	0	0	17	81	724	2081
1961	212	94	106	5	0	0	0	5	0	0	0	0	422	1716
1962	178	54	127	4	49	0	0	0	0	0	0	29	441	1765
1963	0	3	91	0	76	13	0	44	0	0	0	0	226	1380
1964	0	55	144	34	27	0	102	11	77	0	85	65	600	2057
1965	237	155	75	0	56	0	0	0	0	0	2	0	525	1776
1966	0	0	0	225	0	0	0	0	0	30	0	0	256	1477
1967	0	0	85	96	0	0	0	0	0	0	0	0	181	1254
1968	289	110	160	0	0	0	0	39	0	0	0	0	597	1800
1969	0	120	212	0	0	0	0	0	0	0	0	0	332	1363
1970	0	196	1	3	6	0	0	0	0	169	0	177	552	1970
1971	27	76	112	69	98	0	0	0	29	0	214	633	1258	2655
1972	37	28	190	17	76	62	83	118	227	199	0	0	1037	2376
1973	0	29	69	196	0	0	0	0	38	0	177	144	654	2028
1974	83	328	143	239	0	15	0	0	73	311	3	0	1195	2553
1975	3	0	3	56	50	46	18	69	0	0	157	0	402	1746
1976	42	237	95	258	4	0	0	0	41	0	91	0	767	2116
1977	163	150	130	0	0	0	0	0	0	0	0	0	443	1363
1978	0	0	16	141	114	0	0	125	0	123	81	0	600	1930
1979	0	0	53	76	118	154	0	144	157	0	0	0	702	2022
1980	0	0	129	160	0	0	47	70	75	258	0	0	739	2126
1981	0	0	0	0	0	0	0	0	0	0	0	0	0	874
1982	147	104	117	29	151	0	0	39	0	0	0	0	587	1733
1983	0	0	0	0	0	0	0	0	0	0	0	0	0	838
1984	24	83	0	0	0	0	0	0	0	0	0	0	107	1311
1985	0	0	52	0	0	12	0	0	0	0	0	190	254	1363
1986	0	0	0	68	28	126	0	0	0	0	0	0	222	1269
1987	0	0	26	0	0	0	0	0	0	0	0	0	26	901
1988	76	108	0	89	0	0	0	0	136	0	0	0	409	1761
1989	0	574	32	46	131	0	14	0	0	0	5	0	802	2163
1990	39	0	0	0	53	15	117	101	61	0	6	79	471	1849

# APPENDIX J

Page No. 1  
19/03/91

## Ha'apai well monitoring

(from dbase file HAPWELLS.DBF)

Well No	Date	Depth to water (m)	Electrical Conductivity (uS/cm)	Temperature (degrees C)	pH	Pump stat (T=on, F=off)
1	03/03/90	0.00	2450	0.0	0.00	.F.
1	19/09/90	4.35	1878	23.9	8.14	.F.
2	19/09/90	5.29	1925	25.3	7.95	.F.
3	19/09/90	2.30	1096	25.2	7.59	.F.
4	19/09/90	1.49	1245	24.9	7.85	.F.
5	03/03/90	0.00	840	0.0	0.00	.F.
5	19/09/90	2.11	837	25.2	7.77	.F.
6	20/09/90	2.30	1218	24.6	7.82	.F.
7	20/09/90	3.04	2610	25.0	7.83	.F.
8	20/09/90	1.33	433	22.9	8.39	.F.
9	20/09/90	2.71	641	23.6	8.16	.F.
10	20/09/90	2.19	861	24.2	0.00	.F.
11	20/09/90	2.13	523	23.0	0.00	.F.
12	20/09/90	2.69	356	23.0	8.08	.F.
13	20/09/90	1.96	543	23.8	7.96	.F.
14	20/09/90	1.97	1038	23.7	0.00	.F.
15	20/09/90	1.66	674	24.8	7.84	.F.
16	20/09/90	2.57	342	24.2	7.96	.F.
17	20/09/90	3.44	1560	24.6	7.90	.F.
18	20/09/90	3.13	795	25.2	8.04	.F.
19	20/09/90	2.69	1035	23.8	7.98	.F.
20	04/03/90	0.00	2800	0.0	0.00	.F.
20	21/09/90	1.89	1475	24.6	7.74	.F.
21	21/09/90	2.13	684	23.5	8.25	.F.
22	21/09/90	2.47	782	23.8	7.99	.F.
23	04/03/90	0.00	1700	0.0	0.00	.T.
23	21/09/90	4.01	881	23.8	7.93	.F.
23	07/02/91	3.43	2830	26.1	0.00	.F.
24	03/08/85	0.00	1930	24.0	0.00	.T.
24	04/03/90	0.00	4000	0.0	0.00	.T.
24	21/09/90	3.66	1466	24.8	7.95	.F.
24	07/02/91	3.95	2190	26.0	0.00	.F.
25	04/03/90	0.00	1100	0.0	0.00	.F.
25	21/09/90	3.42	646	23.6	8.21	.F.
26	21/09/90	3.29	990	23.6	8.26	.F.
27	21/09/90	2.65	858	24.4	7.94	.F.
28	03/03/90	0.00	2730	0.0	0.00	.F.
28	22/09/90	11.40	2230	25.1	7.50	.F.
28	31/01/91	11.42	0	0.0	0.00	.F.
29	22/09/90	9.70	0	0.0	0.00	.F.
30	22/09/90	0.00	6230	0.0	0.00	.F.
31	03/03/90	0.00	990	0.0	0.00	.F.
31	22/09/90	2.70	926	24.1	8.33	.F.
32	03/03/90	0.00	810	0.0	0.00	.F.
32	22/09/90	0.00	753	25.0	8.07	.F.
33	03/03/90	0.00	830	0.0	0.00	.F.
33	22/09/90	0.00	659	25.4	7.82	.F.
34	03/08/85	0.00	5600	24.8	0.00	.T.
34	03/03/90	0.00	5100	0.0	0.00	.F.

Ha'apai well monitoring

(from dbase file HAPWELLS.DBF)

