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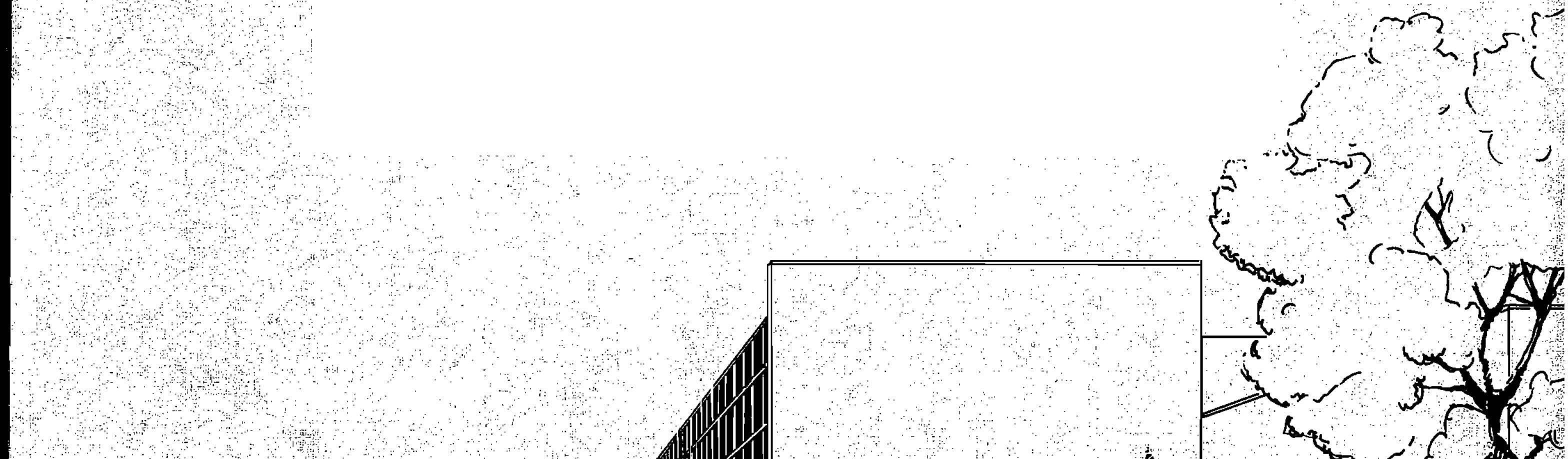

UTAH WATER RESEARCH LABORATORY

College of Engineering
Utah State University
Logan, Utah

HYDROPOWER POTENTIAL AT STATE DAM

LOGAN RIVER

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Utah Water Research Laboratory
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Logan River was early recognized as a potential source of energy. Beginning near the turn of the century, three mainstem run-of-the-river powerplants were constructed. The first plant diverted water from the river at what is locally called "second dam" and carried water by wooden flume to a 200 foot penstock. This plant was built by Hercules Power Company in 1893 and diverted 200 cfs using 210 feet of head. The next powerplant to be built was by Logan City, beginning about 1903, at what is locally known as "third dam." This plant was rebuilt in 1923 and uses 200 cfs at 100 feet head. The third power plant was constructed by the State of Utah at the suggestion of John H. Widstoe, president of the Utah Agricultural College, in 1911-12 at a site below the other two and at what is now referred to as "first dam" or the "state dam." This plant has rights to use 150 cfs at a head of 30 feet.

The power plant at the State dam has produced continuously for over 70 years and has historical significance because it was the first source of continuous power for the state university, the state capitol and the state hospital. It still has economic significance because of the present value of electrical energy.

The state powerplant has recently been renovated, with new windings on the generator and new tolerances built into the turbine. The tailrace has also been reconstructed to provide better downstream control. Despite the rebuilding and rewinding the plant is not producing at rated efficiency and unused power is passing over the spillway. Logan City has filed an application with FERC and with the state engineer to construct a powerplant, using the existing dam, to take advantage of the high flows and unused capacity of the state plant. This has caused some concern to the university and to the Utah Water Research Laboratory which uses the dam to divert water for research needs. It is admitted that additional energy could be generated at the site, but how much, what configuration, and the costs to accomplish it is unknown. It is the purpose of this report to answer some of those questions.

As can be seen from Figure 1, Logan River below the state dam has several large looping bends. The river gradient is steep and head for power generation can be made available with a relatively short length of pipe. A proposed pipeline alignment is shown in Figure 1 with two alternative locations for generation sites. The existing power plant at the dam is also shown. A change in generation equipment at this site is proposed. The existing 48" pipeline from the dam to the UWRL is also shown and the potential generation of the site will be calculated.

The water available at the dam is the natural flow of Logan River minus the diversion of the Logan, Hyde Park and Smithfield Canal. Both of these flows are measured at official USGS gaging stations, 10.1090.00 and 10.1084.00 respectively. Water users below the dam include the Logan and Northern Canal, the Utah Water Research Laboratory, and a group of agricultural users who divert below the mapped area and whose flows would not be interferred with by the proposed power development shown.

The elevation differences between the water surface behind the dam and the river at the proposed power sites are shown in Figure 2. At site 1, the existing dam, the available head is 30 feet, with perhaps some seasonal variation due to decreed water surface elevation. (The court decree specifying drawdown of the reservoir in low river flows has

