

MEMORANDUM

Date: January 23, 2008
To: Water Right File 37-7857, 37-7865 and 37-7922
From: medl
Re: license review

This is one of three water rights with the same POD and POU. The other two rights are 37-7865 and 37-7922. All three water rights are put to use in the Ravenscroft Ranch Project, FERC #4055, which is exempt from FERC small hydroelectric plant licensing requirements. See order 18 FERC P 62161, 1982 WL 38372 (F.E.R.C.)

I created the POU and POD shapes used for all three rights based on 1987 aerial photography and the beneficial use field exam. The application located the POD in a quarter-quarter that differed from where the field examiner and I found it. I placed the POD where the Malad River is constrained to flow through culverts in a diversion dam in the SWNW Twp 6S, Rge 14E, sec 29. The head of the power canal is a short distance north of the dam. The permit has the POD in the NWSW so amendments will be needed for all three rights.

This project has 35-year power sales agreement with Idaho Power Company which expires May 1, 2018. That contract end-date will be used as the date for Directors review.

The three Ravenscroft applications were accepted on different dates. But the permits were all approved on the same date, August 9, 1982. The department received Proof of Beneficial Use cards for all three rights on September 7, 1984 and only one field exam was done for all three rights on September 24, 1986.

The examiner associated each of the three water rights with a different turbine. Because the turbine design discharges and the water right appropriations don't match, that association breaks down after the pairing of the first water right 37-7865 with the smallest turbine. Here is a summary of how the field examiner paired Ravenscroft plant water rights and turbines.

Application Received Date	Water Right No.	Appropriated Rate (cfs)	Turbine	Turbine Discharge Sizing (cfs)
9/25/1980	37-7857	20	Byron-Jackson Unit #1	32
11/05/1980	37-7865	130	Ingersoll-Rand Unit #3	110
7/10/1981	37-7922	50	Ingersoll-Rand Unit #2	63

I processed 37-7865 and 37-7922 in the order that the applications were received rather than the order that the turbines would have been put online for efficient operation. As the table above illustrates, water right 37-7865 was probably beneficially used through more than one turbine. I assumed that the plant as a whole would be operated as efficiently as possible and knowing which block of water went through which turbine was not necessary for confirming the overall beneficial use of the water. Therefore my Excel spreadsheet to analyze the volume and flows is arranged as if the licenses had been issued in the order that the applications were received.

I was able to obtain design curves for the three turbines from the manufacturers' archives. I believe that at the time of the field exam, all three were fixed-geometry turbines. The operation range of a fixed geometry unit is not as broad as that for a unit with variable intake geometry and without overlapping ranges, they would have been put on-line in combinations that depended on water availability. The operation scenarios would have looked something like this:

Units Online	Plant Flow Needed for Full-time Operation (cfs)
None	0-24
#1	34
#2	66
#1 and #2	100
#3	124
#1 and #3	158
#2 and #3	190
#1, #2, and #3	224 and above

The units would have been switched on for those hours when a steady flow or stored water was available, and then off when flows were insufficient or when storage was depleted. In the range above 24 cfs but below 34 cfs, Unit#1 would have been on only part-time. Similar part-time switching would have occurred between the operating ranges of the other turbine combinations. Smooth operation of this project would have been dependant on short-term water storage (storage longer than 24-hours was not permitted) and attentive plant operators. Erratic stream flows would have made this a difficult plant to manage. Based on the number of documents added to the file since the field exam, operation of this project in this configuration was problematic and several changes have been made to the project since the field exam was conducted.

The USGS has maintained a stream gaging station approximately one mile above the diversion point for the Ravenscroft project. That station is Malad River near Gooding, Idaho, USGS #13152500. There are some small gains but no withdrawals in the reach of river between the gaging station and the Ravenscroft hydro project so flows at gaging station 13152500 could represent the inflow at the diversion dam.

Although Proof was submitted in September 1984, according to Idaho PUC records, electricity production at this project did not start until December 1983. Lack of generation made calendar year 1983 a poor representation of beneficial use. Therefore, calendar year 1984, the first full calendar year that the generators were online was chosen for data analysis and review.

The Ravenscroft Ranch Project has a minimum bypass flow requirement with two segments: a minimum of 5 cfs is required from July 1 through April 15 and a minimum of 80 cfs is required from April 16 through June 30.

In 1984, the daily average flow at station 13152500 did not drop below 90 cfs. It would have been possible to run the smallest unit throughout the year and not operate in violation of the minimum bypass flow requirements. However, according to the Idaho Power generation records for the Ravenscroft project (which were obtained from the Idaho Public Utilities Commission), none of the three units in place generated any electricity in February, March or April 1984. That was 90 days (1984 was a leap year), without generation and therefore without beneficial use of water.

Please refer to the attached Excel spreadsheet for the analysis and summary of the 1984 flow and volume data for all three turbines.

