REPORT

OF

COLUMBIA RIVER TREATY

CANADIAN AND UNITED STATES ENTITIES

for the period

16 September 1964

to

30 September 1967

22 April 1968

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INTRODUCTION

The Columbia Treaty

The Columbia River Treaty was signed on 17 January 1961, providing for Canada to construct dams at Duncan, Arrow and Mica with 15,500,000 acre-feet of storage and to operate the storage in accordance with plans of operation designed to produce power and flood control benefits in accordance with principles set forth in the Treaty. Canada would receive payments from the United States in respect of flood control provided in that country and also be entitled to one-half of the downstream power benefits.

In the period 1961 to 1964, negotiations took place between representatives of Canada, the United States and British Columbia resulting in an Exchange of Notes dated 22 January 1964 which included a Protocol which clarified the Columbia River Treaty and an agreement between Canada and the United States that Canada would sell in the United States its entitlement to downstream power benefits for 30 years under certain terms.

Following further negotiation, the Canadian Entitlement Purchase Agreement was concluded on 13 August 1964 between Columbia Storage Power Exchange (CSPE), a non-profit corporation organized under the laws of the State of Washington and British Columbia Hydro and Power Authority, a corporation incorporated under the laws of the Province of British Columbia.

The Agreement provides that the Authority have each of Duncan, Arrow and Mica storages fully operative for power purposes by 1 April 1968, 1 April 1969 and 1 April 1973 respectively and that it sell to CSPE for a period of 30 years from the foregoing dates the Canadian entitlement to

downstream power benefits resulting from operation of each storage project in accordance with the Treaty; in return for which CSPE arranged payment to Canada on 16 September 1964 a sum of $253.9 million in U. S. funds.

Instruments of ratification covering the Columbia River Treaty and Protocol were exchanged by Canada and the United States on 16 September 1964.

The Columbia River Treaty Entities

In accordance with Article XIV(1) of the Columbia River Treaty, the governments of Canada and the United States of America each designated an entity empowered and charged with the duty to formulate and carry out the operating arrangements necessary to implement the Treaty. Order-in-Council P.C. 1964-1407, dated 4 September 1964 designated the British Columbia Hydro and Power Authority as the Canadian Entity; Executive Order No. 11177 dated 16 September 1964 designated the Administrator of the Bonneville Power Administration, Department of the Interior, and the Division Engineer, North Pacific Division, Corps of Engineers, Department of the Army, as the United States Entity, with the Administrator to serve as Chairman.

The names of the members of the two Entities and their chief representatives are shown in Appendix A. The powers and duties of the entities are described in the Treaty and related documents and Article XIV(4) provides that Canada and the United States of America may by an exchange of notes empower or charge the Entities with any other matter coming within the scope of the Treaty. In addition, the respective Entities have set out more specifically their powers and duties in documents entitled "Responsibilities of the United States Entity" dated

16 October 1964 and "Responsibilities of the Canadian Entity" dated 27 May 1965.

This report describes the joint actions of the Canadian and United States Entities up to 30 September 1967 in discharging their responsibility for formulating and carrying out operating arrangements necessary to implement the Columbia River Treaty.

ORGANIZATION AND MEETINGS

Since the Treaty was ratified in September 1964, the Canadian and United States Entities have consulted continuously through correspondence and numerous informal meetings of Entity representatives. Regular meetings of the Entities are held normally once each quarter; meetings of Entity representatives are held as required. Up to 30 September 1967 there were six meetings of the Entities and nine meetings of the representatives.

Actions required in Canada as a result of Entity agreement are implemented by the Canadian Entity through B. C. Hydro and Power Authority; actions required in the United States are implemented by the United States Entity through Bonneville Power Administration, Department of the Interior, or through the U. S. Corps of Engineers, Department of the Army.

In March 1965, International Task Forces were established and assigned to the following areas of action:

Hydrometeorological System
Discharge Capacities of Dams
Initial Filling of Reservoirs
Power Operating Plans
Flood Control Operating Plans

The names of International Task Force members and the agencies

represented by them are listed in Appendix B. Instructions of the United States Entity to each United States Section of each Task Force dated 9 March 1965 and similar instructions of the Canadian Entity to Canadian Sections dated 7 May 1965 defined the scope of the work to be undertaken. The five Task Forces directed and coordinated studies in their five areas with the support of the staffs of B. C. Hydro and Power Authority, Bonneville Power Administration and the U. S. Corps of Engineers, North Pacific Division.