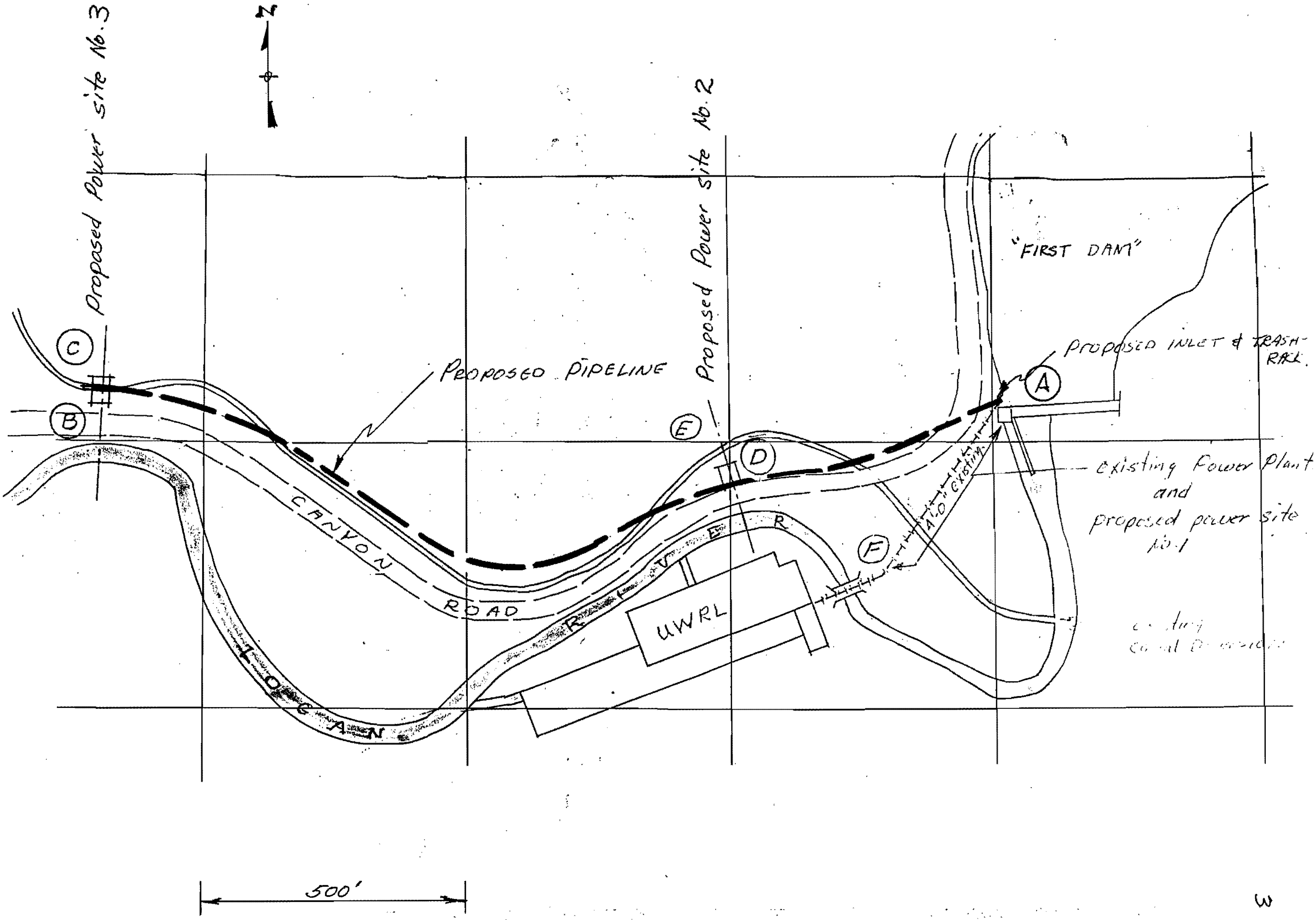

FIG. 1 PLAN VIEW OF POWER SITE

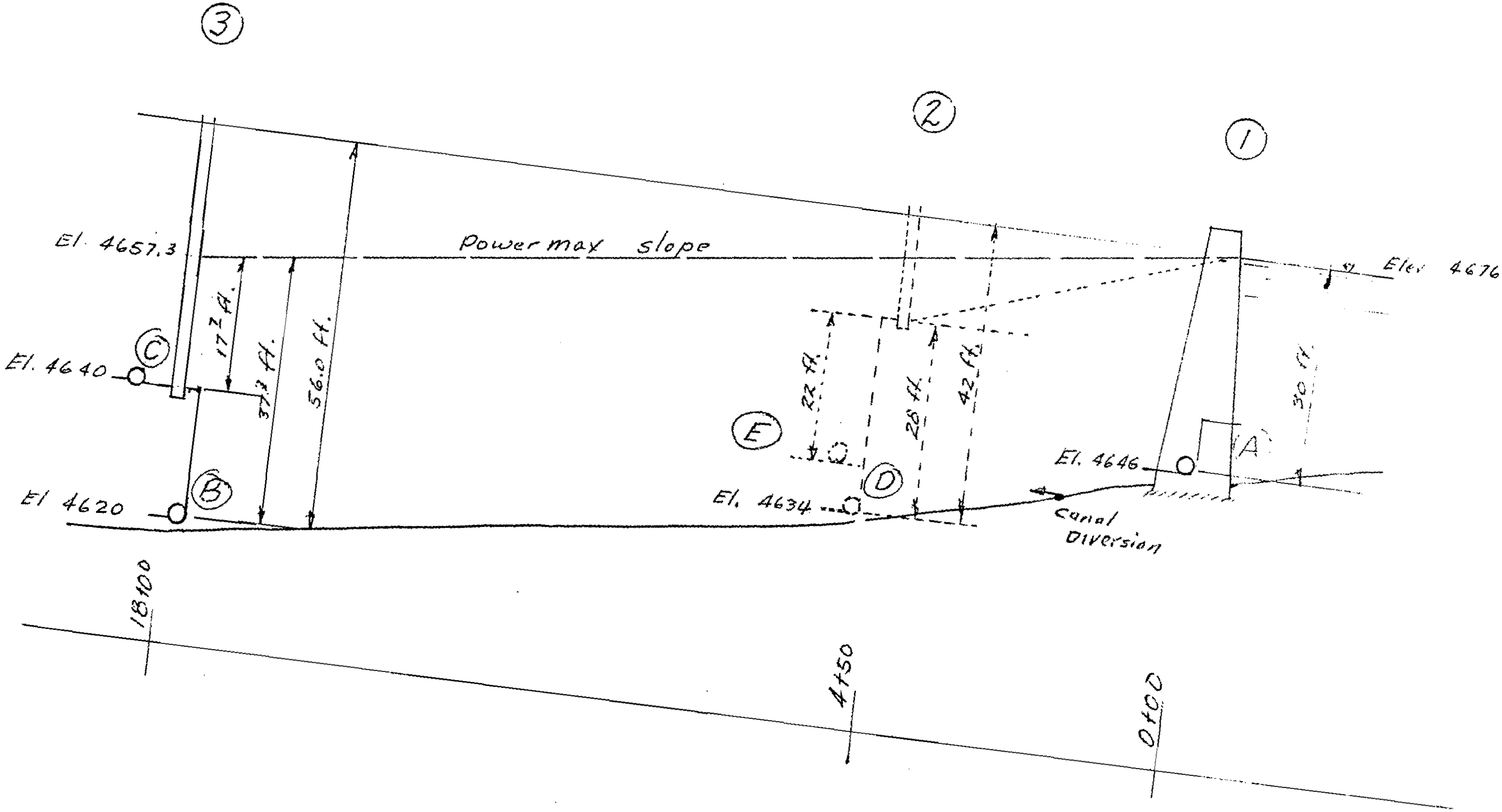

Fig. 2. Hydraulic Profile of Power sites.

not been enforced in recent years and is not considered a factor in power computation for this study). At site 2 the total head is 42 feet and the available head at powermax slope for river flows is 28 feet. For canal flows, the head is 22 ft. At site 3 the available head at powermax slope is 37.3 feet, with a gross head of 56 feet; the minimum canal head is 17.7 ft. At sites 2 and 3 the available head will increase during low flows because of the static energy recovered through decreased friction loss. The head available at the UWRL site, not shown in Figure 2, is 40 ft gross with 27.3 ft at powermax slope.

The objective in building a power plant is to maximize the power generated, which means utilizing the highest flow rate and the largest head that can be economically and physically combined. There are at least two constraints that must be considered. 1) The flow rate of the canal is established by court decree and the geographic position and elevation of the canal are fixed. There are two alternative ways to deliver water to the canal while at the same time generating electricity. One is to use the existing power site which has a gross head of 30 feet. The other is to pipe the water to the canal and generate at the canal with a gross head of 36 feet. 2) The other constraint on maximizing power is that of providing a minimum flow in the river to maintain aesthetics and protect the fishery. The minimum historical flow which will be used as a criterion for fish habitat in this section of the river is 41 cfs and can be released through a turbine/generator with 30 feet of head.

With the constraints noted separate generators must be established to:

1. Utilize the fish flow: Q = 41 cfs, H = 30 feet. ("A" on Figure 2)

2. Utilize the canal flow: Q $\approx$ 20 to 85 cfs, H = 36 feet. ("C" and "E" on Figure 2)

3. Utilize the unused river flows: Q $\approx$ 30 to 1000 cfs, H = either 42 feet or 56 feet. ("B" and "D" on Figure 2)

The above generation sites were chosen to maximize energy without regard to ownership of water rights. If the university, which owns the prior rights to 150 cfs, and Logan City, which has an application to appropriate up to 1000 cfs, were to develop energy independently, the university generation sites would consist of site 1, A plus F and A would probably consist of two parts--one for the fish flow and one for the canal flow; the city generation site would be at site 2, D and would include surplus river flow only. For comparative purposes, the potential energy for these alternatives has been calculated and will be shown later.

Power and Energy

Power analysis has been made for different configurations requiring two different pipeline lengths. Power site no. 1 involves replacing the existing turbine and generator, which are old and inefficient, with a new system designed to utilize the fish flows only. Power sites no. 2 and no. 3 are alternative sites which use a pipeline to conduct both the canal flow and the river flow to two separate generators. Site no. 2 requires 450 feet of pipeline and is analyzed with different alternative diameters of pipe, 3 ft, 4 ft, 5 ft, 6 ft, and 7.5 ft operating at the powermax slope. Power site no. 3 requires a longer pipeline, 1800 feet, to convey both the canal flow and river flow to 2 generating systems. It is analyzed for two pipe diameters, 5 ft and 7.5 feet. The total output of each alternative design is the sum of generators A plus D and E at site no. 2; and generators A plus B, and C at site no. 3, Figure 2.

Since a flow duration curve is a representation of the historical distribution of a natural hydrologic event, and since canal flows do not follow the same natural distribution, it was determined that a duration curve would have no value in this analysis. Instead, the actual daily flow values which occurred in given years were used to compute daily power which could have been produced if the generators were in place at those times. The years chosen include a normal year, 1978, a dry year, 1977, and two wet years, 1971 and 1983. The energy values in megawatt hours for each of the years plus the peak kilowatt rating of each generator are summarized in Table 1. If the constraints on fish flows is removed and that water made available for higher head generation, additional energy would be available and these energy values are also shown in Table 1. Also shown in Table 1 is the energy available if the university and city were to develop projects separately. A summary of energy available for the years studied is shown in Table 2 and the various configurations are ranked in order of total energy potential. The daily power potential for the highest ranked configuration is shown in Figure 3.

Turbine/Generator Selection

The turbines are selected to match the variability in flow and the generators are selected to match the peak power potential. For purposes of this study it is assumed cross flow turbines from Pacific Hydro Co. will be used. The variability of flow and the sizing of turbines and generators is shown in Table 3 and the possible configuration in a powerhouse shown in Figure 4.

Table 1. Energy potential and peak power potential for various alternatives.