	A	B	C	D	E	F	G	H	I	J	K	L
1	#	-----	WARNING	-----								
2	#	The data you have obtained from this automated U.S. Geological Survey database										
3	#	have not received Director's approval and as such are provisional and subject to										
4	#	revision. The data are released on the condition that neither the USGS nor the										
5	#	United States Government may be held liable for any damages resulting from its use.										
6	#	Additional info: http://waterdata.usgs.gov/ld/nwis/help/?provisional										
7	#											
8	#	File-format description: http://waterdata.usgs.gov/nwis/?tab=delimited_format_info										
9	#	Automated-retrieval info: http://waterdata.usgs.gov/nwis/?automated_retrieval_info										
10	#											
11	#	Contact: gs-w_support@nwisweb.usgs.gov										
12	#	retrieved: 2008-01-10 17:29:00 EST										
13	#											
14	#	Data for the following site(s) are contained in this file										
15	#	USGS 13152500 MALAD RIVER NR GOODING ID										
16	#	-----										
17	#											
18	#	Data provided for site 13152500										
19	#	DD parameter statistic Description										
20	#	01 00060 00003 Discharge, cubic feet per second (Mean)										
21	#											
22	#	Data-value qualification codes included in this output:										
23	#	A Approved for publication -- Processing and review completed.										
24	#	e Value has been estimated.										
25												
26												
27	agency	station	date	Q(cts)	Bypass(cts)	Q-Bypass	beneficial use	plant capacity is greater than licenses total	37-7857	37-7865	37-7922	
28	USGS	13152500	1/1/1984	855 A	5	850	20	830	beneficial use max	130	700	50
29	USGS	13152500	1/2/1984	822 A	5	817	20	797	130	667	50	50
30	USGS	13152500	1/3/1984	805 A	5	800	20	780	130	650	50	50
31	USGS	13152500	1/4/1984	820 A	5	815	20	795	130	665	50	50
32	USGS	13152500	1/5/1984	840 A	5	835	20	815	130	685	50	50
33	USGS	13152500	1/6/1984	780 A	5	775	20	755	130	625	50	50
34	USGS	13152500	1/7/1984	540 A	5	535	20	515	130	385	50	50
35	USGS	13152500	1/8/1984	520 A	5	515	20	495	130	365	50	50
36	USGS	13152500	1/9/1984	505 A	5	500	20	480	130	350	50	50
37	USGS	13152500	1/10/1984	500 A	5	495	20	475	130	345	50	50
38	USGS	13152500	1/11/1984	505 A	5	500	20	480	130	350	50	50
39	USGS	13152500	1/12/1984	474 A	5	469	20	449	130	319	50	50
40	USGS	13152500	1/13/1984	444 A	5	439	20	419	130	289	50	50
41	USGS	13152500	1/14/1984	427 A	5	422	20	402	130	272	50	50
42	USGS	13152500	1/15/1984	407 A	5	402	20	382	130	252	50	50
43	USGS	13152500	1/16/1984	391 A	5	386	20	366	130	236	50	50
44	USGS	13152500	1/17/1984	376 A	5	371	20	351	130	221	50	50
45	USGS	13152500	1/18/1984	340 A	5	335	20	315	130	185	50	50
46	USGS	13152500	1/19/1984	320 A	5	315	20	295	130	165	50	50
47	USGS	13152500	1/20/1984	300 A	5	295	20	275	130	145	50	50

	A	B	C	D	E	F	G	H	I	J	K	L
27	agency	station	date	Q(cts)		Bypass(cts)	Q-Bypass	beneficial use	Q-Bypass-20	beneficial use max	Q-Bypass-150	beneficial use max
							20cts			additional 130cts		additional 50cts
48	USGS	13152500	1/21/1984	290 A		5	285	20	265	130	135	50
49	USGS	13152500	1/22/1984	292 A		5	287	20	267	130	137	50
50	USGS	13152500	1/23/1984	301 A		5	296	20	276	130	146	50
51	USGS	13152500	1/24/1984	307 A		5	302	20	282	130	152	50
52	USGS	13152500	1/25/1984	310 A		5	305	20	285	130	155	50
53	USGS	13152500	1/26/1984	302 A		5	297	20	277	130	147	50
54	USGS	13152500	1/27/1984	298 A		5	293	20	273	130	143	50
55	USGS	13152500	1/28/1984	297 A		5	292	20	272	130	142	50
56	USGS	13152500	1/29/1984	289 A		5	284	20	264	130	134	50
57	USGS	13152500	1/30/1984	283 A		5	278	20	258	130	128	50
58	USGS	13152500	1/31/1984	280 A		5	275	20	255	130	125	50
59	USGS	13152500	2/1/1984	272 A		5	267	offline	0	offline	0	offline
60	USGS	13152500	2/2/1984	268 A		5	263	offline	0	offline	0	offline
61	USGS	13152500	2/3/1984	261 A		5	256	offline	0	offline	0	offline
62	USGS	13152500	2/4/1984	250 A		5	245	offline	0	offline	0	offline
63	USGS	13152500	2/5/1984	230 A		5	225	offline	0	offline	0	offline
64	USGS	13152500	2/6/1984	160 A		5	155	offline	0	offline	0	offline
65	USGS	13152500	2/7/1984	130 A		5	125	offline	0	offline	0	offline
66	USGS	13152500	2/8/1984	128 A		5	123	offline	0	offline	0	offline
67	USGS	13152500	2/9/1984	122 A		5	117	offline	0	offline	0	offline
68	USGS	13152500	2/10/1984	121 A		5	116	offline	0	offline	0	offline
69	USGS	13152500	2/11/1984	120 A		5	115	offline	0	offline	0	offline
70	USGS	13152500	2/12/1984	120 A		5	115	offline	0	offline	0	offline
71	USGS	13152500	2/13/1984	129 A		5	124	offline	0	offline	0	offline
72	USGS	13152500	2/14/1984	139 A		5	134	offline	0	offline	0	offline
73	USGS	13152500	2/15/1984	150 A		5	145	offline	0	offline	0	offline
74	USGS	13152500	2/16/1984	137 A		5	132	offline	0	offline	0	offline
75	USGS	13152500	2/17/1984	122 A		5	117	offline	0	offline	0	offline
76	USGS	13152500	2/18/1984	115 A		5	110	offline	0	offline	0	offline
77	USGS	13152500	2/19/1984	113 A		5	108	offline	0	offline	0	offline
78	USGS	13152500	2/20/1984	115 A		5	110	offline	0	offline	0	offline
79	USGS	13152500	2/21/1984	120 A		5	115	offline	0	offline	0	offline
80	USGS	13152500	2/22/1984	127 A		5	122	offline	0	offline	0	offline
81	USGS	13152500	2/23/1984	130 A		5	125	offline	0	offline	0	offline
82	USGS	13152500	2/24/1984	127 A		5	122	offline	0	offline	0	offline
83	USGS	13152500	2/25/1984	126 A		5	121	offline	0	offline	0	offline
84	USGS	13152500	2/26/1984	130 A		5	125	offline	0	offline	0	offline
85	USGS	13152500	2/27/1984	130 A		5	125	offline	0	offline	0	offline
86	USGS	13152500	2/28/1984	125 A		5	120	offline	0	offline	0	offline
87	USGS	13152500	2/29/1984	120 A		5	115	offline	0	offline	0	offline
88	USGS	13152500	3/1/1984	105 A		5	100	offline	0	offline	0	offline
89	USGS	13152500	3/2/1984	130 A		5	125	offline	0	offline	0	offline
90	USGS	13152500	3/3/1984	180 A		5	175	offline	0	offline	0	offline
91	USGS	13152500	3/4/1984	247 A		5	242	offline	0	offline	0	offline
92	USGS	13152500	3/5/1984	257 A		5	252	offline	0	offline	0	offline
93	USGS	13152500	3/6/1984	229 A		5	224	offline	0	offline	0	offline

