

MEMORANDUM

Date: July 19, 2004
To: Water Right File 83-7112
From: E Retelle
Re: Annual volume adjustment model

Annual volume adjustment model for Water Right 83-07112

Setting:

The point of diversion for water right 83-07112 is located in the NW¼NW¼ of Section 29, T39N, R4E, B.M. Water is diverted from Lewis Creek, tributary to the North Fork of the Clearwater River.

Data:

In order to adjust the licensed flow rates to the appropriate values, it was necessary to know how the stream flow changes throughout the year. As there are no measurements regularly taken at Lewis Creek, other data was collected and applied.

Two nearby USGS gauging stations were chosen: Reed's Creek and the North Fork of the Clearwater River, Canyon Ranger Station.

The Reed's Creek station (USGS #13340855) is in the SW¼NW¼ of Section 22, T38N, R4E., B.M., approximately 5.7 miles as the crow flies from the Lewis Creek point of diversion. Reed's Creek is also tributary to the North Fork of the Clearwater River 3.7 miles downstream from Lewis Creek. Average monthly stream flow data collected between October 1983 and September 1987 were used to generate the curve [Figure 1].

The North Fork of the Clearwater River, Canyon Ranger Station (USGS #13340600) is in the Gov't Lot 7(SE¼NE¼) of Section 6, T40N, R7E, B.M., approximately 20.3 miles as the crow flies from the Lewis Creek point of diversion. The station is 27 miles upstream from Lewis Creek. Average monthly stream flow data collected between January 1992 and September 2003 were used to generate the curve [Figure 2].

Method:

Monthly percent differences from the August value were calculated for each gauging station. These percentages were then averaged to yield a synthetic curve that was then applied to Lewis Creek [Figure 3]. A measured stream flow value in August at the Lewis Creek point of diversion was the point the synthetic curve was drawn through to give the rest of the average monthly stream flow values [Table 1]. Further calculations were then completed using the modeled data.

The monthly (and annual) volumes in acre-feet were calculated using the formula:

$$\text{Volume(af)} = \text{flow rate(cfs)} \times 1.984(\text{af/day}) \times \text{days in month}$$

In months where the calculated flow rate exceeded 0.50cfs, 0.50cfs was used in the formula.