As the studies progressed, the Entities received Task Force reports and recommendations on operating procedures, facilities and other matters essential to Columbia River Treaty implementation. After review, formal agreement on various important items was reached by the Entities. Appendix C lists the official agreements reached and recorded up to 30 September 1967.

CONSTRUCTION OF THE TREATY STORAGE PROJECTS

Coordination of construction plans, etc.

Under the terms of the Columbia River Treaty, the two entities are responsible for the coordination of plans and exchange of information relating to facilities to be used in producing and obtaining the benefits contemplated by the Treaty. Under an Exchange of Notes between Canada and the United States dated 16 September 1964, the Canadian Entity is required to provide current reports to the United States Entity of the progress of construction of the Treaty storages. In addition, the Entities arranged for Mr. Don Love, Chief, Construction Division, North Pacific Division, U. S. Corps of Engineers, to meet from time-to-time with Mr. J. P. Ottesen, Columbia Construction Manager, B. C. Hydro and Power Authority, to discuss construction progress.

Columbia Construction Progress Reports covering the period from start of construction up to 30 September 1967 were issued quarterly, and copies were provided by the Canadian Entity to the United States Entity and the Permanent Engineering Board.

In addition, copies of monthly construction progress charts were supplied to the United States Entity and the Permanent Engineering Board.

Starting March 1966, the United States Entity provided the Canadian Entity and the Permanent Engineering Board with quarterly reports by the Division Engineer, North Pacific Division, Corps of Engineers, U.S. Army, on progress of construction of the Libby Dam project.

Detailed construction reports, including diagrams and photographs were contained in the quarterly reports described above. For the purposes of this report, a brief account of construction progress of Duncan, Arrow, Mica and Libby projects follows.

Duncan Construction Progress

Work at the Duncan site started in mid-November 1964 and by the end of April 1965 stripping of the foundation area for the earth-dam was complete. The work force in April 1965 was 336 men, rising by June 1966 to a peak of 472.

Duncan River was diverted through the outlet tunnels on 7 March 1966 and the earth-dam was over 60 per cent complete by January 1966. By April 1967, the dam was nearing completion and regulation of river discharge began on 29 April 1967 when the regulating gates were closed and the controlled filling program started. Filling continued during May, June and

July with brief pauses at elevations 1803 ft., 1860 ft., and 1870 ft. Full supply level of 1892 ft. was reached on 25 July 1967. Foundation instruments indicated that the dam reacted satisfactorily during the filling period and the project was declared operative with effect from 31 July 1967. This date was over 2 years prior to the latest completion date specified by the Columbia River Treaty and eight months prior to the completion date specified by the Canadian Entitlement Purchase Agreement.

The possibility of early operation of Duncan had been foreseen by the Entities from 1965 onwards and provision was made for a Special Operating Program for the project, the determination of downstream power benefits and the delivery to B. C. Hydro of an agreed Canadian share of the power benefits. Details of these matters are reported in the section on Power Operating Plans.

Arrow Construction Progress

Construction of the Arrow Project started in March 1965 with a work force of 319. Twelve months later the cofferdam had been completed and dewatering of the discharge works area had begun. Earth and rock excavation within the cofferdam proceeded from July 1965 to January 1967.

The concrete portion of the dam was started in March 1966 and the bulkheads, discharge works and navigation lock were completed by August 1967, leaving only the rollways in the sluiceways and the control building to be completed.

Construction of the earth-dam began in August 1966 with fill material placed directly from barges in the river channel. Placement of dry fill and rip-rap started in January 1967 and till core in June 1967. The

upstream cofferdam was breached late in September and removal of the cofferdam was under way.

The work force increased from 319 in April 1965 to a peak of 1607 in April 1967 and then fell to 854 at the end of September 1967.

In view of the likelihood of early completion of the Arrow project, the Entities carried out studies and discussions contemplating partial storage operation during 1968 with a tentative date for completion by 15 December 1968. Late in September 1967, the Canadian Entity confirmed the above date and arrangements for the necessary operating plans and determination of the Canadian share of downstream power benefits were in hand.

Mica Construction Progress

Work at the site of the Mica Project in 1964 and early 1965 consisted of preliminary clearing and preparation of the townsite area. Construction of Mica Village started in May and the contract for the diversion tunnels was awarded in July 1965. By October 1965, excavation at tunnel outlets was well advanced and an access adit under construction with a total work force of 920.