A	B	C	D	E	F	G	H	I	J	K	L
agency	station	date	Q(cts)		Bypass(cts)	Q-Bypass	beneficial use	Q-Bypass-20	beneficial use max	Q-Bypass-150	beneficial use max
					20cts				additional 130cts		additional 50cts
27 agency											
94 USGS	13152500	3/7/1984	208 A		5	203	offline	0	offline	0	offline
95 USGS	13152500	3/8/1984	250 A		5	245	offline	0	offline	0	offline
96 USGS	13152500	3/9/1984	564 A		5	559	offline	0	offline	0	offline
97 USGS	13152500	3/10/1984	746 A		5	741	offline	0	offline	0	offline
98 USGS	13152500	3/11/1984	850 A		5	845	offline	0	offline	0	offline
99 USGS	13152500	3/12/1984	1050 A		5	1045	offline	0	offline	0	offline
100 USGS	13152500	3/13/1984	880 A		5	875	offline	0	offline	0	offline
101 USGS	13152500	3/14/1984	820 A		5	815	offline	0	offline	0	offline
102 USGS	13152500	3/15/1984	740 A		5	735	offline	0	offline	0	offline
103 USGS	13152500	3/16/1984	820 A		5	815	offline	0	offline	0	offline
104 USGS	13152500	3/17/1984	900 A		5	895	offline	0	offline	0	offline
105 USGS	13152500	3/18/1984	627 A		5	622	offline	0	offline	0	offline
106 USGS	13152500	3/19/1984	423 A		5	418	offline	0	offline	0	offline
107 USGS	13152500	3/20/1984	434 A		5	429	offline	0	offline	0	offline
108 USGS	13152500	3/21/1984	645 A		5	640	offline	0	offline	0	offline
109 USGS	13152500	3/22/1984	568 A		5	563	offline	0	offline	0	offline
110 USGS	13152500	3/23/1984	474 A		5	469	offline	0	offline	0	offline
111 USGS	13152500	3/24/1984	510 A		5	505	offline	0	offline	0	offline
112 USGS	13152500	3/25/1984	482 A		5	477	offline	0	offline	0	offline
113 USGS	13152500	3/26/1984	411 A		5	406	offline	0	offline	0	offline
114 USGS	13152500	3/27/1984	387 A		5	382	offline	0	offline	0	offline
115 USGS	13152500	3/28/1984	361 A		5	356	offline	0	offline	0	offline
116 USGS	13152500	3/29/1984	340 A		5	335	offline	0	offline	0	offline
117 USGS	13152500	3/30/1984	332 A		5	327	offline	0	offline	0	offline
118 USGS	13152500	3/31/1984	350 A		5	345	offline	0	offline	0	offline
119 USGS	13152500	4/1/1984	361 A		5	356	offline	0	offline	0	offline
120 USGS	13152500	4/2/1984	389 A		5	384	offline	0	offline	0	offline
121 USGS	13152500	4/3/1984	367 A		5	362	offline	0	offline	0	offline
122 USGS	13152500	4/4/1984	357 A		5	352	offline	0	offline	0	offline
123 USGS	13152500	4/5/1984	409 A		5	404	offline	0	offline	0	offline
124 USGS	13152500	4/6/1984	455 A		5	450	offline	0	offline	0	offline
125 USGS	13152500	4/7/1984	460 A		5	455	offline	0	offline	0	offline
126 USGS	13152500	4/8/1984	467 A		5	462	offline	0	offline	0	offline
127 USGS	13152500	4/9/1984	600 A		5	595	offline	0	offline	0	offline
128 USGS	13152500	4/10/1984	665 A		5	660	offline	0	offline	0	offline
129 USGS	13152500	4/11/1984	3450 A		5	3445	offline	0	offline	0	offline
130 USGS	13152500	4/12/1984	3870 A		5	3865	offline	0	offline	0	offline
131 USGS	13152500	4/13/1984	3410 A		5	3405	offline	0	offline	0	offline
132 USGS	13152500	4/14/1984	3060 A		80	2980	offline	0	offline	0	offline
133 USGS	13152500	4/15/1984	3000 A		80	2920	offline	0	offline	0	offline
134 USGS	13152500	4/16/1984	3170 A		80	3090	offline	0	offline	0	offline
135 USGS	13152500	4/17/1984	4160 A		80	4080	offline	0	offline	0	offline
136 USGS	13152500	4/18/1984	4830 A		80	4750	offline	0	offline	0	offline
137 USGS	13152500	4/19/1984	4950 A		80	4870	offline	0	offline	0	offline
138 USGS	13152500	4/20/1984	4640 A		80	4560	offline	0	offline	0	offline
139 USGS	13152500	4/21/1984	4240 A		80	4160	offline	0	offline	0	offline

