Subject: Federal Power Commission Project No. 553, Skagit River, Wash. (Basis: 29 Jun 46 FPC to COE)

800.2251(Seattle Power Project-Skagit River)24 NPSCO 3d Ind. 27 Sep 1946 BC/ehr 26 Sep 46

Office, District Engineer, Seattle District, Seattle 1, Washington

To: Division Engineer, North Pacific Division, 500 Pittock Block, Portland 5, Oregon

1. The plans have been examined and found suitable, as far as the interests of navigation are concerned, for approval by the Chief of Engineers and the Secretary of War, in accordance with Section 4(e) of the Federal Power Act.

2. In 2d indorsement to the Office of the Chief of Engineers, dated 30 September 1943, file No. GE 800.2251(Seattle, Washington-Proj. 553) SPEEN, the Division Engineer recommended that the following provision in the interests of navigation be inserted in an amendment to the license:

> "The licensee shall so operate its project works that the discharge in the Skagit River immediately below the Gorge power plant shall be not less than 1,150 acre-feet of water in each 24-hour period except that when the natural flow of the streams available to the project is less than 1,150 acre-feet in 24 hours, the discharge required shall be at least equivalent to such lower flow. The distribution of said discharge over any 24-hour period shall be subject to such regulations as the Secretary of War may prescribe."

Records in this office do not show that such a provision has previously been incorporated in the license, and it is therefore recommended that these requirements be included in the pending amendment to the license, if it has not already been done. Other conditions now included in the license are considered satisfactory so far as the interests of navigation are concerned and no change is recommended.

3. A flood control survey report on Skagit River is under preparation by this office. Good dam sites are rare and, therefore, it is desirable that multiple use of any feasible site be considered. Damage in the lower valley of the Skagit is caused by winter flood run-off from major tributaries, which are Baker, Sauk, and Cascade Rivers, as well as the upper Skagit on which the city of Seattle has its power developments. During the months of May and June, high flows frequently occur from rapid melting of snow and ice in the high regions of the watershed. These floods

are characterized by long, continuous flow rather than high short-duration peaks, and there are no such floods of record that have exceeded the present diked capacity of the lower Skagit.

4. Flood flows have not been routed through the Skagit Valley so that an accurate statement cannot be made at this time of the effect of upstream storage. Mr. Glen L. Parker of the United States Geological Survey, estimated that a relatively small amount of incidental storage in Diablo Dam reduced the peak of the 1932 flood at Sedro Wooley by about 26,000 cfs. Tabulated below are the mean daily discharges of Skagit River at Ross dam site for all known severe winter floods:

Year	Month and Day	24-hour mean discharge cfs.	Storage capacity needed to store flood flows Acre-feet
	Nov. 28	8,500	
1909	" 29	28,400	
	" 30	25,700	
	Dec. 1	12,900	151,000
	Dec. 29	21,200	
	" 30	19,000	
1917	" 31	18,300	
1918	Jan. 1	24,300	
	" 2	19,400	204,000
	Dec. 11	12,400	
1921	" 12	29,200	
	" 13	24,200	
	" 14	13,000	158,000
	Feb. 26	11,400	
1932	" 27	27,500	
	" 28	23,600	
	" 29	14,900	155,000
	Jan. 24	5,200	
1935	" 25	14,000	
	" 26	18,000	74,000

5. From the tabulation in paragraph 4, it can be seen that 100,000 to 200,000 acre-feet of storage would control the winter floods of record on the upper Skagit. The Federal Power Commission license for Diablo Dam does not contain any reservation for flood control storage. With Ross Reservoir in operation, Diablo Lake would be kept at a nearly constant

level to insure efficient power generation, and therefore no flood control storage is considered desirable or necessary in Diablo Lake. The flood control storage can best be obtained in Ross Reservoir.

6. By letter dated 22 November 1943, the Federal Power Commission requested the Seattle Department of Lighting to furnish information as to the amount of flood control storage that was contemplated in Ross Dam, and the method of reservoir operation for flood control purposes. It is understood that no official report by the Department of Lighting has yet been made in response to this request. This office has informally obtained, however, copies of a recent study of reservoir operation for power only, made by the Department of Lighting. This study is based on an annual assumed peak load of 520,000 kw, which is also shown to be the maximum capacity of Skagit River power plants with storage in Ross Dam to elevation 1,600. The study shows that normal storage releases would provide 200,000 acre-feet of flood storage from 1 November until 1 April in 26 of the 35 years of record. In each of the nine years when it would have been necessary to make special releases in order to provide the desired storage, ample water was available to refill the reservoir by 1 August of the following year. There would be no reduction in the prime capability of the plants or in the firm energy production. Potential production of secondary energy would be somewhat reduced but this is believed unimportant as a fixed market for secondary power in the future is questionable. It should be pointed out that under present load conditions of the Department of Lighting, which is considerably less than that used in the study, special releases of water each year to meet flood control requirements might be necessary.

7. Inclosed are Seattle Department of Lighting drawings Nos. ST-23 and ST-24, which show the results of their power studies. Also inclosed is drawing No. D-1613-4, capacity curve for Ross Reservoir.

8. The floods listed in paragraph 3 above, are the highest of record, but it has been estimated from high water marks that floods nearly 100 per cent greater occurred on the Skagit in 1815 and 1856. If at some time in the future the Seattle Department of Lighting undertakes construction of Ross Dam to the maximum height of about elevation 1,725, consideration should then be given to a flood storage capacity greater than 200,000 acre-feet.

9. The reservation of 200,000 acre-feet of flood storage in Ross Dam will have substantial flood control benefits downstream and will not appreciably impair the operation of Seattle City Light power plants. Therefore, it is recommended that the following method of operation be

incorporated in the Federal Power Commission license:

"During the period 1 November to 1 April, 200,000 acre-feet of storage will be reserved unless this storage is used as prescribed herein. This will require that the reservoir be drawn down to elevation 1582.5 by 1 November of each year. When the flow of the Skagit River at the gaging station below Concrete exceeds 25,000 second-feet (gage reading 21.1) on the rising stage of a flood, the Seattle Department of Lighting shall start storing in Ross Reservoir the flows of the Skagit River above Ross Dam, releasing only such flows as are necessary to the normal production of electric energy by the City's hydroelectric plants at Ross, Diablo, and Gorge. Storing of flood waters shall continue until the water level of the reservoir reaches the top of the spillway gates or elevation 1600, after which the spillway gates will be opened sufficiently to hold the reservoir surface at that level, or in the event of an especially severe flood, they will be opened to full discharge capacity. If the flow of the Skagit River at Concrete, on the receding stage of flood, drops to 50,000 second-feet (gage reading 26.05) before the level of Ross Reservoir rises to elevation 1600, the stored flood waters in Ross Reservoir should be released at a rate not to exceed 10,000 second-feet until the level of the reservoir drops to elevation 1582.5. Operation of the reservoir in the interest of flood control shall be subject to such regulations as the Secretary of War may prescribe."

L. H. HEWITT
Colonel, Corps of Engineers
District Engineer

6 Incls:
Withdrawn 1 set, Incl 2 Map Files #J-8-10-21
Added 3 Incls (trip.):
4. Dwg. No. [illegible] Map Files #J-8-10-22
5. " " [illegible] " " J-8-10-23
6. " " D-1613-4 (Hopkins) Map Files #J-8-10-12

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