By January 1967, the excavation of the diversion tunnels had been completed and by the end of September nearly all concrete in the tunnels had been placed.

The contract for Mica Dam was awarded on 6 September 1967 to a consortium of five firms headed by Guy F. Atkinson Co. of San Francisco. Dyke construction was started at that time and it was planned to divert the flow of the Columbia River through the diversion tunnels in November 1967 after which the construction of the main dam would begin in the dry area of the riverbed.

Libby Construction Progress

By formal notice on 31 January 1966, the United States Government informed the Canadian Government of its intention to exercise the option provided by the Treaty to initiate construction of the Libby Dam on Kootenai River, Montana. The first construction contracts were awarded on 19 April 1966 and first construction work was commenced by the contractor on 4 May 1966.

By October 1966, a work force of 628 was employed at the site, mostly on road and railroad relocation work.

Bids for the construction of the dam and a short section of the Montana State Highway 37 relocation were opened and the contract awarded on 10 March 1967. By the end of September 1967, all construction items were generally on schedule, the dam being about nine per cent completed.

HYDROMETEOROLOGICAL SYSTEM

Annex A of the Columbia River Treaty directs the Entities to establish and operate a hydrometeorological system, including snow courses, precipitation stations and streamflow gauges, for use in establishing data for detailed programming of flood control and power operations. Since Annex A also directs that hydrometeorological information is to be made available to the Entities in both countries for immediate and continuing use in flood control and power operations, a communication system is also part of the Columbia River Treaty Hydrometeorological System. It is specified in the Treaty that the System has to be mutually agreed by the Entities in consultation with the Permanent Engineering Board.

An International Task Force was set up in March 1965 to report to the Entities and recommend additions to existing facilities required to

establish the Treaty hydrometeorological system.

Early action was taken in connection with streamflow and reservoir gauges to ensure sufficient overlap of records for good correlation between new gauges and gauges that would be flooded or abandoned.

Up to September 1967, 21 reservoir and streamflow gauges had been agreed upon, of which 11 were existing, 5 were existing but required improvement and 5 were at new locations.(1)

Action was taken by the Canadian Entity to proceed with the new installations and execute improvements. The work has proceeded according to schedule and it is expected that all streamflow and reservoir gauges agreed upon by the Entities will be in operation by the summer of 1968 except for the Mica reservoir gauge.

In May 1965, agreement was reached on the establishment of six new snow courses in the Columbia River main stem drainage basin in Canada and two new snow courses in the Duncan River drainage basin.(2) These eight snow courses at elevations varying from 5850 feet to 6600 feet were established by the summer of 1966 and snowpack measurements are being obtained each winter.

The establishment of the snow courses was implemented by the Canadian Entity through the agency of B. C. Water Resources Service and B. C. Hydro and Power Authority.

In July 1967, the International Task Force submitted a recommendation on snow course requirements for the Kootenay River Basin in both countries and this has been agreed upon. It is planned to proceed in the summer of

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(1) See Appendix C, Item 3
(2) See Appendix C, Item 5

1968 with establishment of the snow courses recommended.

In September 1967, the Task Force submitted a recommendation on Meteorological stations which is under study by the Entities and the Permanent Engineering Board.

In 1967, the Entities and the Permanent Engineering Board agreed on a definition of the Columbia River Treaty Hydrometeorological System which sets out an agreed frame of reference for planning purposes. The definition also sets out the nature and extent of the responsibilities of the Entities for maintenance of the System.

Early in 1967, the Entities agreed on initial arrangements for hydrometeorological reporting in anticipation of the Special Operating Program for Duncan coming into effect in May 1967. In Canada, eight streamflow gauges, two water-level gauges, five meteorological stations and two snow courses were included in the list of reporting stations. In the United States the existing reporting network was in operation.

During the flood control season, information from the streamflow and water-level gauges and from the meteorological stations in Canada was transmitted daily by teletype or telephone to the River Forecast Centre at Portland, Oregon.

PROJECT DISCHARGE CAPACITIES

Annex A of the Columbia River Treaty directs that the Entities shall agree that sufficient discharge capacity is provided at each dam to afford the desired regulation for power and flood control through outlet works and turbine installations.

The discharge capacity provided for flood control operations is to be large enough to pass inflow plus sufficient storage releases during the evacuation period to provide the storage space required. The discharge capacity is to be evaluated on the basis of full use of any outlet works provided for that purpose plus one-half the hydraulic capacity of the turbine installation at the time of commencement of the operation of storage under the Treaty.