A	B	C	D	E	F	G	H	I	J	K	L
agency	station	date	Q(cts)		Bypass(cts)	Q-Bypass	beneficial use	Q-Bypass-20	beneficial use max	Q-Bypass-150	beneficial use max
27 USGS	13152500	4/22/1984	3930 A		80	3650	offline	0	offline	0	offline
141 USGS	13152500	4/23/1984	3570 A		80	3490	offline	0	offline	0	offline
142 USGS	13152500	4/24/1984	3460 A		80	3380	offline	0	offline	0	offline
143 USGS	13152500	4/25/1984	3360 A		80	3280	offline	0	offline	0	offline
144 USGS	13152500	4/26/1984	3410 A		80	3330	offline	0	offline	0	offline
145 USGS	13152500	4/27/1984	3140 A		80	3060	offline	0	offline	0	offline
146 USGS	13152500	4/28/1984	2860 A		80	2780	offline	0	offline	0	offline
147 USGS	13152500	4/29/1984	2650 A		80	2570	offline	0	offline	0	offline
148 USGS	13152500	4/30/1984	2460 A		80	2380	offline	0	offline	0	offline
149 USGS	13152500	5/1/1984	2160 A		80	2080		2060	130	1930	50
150 USGS	13152500	5/2/1984	2420 A		80	2340		2320	130	2190	50
151 USGS	13152500	5/3/1984	2300 A		80	2220		2200	130	2070	50
152 USGS	13152500	5/4/1984	2190 A		80	2110		2090	130	1960	50
153 USGS	13152500	5/5/1984	2260 A		80	2180		2160	130	2030	50
154 USGS	13152500	5/6/1984	2240 A		80	2160		2140	130	2010	50
155 USGS	13152500	5/7/1984	2220 A		80	2140		2120	130	1990	50
156 USGS	13152500	5/8/1984	2010 A		80	1930		1910	130	1780	50
157 USGS	13152500	5/9/1984	1810 A		80	1730		1710	130	1580	50
158 USGS	13152500	5/10/1984	1860 A		80	1780		1760	130	1630	50
159 USGS	13152500	5/11/1984	1140 A		80	1060		1040	130	910	50
160 USGS	13152500	5/12/1984	1050 A		80	970		950	130	820	50
161 USGS	13152500	5/13/1984	936 A		80	856		836	130	706	50
162 USGS	13152500	5/14/1984	956 A		80	876		856	130	726	50
163 USGS	13152500	5/15/1984	981 A		80	901		881	130	751	50
164 USGS	13152500	5/16/1984	2070 A		80	1990		1970	130	1840	50
165 USGS	13152500	5/17/1984	2980 A		80	2900		2880	130	2750	50
166 USGS	13152500	5/18/1984	3490 A		80	3410		3390	130	3260	50
167 USGS	13152500	5/19/1984	2980 A		80	2900		2880	130	2750	50
168 USGS	13152500	5/20/1984	2480 A		80	2400		2380	130	2250	50
169 USGS	13152500	5/21/1984	2330 A		80	2250		2230	130	2100	50
170 USGS	13152500	5/22/1984	2310 A		80	2230		2210	130	2080	50
171 USGS	13152500	5/23/1984	2240 A		80	2160		2140	130	2010	50
172 USGS	13152500	5/24/1984	2180 A		80	2100		2080	130	1950	50
173 USGS	13152500	5/25/1984	2070 A		80	1990		1970	130	1840	50
174 USGS	13152500	5/26/1984	1970 A		80	1890		1870	130	1740	50
175 USGS	13152500	5/27/1984	1790 A		80	1710		1690	130	1560	50
176 USGS	13152500	5/28/1984	1610 A		80	1530		1510	130	1380	50
177 USGS	13152500	5/29/1984	1480 A		80	1400		1380	130	1250	50
178 USGS	13152500	5/30/1984	1340 A		80	1260		1240	130	1110	50
179 USGS	13152500	5/31/1984	1300 A		80	1220		1200	130	1070	50
180 USGS	13152500	6/1/1984	1580 A		80	1500		1480	130	1350	50
181 USGS	13152500	6/2/1984	1960 A		80	1880		1860	130	1730	50
182 USGS	13152500	6/3/1984	2200 A		80	2120		2100	130	1970	50
183 USGS	13152500	6/4/1984	2070 A		80	1990		1970	130	1840	50
184 USGS	13152500	6/5/1984	1990 A		80	1910		1890	130	1760	50
185 USGS	13152500	6/6/1984	1890 A		80	1810		1790	130	1660	50