Well No	Date	Depth to water (m)	Electrical Conductivity (uS/cm)	Temperature (degrees C)	pH	Pump stat (T=on, F=off)
34	22/09/90	5.14	3490	25.7	7.10	.F.
34	31/01/91	5.24	6000	26.4	0.00	.F.
35	22/09/90	0.00	1811	25.3	7.85	.F.
36	22/09/90	0.00	353	25.0	7.97	.F.
37	03/03/90	0.00	8700	0.0	0.00	.F.
37	22/09/90	6.92	5980	24.9	7.20	.F.
38	03/08/85	0.00	3400	25.4	0.00	.T.
38	03/03/90	0.00	6880	0.0	0.00	.F.
38	22/09/90	4.25	5130	27.2	7.37	.F.
39	05/03/90	0.00	1200	0.0	0.00	.F.
39	22/09/90	4.05	1539	23.9	8.06	.F.
40	22/09/90	0.00	1449	26.0	8.01	.F.
41	22/09/90	2.94	5290	23.8	7.80	.F.
42	04/03/90	0.00	12300	0.0	0.00	.T.
42	22/09/90	2.64	6520	24.5	7.92	.F.
43	22/09/90	2.63	3470	23.6	8.28	.F.
44	03/03/90	0.00	520	0.0	0.00	.F.
44	22/09/90	2.65	542	23.2	8.21	.F.
45	01/08/85	0.00	11900	25.0	0.00	.T.
45	02/08/85	0.00	12800	25.0	0.00	.T.
45	03/03/90	0.00	3120	0.0	0.00	.F.
45	22/09/90	7.23	2940	24.2	7.44	.F.
45	31/01/91	7.20	2190	27.8	7.24	.F.
46	02/08/85	0.00	9200	25.0	0.00	.T.
46	03/03/90	0.00	12500	0.0	0.00	.T.
46	22/09/90	7.18	10030	26.1	7.30	.F.
46	31/01/91	7.05	8730	26.7	7.22	.T.
47	22/09/90	4.00	853	23.6	7.80	.F.
48	22/09/90	4.15	4150	26.2	0.00	.F.
49	22/09/90	8.80	883	0.0	0.00	.F.
49	31/01/91	8.85	1000	27.1	9.85	.F.
50	22/09/90	2.65	869	24.8	8.10	.F.
51	22/09/90	2.30	839	24.7	8.13	.F.
52	22/09/90	2.22	771	24.7	7.78	.F.
53	22/09/90	1.89	826	25.3	8.28	.F.
54	22/09/90	2.43	2390	24.2	0.00	.F.
55	22/09/90	2.17	2620	24.5	7.84	.F.
56	22/09/90	3.82	1410	24.5	8.14	.F.
57	22/09/90	2.80	1436	23.1	0.00	.F.
58	22/09/90	1.46	866	24.8	7.97	.F.
59	22/09/90	2.82	886	23.7	0.00	.F.
60	22/09/90	2.34	1038	23.8	8.11	.F.
61	22/09/90	6.55	2030	25.5	7.44	.F.
62	22/09/90	3.16	1137	24.0	0.00	.F.
63	05/03/90	0.00	3400	0.0	0.00	.F.
63	22/09/90	2.23	550	23.2	8.31	.F.

# APPENDIX K

## PROGRAM WATBAL.6

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Water Balance Program to Compute Recharge to Groundwater  
using MONTHLY Rainfall Data and either Evaporation Data  
or a Relationship between Rainfall and Evapotranspiration

- allows for interception losses
- assumes linear relation between ratio EA/ET and  
soil moisture content (field capacity-wilting point)

### RAINFALL/EVAP DATA USED IN WATER BALANCE:

Name of Rainfall File : HAAPAI.RAI  
Title of Rainfall Data : Monthly rainfall data: Ha'apai: Tonga: 1947-90

Name of Evaporation File : HAAPAI.EVA  
Title of Evaporation Data :  
Monthly evap (Penman): Ha'apai : (from Thompson, 1986)

No. of Years of Record : 44  
First Year of Record : 1947  
Last Year of Record : 1990

### INPUT SOIL AND VEGETATION PARAMETERS

Maximum Interception Store (ISMAX) in mm = 90  
Initial Interception Store (IIS) in mm = 50  
Soil Moisture Zone Thickness(SMZ) in mm = 1000  
Field Capacity(FC)= .55  
Wilting Point(WP)= .4  
Initial Soil Moisture Content(ISMC) in mm = 500  
Deep Rooted Vegetation(eg Coconut Trees) Ratio(DRVR)= .5  
Ratio of these roots reaching water table(DRWT)= .1  
Crop Factor for Deep Rooted Vegetation(CROPPD)= .8  
Crop Factor for Shallow Rooted Vegetation(CROPPS)= 1

### YEAR 1947

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
201	161	90	500	41	120	50	550	70	3	134	67	+0.34
189	144	90	550	46	53	0	550	53	2	139	50	+0.27
313	145	90	550	47	176	0	550	176	2	140	174	+0.55
109	113	90	550	20	-1	0	549	0	1	111	-1	-0.01
177	103	90	549	11	76	1	550	75	1	102	75	+0.42
105	89	89	550	0	15	0	550	15	0	89	15	+0.14
115	101	90	550	9	17	0	550	17	0	100	16	+0.14
99	109	90	550	16	-7	0	543	0	1	107	-1	-0.01
201	121	90	543	25	86	7	550	78	1	117	77	+0.38
88	145	88	550	49	-49	0	501	0	2	139	-2	-0.03
16	156	16	501	81	-81	49	420	0	6	103	-6	-0.35
254	161	90	420	8	156	130	550	26	3	101	23	+0.09
1867	1548	1003		355				509	22	1379	488	+0.26

### YEAR 1948

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
432	161	90	550	61	281	0	550	281	3	154	278	+0.64
147	144	90	550	46	11	0	550	11	2	139	8	+0.06
202	145	90	550	47	65	0	550	65	2	140	62	+0.31
251	113	90	550	20	141	0	550	141	1	111	140	+0.56
52	103	52	550	44	-44	0	506	0	2	98	-2	-0.04
108	89	89	506	0	18	44	524	0	0	89	0	+0.00
45	101	46	524	39	-39	26	485	0	2	87	-2	-0.05
17	109	17	485	45	-45	65	440	0	4	66	-4	-0.22
51	121	51	440	16	-16	110	424	0	3	70	-3	-0.05
139	145	90	424	8	41	126	465	0	2	100	-2	-0.02
245	156	90	465	25	130	85	550	46	3	117	43	+0.18
294	161	90	550	61	143	0	550	143	3	154	140	+0.48
1983	1548	885		412				686	27	1323	660	+0.33

YEAR 1949

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
259	161	90	550	61	108	0	550	108	3	154	105	+0.41
270	144	90	550	46	134	0	550	134	2	139	131	+0.49
212	145	90	550	47	75	0	550	75	2	140	73	+0.34
171	113	90	550	20	61	0	550	61	1	111	60	+0.35
16	103	16	550	75	-75	0	475	0	3	94	-3	-0.22
38	89	38	475	22	-22	75	453	0	2	62	-2	-0.05
238	101	90	453	3	145	97	550	48	0	94	47	+0.20
114	109	90	550	16	8	0	550	8	1	107	7	+0.06
203	121	90	550	27	86	0	550	86	1	118	85	+0.42
255	145	90	550	47	118	0	550	118	2	140	116	+0.45
20	156	20	550	117	-117	0	433	0	5	142	-5	-0.27
285	161	90	433	13	182	117	550	65	3	106	62	+0.22
2081	1548	884		495				702	27	1406	675	+0.32

YEAR 1950

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
237	161	90	550	61	86	0	550	86	3	154	83	+0.35
118	144	90	550	46	-18	0	532	0	2	139	-2	-0.02
470	145	90	532	41	339	18	550	320	2	134	318	+0.68
334	113	90	550	20	224	0	550	224	1	111	223	+0.67
101	103	90	550	11	-0	0	550	0	1	102	-1	-0.01
42	89	42	550	40	-40	0	509	0	2	84	-2	-0.04
156	101	90	509	7	59	41	550	19	0	97	18	+0.12
33	109	33	550	65	-65	0	485	0	3	101	-3	-0.09
156	121	90	485	15	51	65	536	0	1	106	-1	-0.01
128	145	90	536	43	-5	14	531	0	2	135	-2	-0.02
247	156	90	531	50	107	19	550	88	3	142	86	+0.35
353	161	90	550	61	202	0	550	202	3	154	199	+0.56

