[redacted], *Civil Engineer*

MEMBER NAE,AGU FELLOW AAAS,IWRA HONORARY MEMBER ASCE, AWRA
PROFESSOR EMERITUS, UNIVERSITY OF TEXAS AT AUSTIN

[redacted]

[redacted]

February 1, 2001

[redacted]

Dear [redacted]

As per your telephone request, I have estimated Congaree River annual maximum regulated flows for 1926 to 1939 using the MOVE.2 correlation procedure with Broad River data and assuming at your request that the 1926-39 recorded flows on Congaree River are unregulated. The MOVE.2 relation was based on flows for 1940 to 1983. I have also computed the Congaree River regulated frequency relation for 1926 to 1998 using the log-Pearson Type III procedure, as you requested.

I do not understand fully the logic of the assumptions made. However, you have indicated that this complies with provisions in the SCANA letter of December 15, 2000 to FEMA. Computations are enclosed.

Regards,

[redacted]

```
C PROGRAM RELFREQ3.FOR
      DIMENSION X(107),Y(107),IYR(107),QR(107),QB(107),QU(107),AA(8),
     *IQR(107),IQB(107)
      OPEN(5,"BC.I")
      OPEN(6,"REG.O")
      READ(5,4)(IYR(I),y(I),I=1,34)
      READ(5,1)(IYR(I),Y(I),X(I),I=35,92)  ← 1926 to 1983 flows Conguree & Broad
      READ(5,4)(IYR(I),y(I),I=93,107)
    1 FORMAT(12X,I4,2F8.0)
    4 FORMAT(12X,I4,F8.0)
C     WRITE(5,1)(IYR(I),Y(I),X(I),I=1,107)
      DO 2 I=1,107
      QU(I)=Y(I)
      IQR(I)=Y(I)
    2 QR(I)=Y(I)
      DO 3 I=35,92
      IQB(I)=X(I)
    3 QB(I)=X(I)
      TMP=44
      SMX=0.
      SMY=0.
      SMXX=0.
      SMYY=0.
      SMXY=0.
      DO 20 I=49,92  ← 1940 - 1983 flows  C & B
      X(I)=ALOG10(X(I))
      Y(I)=ALOG10(Y(I))
      SMX=SMX+X(I)
      SMY=SMY+Y(I)
      SMXY=SMXY+X(I)*Y(I)
      SMXX=SMXX+X(I)**2
   20 SMYY=SMYY+Y(I)**2
      AVX=SMX/TMP
      AVY=SMY/TMP
      SMXX=SMXX-SMX**2/TMP
      SMYY=SMYY-SMY**2/TMP
      SMXY=SMXY-SMX*SMY/TMP
      SX=SQRT(SMXX/TMP)
      SY=SQRT(SMYY/TMP)
      RSQ=SMXY**2/SMXX/SMYY
      RSQ=1.-(1.-RSQ)*(TMP-1.)/(TMP-2.)
      IF(RSQ.LT.0.)RSQ=0.
      SE=SY*SQRT(RSQ)
      B=SQRT(SMYY/SMXX)  ← MOVE.2 Equation
      A=AVY-B*AVX
      WRITE(6,30)A,B,RSQ,AVX
   30 FORMAT(4H A =,F10.5,4H B =,F10.5,6H RSQ =,F10.4,
     *2X,5HAVX =,F10.4)
      DO 32 I=35,48
      QR(I)=A+ALOG10(QB(I))*B  ← Compute regulated Conguree flows 1926-39
      X=QR(I)
      J=0.
      IF(K.LE.2)GO TO 38
      J=K-2
      QR(I)=QR(I)-J
   38 QR(I)=10.**QR(I)
      IQR(I)=QR(I)
   32 IQR(I)=IQR(I)*10**J
      WRITE(6,33)(IYR(I),IQR(I),IQB(I),I=35,92)
   33 FORMAT(3I8)
      STOP
      END
```