A	B	C	D	E	F	G	H	I	J	K	L
27 agency	station	date	Q(cts)		Bypass/cts, Q-Bypass	beneficial use 20cts	Q-Bypass-20	beneficial use max additional 130cts		Q-Bypass-150	beneficial use max additional 50cts
186 USGS	13152500	6/7/1984	1840 A		80	1760	20	1740	130	1610	50
187 USGS	13152500	6/8/1984	1880 A		80	1800	20	1780	130	1650	50
188 USGS	13152500	6/9/1984	1820 A		80	1740	20	1720	130	1590	50
189 USGS	13152500	6/10/1984	1700 A		80	1620	20	1600	130	1470	50
190 USGS	13152500	6/11/1984	1520 A		80	1440	20	1420	130	1290	50
191 USGS	13152500	6/12/1984	1100 A		80	1020	20	1000	130	870	50
192 USGS	13152500	6/13/1984	985 A		80	905	20	885	130	755	50
193 USGS	13152500	6/14/1984	1000 A		80	920	20	900	130	770	50
194 USGS	13152500	6/15/1984	948 A		80	868	20	848	130	718	50
195 USGS	13152500	6/16/1984	916 A		80	836	20	816	130	686	50
196 USGS	13152500	6/17/1984	1020 A		80	940	20	920	130	790	50
197 USGS	13152500	6/18/1984	1470 A		80	1390	20	1370	130	1240	50
198 USGS	13152500	6/19/1984	1420 A		80	1340	20	1320	130	1190	50
199 USGS	13152500	6/20/1984	1450 A		80	1370	20	1350	130	1220	50
200 USGS	13152500	6/21/1984	1460 A		80	1380	20	1360	130	1230	50
201 USGS	13152500	6/22/1984	1570 A		80	1490	20	1470	130	1340	50
202 USGS	13152500	6/23/1984	1690 A		80	1610	20	1590	130	1460	50
203 USGS	13152500	6/24/1984	1710 A		80	1630	20	1610	130	1480	50
204 USGS	13152500	6/25/1984	1670 A		80	1590	20	1570	130	1440	50
205 USGS	13152500	6/26/1984	1470 A		80	1390	20	1370	130	1240	50
206 USGS	13152500	6/27/1984	1290 A		80	1210	20	1190	130	1060	50
207 USGS	13152500	6/28/1984	1230 A		80	1150	20	1130	130	1000	50
208 USGS	13152500	6/29/1984	1290 A		80	1210	20	1190	130	1060	50
209 USGS	13152500	6/30/1984	1340 A		5	1335	20	1315	130	1185	50
210 USGS	13152500	7/1/1984	1090 A		5	1085	20	1065	130	935	50
211 USGS	13152500	7/2/1984	1010 A		5	1005	20	985	130	855	50
212 USGS	13152500	7/3/1984	695 A		5	690	20	670	130	540	50
213 USGS	13152500	7/4/1984	418 A		5	413	20	393	130	263	50
214 USGS	13152500	7/5/1984	374 A		5	369	20	349	130	219	50
215 USGS	13152500	7/6/1984	342 A		5	337	20	317	130	187	50
216 USGS	13152500	7/7/1984	257 A		5	252	20	232	130	102	50
217 USGS	13152500	7/8/1984	248 A		5	243	20	223	130	93	50
218 USGS	13152500	7/9/1984	252 A		5	247	20	227	130	97	50
219 USGS	13152500	7/10/1984	450 A		5	445	20	425	130	295	50
220 USGS	13152500	7/11/1984	332 A		5	327	20	307	130	177	50
221 USGS	13152500	7/12/1984	233 A		5	228	20	208	130	78	50
222 USGS	13152500	7/13/1984	146 A		5	141	20	121	121	0	0
223 USGS	13152500	7/14/1984	147 A		5	142	20	122	122	0	0
224 USGS	13152500	7/15/1984	140 A		5	135	20	115	115	0	0
225 USGS	13152500	7/16/1984	133 A		5	128	20	108	108	0	0
226 USGS	13152500	7/17/1984	136 A		5	131	20	111	111	0	0
227 USGS	13152500	7/18/1984	123 A		5	118	20	98	98	0	0
228 USGS	13152500	7/19/1984	114 A		5	109	20	89	89	0	0
229 USGS	13152500	7/20/1984	108 A		5	103	20	83	83	0	0
230 USGS	13152500	7/21/1984	137 A		5	132	20	112	112	0	0
231 USGS	13152500	7/22/1984	216 A		5	211	20	191	130	61	50