2375 1548 975 461 939 23 1459 916 +0.39

YEAR 1951

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
233	161	90	550	61	82	0	550	82	3	154	79	+0.34
336	144	90	550	46	200	0	550	200	2	139	197	+0.59
330	145	90	550	47	193	0	550	193	2	140	191	+0.58
165	113	90	550	20	55	0	550	55	1	111	54	+0.33
74	103	74	550	25	-25	0	525	0	1	100	-1	-0.02
12	89	12	525	55	-55	25	470	0	3	70	-3	-0.26
57	101	57	470	18	-18	80	452	0	2	76	-2	-0.03
11	109	11	452	29	-29	98	423	0	4	44	-4	-0.36
308	121	90	423	4	214	127	550	87	1	95	86	+0.28
50	145	50	550	82	-82	0	468	0	4	136	-4	-0.08
26	156	26	468	51	-51	82	417	0	5	82	-5	-0.20
14	161	14	417	15	-15	133	403	0	6	35	-6	-0.42

1616 1548 694 453 616 34 1181 582 +0.36

YEAR 1952

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
159	161	90	403	1	68	147	471	0	3	94	-3	-0.02
105	144	90	471	22	-7	79	464	0	2	114	-2	-0.02
199	145	90	464	20	89	86	550	3	2	112	0	+0.00
31	113	31	550	71	-71	0	479	0	3	105	-3	-0.11
36	103	36	479	31	-31	71	449	0	3	69	-3	-0.07
110	89	89	449	0	20	101	469	0	0	89	0	+0.00
43	101	44	469	23	-23	81	446	0	2	69	-2	-0.05
145	109	90	446	5	50	104	496	0	1	96	-1	-0.01
19	121	19	496	56	-56	54	440	0	4	79	-4	-0.21
110	145	90	440	13	7	110	447	0	2	105	-2	-0.02
70	156	70	447	23	-23	103	424	0	3	97	-3	-0.05
66	161	66	424	13	-13	126	411	0	4	83	-4	-0.06

1093 1548 805 277 3 30 1112 -27 -0.02

YEAR 1953

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
125	161	90	411	4	31	139	441	0	3	97	-3	-0.02
238	144	90	441	13	135	109	550	27	2	105	24	+0.10
350	145	90	550	47	213	0	550	213	2	140	211	+0.60
330	113	90	550	20	220	0	550	220	1	111	219	+0.66
100	103	90	550	11	-1	0	549	0	1	102	-1	-0.01
173	89	89	549	0	83	1	550	82	0	89	82	+0.47
65	101	66	550	30	-30	0	520	0	1	98	-1	-0.02
32	109	32	520	53	-53	30	467	0	3	88	-3	-0.10



12	121	12	467	42	-42	83	425	0	4	58	-4	-0.36
27	145	27	425	17	-17	125	408	0	5	49	-5	-0.17
25	156	25	408	6	-6	142	402	0	5	36	-5	-0.21
76	161	76	402	1	-1	148	401	0	3	80	-3	-0.04

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1553	1548	777		245				541	31	1052	511	+0.33
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YEAR 1954

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RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
37	161	37	401	1	-1	149	400	0	5	43	-5	-0.13
96	144	90	400	0	6	150	406	0	2	92	-2	-0.02
321	145	90	406	2	229	144	550	85	2	94	83	+0.26
288	113	90	550	20	178	0	550	178	1	111	177	+0.62
43	103	43	550	52	-52	0	498	0	2	97	-2	-0.06
135	89	89	498	0	45	52	543	0	0	89	0	+0.00
48	101	49	543	43	-43	7	501	0	2	94	-2	-0.04
122	109	90	501	11	21	49	522	0	1	102	-1	-0.01
38	121	38	522	58	-58	28	464	0	3	99	-3	-0.09
112	145	90	464	20	2	86	466	0	2	112	-2	-0.02
18	156	18	466	52	-52	84	414	0	6	75	-6	-0.31
530	161	90	414	6	434	136	550	298	3	98	295	+0.56

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1788	1548	814		263				562	29	1107	532	+0.30
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YEAR 1955

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RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
147	161	90	550	61	-4	0	546	0	3	154	-3	-0.02
182	144	90	546	45	47	4	550	43	2	137	41	+0.22
428	145	90	550	47	291	0	550	291	2	140	289	+0.67
234	113	90	550	20	124	0	550	124	1	111	123	+0.53
233	103	90	550	11	132	0	550	132	1	102	131	+0.56
87	89	87	550	2	-2	0	548	0	0	89	-0	-0.00
71	101	71	548	26	-26	2	523	0	1	98	-1	-0.02
178	109	90	523	13	75	27	550	47	1	104	47	+0.26
86	121	86	550	30	-30	0	520	0	1	118	-1	-0.02
69	145	69	520	52	-52	30	468	0	3	124	-3	-0.04
98	156	90	468	26	-18	82	450	0	3	118	-3	-0.03
373	161	90	450	20	263	100	550	163	3	113	160	+0.43

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2186	1548	1033		353				800	21	1407	779	+0.36
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YEAR 1956

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RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
223	161	90	550	61	72	0	550	72	3	154	69	+0.31
222	144	90	550	46	86	0	550	86	2	139	83	+0.38
348	145	90	550	47	211	0	550	211	2	140	209	+0.60

339	113	90	550	20	229	0	550	229	1	111	228	+0.67
32	103	32	550	61	-61	0	489	0	3	96	-3	-0.09
60	89	60	489	15	-15	61	474	0	1	76	-1	-0.02
152	101	90	474	5	57	76	531	0	0	95	-0	-0.00
78	109	78	531	23	-23	19	508	0	1	103	-1	-0.02
109	121	90	508	19	-0	42	508	0	1	110	-1	-0.01
163	145	90	508	34	39	42	547	0	2	126	-2	-0.01
169	156	90	547	56	23	3	550	20	3	148	18	+0.10
38	161	38	550	106	-106	0	444	0	5	149	-5	-0.13
1933	1548	928		493				618	25	1446	593	+0.31

YEAR 1957

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
649	161	90	444	18	541	106	550	435	3	111	432	+0.67
300	144	90	550	46	164	0	550	164	2	139	161	+0.54
508	145	90	550	47	371	0	550	371	2	140	369	+0.73
88	113	88	550	22	-22	0	529	0	1	111	-1	-0.01
161	103	90	529	10	61	22	550	40	1	100	39	+0.24
187	89	89	550	0	97	0	550	97	0	89	97	+0.52
217	101	90	550	9	119	0	550	119	0	100	118	+0.54
202	109	90	550	16	96	0	550	96	1	107	95	+0.47
31	121	31	550	77	-77	0	473	0	4	112	-4	-0.12
41	145	41	473	43	-43	77	429	0	4	88	-4	-0.10
101	156	90	429	11	-0	121	429	0	3	104	-3	-0.03
156	161	90	429	12	54	121	483	0	3	105	-3	-0.02
2641	1548	969		312				1321	23	1304	1297	+0.49

YEAR 1958

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
49	161	49	483	54	-54	67	430	0	4	107	-4	-0.09
230	144	90	430	9	131	120	550	11	2	101	8	+0.04
119	145	90	550	47	-18	0	532	0	2	140	-2	-0.02
303	113	90	532	17	196	18	550	177	1	108	176	+0.58
55	103	55	550	41	-41	0	509	0	2	98	-2	-0.03
5	89	5	509	52	-52	41	456	0	3	61	-3	-0.67
99	101	90	456	4	5	94	462	0	0	94	-0	-0.00
40	109	40	462	24	-24	88	437	0	3	67	-3	-0.07
47	121	47	437	16	-16	113	422	0	3	66	-3	-0.06
134	145	90	422	7	37	128	459	0	2	99	-2	-0.02
225	156	90	459	22	113	91	550	22	3	115	19	+0.08
28	161	28	550	114	-114	0	436	0	5	148	-5	-0.19
1334	1548	764		408				209	31	1204	178	+0.13