Year	Pipe Diameter	Energy - MWH River	Energy - MWH Canal	Energy - MWH Dam	Total	Δ Fish	Maximum Power - KW River	Maximum Power - KW Canal	Maximum Power - KW Dam	Total	MAX Q
Length:	1800										
1971	5.0	6,820	337	0	7,157	+299	1117	250	200	1567	353
		5,926	357	1173	7,456						
1977	5.0	3,674	359	0	4,033						
		1,971	372	994	3,337	-696					
1978	5.0	5,920	336	0	6,256						
		4,005	354	1175	5,534	-722					
1983	5.0	7,424	98	0	7,522						
		6,497	105	1113	7,715	+193					
1971	7.5	11,684	469	0	12,153		3200	250	200	3650	1013
		10,325	478	1017	11,820	-333					
1977	7.5	3,805	378	0	4,183						
		2,008	379	994	3,381	-802					
1978	7.5	8,338	442	0	8,781						
		6,666	451	1017	8,134	-647					
1983	7.5	11,450	143	0	11,593						
		10,040	145	1012	11,197	-396					

Table 1. Continued.

Year	Pipe Diameter	Energy - MWH River	Canal	Dam	Total	Δ Fish	Maximum Power - KW River	Canal	Dam	Total	MAX Q
Length:	450										
1971	3.0	2,532	383	1354	4,269	+1057	388	250	203	838	164
		2,829	383	0	3,212						
1977	3.0	1,374	352	970	2,696	+7					
		2,376	313	0	2,689						
1978	3.0	1,707	340	1285	3,332	+596					
		2,417	319	0	2,736						
1983	3.0	3,012	117	1296	4,436	+1113					
		3,206	117	0	3,323						
1971	4.0	4,397	423	1176	5,996	+527	823	250	203	1273	347
		5,061	408	0	5,469						
1977	4.0	1,478	374	970	2,822	-295					
		2,753	364	0	3,117						
1978	4.0	2,971	393	1153	4,517	+207					
		3,930	380	0	4,310						
1983	4.0	4,832	126	1092	6,050	+411					
		5,518	121	0	5,639						

Table 1. Continued.

Year	Pipe Diameter	Energy - MWH River	Canal	Dam	Total	Δ Fish	Maximum Power - KW River	Canal	Dam	Total	MAX Q
Length:	450										
1971	5.0	6,147	475	1068	7,690	+199					
		7,025	466	0	7,491						
1977	5.0	1,500	378	970	2,848	-358					
		2,831	375	0	3,206		1468	250	203	1918	620
1978	5.0	4,134	426	1084	5,641	-31					
		5,254	418	0	5,672						
1983	5.0	6,247	148	1030	7,425	+92					
		7,188	145	0	7,333						
1971	6.0	7,687	514	993	9,194	-15					
		8,702	507	0	9,209						
1977	6.0	1,506	380	970	2,856	+375					
		2,853	378	0	3,231		2356	250	203	2807	995
1978	6.0	4,980	465	988	6,433	-255					
		6,230	458	0	6,688						
1983	6.0	7,483	156	988	8,627	-65					
		8,537	155	0	8,692						

Table 1. Continued.

Year	Pipe Diameter	Energy - MWH River	Energy - MWH Canal	Energy - MWH Dam	Total	Δ Fish	Maximum Power - KW River	Maximum Power - KW Canal	Maximum Power - KW Dam	Total	MAX Q
Length:	450										
1971	7.5	9,181	580	991	10,672	-254	4190	250	200	4640	1769
		10,351	575	0	10,926						
1977	7.5	1,509	380	970	2,859	-385					
		2,864	380	0	3,244						
1978	7.5	5,416	498	988	6,902	-351					
		6,757	496	0	7,253						
1983	7.5	8,699	178	911	9,788	-277					
		9,889	176	0	10,065						
1/ 1971	DAM 80	1,778	0	0			203 380				80 150
	150	3,167	0	0	3,167						
1977	DAM	1,736	0	0							
		2,137	0	0	2,137						
1978	DAM	1,714	0	0							
		2,176	0	0	2,176						
1983	DAM	1,778	0	0							
		3,280	0	0	3,280						
2/ 1971	4.0	4,316	0	0	4,316		527	250	200	977	160
1977	4.0	2,181	0	0	2,181						
1978	4.0	2,554	0	0	2,554						
1983	4.0	4,502	0	0	4,502						

1/ Existing power site with 80 cfs max and 150 cfs max. Turbine range 2:1.
2/ Capacity of pipeline limited by velocity to 10.0 ft/sec and 160 cfs.

Table 1. Continued.

Year	Pipe Diameter	Energy - MWH River	Energy - MWH Canal	Energy - MWH Dam	Total	Δ Fish	Maximum Power - KW River	Maximum Power - KW Canal	Maximum Power - KW Dam	Total	MAX Q
Length: 450											
1971	90	8,761	590	911	10,262		3170	250	200	3520	1000
1977	90	1,509	380	911	2,800						
1978	90	5,416	498	911	6,825						
1983	90	8,422	180	911	9,513						
University Only - UWRL Canal Dam											
1971	48	2,175	523	911	3,609		246	250	200	696	150
1977	48	1,393	317	911	2,621						
1978	48	1,483	429	911	2,823						
1983	48	2,822	160	911	3,893						
Logan City Only - Lenth 450											
1971	72	5,596	0	0	5,596		2357	0	0	2357	995
1977	72	7	0	0	7						
1978	72	3,582	0	0	3,582						
1983	72	4,801	0	0	4,801						

Table 2. Summary of alternative power configurations.

Rank	Total MWH Average	High	Low	kw	Q	D inch	Site No.	Notes
1	8,781	12,153	4,183	3,450	1,013	90	3	w/o fish
2	8,134	11,820	3,381	3,650	1,013	90	3	w/fish
3	7,253	10,926	3,244	4,440	1,769	90	2	w/o fish
4	6,902	10,672	2,829	4,640	1,769	90	2	w/fish
5	6,825	10,262	2,800	3,620	1,000	90	2	w/fish
6	6,688	9,209	3,231	2,607	995	72	2	w/o fish
7	6,433	9,194	2,856	2,807	995	72	2	w/fish
8[1/]	6,405	9,205	2,628	3,053	1,145	48	1	2/fish
9	6,256	7,157	4,033	1,367	353	60	3	w/o fish
10	5,534	7,456	3,337	1,567	353	60	3	w/fish
11	5,672	7,491	3,206	1,718	620	60	2	w/o fish
12	5,641	7,690	2,848	1,918	620	60	2	w/fish
13	4,517	5,996	2,822	1,273	347	48	2	w/fish
14	4,310	5,469	3,117	1,073	347	48	2	w/o fish
15	3,332	4,269	2,696	838	164	36	2	w/fish
16	2,736	3,212	2,689	638	164	36	2	w/o fish
17	2,554	4,316	2,181	527	160	48	2	w/o fish, limit to 160 cfs
18	2,176	3,167	2,137	380	150	-	1	existing dam
[1/]City	3,582	5,596	7	2,357	995	72	2	surplus only
USU	2,823	3,609	2,621	696	150	48	1	w/fish