	A	B	C	D	E	F	G	H	I	J	K	L
27 agency	station	date	Q(cts)			Bypass(cts)	Q-Bypass	beneficial use 20cts	Q-Bypass-20	beneficial use max additional 130cts	Q-Bypass-150	beneficial use max additional 50cts
232 USGS	13152500	7/23/1984	293 A			5	288	20	268	130	138	50
233 USGS	13152500	7/24/1984	314 A			5	309	20	289	130	159	50
234 USGS	13152500	7/25/1984	316 A			5	311	20	291	130	161	50
235 USGS	13152500	7/26/1984	295 A			5	290	20	270	130	140	50
236 USGS	13152500	7/27/1984	303 A			5	298	20	278	130	148	50
237 USGS	13152500	7/28/1984	340 A			5	335	20	315	130	185	50
238 USGS	13152500	7/29/1984	389 A			5	384	20	364	130	234	50
239 USGS	13152500	7/30/1984	361 A			5	356	20	336	130	206	50
240 USGS	13152500	7/31/1984	348 A			5	343	20	323	130	193	50
241 USGS	13152500	8/1/1984	359 A			5	354	20	334	130	204	50
242 USGS	13152500	8/2/1984	387 A			5	382	20	362	130	232	50
243 USGS	13152500	8/3/1984	425 A			5	420	20	400	130	270	50
244 USGS	13152500	8/4/1984	439 A			5	434	20	414	130	284	50
245 USGS	13152500	8/5/1984	434 A			5	429	20	409	130	279	50
246 USGS	13152500	8/6/1984	416 A			5	411	20	391	130	261	50
247 USGS	13152500	8/7/1984	402 A			5	397	20	377	130	247	50
248 USGS	13152500	8/8/1984	365 A			5	360	20	340	130	210	50
249 USGS	13152500	8/9/1984	307 A			5	302	20	282	130	152	50
250 USGS	13152500	8/10/1984	250 A			5	245	20	225	130	95	50
251 USGS	13152500	8/11/1984	204 A			5	199	20	179	130	49	50
252 USGS	13152500	8/12/1984	199 A			5	194	20	174	130	44	44
253 USGS	13152500	8/13/1984	202 A			5	197	20	177	130	47	47
254 USGS	13152500	8/14/1984	224 A			5	219	20	199	130	69	50
255 USGS	13152500	8/15/1984	200 A			5	195	20	175	130	45	45
256 USGS	13152500	8/16/1984	270 A			5	265	20	245	130	115	50
257 USGS	13152500	8/17/1984	289 A			5	284	20	264	130	134	50
258 USGS	13152500	8/18/1984	297 A			5	292	20	272	130	142	50
259 USGS	13152500	8/19/1984	272 A			5	267	20	247	130	117	50
260 USGS	13152500	8/20/1984	254 A			5	249	20	229	130	99	50
261 USGS	13152500	8/21/1984	231 A			5	226	20	206	130	76	50
262 USGS	13152500	8/22/1984	252 A			5	247	20	227	130	97	50
263 USGS	13152500	8/23/1984	272 A			5	267	20	247	130	117	50
264 USGS	13152500	8/24/1984	284 A			5	279	20	259	130	129	50
265 USGS	13152500	8/25/1984	308 A			5	303	20	283	130	153	50
266 USGS	13152500	8/26/1984	303 A			5	298	20	278	130	148	50
267 USGS	13152500	8/27/1984	308 A			5	303	20	283	130	153	50
268 USGS	13152500	8/28/1984	285 A			5	280	20	260	130	130	50
269 USGS	13152500	8/29/1984	261 A			5	256	20	236	130	106	50
270 USGS	13152500	8/30/1984	252 A			5	247	20	227	130	97	50
271 USGS	13152500	8/31/1984	284 A			5	279	20	259	130	129	50
272 USGS	13152500	9/1/1984	348 A			5	343	20	323	130	193	50
273 USGS	13152500	9/2/1984	380 A			5	375	20	355	130	225	50
274 USGS	13152500	9/3/1984	365 A			5	360	20	340	130	210	50
275 USGS	13152500	9/4/1984	342 A			5	337	20	317	130	187	50
276 USGS	13152500	9/5/1984	324 A			5	319	20	299	130	169	50
277 USGS	13152500	9/6/1984	318 A			5	313	20	293	130	163	50