YEAR 1959

RAIN	ET	EI	SMC1	ES	XCESS	SMDEF	SMC2	GWR	TL	EA	NETR	RECHARGE
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(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	RATIO
512	161	90	436	14	408	114	550	293	3	107	290	+0.57
35	144	35	550	94	-94	0	456	0	4	133	-4	-0.12
313	145	90	456	18	205	94	550	112	2	110	109	+0.35
177	113	90	550	20	67	0	550	67	1	111	66	+0.37
90	103	90	550	11	-11	0	539	0	1	102	-1	-0.01
70	89	70	539	15	-15	11	524	0	1	86	-1	-0.01
85	101	85	524	11	-11	26	512	0	1	97	-1	-0.01
106	109	90	512	12	4	38	516	0	1	103	-1	-0.01
99	121	90	516	21	-12	34	504	0	1	112	-1	-0.01
98	145	90	504	33	-25	46	480	0	2	125	-2	-0.02
125	156	90	480	30	5	70	484	0	3	123	-3	-0.02
142	161	90	484	34	18	66	502	0	3	127	-3	-0.02
1852	1548	1000		314				472	22	1336	450	+0.24

YEAR 1960

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
125	161	90	502	42	-7	48	496	0	3	134	-3	-0.02
130	144	90	496	30	10	54	506	0	2	122	-2	-0.02
234	145	90	506	33	111	44	550	67	2	126	64	+0.27
155	113	90	550	20	45	0	550	45	1	111	44	+0.29
21	103	21	550	71	-71	0	479	0	3	95	-3	-0.16
73	89	73	479	7	-7	71	472	0	1	81	-1	-0.01
94	101	90	472	5	-1	78	472	0	0	95	-0	-0.00
111	109	90	472	8	13	78	485	0	1	99	-1	-0.01
34	121	34	485	42	-42	65	443	0	3	80	-3	-0.10
42	145	42	443	25	-25	107	417	0	4	71	-4	-0.10
70	156	70	417	9	-9	133	409	0	3	82	-3	-0.05
171	161	90	409	4	77	141	486	0	3	96	-3	-0.02
1260	1548	870		294				112	27	1191	85	+0.07

YEAR 1961

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
290	161	90	486	35	165	64	550	101	3	128	98	+0.34
262	144	90	550	46	126	0	550	126	2	139	123	+0.47
432	145	90	550	47	295	0	550	295	2	140	293	+0.68
69	113	69	550	38	-38	0	512	0	2	109	-2	-0.03
185	103	90	512	8	87	38	550	49	1	99	48	+0.26
39	89	39	550	43	-43	0	507	0	2	84	-2	-0.05
193	101	90	507	7	96	43	550	53	0	97	53	+0.27
118	109	90	550	16	12	0	550	12	1	107	11	+0.09
34	121	34	550	75	-75	0	475	0	3	112	-3	-0.10
98	145	90	475	24	-16	75	459	0	2	116	-2	-0.02
201	156	90	459	23	88	91	548	0	3	115	-3	-0.01
102	161	90	548	60	-48	2	500	0	3	153	-3	-0.03
2023	1548	952		422				635	24	1398	611	+0.30

YEAR 1962

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
394	161	90	500	41	263	50	550	213	3	133	210	+0.53
119	144	90	550	46	-17	0	533	0	2	139	-2	-0.02
53	145	53	533	70	-70	17	463	0	4	127	-4	-0.07
126	113	90	463	8	28	87	490	0	1	99	-1	-0.01
64	103	64	490	20	-20	60	470	0	2	86	-2	-0.02
128	89	89	470	0	38	80	508	0	0	89	0	+0.00
44	101	45	508	35	-35	42	473	0	2	82	-2	-0.05
22	109	22	473	37	-37	77	437	0	3	62	-3	-0.16
84	121	84	437	8	-8	113	429	0	1	93	-1	-0.02
61	145	61	429	14	-14	121	415	0	3	78	-3	-0.06
131	156	90	415	6	35	135	450	0	3	98	-3	-0.02
286	161	90	450	20	176	100	550	76	3	113	73	+0.26
1512	1548	868		305				289	27	1200	262	+0.17

YEAR 1963

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
182	161	90	550	61	31	0	550	31	3	154	28	+0.15
218	144	90	550	46	82	0	550	82	2	139	79	+0.36
550	145	90	550	47	413	0	550	413	2	140	411	+0.75
99	113	90	550	20	-11	0	539	0	1	111	-1	-0.01
110	103	90	539	10	10	11	549	0	1	101	-1	-0.00
27	89	27	549	53	-53	1	496	0	2	82	-2	-0.09
26	101	26	496	41	-41	54	455	0	3	70	-3	-0.12
214	109	90	455	6	118	95	550	23	1	97	22	+0.10
34	121	34	550	75	-75	0	475	0	3	112	-3	-0.10
69	145	69	475	33	-33	75	442	0	3	105	-3	-0.04
40	156	40	442	28	-28	108	414	0	5	73	-5	-0.12
49	161	49	414	9	-9	136	405	0	4	63	-4	-0.09
1618	1548	785		430				548	31	1246	517	+0.32

YEAR 1964

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
50	161	50	405	3	-3	145	402	0	4	58	-4	-0.09
212	144	90	402	1	121	148	523	0	2	93	-2	-0.01
593	145	90	523	39	464	27	550	437	2	131	435	+0.73
96	113	90	550	20	-14	0	536	0	1	111	-1	-0.01
30	103	30	536	57	-57	14	479	0	3	90	-3	-0.10
10	89	10	479	36	-36	71	443	0	3	49	-3	-0.32
208	101	90	443	3	115	107	550	9	0	93	8	+0.04
96	109	90	550	16	-10	0	540	0	1	107	-1	-0.01
294	121	90	540	25	179	10	550	169	1	116	168	+0.57
123	145	90	550	47	-14	0	536	0	2	140	-2	-0.02
188	156	90	536	51	47	14	550	32	3	144	30	+0.16

105	161	90	550	61	-46	0	504	0	3	154	-3	-0.03
2005	1548	900		359				647	26	1285	621	+0.31

YEAR 1965

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
213	161	90	504	42	81	46	550	35	3	135	32	+0.15
360	144	90	550	46	224	0	550	224	2	139	221	+0.62
217	145	90	550	47	80	0	550	80	2	140	78	+0.36
137	113	90	550	20	27	0	550	27	1	111	26	+0.19
104	103	90	550	11	3	0	550	3	1	102	2	+0.02
22	89	22	550	58	-58	0	492	0	3	82	-3	-0.12
35	101	35	492	35	-35	58	457	0	3	73	-3	-0.08
122	109	90	457	6	26	93	483	0	1	97	-1	-0.01
208	121	90	483	15	103	67	550	36	1	106	35	+0.17
120	145	90	550	47	-17	0	533	0	2	140	-2	-0.02
134	156	90	533	50	-6	17	526	0	3	143	-3	-0.02
52	161	52	526	79	-79	24	447	0	4	135	-4	-0.08
1724	1548	919		457				404	25	1401	379	+0.22