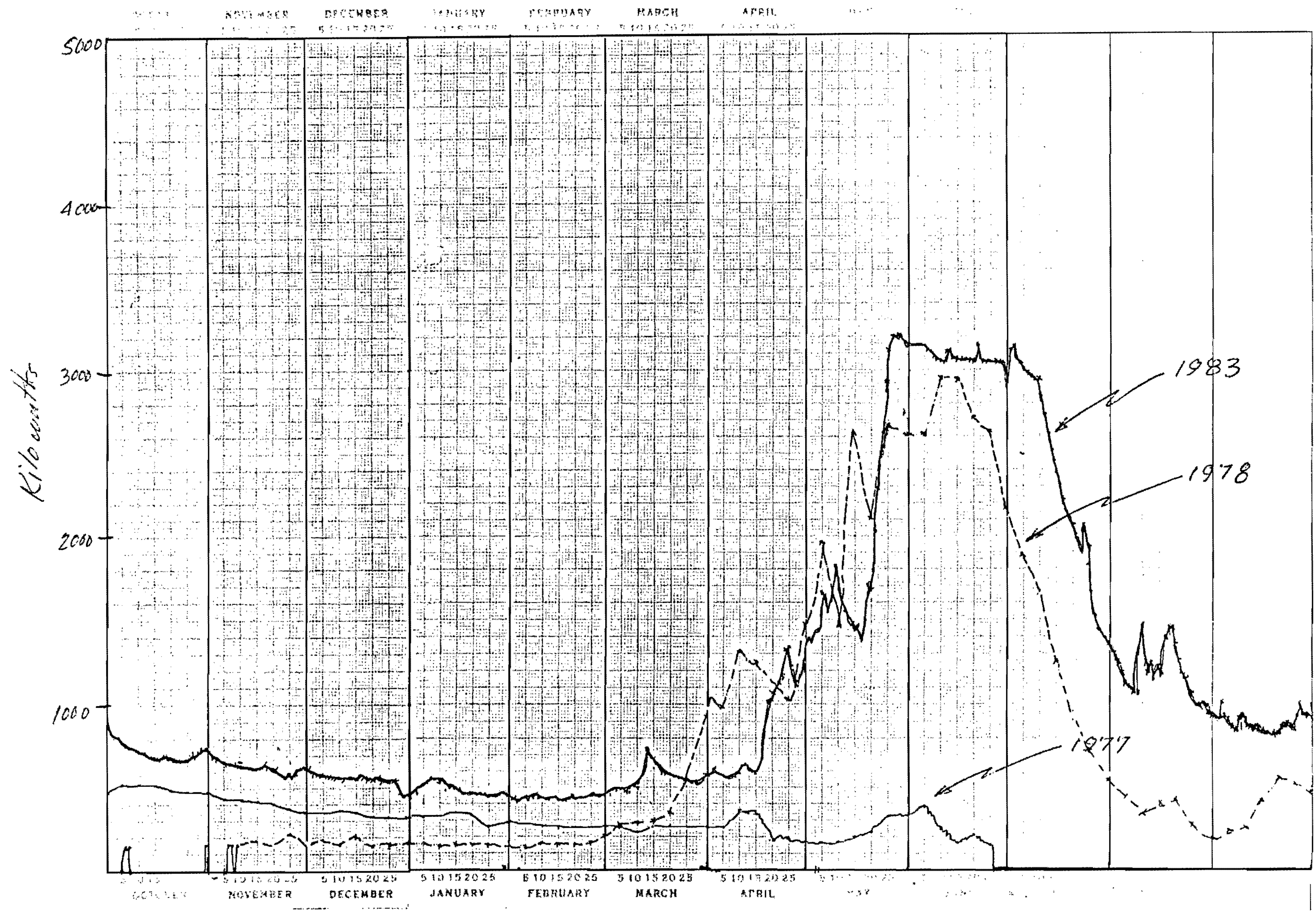

Figure 3. Daily Power Potential - Site No. 3, 90" pipe - River only.

Table 3. Variability of flow and peak power requirements (100 percent efficiency).

Power Site	Max Q cfs	Min Q cfs	Peak KW	Type of Unit
First Dam	80	40	200	Francis or cross flow
L&N Canal	85	20	250	Cross flow
River, 3 units	150	30	460	Cross flow
1, 2, 4	300	60	920	Cross flow
	600	120	1820	Cross flow
Total	-	-	3525	

At 80 percent efficiency - rated capacity is 2.82 mw.

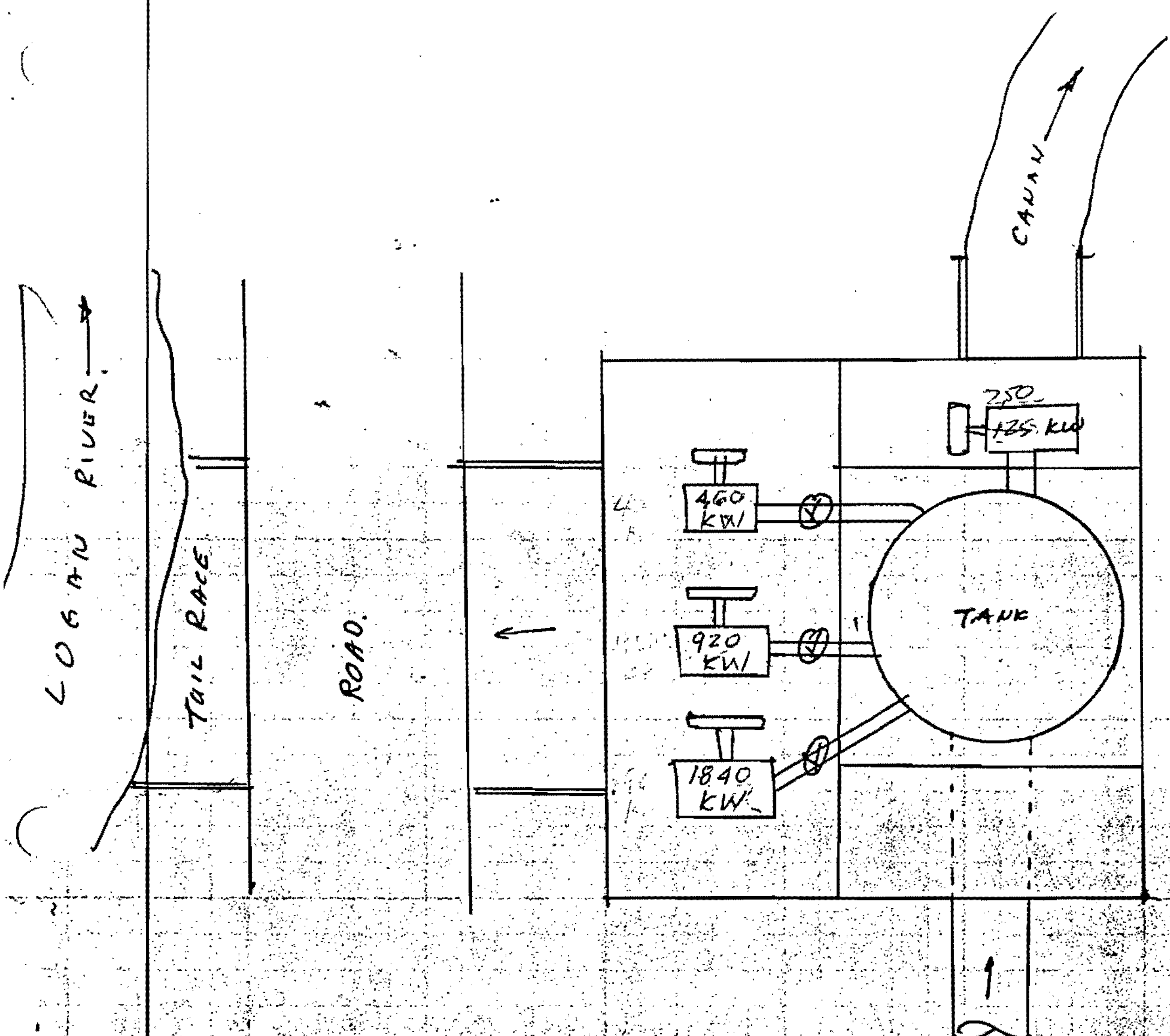

Fig. 4 LAYOUT OF POWER HOUSE.

Cost

When choosing among alternative engineering designs, it is usually recommended that the alternative with the lowest annual cost be selected. When, however, energy systems are being considered, the choice must also take into account the source of energy and consider the costs of alternate energy sources. Falling water as a source of energy does not consume the water and therefore the costs of production are related almost exclusively to the costs of equipment and its use and maintenance. Burning fuel, on the other hand, consumes the fuel and the costs of production must figure in its cost and the availability of the fuel. Since the major part of the energy used in Utah today is produced from burning fuel (coal in this case), it would make sense to maximize the production of any individual hydro production facility as long as that cost of hydro production was less than the cost of fuel-fired energy sources. This means that the alternative present in a specific hydro site that would produce the most energy at a cost less than the alternative fuel-fired source would be chosen. This may or may not be the least cost design among the various hydro designs at a specific site. The cost analysis of the most productive alternative which also supplies the fish demand (Rank No. 2, Table 2) is shown in Table 4. To compare site locations, the cost of generation at site 2, which has the shorter pipe length, is also shown in Table 4. The same pipe diameter is used, but the flow is limited to 1000 cfs. The energy production is shown in Table 2 as Rank No. 5. The only cost difference would be in the cost of pipe. The turbine, generator, and diversion would remain essentially the same. The value of new electrical generation for Logan City is set in other studies (Logan City Hydro No.

Table 4. Costs of hydropower plant at First Dam.

	$ x 1000	
	Alternative 1	Alternative 2
Land and land rights	0	0
Construction Costs		
Civil		
Site preparation	10	10
Powerhouse and tailrace	250	250
Pipeline 1800' - 90" dia. (450'-90" dia.)	450	113
Valves	40	40
Inlet - trashrack	100	100
Surge - tank	168	168
Electrical-Mechanical		
Turbine-generators		
First Dam - 80 cfs, 200 kw	50	50
L&N Canal - 85 cfs, 250 kw	69	69
River: 1 @ 150 cfs, 460 kw 1 @ 300 cfs, 920 kw 1 @ 600 cfs, 1840 kw	546	546
Switchgear	40	40
Miscellaneous	25	25
Contingencies and Engineering	520	430
Total	2,268	1,841
Annual Cost		
O&M 1%	$ 23,000	$ 18,400
Amortization 10%, 35 yr. (0.10369)	234,000	191,000
	$257,000	$209,400
Average production (based on 1978 @ 80% eff.) MWH	6,500	5,460
Cost per MWH	$39.5	$38.4
Value of energy (from Logan City)	$83.0	$83.0
Cost/benefit ratio	2.10	2.16

2) at 83 mills per kwhr. This gives the First Dam site a benefit cost ratio of 2.10 or 2.16 before adding costs of financing. Since for every one dollar invested, two are returned, the larger energy producer is probably the most attractive.