Round to 3 significant figures

Print Conguree regulated and Broad K flows 1926-93 REG.O

BC, I as recorded

	Comparse		
1201892	154000.		
8291893	110000.		
10241893	49800.		
10101894	103000.		
2071896	79600.		
2071897	115000.		
9251898	39100.		
2081899	117000.		
4221900	120000.		
4031901	132000.		
3021902	120000.		
6091903	194000.		
8101904	47500.		
2221905	59400.		
12221905	102000.		
6031907	34500.		
8271908	364000.		
6051909	120000.		
3031910	54900.		
10091910	41900.		
3171912	256000.		
3161913	135000.		
12311913	58900.		
1081915	76500.		
7171916	272000.		
3061917	79600.		
1311918	47500.		
10281918	106000.		
8281920	94100.		
2111921	149000.		
2171922	123000.		
3181923	78800.		
1181924	64600.	Broad	
1201925	139000.		
2261926	51100.	40300.	
2251927	39100.	28400.	
8181928	311000.	222000.	
3011929	173000.	88200.	
10031929	303000.	228000.	
12081930	26800.	23000.	
1101932	71600.	51200.	
10191932	115000.	101000.	
3291934	33400.	34400.	
10121934	92300.	84600.	Rec 15
4081936	231000.	157000.	
10191936	70900.	72400.	
10211937	57900.	55800.	
3021939	66400.	53400.	
8161940	121000.	120000.	
7181941	52000.	49400.	
2191942	52400.	53300.	
1201943	63400.	57200.	
3211944	105000.	84700.	
9201945	102000.	96600.	
1091946	62200.	59200.	

BC . I (27

1211947	63400.	57800.
2141948	54400.	49400.
11301948	116000.	95700.
10091949	50200.	52000.
12091950	32000.	30600.
3061952	91400.	84700.
2231953	43500.	42000.
1251954	65200.	64700.
4151955	47000.	43200.
4181956	43100.	42000.
4071957	31000.	31800.
5011958	64000.	55900.
9301959	53900.	31200.
10011959	65200.	55900.
2251961	74400.	56600.
1081962	65200.	55900.
3151963	91300.	75300.
4101964	142000.	99500.
10181964	120000.	102000.
3061966	80600.	65300.
8251967	97900.	74500.
1121968	61200.	46200.
4191969	94200.	52700.
8121970	45200.	40600.
3041971	79100.	58000.
1121972	63900.	61600.
4021973	99800.	74100.
1021974	51600.	47500.
3161975	122000.	94900.
3171976	48400.	35200.
10111976	155000.	146000.
1281978	81700.	64500.
2261979	94500.	77300.
3301980	93100.	64200.
10021980	51300.	46700.
1061982	84200.	62100.
3181983	66000.	48400.
2161984	70300.	
8191985	54700.	
11231985	58900.	
3031987	123000.	
1231988	24700.	
3251989	48400.	
10031989	93700.	
10151990	135000.	
4231992	51200.	
3261993	65200.	
8201994	72300.	
1171995	116000.	
2041996	74900.	
1997	50800.	
1998	55200.	

A = -0.30069 B = 1.07831 RSQ = 0.8547 AVX = 4.7766

1926	46200	40300
1927	31700	28400
1928	291000	222000
1929	107000	88200
1929	299000	228000
1930	25200	23000
1932	59800	51200
1932	124000	101000
1934	39000	34400
1934	102000	84600
1936	200000	157000
1936	87000	72400
1937	65700	55800
1939	62600	53400
1940	121000	120000
1941	52000	49400
1942	52400	53300
1943	63400	57200
1944	105000	84700
1945	102000	96600
1946	62200	59200
1947	63400	57800
1948	54400	49400
1948	116000	95700
1949	50200	52000
1950	32000	30600
1952	91400	84700
1953	43500	42000
1954	65200	64700
1955	47000	43200
1956	43100	42000
1957	31000	31800
1958	64000	55900
1959	53900	31200
1959	65200	55900
1961	74400	56600
1962	65200	55900
1963	91800	75300
1964	142000	99500
1964	120000	102000
1966	80600	65300
1967	97900	74500
1968	61200	46200
1969	94200	52700
1970	45200	40600
1971	79100	58000
1972	63900	61600
1973	99800	74100
1974	51600	47500

1975	122000	94900
1976	48400	35200
1976	155000	146000
1978	81700	64500
1979	94500	72300
1980	93100	64200
1980	51300	46700
1982	84200	62100
1983	66000	48400

```
*********************************          ************************************
*            HECWRC                 *          *                                  *
* FLOOD FLOW FREQUENCY ANALYSIS     *          *   U.S. ARMY CORPS OF ENGINEERS   *
* PROGRAM DATE:     1 APRIL 1978    *          * THE HYDROLOGIC ENGINEERING CENTER *
* VERSION DATE:     1 APRIL 1987    *          *        609 SECOND STREET         *
* RUN  DATE      AND      TIME:     *          *      DAVIS, CALIFORNIA 95616     *
*     1/ 5/**          19:42:35     *          * (916) 551-1748 OR (FTS) 460-1748  *
*********************************          ************************************
```