YEAR 1966

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
106	161	90	447	19	-3	103	444	0	3	112	-3	-0.03
137	144	90	444	14	33	106	477	0	2	106	-2	-0.02
112	145	90	477	24	-2	73	475	0	2	117	-2	-0.02
279	113	90	475	10	179	75	550	104	1	101	103	+0.37
88	103	88	550	13	-13	0	537	0	1	102	-1	-0.01
46	89	46	537	34	-34	13	503	0	2	82	-2	-0.04
83	101	83	503	11	-11	47	493	0	1	94	-1	-0.01
62	109	62	493	25	-25	57	468	0	2	89	-2	-0.03
42	121	42	468	31	-31	82	437	0	3	76	-3	-0.08
167	145	90	437	12	65	113	502	0	2	104	-2	-0.01
95	156	90	502	39	-34	48	469	0	3	131	-3	-0.03
144	161	90	469	28	26	81	495	0	3	121	-3	-0.02
1361	1548	951		259				104	24	1233	80	+0.06

YEAR 1967

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
123	161	90	495	39	-6	55	489	0	3	131	-3	-0.02
168	144	90	489	28	50	61	540	0	2	120	-2	-0.01
329	145	90	540	44	195	10	550	185	2	136	182	+0.55
190	113	90	550	20	80	0	550	80	1	111	79	+0.42
146	103	90	550	11	45	0	550	45	1	102	44	+0.30
18	89	18	550	61	-61	0	489	0	3	82	-3	-0.16

52	101	52	489	25	-25	61	464	0	2	79	-2	-0.04
12	109	12	464	36	-36	86	428	0	4	51	-4	-0.32
49	121	49	428	12	-12	122	417	0	3	64	-3	-0.06
294	145	90	417	5	199	133	550	65	2	97	63	+0.22
26	156	26	550	112	-112	0	438	0	5	143	-5	-0.20
66	161	66	438	21	-21	112	417	0	4	91	-4	-0.06

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1473	1548	763		412				375	31	1207	344	+0.23
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YEAR 1968

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RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
337	161	90	417	7	240	133	550	107	3	100	104	+0.31
90	144	90	550	46	-46	0	504	0	2	139	-2	-0.02
233	145	90	504	33	110	46	550	64	2	125	62	+0.26
77	113	77	550	31	-31	0	519	0	1	109	-1	-0.02
68	103	68	519	24	-24	31	495	0	1	93	-1	-0.02
52	89	52	495	20	-20	55	475	0	1	74	-1	-0.03
21	101	21	475	34	-34	75	441	0	3	59	-3	-0.15
116	109	90	441	4	22	109	462	0	1	95	-1	-0.01
61	121	61	462	21	-21	88	441	0	2	85	-2	-0.04
145	145	90	441	13	42	109	483	0	2	105	-2	-0.02
82	156	82	483	35	-35	67	448	0	3	120	-3	-0.04
143	161	90	448	19	34	102	481	0	3	112	-3	-0.02

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1425	1548	901		289				171	26	1216	145	+0.10
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YEAR 1969

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RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
274	161	90	481	33	151	69	550	82	3	126	79	+0.29
134	144	90	550	46	-2	0	548	0	2	139	-2	-0.02
496	145	90	548	47	359	2	550	357	2	139	355	+0.72
111	113	90	550	20	1	0	550	1	1	111	0	+0.00
14	103	14	550	77	-77	0	473	0	4	94	-4	-0.25
18	89	18	473	30	-30	77	444	0	3	51	-3	-0.16
148	101	90	444	3	55	106	499	0	0	93	-0	-0.00
112	109	90	499	11	11	51	510	0	1	102	-1	-0.01
7	121	7	510	72	-72	40	438	0	5	83	-5	-0.65
89	145	89	438	12	-12	112	426	0	2	103	-2	-0.03
199	156	90	426	10	99	124	525	0	3	102	-3	-0.01
56	161	56	525	75	-75	25	450	0	4	136	-4	-0.07

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1658	1548	814		435				440	29	1278	411	+0.25
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YEAR 1970

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RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
183	161	90	450	20	73	100	523	0	3	113	-3	-0.02

302	144	90	523	38	174	27	550	147	2	130	144	+0.48
214	145	90	550	47	77	0	550	77	2	140	75	+0.35
326	113	90	550	20	216	0	550	216	1	111	215	+0.66
224	103	90	550	11	123	0	550	123	1	102	122	+0.55
106	89	89	550	0	16	0	550	16	0	89	16	+0.15
20	101	21	550	69	-69	0	481	0	3	93	-3	-0.16
13	109	13	481	45	-45	69	437	0	4	62	-4	-0.30
91	121	90	437	6	-5	113	431	0	1	98	-1	-0.01
21	145	21	431	22	-22	119	409	0	5	48	-5	-0.24
351	156	90	409	3	258	141	550	117	3	96	114	+0.32
252	161	90	550	61	101	0	550	101	3	154	98	+0.39
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2103	1548	864		343				796	27	1234	768	+0.37
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YEAR 1971

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
287	161	90	550	61	136	0	550	136	3	154	133	+0.46
96	144	90	550	46	-40	0	510	0	2	139	-2	-0.02
244	145	90	510	35	119	40	550	79	2	127	77	+0.31
203	113	90	550	20	93	0	550	93	1	111	92	+0.45
155	103	90	550	11	54	0	550	54	1	102	53	+0.34
69	89	69	550	17	-17	0	533	0	1	87	-1	-0.01
69	101	69	533	24	-24	17	508	0	1	95	-1	-0.02
218	109	90	508	12	116	42	550	75	1	103	74	+0.34
103	121	90	550	27	-14	0	536	0	1	118	-1	-0.01
95	145	90	536	43	-38	14	498	0	2	135	-2	-0.02
512	156	90	498	37	385	52	550	333	3	130	330	+0.65
613	161	90	550	61	462	0	550	462	3	154	459	+0.75
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2664	1548	1038		394				1232	20	1453	1211	+0.45
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YEAR 1972

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
170	161	90	550	61	19	0	550	19	3	154	16	+0.09
141	144	90	550	46	5	0	550	5	2	139	2	+0.02
476	145	90	550	47	339	0	550	339	2	140	337	+0.71
332	113	90	550	20	222	0	550	222	1	111	221	+0.67
95	103	90	550	11	-6	0	544	0	1	102	-1	-0.01
110	89	89	544	0	20	6	550	14	0	89	14	+0.13
102	101	90	550	9	4	0	550	4	0	100	3	+0.03
226	109	90	550	16	120	0	550	120	1	107	119	+0.53
283	121	90	550	27	166	0	550	166	1	118	165	+0.58
316	145	90	550	47	179	0	550	179	2	140	177	+0.56
33	156	33	550	106	-106	0	444	0	5	144	-5	-0.15
44	161	44	444	30	-30	106	415	0	5	78	-5	-0.11
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2328	1548	976		421				1066	23	1420	1044	+0.45
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YEAR 1973