Annual Distribution of Power

The high flows in Logan River occur in the spring during snowmelt runoff. The maximum power therefore occurs at this time, but because of the grid network and intertie system of Logan City and UP&L, it should cause no problems. There should always be a demand for the power generated at the proposed site. The monthly distribution of energy and peak power during the month is shown in Table 5.

Table 5. Distribution of power and energy by month.

Month	Peak Power kw (1971)	Energy kwh (1978)
J	782	461
F	578	545
M	1022	834
A	1726	1495
M	2357	2327
J	2357	2789
J	2342	1921
A	1067	1327
S	921	1333
O	549	132
N	589	301
D	525	417

APPENDIX

POWER POTENTIAL FOR LOGAN RIVER FOR 1983 WATER YEAR OCTOBER 1 THRU SEPTEMBER 30.
7.5 FOOT DIA. PIPE

DAY	TOTAL PIPE FLOW (CFS)	FRICTION FACTOR	PIPE HEAD LOSS (FT)	PIPE POWER FLOW (CFS)	PIPE POWER (KW)	CANAL FLOW (CFS)	CANAL POWER (KW)	DAM FLOW (CFS)	DAM POWER (KW)
1	191.	.010855	.8	191.0	893.	0.	0.	41.0	104.1
2	179.	.010936	.7	179.0	838.	0.	0.	41.0	104.1
3	172.	.010987	.6	172.0	806.	0.	0.	41.0	104.1
4	172.	.010987	.6	172.0	806.	0.	0.	41.0	104.1
5	167.	.011025	.6	167.0	783.	0.	0.	41.0	104.1
6	165.	.011041	.6	165.0	774.	0.	0.	41.0	104.1
7	163.	.011057	.6	163.0	765.	0.	0.	41.0	104.1
8	163.	.011057	.6	163.0	765.	0.	0.	41.0	104.1
9	160.	.011081	.5	160.0	751.	0.	0.	41.0	104.1
10	158.	.011098	.5	158.0	742.	0.	0.	41.0	104.1
11	153.	.011141	.5	153.0	719.	0.	0.	41.0	104.1
12	153.	.011141	.5	153.0	719.	0.	0.	41.0	104.1
13	151.	.011159	.5	151.0	709.	0.	0.	41.0	104.1
14	149.	.011177	.5	149.0	700.	0.	0.	41.0	104.1
15	147.	.011196	.5	147.0	691.	0.	0.	41.0	104.1
16	147.	.011196	.5	147.0	691.	0.	0.	41.0	104.1
17	149.	.011177	.5	149.0	700.	0.	0.	41.0	104.1
18	149.	.011177	.5	149.0	700.	0.	0.	41.0	104.1
19	147.	.011196	.5	147.0	691.	0.	0.	41.0	104.1
20	147.	.011196	.5	147.0	691.	0.	0.	41.0	104.1
21	147.	.011196	.5	147.0	691.	0.	0.	41.0	104.1
22	144.	.011225	.4	144.0	677.	0.	0.	41.0	104.1
23	144.	.011225	.4	144.0	677.	0.	0.	41.0	104.1
24	142.	.011244	.4	142.0	668.	0.	0.	41.0	104.1
25	142.	.011244	.4	142.0	668.	0.	0.	41.0	104.1
26	151.	.011159	.5	151.0	709.	0.	0.	41.0	104.1
27	153.	.011141	.5	153.0	719.	0.	0.	41.0	104.1
28	151.	.011159	.5	151.0	709.	0.	0.	41.0	104.1
29	153.	.011141	.5	153.0	719.	0.	0.	41.0	104.1
30	158.	.011098	.5	158.0	742.	0.	0.	41.0	104.1
31	156.	.011115	.5	156.0	733.	0.	0.	41.0	104.1
32	153.	.011141	.5	153.0	719.	0.	0.	41.0	104.1
33	149.	.011177	.5	149.0	700.	0.	0.	41.0	104.1
34	142.	.011244	.4	142.0	668.	0.	0.	41.0	104.1
35	142.	.011244	.4	142.0	668.	0.	0.	41.0	104.1
36	142.	.011244	.4	142.0	668.	0.	0.	41.0	104.1
37	144.	.011225	.4	144.0	677.	0.	0.	41.0	104.1
38	142.	.011244	.4	142.0	668.	0.	0.	41.0	104.1
39	142.	.011244	.4	142.0	668.	0.	0.	41.0	104.1
40	142.	.011244	.4	142.0	668.	0.	0.	41.0	104.1
41	142.	.011244	.4	142.0	668.	0.	0.	41.0	104.1
42	138.	.011284	.4	138.0	649.	0.	0.	41.0	104.1
43	138.	.011284	.4	138.0	649.	0.	0.	41.0	104.1
44	131.	.011359	.4	131.0	617.	0.	0.	41.0	104.1
45	131.	.011359	.4	131.0	617.	0.	0.	41.0	104.1
46	129.	.011381	.4	129.0	607.	0.	0.	41.0	104.1
47	129.	.011381	.4	129.0	607.	0.	0.	41.0	104.1
48	129.	.011381	.4	129.0	607.	0.	0.	41.0	104.1
49	131.	.011359	.4	131.0	617.	0.	0.	41.0	104.1
50	142.	.011244	.4	142.0	668.	0.	0.	41.0	104.1
51	133.	.011337	.4	133.0	626.	0.	0.	41.0	104.1
52	133.	.011337	.4	133.0	626.	0.	0.	41.0	104.1
53	127.	.011404	.4	127.0	598.	0.	0.	41.0	104.1
54	125.	.011428	.3	125.0	589.	0.	0.	41.0	104.1
55	121.	.011476	.3	121.0	570.	0.	0.	41.0	104.1

POWER POTENTIAL FOR LOGAN RIVER FOR 1983 WATER YEAR OCTOBER 1 THRU SEPTEMBER 30.
7.5 FOOT DIA. PIPE

DAY	TOTAL PIPE FLOW (CFS)	FRICTION FACTOR	PIPE HEAD LOSS (FT)	PIPE POWER FLOW (CFS)	PIPE POWER (KW)	CANAL FLOW (CFS)	CANAL POWER (KW)	DAM FLOW (CFS)	DAM POWER (KW)
56	127.	.011404	.4	127.0	598.	0.	0.	41.0	104.1
57	121.	.011476	.3	121.0	570.	0.	0.	41.0	104.1
58	122.	.011464	.3	122.0	575.	0.	0.	41.0	104.1
59	125.	.011428	.3	125.0	589.	0.	0.	41.0	104.1
60	129.	.011381	.4	129.0	607.	0.	0.	41.0	104.1
61	131.	.011359	.4	131.0	617.	0.	0.	41.0	104.1
62	131.	.011359	.4	131.0	617.	0.	0.	41.0	104.1
63	127.	.011404	.4	127.0	598.	0.	0.	41.0	104.1
64	125.	.011428	.3	125.0	589.	0.	0.	41.0	104.1
65	125.	.011428	.3	125.0	589.	0.	0.	41.0	104.1
66	123.	.011451	.3	123.0	580.	0.	0.	41.0	104.1
67	123.	.011451	.3	123.0	580.	0.	0.	41.0	104.1
68	123.	.011451	.3	123.0	580.	0.	0.	41.0	104.1
69	123.	.011451	.3	123.0	580.	0.	0.	41.0	104.1
70	121.	.011476	.3	121.0	570.	0.	0.	41.0	104.1
71	121.	.011476	.3	121.0	570.	0.	0.	41.0	104.1
72	121.	.011476	.3	121.0	570.	0.	0.	41.0	104.1
73	117.	.011527	.3	117.0	552.	0.	0.	41.0	104.1
74	120.	.011488	.3	120.0	566.	0.	0.	41.0	104.1
75	120.	.011488	.3	120.0	566.	0.	0.	41.0	104.1
76	120.	.011488	.3	120.0	566.	0.	0.	41.0	104.1
77	121.	.011476	.3	121.0	570.	0.	0.	41.0	104.1
78	121.	.011476	.3	121.0	570.	0.	0.	41.0	104.1
79	119.	.011501	.3	119.0	561.	0.	0.	41.0	104.1
80	119.	.011501	.3	119.0	561.	0.	0.	41.0	104.1
81	117.	.011527	.3	117.0	552.	0.	0.	41.0	104.1
82	117.	.011527	.3	117.0	552.	0.	0.	41.0	104.1
83	119.	.011501	.3	119.0	561.	0.	0.	41.0	104.1
84	121.	.011476	.3	121.0	570.	0.	0.	41.0	104.1
85	119.	.011501	.3	119.0	561.	0.	0.	41.0	104.1
86	110.	.011621	.3	110.0	519.	0.	0.	41.0	104.1
87	112.	.011593	.3	112.0	528.	0.	0.	41.0	104.1
88	119.	.011501	.3	119.0	561.	0.	0.	41.0	104.1
89	117.	.011527	.3	117.0	552.	0.	0.	41.0	104.1
90	101.	.011756	.2	101.0	477.	0.	0.	41.0	104.1
91	91.	.011928	.2	91.0	430.	0.	0.	41.0	104.1
92	95.	.011856	.2	95.0	449.	0.	0.	41.0	104.1
93	95.	.011856	.2	95.0	449.	0.	0.	41.0	104.1
94	95.	.011856	.2	95.0	449.	0.	0.	41.0	104.1
95	101.	.011756	.2	101.0	477.	0.	0.	41.0	104.1
96	105.	.011694	.2	105.0	495.	0.	0.	41.0	104.1
97	103.	.011725	.2	103.0	486.	0.	0.	41.0	104.1
98	112.	.011593	.3	112.0	528.	0.	0.	41.0	104.1
99	117.	.011527	.3	117.0	552.	0.	0.	41.0	104.1
100	117.	.011527	.3	117.0	552.	0.	0.	41.0	104.1
101	110.	.011621	.3	110.0	519.	0.	0.	41.0	104.1
102	116.	.011540	.3	116.0	547.	0.	0.	41.0	104.1
103	111.	.011607	.3	111.0	524.	0.	0.	41.0	104.1
104	104.	.011710	.2	104.0	491.	0.	0.	41.0	104.1
105	106.	.011679	.3	106.0	500.	0.	0.	41.0	104.1
106	106.	.011679	.3	106.0	500.	0.	0.	41.0	104.1
107	104.	.011710	.2	104.0	491.	0.	0.	41.0	104.1
108	102.	.011741	.2	102.0	481.	0.	0.	41.0	104.1
109	105.	.011694	.2	105.0	495.	0.	0.	41.0	104.1
110	103.	.011725	.2	103.0	486.	0.	0.	41.0	104.1