INPUT FILE NAME: CSK.I26
OUTPUT FILE NAME: CSK.O26 → Sta. skew
FINAL RESULTS
-PLOTTING POSITIONS-

EVENTS ANALYZED				ORDERED EVENTS			
MON	DAY	YEAR	FLOW,CFS	RANK	WATER YEAR	FLOW,CFS	WEIBULL PLOT POS
2	26	1926	46000.	1	1930	299000.	.0135
2	25	1927	32000.	2	1928	291000.	.0270
8	18	1928	291000.	3	1936	200000.	.0405
3	1	1929	107000.	4	1977	155000.	.0541
10	3	1929	299000.	5	1964	142000.	.0676
12	8	1930	25000.	6	1991	135000.	.0811
1	10	1932	60000.	7	1933	124000.	.0946
10	19	1932	124000.	8	1987	123000.	.1081
3	29	1934	39000.	9	1975	122000.	.1216
10	12	1934	102000.	10	1940	121000.	.1351
4	8	1936	200000.	11	1965	120000.	.1486
10	19	1936	87000.	12	1949	116000.	.1622
10	21	1937	66000.	13	1995	116000.	.1757
3	2	1939	63000.	14	1929	107000.	.1892
8	16	1940	121000.	15	1944	105000.	.2027
7	18	1941	52000.	16	1935	102000.	.2162
2	19	1942	52400.	17	1945	102000.	.2297
1	20	1943	63400.	18	1973	99800.	.2432
3	21	1944	105000.	19	1967	97900.	.2568
9	20	1945	102000.	20	1998	95200.	.2703
1	9	1946	62200.	21	1979	94500.	.2838
1	21	1947	63400.	22	1969	94200.	.2973
2	14	1948	54400.	23	1990	93700.	.3108
11	30	1948	116000.	24	1980	93100.	.3243
10	9	1949	50200.	25	1963	91800.	.3378
12	9	1950	32000.	26	1952	91400.	.3514
3	6	1952	91400.	27	1937	87000.	.3649
2	23	1953	43500.	28	1982	84200.	.3784
1	25	1954	65200.	29	1978	81700.	.3919
4	15	1955	47000.	30	1966	80600.	.4054
4	18	1956	43100.	31	1971	79100.	.4189
4	7	1957	31000.	32	1996	74900.	.4324
5	1	1958	64000.	33	1961	74400.	.4459
9	30	1959	53900.	34	1994	72300.	.4595
10	1	1959	65200.	35	1984	70300.	.4730
2	25	1961	74400.	36	1983	66000.	.4865
1	8	1962	65200.	37	1938	66000.	.5000
3	15	1963	91800.	38	1954	65200.	.5135
4	10	1964	142000.	39	1960	65200.	.5270
10	18	1964	120000.	40	1993	65200.	.5405
3	6	1966	80600.	41	1962	65200.	.5541
8	25	1967	97900.	42	1958	64000.	.5676
1	12	1968	61200.	43	1972	63900.	.5811
4	19	1969	94200.	44	1947	63400.	.5946
8	12	1970	45200.	45	1943	63400.	.6081
3	4	1971	79100.	46	1939	63000.	.6216
1	12	1972	63900.	47	1946	62200.	.6351
4	2	1973	99800.	48	1968	61200.	.6486
1	2	1974	51600.	49	1932	60000.	.6622
3	16	1975	122000.	50	1986	58900.	.6757

