


Ch, Plng Br

Ch, Puget Sound Sec

21 Sep 67

Mr. Cook/mj/649

1. Reference your 6 September 1967 buckslip requesting data on possibility of storage in lower Baker River Project. Flood control storage in the lower Baker River Project has been investigated only on a very preliminary basis and is discussed subsequently. Such storage would be far more costly than corresponding storage in the Upper Baker Project. 

2. Description. Puget Sound Power and Light Company operates two storage projects for the production of hydropower on the Baker River.

a. Lower Baker. This dam was placed in operation in 1925. The dam is a concrete gravity arch, 285 feet high and 530 feet long. Lower Baker Reservoir, Lake Shannon, has a surface area of 2,218 acres. Lake Shannon has a gross storage capacity of 150,000 acre-feet, 142,400 acre-feet being used for power operations, and backs water upstream 9.5 miles to Upper Baker Dam. The powerhouse was destroyed by mud and rock slide in mid-May 1965 and is currently being repaired.

b. Upper Baker Dam. This dam was completed in 1959. The dam is concrete gravity, 330 feet high and 1,235 feet long. Baker Lake has a gross storage capacity of 298,000 acre-feet, 220,000 acre-feet being usable for power operations in the plant at the dam and in the Lower Baker plant downstream. The area of Baker Lake at normal full pool is 4,985 acres, and the water backs up 9 miles from the dam. An earthfill dam in a nearby saddle is 115 feet high and 12,000 feet long.

3. Availability of Storage. Storage for flood control purposes was not specifically set aside for flood control in these projects except for 16,000 acre-feet at Upper Baker to replace lost valley storage. However, Article 32 of F.P.C. license dated 4 June 1956 for Upper Baker Dam states that "the licenses shall so operate the Upper Baker Reservoir as to provide each year 16,000 acre-feet of space for flood regulation between 1 November and 1 March, as replacement for the valley storage eliminated by the development. Utilization of this storage space shall be as directed by the District Engineer, Corps of Engineers. In addition to the above-specified 16,000 acre-feet, the licenses shall provide in the Upper Baker River Reservoir space for flood control during the storage drawdown season (about 1 September to 15 April) up to a maximum of 54,000 acre-feet as may be requested by the District Engineer, provided that suitable arrangements shall have been made to compensate the licenses for the reservation of flood control space, other than the 16,000 acre-feet specified herein."

4. Effectiveness of Storage. The Baker River contributes between 15 percent and 20 percent of the total Skagit River flow near Concrete. 90,000 acre-feet is the maximum flood storage that could effectively be used at the Baker Dams to control the 100-year event at Mt. Vernon (220,000 cfs with 120,000 acre-feet at Ross operating). With Ross operating 90,000 acre-feet of storage at the Baker Dams, then the 100-year event at Mt. Vernon would have flows of 200,000 cfs. 50,000 acre-feet is the maximum flood storage that could effectively be used at the Baker Dams to control the 50-year event at Mt. Vernon (193,000 cfs with 120,000 acre-feet at Ross operating). With Ross operating and 50,000 acre-feet of storage at the Baker Dams, then the 50-year event at Mt. Vernon would have flows of 180,000 cfs.

5. Physical Capability of Reservoirs.

	<u>Lower Baker</u>	<u>Upper Baker</u>
Storage, maximum	162,500 A.F.	325,000 A.F.
Storage, normal	159,500 A.F.	298,000 A.F.
Storage below crest	131,000 A.F.	170,000 A.F.
Drawdown from normal pool		
for 50,000 acre-feet storage	24.6 ft.	9 ft.
Drawdown from normal pool		
for 90,000 acre-feet storage	47.6 ft.	14 ft.
Gross head	259 ft.	285 ft.

Both Upper Baker and Lower Baker Dams have gated conventional spillways capable of passing flows in excess of the 100-year event. Drawdown for flood control storage of 90,000 acre-feet would not present a problem in Upper Baker because 128,000 acre-feet of storage is above the crest and could be spilled if hydraulic capacity of power intake was exceeded. For Lower Baker, there is 28,500 acre-feet of storage above the crest and, therefore, drafting for the 90,000 acre-feet of storage would require that the 4,500 cfs capacity power intake would be required to take the average daily September inflow of 2,000 cfs, plus drafting the 61,500 acre-feet storage below the crest. In order to provide reliable flood storage at Lower Baker, structural modifications would be required to increase the outlet works capacity.

6. Feasibility of Storage Use. Computations by Hydro-Power Section, dated 21 June 1966, indicate the losses in power revenue that could be anticipated for various amounts of flood control storage at Upper Baker are as follows:

<u>Total Flood Storage</u>	<u>Total Annual Power Losses</u>
15,000	\$ 4,000
30,000	8,200
50,000	14,400
90,000	26,900

Flood prevention benefits that could be anticipated for storage provided at the Baker Dams are not available at this time, but based on data used on previous studies, indicate that flood prevention benefits would far exceed the cost of power losses.

7. Upper Baker for Storage. Lower Baker should not be considered for flood control storage for the following reasons:

a. Lower Baker's more downstream location and greater head loss, due to draw-down, would have significantly greater power losses.

b. Costly structural modifications would be required to provide a greater outlet capacity to guarantee flood storage of greater than 40,000 acre-feet.