POWER POTENTIAL FOR LOGAN RIVER FOR 1983 WATER YEAR OCTOBER 1 THRU SEPTEMBER 30.
7.5 FOOT DIA. PIPE

DAY	TOTAL PIPE FLOW (CFS)	FRICTION FACTOR	PIPE HEAD LOSS (FT)	PIPE POWER FLOW (CFS)	PIPE POWER (KW)	CANAL FLOW (CFS)	CANAL POWER (KW)	DAM FLOW (CFS)	DAM POWER (KW)
111	99.	.011789	.2	99.0	467.	0.	0.	41.0	104.1
112	99.	.011789	.2	99.0	467.	0.	0.	41.0	104.1
113	99.	.011789	.2	99.0	467.	0.	0.	41.0	104.1
114	97.	.011822	.2	97.0	458.	0.	0.	41.0	104.1
115	99.	.011789	.2	99.0	467.	0.	0.	41.0	104.1
116	95.	.011856	.2	95.0	449.	0.	0.	41.0	104.1
117	97.	.011822	.2	97.0	458.	0.	0.	41.0	104.1
118	95.	.011856	.2	95.0	449.	0.	0.	41.0	104.1
119	97.	.011822	.2	97.0	458.	0.	0.	41.0	104.1
120	103.	.011725	.2	103.0	486.	0.	0.	41.0	104.1
121	97.	.011822	.2	97.0	458.	0.	0.	41.0	104.1
122	101.	.011756	.2	101.0	477.	0.	0.	41.0	104.1
123	95.	.011856	.2	95.0	449.	0.	0.	41.0	104.1
124	93.	.011891	.2	93.0	439.	0.	0.	41.0	104.1
125	95.	.011856	.2	95.0	449.	0.	0.	41.0	104.1
126	89.	.011965	.2	89.0	420.	0.	0.	41.0	104.1
127	91.	.011928	.2	91.0	430.	0.	0.	41.0	104.1
128	93.	.011891	.2	93.0	439.	0.	0.	41.0	104.1
129	87.	.012004	.2	87.0	411.	0.	0.	41.0	104.1
130	97.	.011822	.2	97.0	458.	0.	0.	41.0	104.1
131	93.	.011891	.2	93.0	439.	0.	0.	41.0	104.1
132	95.	.011856	.2	95.0	449.	0.	0.	41.0	104.1
133	93.	.011891	.2	93.0	439.	0.	0.	41.0	104.1
134	91.	.011928	.2	91.0	430.	0.	0.	41.0	104.1
135	89.	.011965	.2	89.0	420.	0.	0.	41.0	104.1
136	93.	.011891	.2	93.0	439.	0.	0.	41.0	104.1
137	93.	.011891	.2	93.0	439.	0.	0.	41.0	104.1
138	89.	.011965	.2	89.0	420.	0.	0.	41.0	104.1
139	89.	.011965	.2	89.0	420.	0.	0.	41.0	104.1
140	89.	.011965	.2	89.0	420.	0.	0.	41.0	104.1
141	91.	.011928	.2	91.0	430.	0.	0.	41.0	104.1
142	97.	.011822	.2	97.0	458.	0.	0.	41.0	104.1
143	91.	.011928	.2	91.0	430.	0.	0.	41.0	104.1
144	91.	.011928	.2	91.0	430.	0.	0.	41.0	104.1
145	91.	.011928	.2	91.0	430.	0.	0.	41.0	104.1
146	91.	.011928	.2	91.0	430.	0.	0.	41.0	104.1
147	93.	.011891	.2	93.0	439.	0.	0.	41.0	104.1
148	95.	.011856	.2	95.0	449.	0.	0.	41.0	104.1
149	97.	.011822	.2	97.0	458.	0.	0.	41.0	104.1
150	95.	.011856	.2	95.0	449.	0.	0.	41.0	104.1
151	93.	.011891	.2	93.0	439.	0.	0.	41.0	104.1
152	97.	.011822	.2	97.0	458.	0.	0.	41.0	104.1
153	101.	.011756	.2	101.0	477.	0.	0.	41.0	104.1
154	97.	.011822	.2	97.0	458.	0.	0.	41.0	104.1
155	103.	.011725	.2	103.0	486.	0.	0.	41.0	104.1
156	103.	.011725	.2	103.0	486.	0.	0.	41.0	104.1
157	103.	.011725	.2	103.0	486.	0.	0.	41.0	104.1
158	101.	.011756	.2	101.0	477.	0.	0.	41.0	104.1
159	101.	.011756	.2	101.0	477.	0.	0.	41.0	104.1
160	99.	.011789	.2	99.0	467.	0.	0.	41.0	104.1
161	110.	.011621	.3	110.0	519.	0.	0.	41.0	104.1
162	106.	.011679	.3	106.0	500.	0.	0.	41.0	104.1
163	121.	.011476	.3	121.0	570.	0.	0.	41.0	104.1
164	127.	.011404	.4	127.0	598.	0.	0.	41.0	104.1
165	160.	.011081	.5	160.0	751.	0.	0.	41.0	104.1