	A	B	C	D	E	F	G	H	I	J	K	L
27	agency	station	date	Q(cts)		Bypass(cts, Q-Bypass		beneficial use	Q-Bypass-20	beneficial use max	Q-Bypass-150	beneficial use max
						20cts				additional 130cts		additional 50cts
278	USGS	13152500	9/7/1984	285 A		5	280	20	260	130	130	50
279	USGS	13152500	9/8/1984	297 A		5	292	20	272	130	142	50
280	USGS	13152500	9/9/1984	378 A		5	373	20	353	130	223	50
281	USGS	13152500	9/10/1984	398 A		5	393	20	373	130	243	50
282	USGS	13152500	9/11/1984	387 A		5	382	20	362	130	232	50
283	USGS	13152500	9/12/1984	393 A		5	388	20	368	130	238	50
284	USGS	13152500	9/13/1984	346 A		5	341	20	321	130	191	50
285	USGS	13152500	9/14/1984	348 A		5	343	20	323	130	193	50
286	USGS	13152500	9/15/1984	378 A		5	373	20	353	130	223	50
287	USGS	13152500	9/16/1984	434 A		5	429	20	409	130	279	50
288	USGS	13152500	9/17/1984	446 A		5	441	20	421	130	291	50
289	USGS	13152500	9/18/1984	462 A		5	457	20	437	130	307	50
290	USGS	13152500	9/19/1984	465 A		5	460	20	440	130	310	50
291	USGS	13152500	9/20/1984	402 A		5	397	20	377	130	247	50
292	USGS	13152500	9/21/1984	398 A		5	393	20	373	130	243	50
293	USGS	13152500	9/22/1984	427 A		5	422	20	402	130	272	50
294	USGS	13152500	9/23/1984	531 A		5	526	20	506	130	376	50
295	USGS	13152500	9/24/1984	606 A		5	601	20	581	130	451	50
296	USGS	13152500	9/25/1984	698 A		5	693	20	673	130	543	50
297	USGS	13152500	9/26/1984	771 A		5	766	20	746	130	616	50
298	USGS	13152500	9/27/1984	698 A		5	693	20	673	130	543	50
299	USGS	13152500	9/28/1984	708 A		5	703	20	683	130	553	50
300	USGS	13152500	9/29/1984	691 A		5	686	20	666	130	536	50
301	USGS	13152500	9/30/1984	708 A		5	703	20	683	130	553	50
302	USGS	13152500	10/1/1984	725 A		5	720	20	700	130	570	50
303	USGS	13152500	10/2/1984	778 A		5	773	20	753	130	623	50
304	USGS	13152500	10/3/1984	779 A		5	774	20	754	130	624	50
305	USGS	13152500	10/4/1984	724 A		5	719	20	699	130	569	50
306	USGS	13152500	10/5/1984	669 A		5	664	20	634	130	504	50
307	USGS	13152500	10/6/1984	635 A		5	630	20	610	130	480	50
308	USGS	13152500	10/7/1984	578 A		5	573	20	553	130	423	50
309	USGS	13152500	10/8/1984	486 A		5	481	20	461	130	331	50
310	USGS	13152500	10/9/1984	450 A		5	445	20	425	130	295	50
311	USGS	13152500	10/10/1984	481 A		5	476	20	456	130	326	50
312	USGS	13152500	10/11/1984	436 A		5	431	20	411	130	281	50
313	USGS	13152500	10/12/1984	334 A		5	329	20	309	130	179	50
314	USGS	13152500	10/13/1984	231 A		5	226	20	206	130	76	50
315	USGS	13152500	10/14/1984	269 A		5	264	20	244	130	114	50
316	USGS	13152500	10/15/1984	295 A		5	290	20	270	130	140	50
317	USGS	13152500	10/16/1984	190 A		5	185	20	165	130	35	35
318	USGS	13152500	10/17/1984	230 A		5	225	20	205	130	75	50
319	USGS	13152500	10/18/1984	207 A		5	202	20	182	130	52	50
320	USGS	13152500	10/19/1984	208 A		5	203	20	183	130	53	50
321	USGS	13152500	10/20/1984	217 A		5	212	20	192	130	62	50
322	USGS	13152500	10/21/1984	220 A		5	215	20	195	130	65	50
323	USGS	13152500	10/22/1984	218 A		5	213	20	193	130	63	50

