Wagner&Bonsignore
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MEMORANDUM

To: Tevis Armstrong

From: Nicholas F. Bonsignore, P.E. 7B

Date: May 9, 2008

Re: **New Water Right Application by Elliot-Smith – Reasonable Likelihood of Water Availability**

California Water Code Section 1260(k) requires that every application for a permit to appropriate water shall include "sufficient information to demonstrate a reasonable likelihood that unappropriated water is available for the proposed appropriation." This narrative and accompanying calculations provide the required information.

The subject Application is within the watershed of an unnamed stream tributary to Capell Creek thence the Putah Creek thence Lake Berryessa in Napa County (see attached map). According to State Water Resources Control Board Order WR 98-08, Putah Creek is fully appropriated upstream of Monticello Dam year-round, with the caveat that new applications will be processed only after a determination is made that water is available under the Condition 12 Settlement Agreement dated March 10, 1995. The purpose of this calculation is to demonstrate the likelihood of water being *physically* available at the points of diversion, and is not intended to be a Condition 12 determination. The Application proposes a diversion season of November 1 to April 30. The following describes the methodology used to demonstrate a *reasonable* likelihood that water is physically available for the proposed appropriation.

The attached map shows the locations and tributary watersheds of the two points of diversion. POD 1 is an existing onstream reservoir with an estimated capacity of 26 acre-feet. Water collected in the POD 1 reservoir will be used for irrigation. POD 2 is an existing onstream reservoir with an estimated capacity of 4.5 acre-feet. The POD 2 reservoir will be used for stockwatering purposes and hence in most years will require replenishment only for evaporation from the reservoir surface and seepage losses (if any). The map also shows lines of equal mean annual runoff as shown on the map included with the document entitled *Mean Annual Runoff in the San Francisco Bay Region, California, 1931-70 by S.E. Rantz, 1974.*[1] An excerpt of this map is attached (Rantz map).

[1] USGS Miscellaneous Field Studies Map MF-613, prepared in cooperation with the California Department of Water Resources.

The weighted mean annual runoff for the watershed tributary to each reckoning point was computed based on the Rantz map. Mean *seasonal* runoff for the subject watershed was estimated by adjusting the mean *annual* runoff assuming that the ratio of seasonal to annual runoff is identical to the ratio of seasonal to annual mean precipitation. The pattern of precipitation was based on the record for the Angwin Pacific Union College precipitation station (record attached). There are no other water rights of record within the watersheds tributary to the PODs.

Calculations for the foregoing methodology are attached. The calculations show that in a normal year the estimated seasonal runoff at POD 1 is about 33 acre-feet, which is about 7 acre-feet greater than the amount requested at this POD.