POWER POTENTIAL FOR LOGAN RIVER FOR 1983 WATER YEAR OCTOBER 1 THRU SEPTEMBER 30.
7.5 FOOT DIA. PIPE

DAY	TOTAL PIPE FLOW (CFS)	FRICTION FACTOR	PIPE HEAD LOSS (FT)	PIPE POWER FLOW (CFS)	PIPE POWER (KW)	CANAL FLOW (CFS)	CANAL POWER (KW)	DAM FLOW (CFS)	DAM POWER (KW)
166	146.	.011206	.5	146.0	686.	0.	0.	41.0	104.1
167	140.	.011264	.4	140.0	659.	0.	0.	41.0	104.1
168	129.	.011381	.4	129.0	607.	0.	0.	41.0	104.1
169	127.	.011404	.4	127.0	598.	0.	0.	41.0	104.1
170	125.	.011428	.3	125.0	589.	0.	0.	41.0	104.1
171	123.	.011451	.3	123.0	580.	0.	0.	41.0	104.1
172	121.	.011476	.3	121.0	570.	0.	0.	41.0	104.1
173	121.	.011476	.3	121.0	570.	0.	0.	41.0	104.1
174	121.	.011476	.3	121.0	570.	0.	0.	41.0	104.1
175	117.	.011527	.3	117.0	552.	0.	0.	41.0	104.1
176	115.	.011553	.3	115.0	542.	0.	0.	41.0	104.1
177	115.	.011553	.3	115.0	542.	0.	0.	41.0	104.1
178	115.	.011553	.3	115.0	542.	0.	0.	41.0	104.1
179	115.	.011553	.3	115.0	542.	0.	0.	41.0	104.1
180	112.	.011593	.3	112.0	528.	0.	0.	41.0	104.1
181	117.	.011527	.3	117.0	552.	0.	0.	41.0	104.1
182	124.	.011439	.3	124.0	584.	0.	0.	41.0	104.1
183	124.	.011439	.3	124.0	584.	0.	0.	41.0	104.1
184	126.	.011416	.3	126.0	594.	0.	0.	41.0	104.1
185	130.	.011370	.4	130.0	612.	0.	0.	41.0	104.1
186	126.	.011416	.3	126.0	594.	0.	0.	41.0	104.1
187	124.	.011439	.3	124.0	584.	0.	0.	41.0	104.1
188	122.	.011464	.3	122.0	575.	0.	0.	41.0	104.1
189	122.	.011464	.3	122.0	575.	0.	0.	41.0	104.1
190	122.	.011464	.3	122.0	575.	0.	0.	41.0	104.1
191	122.	.011464	.3	122.0	575.	0.	0.	41.0	104.1
192	126.	.011416	.3	126.0	594.	0.	0.	41.0	104.1
193	134.	.011326	.4	134.0	631.	0.	0.	41.0	104.1
194	134.	.011326	.4	134.0	631.	0.	0.	41.0	104.1
195	132.	.011348	.4	132.0	621.	0.	0.	41.0	104.1
196	130.	.011370	.4	130.0	612.	0.	0.	41.0	104.1
197	126.	.011416	.3	126.0	594.	0.	0.	41.0	104.1
198	130.	.011370	.4	130.0	612.	0.	0.	41.0	104.1
199	139.	.011274	.4	139.0	654.	0.	0.	41.0	104.1
200	166.	.011033	.6	166.0	779.	0.	0.	41.0	104.1
201	185.	.010895	.7	185.0	866.	0.	0.	41.0	104.1
202	219.	.010693	1.0	219.0	1020.	0.	0.	41.0	104.1
203	233.	.010623	1.1	233.0	1083.	0.	0.	41.0	104.1
204	246.	.010563	1.2	246.0	1141.	0.	0.	41.0	104.1
205	257.	.010516	1.3	257.0	1189.	0.	0.	41.0	104.1
206	289.	.010396	1.7	289.0	1329.	0.	0.	41.0	104.1
207	292.	.010385	1.7	292.0	1342.	0.	0.	41.0	104.1
208	266.	.010480	1.4	266.0	1229.	0.	0.	41.0	104.1
209	246.	.010563	1.2	246.0	1141.	0.	0.	41.0	104.1
210	238.	.010599	1.1	238.0	1105.	0.	0.	41.0	104.1
211	257.	.010516	1.3	257.0	1189.	0.	0.	41.0	104.1
212	283.	.010417	1.6	283.0	1303.	0.	0.	41.0	104.1
213	303.	.010349	1.8	303.0	1390.	0.	0.	41.0	104.1
214	301.	.010356	1.8	301.0	1381.	0.	0.	41.0	104.1
215	309.	.010330	1.9	309.0	1415.	0.	0.	41.0	104.1
216	316.	.010309	2.0	316.0	1445.	0.	0.	41.0	104.1
217	372.	.010161	2.7	372.0	1679.	0.	0.	41.0	104.1
218	369.	.010168	2.6	369.0	1666.	0.	0.	41.0	104.1
219	343.	.010233	2.3	343.0	1559.	0.	0.	41.0	104.1
220	369.	.010168	2.6	369.0	1666.	0.	0.	41.0	104.1

POWER POTENTIAL FOR LOGAN RIVER FOR 1983 WATER YEAR OCTOBER 1 THRU SEPTEMBER 30.
7.5 FOOT DIA. PIPE

DAY	TOTAL PIPE FLOW (CFS)	FRICTION FACTOR	PIPE HEAD LOSS (FT)	PIPE POWER FLOW (CFS)	PIPE POWER (KW)	CANAL FLOW (CFS)	CANAL POWER (KW)	DAM FLOW (CFS)	DAM POWER (KW)
221	405.	.010089	3.2	405.0	1811.	0.	0.	41.0	104.1
222	372.	.010161	2.7	372.0	1679.	0.	0.	41.0	104.1
223	66.	.012499	.1	66.0	312.	0.	0.	41.0	104.1
224	340.	.010241	2.3	340.0	1546.	0.	0.	41.0	104.1
225	325.	.010282	2.1	325.0	1483.	0.	0.	41.0	104.1
226	319.	.010300	2.0	319.0	1458.	0.	0.	41.0	104.1
227	313.	.010318	1.9	313.0	1432.	0.	0.	41.0	104.1
228	319.	.010300	2.0	319.0	1458.	0.	0.	41.0	104.1
229	303.	.010349	1.8	303.0	1390.	0.	0.	41.0	104.1
230	328.	.010274	2.1	328.0	1496.	0.	0.	41.0	104.1
231	379.	.010145	2.8	379.0	1707.	0.	0.	41.0	104.1
232	372.	.010161	2.7	372.0	1679.	0.	0.	41.0	104.1
233	402.	.010095	3.1	402.0	1799.	0.	0.	41.0	104.1
234	461.	.009986	4.1	461.0	2027.	0.	0.	41.0	104.1
235	554.	.009854	5.8	554.0	2355.	0.	0.	41.0	104.1
236	647.	.009754	7.8	647.0	2640.	0.	0.	41.0	104.1
237	763.	.009658	10.7	763.0	2923.	0.	0.	41.0	104.1
238	893.	.009577	14.6	893.0	3130.	0.	0.	41.0	104.1
239	1013.	.009518	18.6	1012.9	3202.	0.	0.	47.1	119.6
240	1013.	.009518	18.6	1012.9	3202.	0.	0.	80.0	203.1
241	1013.	.009518	18.6	1012.9	3202.	0.	0.	80.0	203.1
242	1013.	.009518	18.6	994.9	3145.	18.	0.	80.0	203.1
243	1013.	.009518	18.6	994.9	3145.	18.	0.	80.0	203.1
244	1013.	.009518	18.6	994.9	3145.	18.	0.	80.0	203.1
245	1013.	.009518	18.6	994.9	3145.	18.	0.	80.0	203.1
246	1013.	.009518	18.6	994.9	3145.	18.	0.	80.0	203.1
247	1013.	.009518	18.6	994.9	3145.	18.	0.	80.0	203.1
248	1013.	.009518	18.6	994.9	3145.	18.	0.	80.0	203.1
249	1013.	.009518	18.6	992.9	3139.	20.	29.	80.0	203.1
250	1013.	.009518	18.6	986.9	3120.	26.	38.	80.0	203.1
251	1013.	.009518	18.6	975.9	3085.	37.	54.	80.0	203.1
252	1013.	.009518	18.6	968.9	3063.	44.	65.	80.0	203.1
253	1013.	.009518	18.6	968.9	3063.	44.	65.	80.0	203.1
254	1013.	.009518	18.6	969.9	3066.	43.	63.	80.0	203.1
255	1013.	.009518	18.6	981.9	3104.	31.	46.	80.0	203.1
256	1013.	.009518	18.6	982.9	3107.	30.	44.	80.0	203.1
257	1013.	.009518	18.6	970.9	3070.	42.	62.	80.0	203.1
258	1013.	.009518	18.6	967.9	3060.	45.	66.	80.0	203.1
259	1013.	.009518	18.6	967.9	3060.	45.	66.	80.0	203.1
260	1013.	.009518	18.6	967.9	3060.	45.	66.	80.0	203.1
261	1013.	.009518	18.6	967.9	3060.	45.	66.	80.0	203.1
262	1013.	.009518	18.6	967.9	3060.	45.	66.	80.0	203.1
263	1013.	.009518	18.6	967.9	3060.	45.	66.	80.0	203.1
264	1013.	.009518	18.6	1002.9	3171.	10.	0.	80.0	203.1
265	1013.	.009518	18.6	971.9	3073.	41.	60.	80.0	203.1
266	1013.	.009518	18.6	969.9	3066.	43.	63.	80.0	203.1
267	1013.	.009518	18.6	968.9	3063.	44.	65.	80.0	203.1
268	1013.	.009518	18.6	968.9	3063.	44.	65.	80.0	203.1
269	1013.	.009518	18.6	968.9	3063.	44.	65.	80.0	203.1
270	1013.	.009518	18.6	968.9	3063.	44.	65.	67.1	170.4
271	1013.	.009518	18.6	968.9	3063.	44.	65.	47.1	119.6
272	989.	.009529	17.8	928.0	3001.	61.	94.	41.0	104.1
273	911.	.009567	15.2	844.0	2917.	67.	118.	41.0	104.1
274	907.	.009569	15.0	838.0	2906.	69.	122.	41.0	104.1
275	969.	.009538	17.1	947.0	3118.	22.	35.	41.0	104.1