	A	B	C	D	E	F	G	H	I	J	K	L
27	agency	station	date	Q(cts)		Bypass(cts)	Q-Bypass	beneficial use 20cts	Q-Bypass-20	beneficial use max additional 130cts	Q-Bypass-150	beneficial use max additional 50cts
324	USGS	13152500	10/23/1984	227 A		5	222	20	202	130	72	50
325	USGS	13152500	10/24/1984	240 A		5	235	20	215	130	85	50
326	USGS	13152500	10/25/1984	238 A		5	233	20	213	130	83	50
327	USGS	13152500	10/26/1984	278 A		5	273	20	253	130	123	50
328	USGS	13152500	10/27/1984	318 A		5	313	20	293	130	163	50
329	USGS	13152500	10/28/1984	311 A		5	306	20	286	130	156	50
330	USGS	13152500	10/29/1984	311 A		5	306	20	286	130	156	50
331	USGS	13152500	10/30/1984	325 A		5	320	20	300	130	170	50
332	USGS	13152500	10/31/1984	306 A		5	301	20	281	130	151	50
333	USGS	13152500	11/1/1984	305 A		5	300	20	280	130	150	50
334	USGS	13152500	11/2/1984	349 A		5	344	20	324	130	194	50
335	USGS	13152500	11/3/1984	361 A		5	356	20	336	130	206	50
336	USGS	13152500	11/4/1984	357 A		5	352	20	332	130	202	50
337	USGS	13152500	11/5/1984	364 A		5	359	20	339	130	209	50
338	USGS	13152500	11/6/1984	375 A		5	370	20	350	130	220	50
339	USGS	13152500	11/7/1984	374 A		5	369	20	349	130	219	50
340	USGS	13152500	11/8/1984	385 A		5	380	20	360	130	230	50
341	USGS	13152500	11/9/1984	403 A		5	398	20	378	130	248	50
342	USGS	13152500	11/10/1984	420 A		5	415	20	395	130	265	50
343	USGS	13152500	11/11/1984	449 A		5	444	20	424	130	294	50
344	USGS	13152500	11/12/1984	450 A		5	445	20	425	130	295	50
345	USGS	13152500	11/13/1984	435 A		5	430	20	410	130	280	50
346	USGS	13152500	11/14/1984	408 A		5	403	20	383	130	253	50
347	USGS	13152500	11/15/1984	476 A		5	471	20	451	130	321	50
348	USGS	13152500	11/16/1984	473 A		5	468	20	448	130	318	50
349	USGS	13152500	11/17/1984	368 A		5	363	20	343	130	213	50
350	USGS	13152500	11/18/1984	267 A		5	262	20	242	130	112	50
351	USGS	13152500	11/19/1984	230 A		5	225	20	205	130	75	50
352	USGS	13152500	11/20/1984	226 A		5	221	20	201	130	71	50
353	USGS	13152500	11/21/1984	208 A		5	203	20	183	130	53	50
354	USGS	13152500	11/22/1984	215 A		5	210	20	190	130	60	50
355	USGS	13152500	11/23/1984	215 A		5	210	20	190	130	60	50
356	USGS	13152500	11/24/1984	220 A		5	215	20	195	130	65	50
357	USGS	13152500	11/25/1984	230 A		5	225	20	205	130	75	50
358	USGS	13152500	11/26/1984	213 A		5	208	20	188	130	58	50
359	USGS	13152500	11/27/1984	199 A		5	194	20	174	130	44	44
360	USGS	13152500	11/28/1984	235 A		5	230	20	210	130	80	50
361	USGS	13152500	11/29/1984	219 A		5	214	20	194	130	64	50
362	USGS	13152500	11/30/1984	201 A		5	196	20	176	130	46	46
363	USGS	13152500	12/1/1984	172 A		5	167	20	147	130	17	17
364	USGS	13152500	12/2/1984	131 A		5	126	20	106	106	0	0
365	USGS	13152500	12/3/1984	128 A		5	123	20	103	103	0	0
366	USGS	13152500	12/4/1984	125 A		5	120	20	100	100	0	0
367	USGS	13152500	12/5/1984	120 A		5	115	20	95	95	0	0
368	USGS	13152500	12/6/1984	115 A		5	110	20	90	90	0	0
369	USGS	13152500	12/7/1984	110 A		5	105	20	85	85	0	0

	A	B	C	D	E	F	G	H	I	J	K	L
27	agency	station	date	Q(cts)		Bypass(cts)	Q-Bypass	beneficial use 20cts	Q-Bypass-20	beneficial use max additional 130cts		beneficial use max additional 50cts
370	USGS	13152500	12/8/1984	105 A		5	100	20	80	80	0	0
371	USGS	13152500	12/9/1984	100 A		5	95	20	75	75	0	0
372	USGS	13152500	12/10/1984	95 A		5	90	20	70	70	0	0
373	USGS	13152500	12/11/1984	95 A		5	90	20	70	70	0	0
374	USGS	13152500	12/12/1984	95 A		5	90	20	70	70	0	0
375	USGS	13152500	12/13/1984	95 A		5	90	20	70	70	0	0
376	USGS	13152500	12/14/1984	92 A		5	87	20	67	67	0	0
377	USGS	13152500	12/15/1984	92 A		5	87	20	67	67	0	0
378	USGS	13152500	12/16/1984	92 A		5	87	20	67	67	0	0
379	USGS	13152500	12/17/1984	92 A		5	87	20	67	67	0	0
380	USGS	13152500	12/18/1984	90 A		5	85	20	65	65	0	0
381	USGS	13152500	12/19/1984	90 A		5	85	20	65	65	0	0
382	USGS	13152500	12/20/1984	90 A		5	85	20	65	65	0	0
383	USGS	13152500	12/21/1984	92 A		5	87	20	67	67	0	0
384	USGS	13152500	12/22/1984	92 A		5	87	20	67	67	0	0
385	USGS	13152500	12/23/1984	95 A		5	90	20	70	70	0	0
386	USGS	13152500	12/24/1984	95 A		5	90	20	70	70	0	0
387	USGS	13152500	12/25/1984	100 A		5	95	20	75	75	0	0
388	USGS	13152500	12/26/1984	100 A		5	95	20	75	75	0	0
389	USGS	13152500	12/27/1984	100 A		5	95	20	75	75	0	0
390	USGS	13152500	12/28/1984	98 A		5	93	20	73	73	0	0
391	USGS	13152500	12/29/1984	98 A		5	93	20	73	73	0	0
392	USGS	13152500	12/30/1984	98 A		5	93	20	73	73	0	0
393	USGS	13152500	12/31/1984	98 A		5	93	20	73	73	0	0
394	sum cfs							5520		34035		11777
395		1.9835 cfs to AF conversion factor										
396	sum AF							10948.92		67508.4225		23359.6795
397	rounded to 3 sig fig							10900		67500		23400