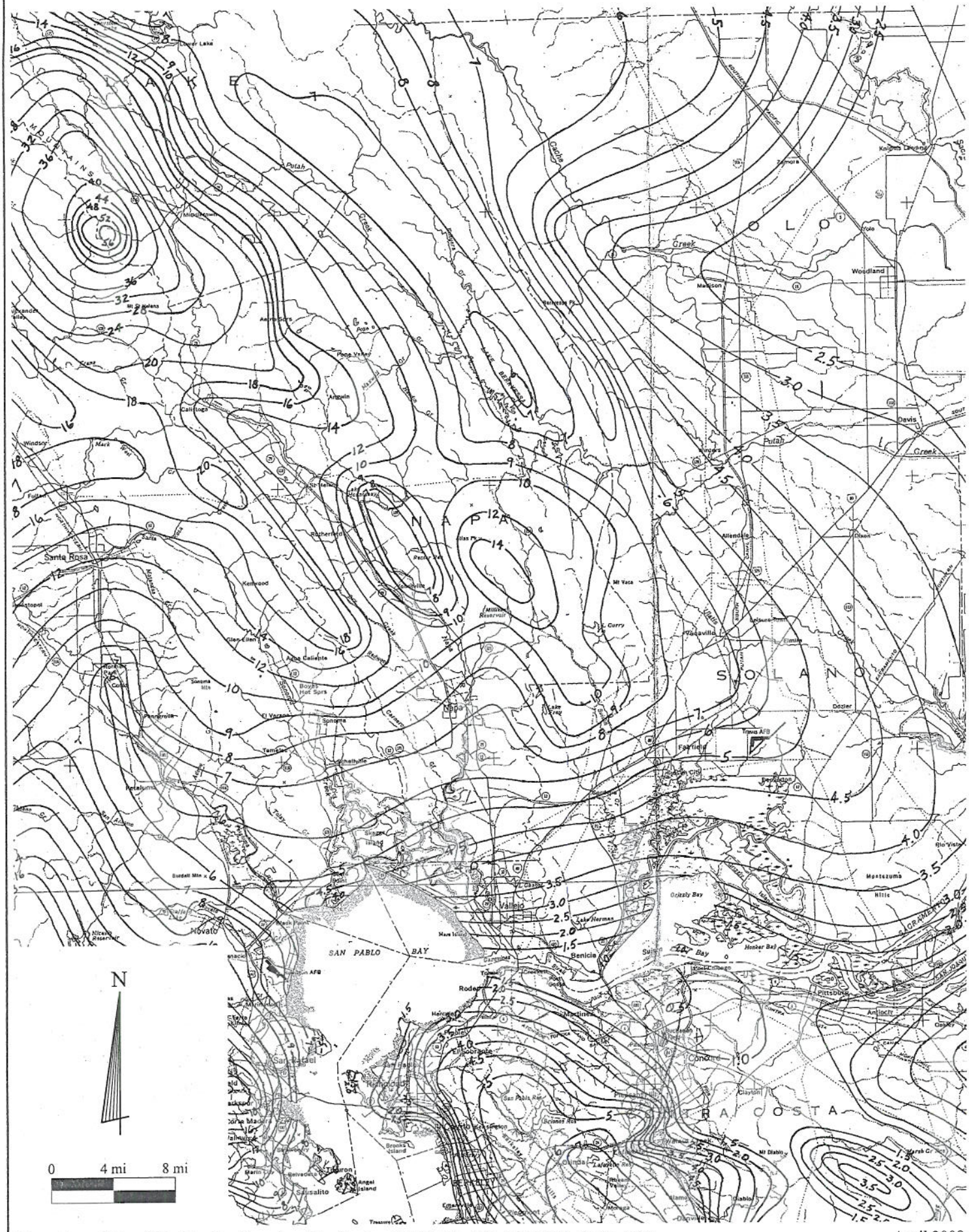
The estimated seasonal runoff at POD 2 in a normal year is about 4.7 acre-feet, which is slightly in excess of the estimated capacity of the reservoir. Because the POD 2 reservoir will be used only for nonconsumptive purposes (stockwatering), diversions will only be required to replenish stored water lost to evaporation and seepage (if any). Based on review of aerial photographs, the surface area of the reservoir is estimated to be about 0.6 acres.[2] For the Berryessa Lake station, pan evaporation for the months of May through October averaged about 60 inches over a 13-year period of record from 1957 to 1970 (see attached summary). Applying a pan factor of 0.8, the estimated lake evaporation is about 48 inches over this period, which results in an estimated evaporated volume of about 2.4 acre-feet from the POD 2 reservoir. The estimated 4.7 acre-feet of runoff in a normal year is about double the replenishment requirement.

Based on the foregoing it is reasonable to conclude that water is available for the subject Application.

TARMB006.Doc

[2] http://www.acme.com/planimeter/

ATTACHMENT B



Mean Annual Runoff In The San Francisco Bay Region, California, 1931-70 by S.E. Rantz, 1974.

April 2008

ANGWIN PAC UNION COL, CALIFORNIA[1]

Monthly Total Precipitation (inches)