**Mean monthly streamflow (cfs) for
Reeds Creek
Oct 1983 - Sept 1987**

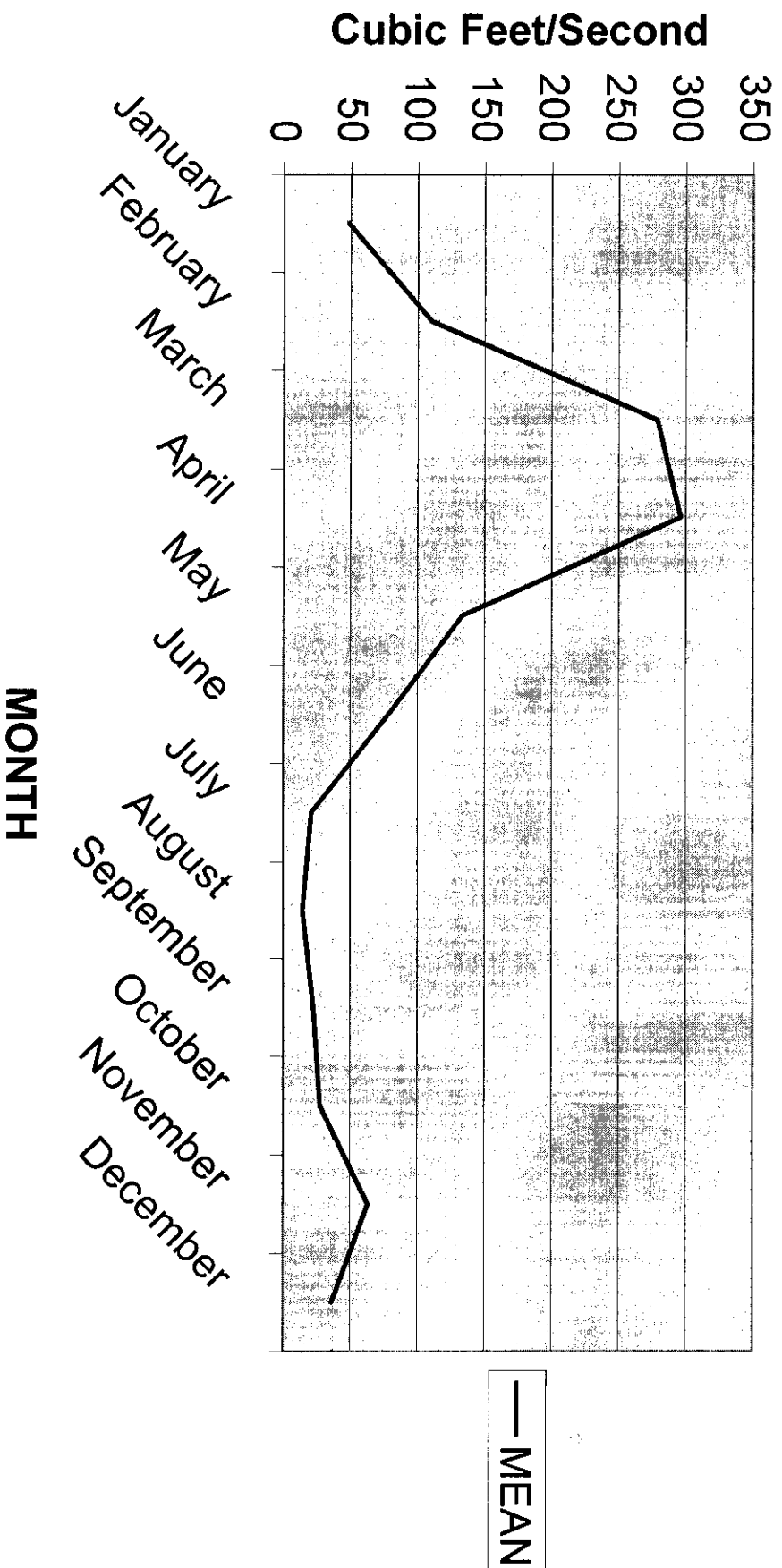


Figure 1

**Mean monthly streamflow (cfs) for
North Fork Clearwater River
Jan 1992 - Sept 2003**

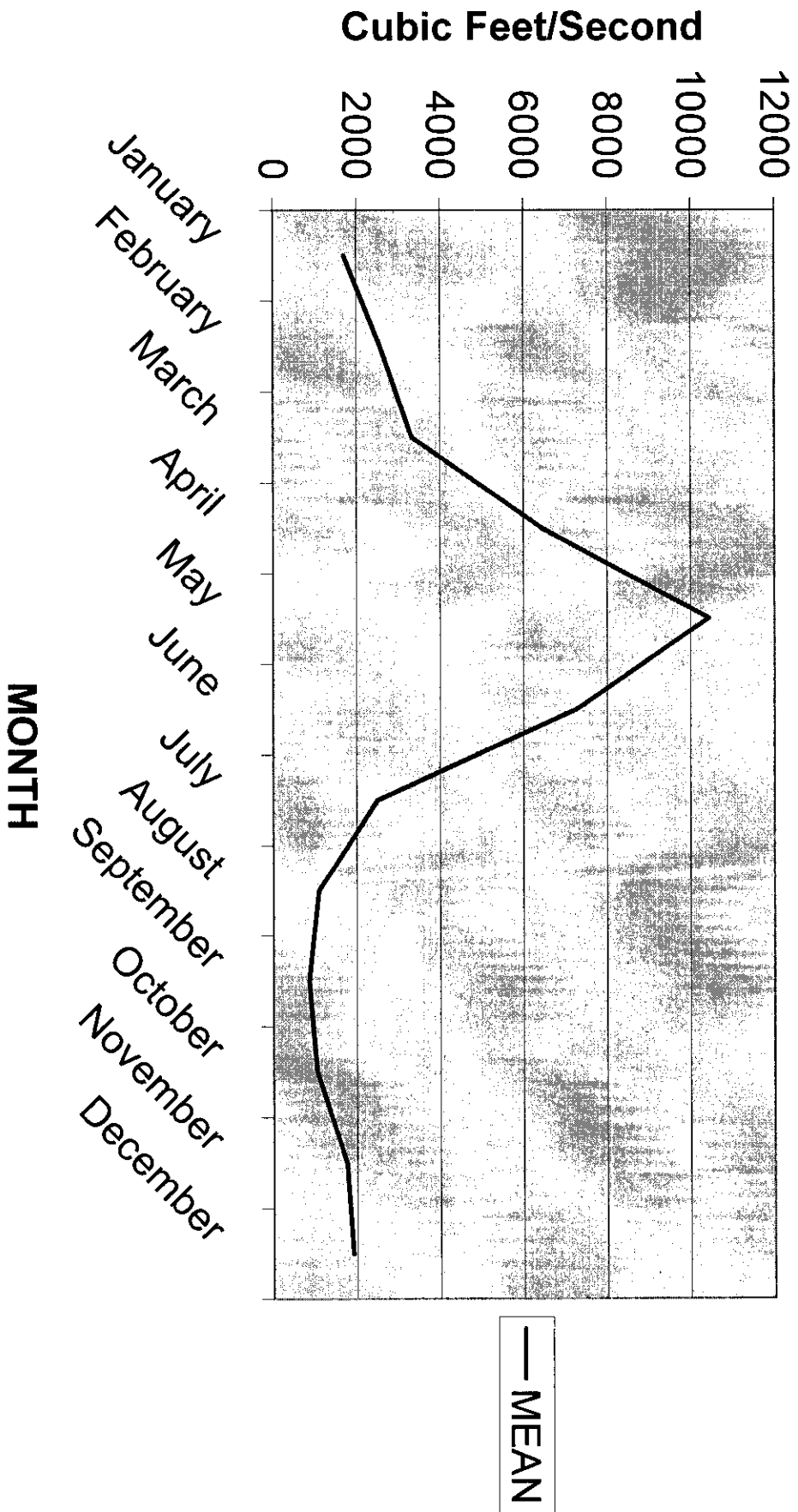


Figure 2

Mean monthly streamflow (cfs) model for Lewis Creek

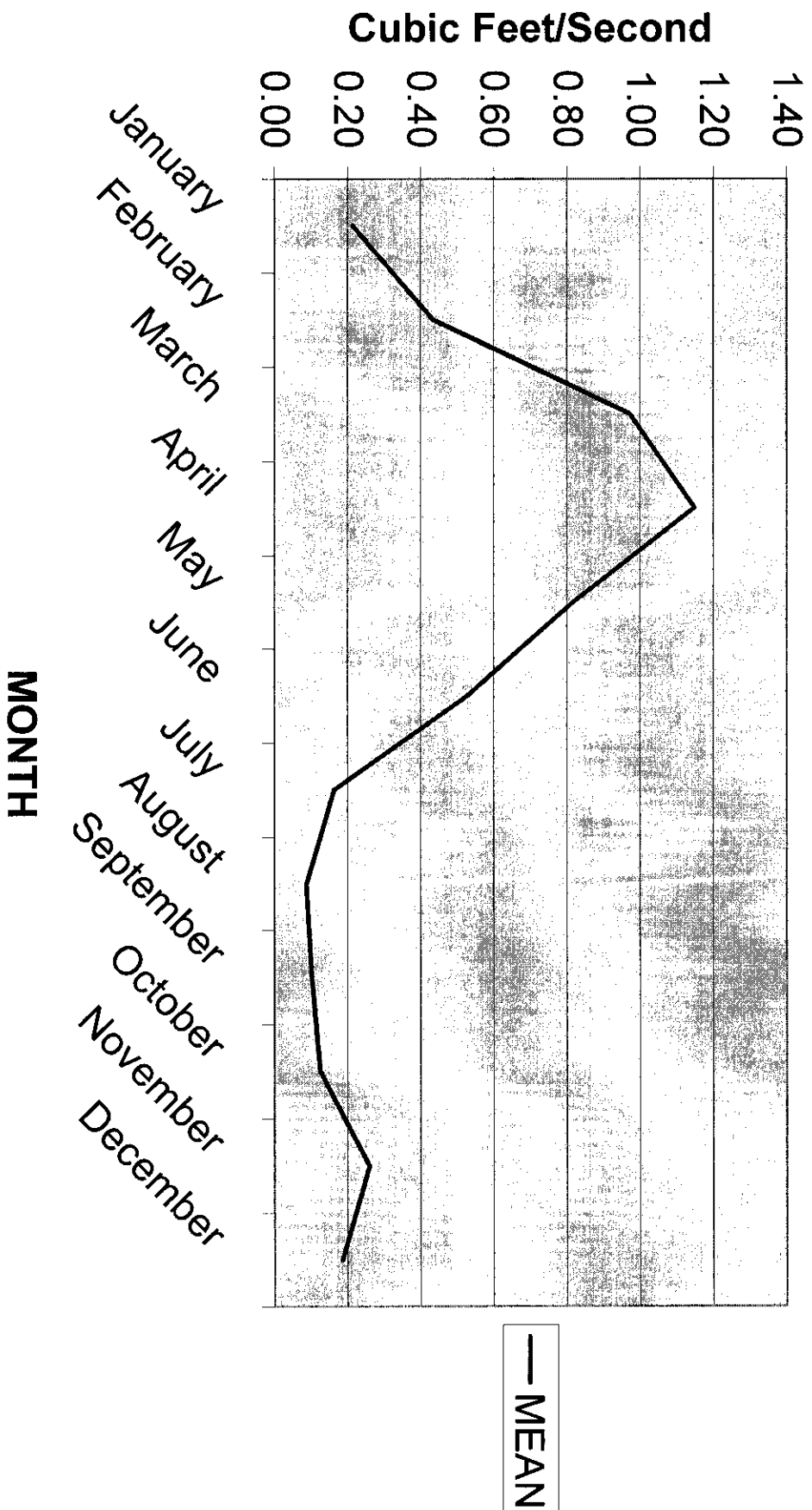


Figure 3

STREAMFLOW 83-7112

REEDS	January	February	March	April	May	June	July	August	September	October	November	December	TOTAL
1983													
1984	90.4	87.4	316	298	183	96.3	25.5	14.5	20.9	21.2	85.4	49.4	
1985	38.2	35.4	93.3	579	210	154	16.9	22.1	44	38.4	64.7	43.5	
1986	40	262	479	173	82.2	32.4	22.6	10.1	16.3	18.1	52.7	24.8	
1987	23.8	54.9	226	134	57.6	30.8	19.2	11.1	9.09			26.5	