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
88	161	88	415	6	-6	135	408	0	3	97	-3	-0.03
310	144	90	408	3	217	142	550	76	2	95	74	+0.24
230	145	90	550	47	93	0	550	93	2	140	91	+0.39
332	113	90	550	20	222	0	550	222	1	111	221	+0.67
29	103	29	550	64	-64	0	486	0	3	96	-3	-0.10
116	89	89	486	0	26	64	512	0	0	89	0	+0.00
178	101	90	512	7	82	38	550	44	0	98	44	+0.25
63	109	63	550	40	-40	0	510	0	2	104	-2	-0.03
227	121	90	510	20	117	40	550	78	1	111	77	+0.34
114	145	90	550	47	-23	0	527	0	2	140	-2	-0.02
226	156	90	527	48	88	23	550	65	3	141	62	+0.27
101	161	90	550	61	-50	0	500	0	3	154	-3	-0.03
2014	1548	989		362				578	22	1373	555	+0.28

YEAR 1974

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
152	161	90	500	41	21	50	521	0	3	134	-3	-0.02
403	144	90	521	38	275	29	550	247	2	130	245	+0.61
111	145	90	550	47	-26	0	524	0	2	140	-2	-0.02
254	113	90	524	16	148	26	550	121	1	107	120	+0.47
167	103	90	550	11	66	0	550	66	1	102	65	+0.39
122	89	89	550	0	32	0	550	32	0	89	32	+0.26
138	101	90	550	9	40	0	550	40	0	100	39	+0.28
73	109	73	550	31	-31	0	519	0	1	105	-1	-0.02
163	121	90	519	21	52	31	550	21	1	112	20	+0.12
199	145	90	550	47	62	0	550	62	2	140	60	+0.30
120	156	90	550	57	-27	0	523	0	3	149	-3	-0.02
153	161	90	523	50	13	27	536	0	3	143	-3	-0.02
2055	1548	1062		369				588	19	1450	569	+0.28

YEAR 1975

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
281	161	90	536	55	136	14	550	122	3	148	119	+0.42
265	144	90	550	46	129	0	550	129	2	139	126	+0.48
207	145	90	550	47	70	0	550	70	2	140	68	+0.33
74	113	74	550	34	-34	0	516	0	2	109	-2	-0.02
161	103	90	516	9	62	34	550	29	1	99	28	+0.18
75	89	75	550	12	-12	0	538	0	1	88	-1	-0.01
191	101	90	538	9	92	12	550	80	0	99	80	+0.42
144	109	90	550	16	38	0	550	38	1	107	37	+0.26
85	121	85	550	31	-31	0	519	0	1	117	-1	-0.02
135	145	90	519	38	7	31	527	0	2	130	-2	-0.02
380	156	90	527	48	242	23	550	219	3	141	216	+0.57
313	161	90	550	61	162	0	550	162	3	154	159	+0.51
2311	1548	1044		406				847	20	1470	827	+0.36



YEAR 1976

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
245	161	90	550	61	94	0	550	94	3	154	91	+0.37
299	144	90	550	46	163	0	550	163	2	139	160	+0.54
354	145	90	550	47	217	0	550	217	2	140	215	+0.61
254	113	90	550	20	144	0	550	144	1	111	143	+0.56
68	103	68	550	30	-30	0	520	0	1	100	-1	-0.02
26	89	26	520	43	-43	30	477	0	3	72	-3	-0.10
55	101	55	477	20	-20	73	456	0	2	77	-2	-0.03
96	109	90	456	6	-0	94	456	0	1	97	-1	-0.01
144	121	90	456	10	44	94	500	0	1	101	-1	-0.01
6	145	6	500	80	-80	50	420	0	6	91	-6	-0.93
36	156	36	420	14	-14	130	406	0	5	55	-5	-0.13
171	161	90	406	3	78	144	485	0	3	95	-3	-0.02
1754	1548	821		381				617	29	1231	588	+0.34

YEAR 1977

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
271	161	90	485	35	146	65	550	81	3	127	78	+0.29
339	144	90	550	46	203	0	550	203	2	139	200	+0.59
168	145	90	550	47	31	0	550	31	2	140	29	+0.17
158	113	90	550	20	48	0	550	48	1	111	47	+0.30
70	103	70	550	28	-28	0	522	0	1	100	-1	-0.02
42	89	42	522	33	-33	28	489	0	2	77	-2	-0.04
57	101	57	489	22	-22	61	466	0	2	81	-2	-0.03
76	109	76	466	13	-13	84	454	0	1	90	-1	-0.02
46	121	46	454	23	-23	96	431	0	3	72	-3	-0.07
39	145	39	431	19	-19	119	412	0	4	62	-4	-0.11
11	156	11	412	10	-10	138	402	0	6	27	-6	-0.53
46	161	46	402	1	-1	148	401	0	5	52	-5	-0.10
1323	1548	747		297				363	32	1076	331	+0.25

YEAR 1978

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
123	161	90	401	0	33	149	433	0	3	93	-3	-0.02
145	144	90	433	10	45	117	478	0	2	103	-2	-0.01
308	145	90	478	25	193	72	550	121	2	117	119	+0.39
170	113	90	550	20	60	0	550	60	1	111	59	+0.35
161	103	90	550	11	60	0	550	60	1	102	59	+0.37
15	89	15	550	64	-64	0	486	0	3	82	-3	-0.20
2	101	2	486	49	-49	64	437	0	4	55	-4	-1.98
245	109	90	437	4	151	113	550	38	1	95	38	+0.15
137	121	90	550	27	20	0	550	20	1	118	19	+0.14

41	145	41	550	89	-89	0	461	0	4	135	-4	-0.10
73	156	73	461	29	-29	89	432	0	3	105	-3	-0.05
33	161	33	432	23	-23	118	408	0	5	61	-5	-0.16
1453	1548	794		351				300	30	1175	270	+0.19

YEAR 1979

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
104	161	90	408	3	11	142	419	0	3	96	-3	-0.03
50	144	50	419	10	-10	131	409	0	4	64	-4	-0.08
223	145	90	409	3	130	141	539	0	2	95	-2	-0.01
40	113	40	539	58	-58	11	481	0	3	101	-3	-0.07
70	103	70	481	15	-15	69	466	0	1	87	-1	-0.02
146	89	89	466	0	56	84	522	0	0	89	0	+0.00
48	101	49	522	36	-36	28	485	0	2	87	-2	-0.04
126	109	90	485	9	27	65	512	0	1	100	-1	-0.01
199	121	90	512	20	89	38	550	51	1	111	50	+0.25
47	145	47	550	84	-84	0	466	0	4	135	-4	-0.08
111	156	90	466	25	-4	84	462	0	3	118	-3	-0.02
115	161	90	462	25	-0	88	462	0	3	118	-3	-0.02
1279	1548	885		290				51	27	1201	25	+0.02

YEAR 1980

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
61	161	61	462	35	-35	88	426	0	4	100	-4	-0.07
61	144	61	426	13	-13	124	414	0	3	77	-3	-0.05
402	145	90	414	4	308	136	550	171	2	97	169	+0.42
204	113	90	550	20	94	0	550	94	1	111	93	+0.46
0	103	0	550	89	-89	0	461	0	4	93	-4	+0.00
91	89	89	461	0	1	89	462	0	0	89	0	+0.00
92	101	90	462	4	-1	88	461	0	0	94	-0	-0.00
174	109	90	461	7	77	89	539	0	1	97	-1	-0.00
75	121	75	539	37	-37	11	502	0	2	113	-2	-0.02
79	145	79	502	39	-39	48	464	0	3	120	-3	-0.03
92	156	90	464	24	-22	86	441	0	3	117	-3	-0.03
154	161	90	441	17	47	109	489	0	3	110	-3	-0.02
1485	1548	905		287				266	26	1218	240	+0.16