Water Year

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Total
1948										0	0	0.14	-
1949	1.24	2	7.12	1.94	3.48	0.77 z	0.01	0.44	0	0	0.07	0	-
1950	0	2.83	2.81	9.83	6.11	3.99	2.04	1.02	0.05	0	0	0.03	28.71
1951	6.31	10.8	10.85	8.19 b	3.57	2.57	1.58	1.48	0	0	0	0.04	45.39
1952	3.36	7.05	12.17	13.34	5.51	5.78	1.37	0.28	1.3	0	0	0	50.16
1953	0.02	3.6	19.53	10.02	0.03	5.19	4.16	0.63	0.56	0	0.3	0	44.04
1954	1.48	6.05	1.59	11.73	6.92	6.86	4.05	0.22	0.31	0.02	1.24	0.05	40.52
1955	0.5	6.64 a	6.5	3.55	1.81	0.86	4.08	0	0.1	0	0	0.6	24.64
1956	0.37	3.14	30.44	13.18	10.59	0.58	2.44	0.06	0.05	0	0	0.17	61.02
1957	3.95	0.13	0.68	5.21	9.55	4.31	2.36	4.91	0.23	0	0	2.95	34.28
1958	7.38	2.1	5.97	10.06	20.09	9.23	6.19	0.87	0.97	0.22	0	0.02	63.1
1959	0.2	0.48	2.76	10.17	8.33	1.92	0.47	0.25	0	0	0	3.99	28.57
1960	0.09	0.01	2.56	8.88	11.72	6.93	1.94	1.26	0	0	0	0	33.39
1961	1.23	5.77	5.03	6.36	3.23	5.5	1.83	0.22	0.15	0	0.05	0.46	29.83
1962	0.6	5.03	6.66	3.53	14.83	5.72	0.6	0.32	0	0	0.09	0.33	37.71
1963	14.47	1.76	6.55	10.54	4.61	7.12	8.62	1.12	0	0	0	0	54.79
1964	2.87	10.16	0.81	7.09	0.22	3.03	0.09	0.55	0.89	0	0	0	25.71
1965	1.69	8.06	17.82	10.44	1.46	1.5	5.5	0.06	0	0.04	0.8	0	47.37
1966	0.08	8.53	5.1	9.81	4.75	1.28	2.71	0.14	0.03	0.05	0.37	0.03	32.88
1967	0	11.92	8.72	17.4	0.42	8.03	6.83	0.34	3.06	0	0	0.13	56.85
1968	1.16	2.77	4.85	10.46	5.5	3.91	0.63	0.72	0	0	0.97	0.02	30.99
1969	3.74	4	12.24	21.27	11.13	2.08	3.53	0.09	0.09	0	0	0	58.17
1970	3.05	1.56	15.15	24	3.54	3.78	0.41	0	0.49	0	0	0	51.98
1971	2.63	12.8	13.38	4.33	0.29	6.54	1.16	0.53	0.02	0	0	0.16	41.84
1972	0.37	3.15	8.77	3.91	4.37	1	2.59	0.08	0.38	0	0.01	1.29	25.92
1973	4.35	8.43	4.79	18.04	9.99	4.58	0.26	0.07	0	0	0	0.95	51.46
1974	3.41	17.33	7.6	9.96	3.07	13.1	3.59	0	0	1.12	0.05	0	59.23
1975	1.8	1.52	5.77	3.24 z	12.91	12	3.07	0.22	0.04	0.2	0 z	0 z	-
1976	0 z	0 z	0 z	0.48	3.07	1.48	2.3	0.05	0.09	0	1.42	0.87	-
1977	0.25	1.53	0 z	2.7	2.74	3.59	0 z	1.92	0	0	0	2.01	-
1978	0.83	7.13	10.24	16.28	8.89	7.19	4.34	0.27	0.03	0	0	1.87	57.07
1979	0	0 z	0.96	12.64	9.72	4.42	3.19	1.32	0	0	0	0.06	-
1980	5.94	3.83	7.43 b	11.41	14.69	2.59	3.09	0.46	0.17	0.12	0	0.06	49.79
1981	0.42	0.68	8.88	9.84	3.34	4.51	0.72	0.42	0	0.01	0	0.59	29.41
1982	4.51	14.34	13.18	9.52	7.44	8.5 a	7.43	0	0.3	0.05	0.06	3.08	68.41
1983	5.07	11.11	7.12	13.22	16.06	19.12	4.42	0.97	0.25	0	0.36	0.56	78.26
1984	1.44	16.32	16.17	0.83	2.98	3.31 a	1.6	0.36	0.52	0	0.35	0.16	44.04
1985	2.37	12.81	2.53	1.29	4.88	5.38	0.26	0.01	0.04	0.04	0	1.45	31.06
1986	0 z	5.21	5.15	9.42	28.49	9.16	0.91	1.55	0	0	0	0 z	-
1987	0.44	0.24	2.54	4.95	6.31	5.87	0.17	0.06	0	0	0	0 z	-
1988	0 z	4.58 b	0 z	0 z	0 z	0.05	2.21	1.3	0.48	0	0	0	-
1989	0.13	6.42	4.08	1.49	0.76	11.46	1.11	0	0.14	0	0.03	2.12	27.74
1990	4.29	1.3	0	6.71	3.29	1.55	0.39	4.37	0	0	0	0.5	22.4
1991	0.67	0.6	0.92	0.61	5.18	16.57	0.57	0.39	0.66	0	0.22	0	26.39
1992	2.28	1.8	3.21	2.31	11.07	6.22	1.7	0	1.39	0	0	0	29.98