3	17	1976	48400.	51	1985	54700.	.6892
10	11	1976	155000.	52	1948	54400.	.7027
1	28	1978	81700.	53	1959	53900.	.7162
2	26	1979	94500.	54	1942	52400.	.7297
3	30	1980	93100.	55	1941	52000.	.7432
10	2	1980	51300.	56	1974	51600.	.7568
1	6	1982	84200.	57	1981	51300.	.7703
3	18	1983	66000.	58	1992	51200.	.7838
2	16	1984	70300.	59	1997	50800.	.7973
8	19	1985	54700.	60	1950	50200.	.8108
11	23	1985	58900.	61	1989	48400.	.8243
3	3	1987	123000.	62	1976	48400.	.8378
1	23	1988	24700.	63	1955	47000.	.8514
3	25	1989	48400.	64	1926	46000.	.8649
10	3	1989	93700.	65	1970	45200.	.8784
10	15	1990	135000.	66	1953	43500.	.8919
4	23	1992	51200.	67	1956	43100.	.9054
3	26	1993	65200.	68	1934	39000.	.9189
8	20	1994	72300.	69	1927	32000.	.9324
1	17	1995	116000.	70	1951	32000.	.9459
2	4	1996	74900.	71	1957	31000.	.9595
0	0	1997	50800.	72	1931	25000.	.9730
0	0	1998	95200.	73	1988	24700.	.9865

FINAL RESULTS
-FREQUENCY CURVE-

FLOW, CFS COMPUTED	FLOW, CFS EXPECTED PROBABILITY	EXCEEDANCE PROBABILITY	CONFIDENCE LIMITS .05 LIMIT	CONFIDENCE LIMITS .95 LIMIT
373000.	404000.	.002	493000.	301000.
305000.	323000.	.005	391000.	251000.
259000.	271000.	.010	325000.	217000.
218000.	226000.	.020	267000.	186000.
170000.	174000.	.050	201000.	149000.
138000.	140000.	.100	159000.	123000.
108000.	109000.	.200	122000.	97600.
70400.	70400.	.500	77300.	64000.
48000.	47800.	.800	53200.	42600.
40000.	39600.	.900	44800.	34800.
34700.	34200.	.950	39300.	29700.
27100.	26500.	.990	31400.	22500.

FREQUENCY CURVE STATISTICS		STATISTICS BASED ON	
MEAN LOGARITHM	4.8616	HISTORIC EVENTS	0
STANDARD DEVIATION	.2111	HIGH OUTLIERS	0
COMPUTED SKEW	.3994	LOW OUTLIERS	0
GENERALIZED SKEW	-99.0000	ZERO OR MISSING	0
ADOPTED SKEW	.3994	SYSTEMATIC EVENTS	73

SCANA
Power For Living

VIA Fax
December 15, 2000

Federal Emergency Management Agency
Mr. Michael K. Buckley, P.E., Director
Technical Service Division
Mitigation Directorate
Room 423
500 "C" Street, S.W.
Washington, DC 20472
Fax (404) 646-4596

Re: Lake Murray Dam Flood Modeling

Dear Mr. Buckley:

Since my last letter to you dated November 17, 2000, the staff in our company that would work on the hydrographs we discussed has had a significant change in their workload. Additionally, I am concerned that the dialogue for your re-mapping efforts has become very contentious, and our participation at this late date will only cause our company to be engulfed in a public debate that is not of our making. On the other hand, we are still concerned about the integrity of the data that FEMA uses for its re-mapping of the Congaree River.

If FEMA corrects several data points that were used in its frequency computations for the September 26, 2000 map, the result should provide a more accurate representation of actual conditions. The data points that need to be corrected are:

- The 1930 and 1936 Water Year peak flows for the Congaree River at Gervais Street should be adjusted for varying regulation. During the 1930 Water Year flood, the reservoir was not fully operational. It is also important to note that in 1936, the only time that Lake Murray has risen above the 360-foot mark, there were only four spillway gates and four hydraulic turbines in place at the time, and no record exists of the operating plan in place at the time nor how the decision to spill was made. As you know, we now have the Flow Forecasting Model which tells us what the inflow into the Saluda River drainage basin is at any given time, and provides a mechanism for decision making, as well as the current

project configuration (five turbines, six spillway gates), would have an affect on the 1930 and 1936 floods that is not reflected in your computations, but could be reflected using the statistical procedure that you used in your September report.

- As we have indicated in previous correspondence, FEMA cannot correctly reflect the flood control benefits of the Reservoir prior to the 1926 Water Year.

I trust you will understand our position. Certainly, this letter should provide FEMA with the information that it needs to complete its re-mapping of the Congaree River at Columbia with an accurate reflection of the flood control benefits of the Saluda Dam on peak flows on the Congaree River at Gervais Street. If you have any further questions, please fax them to me at (803) 933-7048.

Sincerely,

[redacted]

President & Chief Operating Officer