YEAR 1981

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
88	161	88	489	37	-37	61	452	0	3	128	-3	-0.03
356	144	90	452	16	250	98	550	152	2	108	149	+0.42
180	145	90	550	47	43	0	550	43	2	140	41	+0.23
54	113	54	550	51	-51	0	499	0	2	107	-2	-0.04

94	103	90	499	7	-3	51	496	0	1	98	-1	-0.01
30	89	30	496	32	-32	54	463	0	2	65	-2	-0.08
11	101	11	463	33	-33	87	431	0	4	47	-4	-0.33
52	109	52	431	10	-10	119	421	0	2	64	-2	-0.04
71	121	71	421	6	-6	129	415	0	2	79	-2	-0.03
41	145	41	415	9	-9	135	406	0	4	54	-4	-0.10
70	156	70	406	3	-3	144	403	0	3	76	-3	-0.05
128	161	90	403	1	37	147	440	0	3	94	-3	-0.02

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1175	1548	777		253				194	31	1060	163	+0.14
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YEAR 1982

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RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
261	161	90	440	16	155	110	550	45	3	109	42	+0.16
199	144	90	550	46	63	0	550	63	2	139	60	+0.30
253	145	90	550	47	116	0	550	116	2	140	114	+0.45
436	113	90	550	20	326	0	550	326	1	111	325	+0.75
217	103	90	550	11	116	0	550	116	1	102	115	+0.53
54	89	54	550	30	-30	0	520	0	1	86	-1	-0.03
59	101	59	520	29	-29	30	491	0	2	90	-2	-0.03
74	109	74	491	18	-18	59	473	0	1	94	-1	-0.02
156	121	90	473	13	53	77	526	0	1	104	-1	-0.01
14	145	14	526	95	-95	24	431	0	5	114	-5	-0.37
24	156	24	431	24	-24	119	408	0	5	53	-5	-0.22
80	161	80	408	4	-4	142	404	0	3	87	-3	-0.04

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1827	1548	845		353				665	28	1226	637	+0.35
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YEAR 1983

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RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
15	161	15	404	3	-3	146	401	0	6	24	-6	-0.39
68	144	68	401	0	-0	149	400	0	3	71	-3	-0.04
177	145	90	400	0	87	150	487	0	2	92	-2	-0.01
21	113	21	487	46	-46	63	441	0	4	71	-4	-0.18
48	103	48	441	13	-13	109	428	0	2	63	-2	-0.05
8	89	8	428	13	-13	122	415	0	3	24	-3	-0.41
59	101	59	415	4	-4	135	411	0	2	64	-2	-0.03
21	109	21	411	6	-6	139	406	0	4	30	-4	-0.17
95	121	90	406	1	4	144	410	0	1	92	-1	-0.01
157	145	90	410	3	64	140	474	0	2	95	-2	-0.01
61	156	61	474	40	-40	76	434	0	4	105	-4	-0.06
96	161	90	434	14	-8	116	426	0	3	106	-3	-0.03

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826	1548	661		143				0	35	840	-35	-0.04
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YEAR 1984

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RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
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230	161	90	426	11	129	124	550	5	3	103	3	+0.01
238	144	90	550	46	102	0	550	102	2	139	99	+0.42
52	145	52	550	80	-80	0	470	0	4	136	-4	-0.07
217	113	90	470	9	118	80	550	38	1	100	37	+0.17
34	103	34	550	59	-59	0	491	0	3	96	-3	-0.08
92	89	89	491	0	2	59	493	0	0	89	0	+0.00
94	101	90	493	6	-1	57	492	0	0	96	-0	-0.00
95	109	90	492	10	-5	58	487	0	1	101	-1	-0.01
216	121	90	487	15	111	63	550	47	1	107	46	+0.21
44	145	44	550	87	-87	0	463	0	4	135	-4	-0.09
5	156	5	463	55	-55	87	408	0	6	66	-6	-1.21
60	161	60	408	5	-5	142	404	0	4	69	-4	-0.07
1377	1548	824		383				192	29	1236	163	+0.12

YEAR 1985

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
35	161	35	404	3	-3	146	401	0	5	43	-5	-0.14
236	144	90	401	0	146	149	547	0	2	92	-2	-0.01
238	145	90	547	46	102	3	550	98	2	138	96	+0.40
130	113	90	550	20	20	0	550	20	1	111	19	+0.15
35	103	35	550	58	-58	0	492	0	3	96	-3	-0.08
116	89	89	492	0	26	58	518	0	0	89	0	+0.00
231	101	90	518	7	135	32	550	102	0	98	102	+0.44
66	109	66	550	37	-37	0	513	0	2	105	-2	-0.03
38	121	38	513	54	-54	37	459	0	3	95	-3	-0.09
13	145	13	459	45	-45	91	414	0	5	63	-5	-0.41
4	156	4	414	13	-13	136	402	0	6	23	-6	-1.52
172	161	90	402	1	81	148	483	0	3	94	-3	-0.02
1314	1548	730		284				221	33	1046	188	+0.14

YEAR 1986

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
88	161	88	483	35	-35	67	448	0	3	126	-3	-0.03
77	144	77	448	19	-19	102	430	0	3	98	-3	-0.03
154	145	90	430	9	55	120	484	0	2	102	-2	-0.01
307	113	90	484	11	206	66	550	140	1	102	139	+0.45
98	103	90	550	11	-3	0	547	0	1	102	-1	-0.01
231	89	89	547	0	141	3	550	138	0	89	138	+0.60
163	101	90	550	9	65	0	550	65	0	100	64	+0.39
75	109	75	550	29	-29	0	521	0	1	106	-1	-0.02
50	121	50	521	49	-49	29	472	0	3	102	-3	-0.06
63	145	63	472	34	-34	78	438	0	3	100	-3	-0.05
11	156	11	438	32	-32	112	406	0	6	48	-6	-0.53
12	161	12	406	5	-5	144	401	0	6	23	-6	-0.50
1329	1548	825		244				343	29	1097	314	+0.24

YEAR 1987

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
21	161	21	401	1	-1	149	400	0	6	27	-6	-0.27
110	144	90	400	0	20	150	420	0	2	92	-2	-0.02
352	145	90	420	6	256	130	550	126	2	99	124	+0.35
2	113	2	550	95	-95	0	455	0	4	102	-4	-2.22
47	103	47	455	18	-18	95	437	0	2	67	-2	-0.05
41	89	41	437	10	-10	113	427	0	2	53	-2	-0.05
64	101	64	427	6	-6	123	421	0	1	71	-1	-0.02
103	109	90	421	2	11	129	432	0	1	93	-1	-0.01
6	121	6	432	21	-21	118	411	0	5	32	-5	-0.77
0	145	0	411	9	-9	139	402	0	6	15	-6	+0.00
3	156	3	402	2	-2	148	400	0	6	11	-6	-2.04
385	161	90	400	0	295	150	550	145	3	93	142	+0.37
1134	1548	544		170				271	40	754	231	+0.20