1993	4.45	0.4	12.09	15.59	8.52	3.23	1.72	3.05	1.66	0	0	0	50.71
1994	1.23	3.13	5.18	3.26	5.98	0.35	1.94	1.17	0.05	0	0	0	22.29
1995	1.53	7.38	4.88	28.29	1.17 e	16.61	3.29	2.8	0.72	0	0	0	66.67
1996	0	0.24	11.15	9.52	11.36	3.94	4.37	4.7	0	0	0	0.14	45.42
1997	1.55	5.28	17.95	15.91	0.59	1.67	1.03	0.77	0.27	0	0.45	0.34	45.81
1998	1.95	8.72	4.13	0 z	21.45	3.57	5.2	5.09	0	0	0	0.27	-
1999	1.01	9.27	2.1	4.35	11.5	4.35	2.83	0.25	0.4	0	0	0.04	36.1
2000	1.38	5.36	0.65	8	11.98	4.26	2.6	2	0.28	0	0	0.51	37.02
2001	4.78	1.61	1.32	7.1	9.32	3.7	1.89	0	0.32	0	0	0.52	30.56
2002	1.44	9.16	15.12	5.7	2.48	3.69	0.44	1.4	0	0	0	0	39.43
2003	0.03	4.85	22.18	4.02	2.56	3.52	6.19	1.16	0	0	0.31	0.03	44.85
2004	0.09	5.07	15.56	4.17	11.14	2.14	0 z	0	0.19	0	0	0	-
2005	5.38	2.99	12.69	0 z	4.69	7.93	1.54	6.4	0.98	0	0	0	-
2006	0.95	3.33	23.33	6.96	6.58	10.73	6.87	1.14	0 z	0	0	0	-
2007	0.29	3.21	6.16	0.48	9.82	0.39	1.76	0.63	0	0.17	0	0.16	23.07
2008	2.42	0.7	4.56										-

Period of Record Statistics													
MEAN	2.17	5.28	8.20	8.73	7.17	5.32	2.60	1.02	0.30	0.03	0.12	0.47	41.81
MAX	14.47	17.33	30.44	28.29	28.49	19.12	8.62	6.40	3.06	1.12	1.42	3.99	78.26
MIN	0.00	0.01	0.00	0.48	0.03	0.05	0.01	0.00	0.00	0.00	0.00	0.00	22.29
NO YRS	57	58	57	55	58	58	57	59	58	60	59	57	47

Notes:

(1) Source: Western Regional Climate Center website, http://www.wrcc.dri.edu/summary/climsmnca.html

Water Right Application by Elliot-Smith
Estimate of Water Availability

Point of Diversion #1

Monthly Precipitation[1]

ANGWIN PACIFIC UNION COLLEGE, CALIFORNIA

Month	Mean Precipitation (in)
October	2.17
November	5.28
December	8.20
January	8.73
February	7.17
March	5.32
April	2.60
May	1.02
June	0.30
July	0.03
August	0.12
September	0.47
Annual	**41.42**

Mean Precipitation for requested diversion season (11/1 - 4/30):	37.31 in
Precipitation during requested diversion season as a percentage of total precipitation:	90.08%
Mean Annual Runoff:[2]	14.0 in
Estimated Mean Seasonal Runoff:[3]	12.6 in
Watershed Area for Point of Diversion #1:	31.4 ac

Total Estimated Mean Seasonal Runoff at Point of Diversion #1:	33.0 ac-ft
Senior Diverters of Record within subject watershed (face value):	0.0
Subtotal water available:	33.0 ac-ft
Requested diversion amount:	26.0 ac-ft
Total seasonal amount remaining in stream after diversion:	7.0 ac-ft

Notes:

[1] Source: Western Regional Climate Center website, http://www.wrcc.dri.edu/summary/climsmnca.html

[2] *Mean Annual Runoff in the San Francisco Bay Region, California, 1931-70 (Miscellaneous Field Studies Map MF-613)*, by S.E. Rantz, 1974.