POWER POTENTIAL FOR LOGAN RIVER FOR 1983 WATER YEAR OCTOBER 1 THRU SEPTEMBER 30.
7.5 FOOT DIA. PIPE

DAY	TOTAL PIPE FLOW (CFS)	FRICTION FACTOR	PIPE HEAD LOSS (FT)	PIPE POWER FLOW (CFS)	PIPE POWER (KW)	CANAL FLOW (CFS)	CANAL POWER (KW)	DAM FLOW (CFS)	DAM POWER (KW)
276	927.	.009559	15.7	927.0	3163.	0.	0.	41.0	104.1
277	854.	.009599	13.4	854.0	3082.	0.	0.	41.0	104.1
278	831.	.009613	12.7	831.0	3047.	0.	0.	41.0	104.1
279	804.	.009630	11.9	804.0	3002.	0.	0.	41.0	104.1
280	799.	.009633	11.7	799.0	2993.	0.	0.	41.0	104.1
281	790.	.009639	11.5	790.0	2976.	0.	0.	41.0	104.1
282	781.	.009645	11.2	781.0	2959.	0.	0.	41.0	104.1
283	785.	.009643	11.3	785.0	2967.	0.	0.	41.0	104.1
284	727.	.009685	9.8	727.0	2844.	0.	0.	41.0	104.1
285	680.	.009724	8.6	680.0	2729.	0.	0.	41.0	104.1
286	638.	.009762	7.6	638.0	2614.	0.	0.	41.0	104.1
287	601.	.009800	6.8	601.0	2505.	0.	0.	41.0	104.1
288	589.	.009813	6.5	589.0	2468.	0.	0.	41.0	104.1
289	566.	.009839	6.0	566.0	2394.	0.	0.	41.0	104.1
290	539.	.009873	5.5	539.0	2305.	0.	0.	41.0	104.1
291	512.	.009909	5.0	512.0	2212.	0.	0.	41.0	104.1
292	497.	.009930	4.7	497.0	2159.	0.	0.	41.0	104.1
293	483.	.009951	4.4	483.0	2108.	0.	0.	41.0	104.1
294	475.	.009963	4.3	453.0	1983.	22.	59.	41.0	104.1
295	457.	.009993	4.0	434.0	1911.	23.	62.	41.0	104.1
296	447.	.010010	3.8	424.0	1873.	23.	63.	41.0	104.1
297	429.	.010042	3.5	406.0	1803.	23.	63.	41.0	104.1
298	450.	.010005	3.9	450.0	1986.	0.	0.	41.0	104.1
299	457.	.009993	4.0	413.0	1818.	44.	119.	41.0	104.1
300	416.	.010067	3.3	367.0	1636.	49.	136.	41.0	104.1
301	395.	.010110	3.0	346.0	1552.	49.	137.	41.0	104.1
302	385.	.010131	2.9	337.0	1515.	48.	135.	41.0	104.1
303	369.	.010168	2.6	323.0	1459.	46.	130.	41.0	104.1
304	353.	.010207	2.4	307.0	1392.	46.	131.	41.0	104.1
305	348.	.010220	2.4	302.0	1371.	46.	131.	41.0	104.1
306	338.	.010246	2.2	292.0	1329.	46.	131.	41.0	104.1
307	328.	.010274	2.1	282.0	1286.	46.	132.	41.0	104.1
308	322.	.010291	2.0	276.0	1261.	46.	132.	41.0	104.1
309	313.	.010318	1.9	259.0	1185.	54.	156.	41.0	104.1
310	303.	.010349	1.8	244.0	1119.	59.	171.	41.0	104.1
311	298.	.010365	1.8	240.0	1102.	58.	168.	41.0	104.1
312	292.	.010385	1.7	237.0	1089.	55.	160.	41.0	104.1
313	340.	.010241	2.3	285.0	1296.	55.	157.	41.0	104.1
314	286.	.010406	1.6	232.0	1068.	54.	157.	41.0	104.1
315	366.	.010175	2.6	324.0	1464.	42.	119.	41.0	104.1
316	328.	.010274	2.1	273.0	1245.	55.	158.	41.0	104.1
317	301.	.010356	1.8	261.0	1197.	40.	116.	41.0	104.1
318	309.	.010330	1.9	271.0	1241.	38.	110.	41.0	104.1
319	292.	.010385	1.7	255.0	1172.	37.	107.	41.0	104.1
320	301.	.010356	1.8	265.0	1216.	36.	104.	41.0	104.1
321	292.	.010385	1.7	260.0	1195.	32.	93.	41.0	104.1
322	322.	.010291	2.0	292.0	1334.	30.	86.	41.0	104.1
323	328.	.010274	2.1	319.0	1455.	9.	0.	41.0	104.1
324	328.	.010274	2.1	318.0	1450.	10.	0.	41.0	104.1
325	313.	.010318	1.9	302.0	1382.	11.	0.	41.0	104.1
326	280.	.010427	1.6	269.0	1239.	11.	0.	41.0	104.1
327	269.	.010469	1.4	258.0	1191.	11.	0.	41.0	104.1
328	266.	.010480	1.4	255.0	1178.	11.	0.	41.0	104.1
329	263.	.010492	1.4	257.0	1188.	6.	0.	41.0	104.1
330	257.	.010516	1.3	230.0	1064.	27.	79.	41.0	104.1

POWER POTENTIAL FOR LOGAN RIVER FOR 1983 WATER YEAR OCTOBER 1 THRU SEPTEMBER 30.
7.5 FOOT DIA. PIPE

DAY	TOTAL PIPE FLOW (CFS)	FRICTION FACTOR	PIPE HEAD LOSS (FT)	PIPE POWER FLOW (CFS)	PIPE POWER (KW)	CANAL FLOW (CFS)	CANAL POWER (KW)	DAM FLOW (CFS)	DAM POWER (KW)
331	243.	.010577	1.2	216.0	1002.	27.	80.	41.0	104.1
332	238.	.010599	1.1	211.0	980.	27.	80.	41.0	104.1
333	235.	.010613	1.1	215.0	999.	20.	59.	41.0	104.1
334	230.	.010637	1.1	210.0	976.	20.	59.	41.0	104.1
335	227.	.010652	1.0	202.0	939.	25.	74.	41.0	104.1
336	225.	.010662	1.0	200.0	930.	25.	74.	41.0	104.1
337	225.	.010662	1.0	200.0	930.	25.	74.	41.0	104.1
338	246.	.010563	1.2	221.0	1025.	25.	74.	41.0	104.1
339	225.	.010662	1.0	200.0	930.	25.	74.	41.0	104.1
340	219.	.010693	1.0	194.0	903.	25.	74.	41.0	104.1
341	214.	.010720	.9	189.0	881.	25.	74.	41.0	104.1
342	209.	.010747	.9	184.0	858.	25.	74.	41.0	104.1
343	212.	.010731	.9	200.0	932.	12.	0.	41.0	104.1
344	212.	.010731	.9	201.0	937.	11.	0.	41.0	104.1
345	204.	.010776	.9	193.0	901.	11.	0.	41.0	104.1
346	201.	.010793	.8	190.0	887.	11.	0.	41.0	104.1
347	199.	.010805	.8	188.0	878.	11.	0.	41.0	104.1
348	196.	.010824	.8	184.0	860.	12.	0.	41.0	104.1
349	194.	.010836	.8	182.0	851.	12.	0.	41.0	104.1
350	196.	.010824	.8	184.0	860.	12.	0.	41.0	104.1
351	191.	.010855	.8	179.0	837.	12.	0.	41.0	104.1
352	189.	.010868	.7	177.0	828.	12.	0.	41.0	104.1
353	189.	.010868	.7	177.0	828.	12.	0.	41.0	104.1
354	187.	.010881	.7	175.0	819.	12.	0.	41.0	104.1
355	184.	.010901	.7	172.0	805.	12.	0.	41.0	104.1
356	201.	.010793	.8	188.0	878.	13.	0.	41.0	104.1
357	199.	.010805	.8	186.0	869.	13.	0.	41.0	104.1
358	199.	.010805	.8	187.0	873.	12.	0.	41.0	104.1
359	201.	.010793	.8	189.0	882.	12.	0.	41.0	104.1
360	199.	.010805	.8	187.0	873.	12.	0.	41.0	104.1
361	196.	.010824	.8	184.0	860.	12.	0.	41.0	104.1
362	209.	.010747	.9	198.0	923.	11.	0.	41.0	104.1
363	214.	.010720	.9	214.0	997.	0.	0.	41.0	104.1
364	204.	.010776	.9	204.0	952.	0.	0.	41.0	104.1
365	204.	.010776	.9	204.0	952.	0.	0.	41.0	104.1
				10040. MWH			145. MWH		1012. MWH

MONTHLY CITY POWER SUMMARY IN MW-HRS

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MW-HRS	544.	455.	414.	361.	293.	409.	598.	1450.	2219.	1763.	893.	642.

MONTHLY CANAL POWER SUMMARIES IN MW-HRS

MW-HRS	0.	0.	0.	0.	0.	0.	0.	0.	37.	29.	68.	12.

MONTHLY DAM POWER SUMMARIES IN MW-HRS

77.	152.	230.	307.	377.	455.	530.	617.	756.	833.	911.	986.

Cumulative totals →

Total 365 days

Should be same