YEAR 1988

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
236	161	90	550	61	85	0	550	85	3	154	82	+0.35
108	144	90	550	46	-28	0	522	0	2	139	-2	-0.02
145	145	90	522	38	17	28	538	0	2	131	-2	-0.02
113	113	90	538	18	5	12	543	0	1	109	-1	-0.01
210	103	90	543	11	109	7	550	102	1	101	102	+0.48
35	89	35	550	46	-46	0	504	0	2	84	-2	-0.06
84	101	84	504	10	-10	46	493	0	1	95	-1	-0.01
20	109	20	493	48	-48	57	446	0	4	71	-4	-0.18
237	121	90	446	8	139	104	550	35	1	99	33	+0.14
114	145	90	550	47	-23	0	527	0	2	140	-2	-0.02
27	156	27	527	94	-94	23	433	0	5	126	-5	-0.19
209	161	90	433	13	106	117	539	0	3	106	-3	-0.01
1538	1548	886		442				222	26	1354	195	+0.13

YEAR 1989

RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
131	161	90	539	56	-15	11	523	0	3	149	-3	-0.02
486	144	90	523	38	358	27	550	331	2	130	329	+0.68
348	145	90	550	47	211	0	550	211	2	140	209	+0.60
437	113	90	550	20	327	0	550	327	1	111	326	+0.75
430	103	90	550	11	329	0	550	329	1	102	328	+0.76
74	89	74	550	13	-13	0	537	0	1	88	-1	-0.01
38	101	38	537	50	-50	13	488	0	3	90	-3	-0.07
41	109	41	488	34	-34	62	453	0	3	78	-3	-0.07
97	121	90	453	9	-2	97	451	0	1	101	-1	-0.01
96	145	90	451	16	-10	99	441	0	2	108	-2	-0.02
134	156	90	441	15	29	109	469	0	3	108	-3	-0.02
221	161	90	469	28	103	81	550	22	3	121	19	+0.09

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 2533 1548 963 339 1220 23 1325 1197 +0.47  
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YEAR 1990  
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RAIN (mm)	ET (mm)	EI (mm)	SMC1 (mm)	ES (mm)	XCESS (mm)	SMDEF (mm)	SMC2 (mm)	GWR (mm)	TL (mm)	EA (mm)	NETR (mm)	RECHARGE RATIO
270	161	90	550	61	119	0	550	119	3	154	116	+0.43
88	144	88	550	48	-48	0	502	0	2	138	-2	-0.03
264	145	90	502	32	142	48	550	94	2	124	92	+0.35
157	113	90	550	20	47	0	550	47	1	111	46	+0.29
263	103	90	550	11	162	0	550	162	1	102	161	+0.61
163	89	89	550	0	73	0	550	73	0	89	73	+0.45
77	101	78	550	20	-20	0	530	0	1	99	-1	-0.01
104	109	90	530	14	-0	20	530	0	1	105	-1	-0.01
108	121	90	530	23	-5	20	525	0	1	114	-1	-0.01
129	145	90	525	39	-0	25	525	0	2	132	-2	-0.02
29	156	29	525	91	-91	25	434	0	5	125	-5	-0.18
57	161	57	434	20	-20	116	414	0	4	81	-4	-0.07

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 1709 1548 971 380 495 23 1374 472 +0.28  
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44 YEAR AVERAGES  
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1725 1548 873 350 505 27 1250 478 +0.28

Monthly recharge (mm) on Ha'apai for period 1947-90

Year	J	F	M	A	M	J	J	A	S	O	N	D	Annual Recharge	Annual Rainfall
1947	67	50	174	-1	75	15	16	-1	77	-2	-6	23	488	1867
1948	278	8	62	140	-2	0	-2	-4	-3	-2	43	140	660	1983
1949	105	131	73	60	-3	-2	47	7	85	116	-5	62	675	2081
1950	83	-2	318	223	-1	-2	18	-3	-1	-2	86	199	916	2375
1951	79	197	191	54	-1	-3	-2	-4	86	-4	-5	-6	582	1616
1952	-3	-2	0	-3	-3	0	-2	-1	-4	-2	-3	-4	-27	1093
1953	-3	24	211	219	-1	82	-1	-3	-4	-5	-5	-3	511	1553
1954	-5	-2	83	177	-2	0	-2	-1	-3	-2	-6	295	532	1788
1955	-3	41	289	123	131	0	-1	47	-1	-3	-3	160	779	2186
1956	69	83	209	228	-3	-1	0	-1	-1	-2	18	-5	593	1933
1957	432	161	369	-1	39	97	118	95	-4	-4	-3	-3	1297	2641
1958	-4	8	-2	176	-2	-3	0	-3	-3	-2	19	-5	178	1334
1959	290	-4	109	66	-1	-1	-1	-1	-1	-2	-3	-3	450	1852
1960	-3	-2	64	44	-3	-1	0	-1	-3	-4	-3	-3	85	1260
1961	98	123	293	-2	48	-2	53	11	-3	-2	-3	-3	611	2023
1962	210	-2	-4	-1	-2	0	-2	-3	-1	-3	-3	73	262	1512
1963	28	79	411	-1	-1	-2	-3	22	-3	-3	-5	-4	517	1618
1964	-4	-2	435	-1	-3	-3	8	-1	168	-2	30	-3	621	2005
1965	32	221	78	26	2	-3	-3	-1	35	-2	-3	-4	379	1724
1966	-3	-2	-2	103	-1	-2	-1	-2	-3	-2	-3	-3	80	1361
1967	-3	-2	182	79	44	-3	-2	-4	-3	63	-5	-4	344	1473
1968	104	-2	62	-1	-1	-1	-3	-1	-2	-2	-3	-3	145	1425
1969	79	-2	355	0	-4	-3	0	-1	-5	-2	-3	-4	411	1658
1970	-3	144	75	215	122	16	-3	-4	-1	-5	114	98	768	2103
1971	133	-2	77	92	53	-1	-1	74	-1	-2	330	459	1211	2664
1972	16	2	337	221	-1	14	3	119	165	177	-5	-5	1044	2328
1973	-3	74	91	221	-3	0	44	-2	77	-2	62	-3	555	2014
1974	-3	245	-2	120	65	32	39	-1	20	60	-3	-3	569	2055
1975	119	126	68	-2	28	-1	80	37	-1	-2	216	159	827	2311
1976	91	160	215	143	-1	-3	-2	-1	-1	-6	-5	-3	588	1754
1977	78	200	29	47	-1	-2	-2	-1	-3	-4	-6	-5	331	1323
1978	-3	-2	119	59	59	-3	-4	38	19	-4	-3	-5	270	1453
1979	-3	-4	-2	-3	-1	0	-2	-1	50	-4	-3	-3	25	1279
1980	-4	-3	169	93	-4	0	0	-1	-2	-3	-3	-3	240	1485
1981	-3	149	41	-2	-1	-2	-4	-2	-2	-4	-3	-3	163	1155
1982	42	60	114	325	115	-1	-2	-1	-1	-5	-5	-3	637	1827
1983	-6	-3	-2	-4	-2	-3	-2	-4	-1	-2	-4	-3	-35	826
1984	3	99	-4	37	-3	0	0	-1	46	-4	-6	-4	163	1377
1985	-5	-2	96	19	-3	0	102	-2	-3	-5	-6	-3	188	1314
1986	-3	-3	-2	139	-1	138	64	-1	-3	-3	-6	-6	314	1329
1987	-6	-2	124	-4	-2	-2	-1	-1	-5	-6	-6	142	231	1134
1988	82	-2	-2	-1	102	-2	-1	-4	33	-2	-5	-3	195	1538
1989	-3	329	209	326	328	-1	-3	-3	-1	-2	-3	19	1197	2533
1990	116	-2	92	46	161	73	-1	-1	-1	-2	-5	-4	472	1709