[3] Estimated mean seasonal runoff is computed by multiplying mean annual runoff by percent seasonal precipitation.

Water Right Application by Elliot-Smith
Estimate of Water Availability

Point of Diversion #2

Monthly Precipitation[1]

ANGWIN PACIFIC UNION COLLEGE, CALIFORNIA

Month	Mean Precipitation (in)
October	2.17
November	5.28
December	8.20
January	8.73
February	7.17
March	5.32
April	2.60
May	1.02
June	0.30
July	0.03
August	0.12
September	0.47
Annual	**41.42**

Mean Precipitation for requested diversion season (11/1 - 4/30):	37.31 in
Precipitation during requested diversion season as a percentage of total precipitation:	90.08%
Mean Annual Runoff:[2]	14.0 in
Estimated Mean Seasonal Runoff:[3]	12.6 in
Watershed Area for Point of Diversion #2:	4.5 ac

Total Estimated Mean Seasonal Runoff at Point of Diversion #2:	4.7 ac-ft
Senior Diverters of Record within subject watershed (face value):	0.0
Subtotal water available:	4.7 ac-ft
Requested diversion amount:	4.5 ac-ft
Total seasonal amount remaining in stream after diversion:	0.2 ac-ft

Notes:

[1] Source: Western Regional Climate Center website, http://www.wrcc.dri.edu/summary/climsmnca.html

[2] *Mean Annual Runoff in the San Francisco Bay Region, California, 1931-70 (Miscellaneous Field Studies Map MF-613)*, by S.E. Rantz, 1974.

[3] Estimated mean seasonal runoff is computed by multiplying mean annual runoff by percent seasonal precipitation.

Station BERRYESSA LAKE | Parameter Evap | % Coverage 99
PO Code CA | Latitude N38:33:00 | Begin M/Yr 11/1957
Stn ID 705 | Longitude W122:14:00 | End M/Yr 06/1970
County NAPA | Elevation(m.) 459.0 | # Record Years 14
Years 1959-69

Evap (in)

	Jan's	Feb's	Mar's	Apr's	May's	Jun's	Jul's	Aug's	Sep's	Oct's	Nov's	Dec's	Year's
# Days	395	354	400	387	398	389	365	371	359	371	359	398	4546
Avg Day	0.05	0.08	0.12	0.2	0.29	0.37	0.43	0.39	0.29	0.18	0.09	0.05	0.21
# Valid	13	13	13	13	13	13	12	12	12	12	11	13	11
Maximum	2.95	4.73	5.15	7.43	10.03	12.94	14.61	13	9.44	7.29	4.08	2.98	84.2
Max Yr	1962	1964	1970	1968	1970	1960	1960	1960	1968	1958	1959	1967	1959
Minimum	0.79	0.81	2.35	2.68	6.85	8.76	11.64	10.31	7	4.51	1.97	0.7	65.23
Min Yr	1958	1958	1958	1967	1963	1967	1963	1968	1963	1968	1962	1957	1963
Average	1.52	2.1	3.79	5.82	8.9	11	13.22	12.06	8.67	5.72	2.48	1.66	76.96
Std Dev	0.59	0.95	0.81	1.55	0.94	1.26	0.77	0.9	0.71	0.89	0.66	0.57	5.56
Skew	0.95	1.39	-0.13	-0.93	-0.53	-0.06	-0.29	-0.66	-1.02	0.1	1.25	0.57	-0.52
Kurt	3.22	4.93	2.29	2.37	2.26	1.71	2.62	1.85	3.06	1.65	3.36	3.02	2.4

Source: Earthinfo, Inc. (CD, Summary of the Day)