MEAN	48	110	279	296	133	78	21	14	23	28	63	36	
PERCENT	3.32872	7.60727	19.2785	20.4844	9.21799	5.42388	1.45675	0	1.562107	1.90311	4.361592	2.49481	
NF CWC	January	February	March	April	May	June	July	August	September	October	November	December	
1992	997	2216	3714	5762	6758	2367	1416	824	966	841	1184	876	
1993	831	933	3083	5157	11490	4504	2284	1270	899	873	740	841	
1994	1137	756	2129	6209	6153	3313	1341	730	607	755	992	1110	
1995	1400	5433	4317	4571	8137	5605	2189	1122	847	1777	6581	8582	
1996	3459	8133	4363	9512	11700	9284	2693	1158	916	969	1171	1481	
1997	2933	2261	3997	8588	20670	14330	4824	1591	1212	1484	2120	1405	
1998	1492	1807	3039	5208	9987	5004	2206	1120	861	807	1525	1904	
1999	2441	1750	3739	5836	11100	12740	4277	1469	896	1015	1815	1999	
2000	1308	1756	2958	8898	10200	6377	1860	881	865	1208	821	741	
2001	687	747	1768	3103	7737	3698	1390	782	551	990	1389	1101	
2002	1689	1371	2147	7206	11900	13070	3595	1236	839	733	884	892	
2003	1997	3590	4584	7069	9296	6914	1678	874	727				
MEAN	1698	2563	3320	6427	10427	7267	2479	1088	849	1041	1747	1903	
PERCENT	1.56016	2.35529	3.05108	5.90633	9.58321	6.67887	2.2787	0	0.7801179	0.95681	1.605993	1.748863	
AVG PERCENT	2.44444	4.98128	11.1648	13.1954	9.4006	6.05137	1.86772	0	1.1711143	1.42996	2.983792	2.121837	
Applied to Lewis	0.21	0.43	0.97	1.15	0.82	0.53	0.16	0.09	0.10	0.12	0.26	0.18	
Monthly acre-feet	13.1	24.1	30.8	29.8	30.8	29.8	10.0	5.4	6.1	7.7	15.5	11.4	214.0

Table 1