An International Task Force was set up in March 1965 to report to the Entities on the discharge capacities provided by the project designs of Duncan, Arrow and Mica dams. The Task Force initiated studies of the following items:-

1. Discharge rating curves showing the discharges available over the range of reservoir operating levels.
2. Routing studies to determine minimum evacuation and refill periods for each reservoir under various inflow conditions, including maximum floods of record.
3. Project performance under historical critical conditions and assumed operating plans.

Detailed discharge capacity reports by the Canadian Entity prepared in consultation with the United States Entity were completed for Duncan in January 1965 and for Arrow in August 1965. A supplemental report for Duncan discharge capacity was completed in March 1966. Formal agreement between the Entities on the discharge capacity of Duncan was recorded in May 1965[1] and May 1966[2] and on the discharge capacity of Arrow in October 1965.[3]

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(1) See Appendix C, Item 1
(2) See Appendix C, Item 4
(3) See Appendix C, Item 2

Following hydraulic model tests, studies of Mica discharge capacity started in October 1966 and a report to the Entities was nearing completion in September 1967.

INITIAL FILLING PROGRAMS

It is required under the Exchange of Notes dated 16 September 1964 that as soon as practicable after start of construction of each Treaty project, the entities shall agree upon a program for filling the storage provided by the project.

An International Task Force was set up in March 1965 to make the basic studies necessary to establish criteria for the initial filling program for each of the Canadian storage reservoirs and to develop the operating procedures for these programs. Of the three reservoirs, Mica with its large volume of dead storage, presented the main filling problem.

Mica

The objective of the initial filling program for Mica reservoir, as established by the Exchange of Notes, is 7 million acre-feet of usable storage by 1 September 1973 and 15 million acre-feet of total storage by 1 September 1975. Joint studies to determine the probabilities of attaining this objective under various conditions were started in the fall of 1964, initially under the direction of a committee with members from each country and later under the direction of the Task Force. It became evident that the probabilities of attaining the filling objective while operating the reservoir to provide optimum generation downstream in the United States in accordance with the Treaty would not be high. Additional studies of

various alternative means of filling were therefore undertaken. These studies enabled the Task Force to develop a set of operating guidelines for most effective cooperative filling; and finally these guidelines were incorporated into a program for the initial filling of Mica reservoir, completed in July 1967 and agreed by the Entities in August 1967.(1)

Duncan

Preliminary papers on the initial filling of Duncan were prepared in May 1966 and in August 1967 the Entities agreed on a filling program based on Duncan becoming fully operative prior to 1 April 1968, following a trial filling and test operation period.(2)

Controlled filling of Duncan started on 30 April 1967 and the reservoir reached full supply level on 25 July 1967 and became fully operative on 31 July 1967.

Arrow

Preliminary work on plans for filling Arrow reservoir were carried out in May 1966 and a program for initial filling was developed during the following months. In August 1967, the Entities agreed on a program for filling the reservoir prepared on the basis that Arrow project will become fully operative on 1 April 1969.(3)

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(1) See Appendix C, Item 9
(2) See Appendix C, Item 7
(3) See Appendix C, Item 8

POWER OPERATING PLANS

The Columbia River Treaty directs that the 15,500,000 acre-feet of Canadian storage is to be operated in accordance with power operating plans to be agreed in advance by the Entities. Before generating facilities are installed at Mica or at sites downstream in Canada, the objective of the plans will be to achieve optimum power generation downstream in the United States. After at-site power is developed at Mica or at downstream sites in Canada, the objective of the plans will be changed to achieve optimum power generation at-site in Canada and downstream in Canada and the United States.

An International Task Force was set up in March 1965 to develop and recommend general criteria and form for the operating plans. In addition, the Task Force was instructed to develop and recommend power operating plans as required and to determine downstream power benefits resulting from operation.

Typical reservoir operation studies were carried out covering the 1974-5 level of development and using the 1928-1958 historical streamflow conditions as specified in the Protocol to the Columbia River Treaty. During 1966 and 1967, drafts were reviewed and amended of a paper setting out principles and procedures for preparing power operating plans. This document was agreed by the Entities in August 1967.(1)

During 1966, the Canadian Entity advised that Duncan project was ahead of construction schedule and would probably be capable of operation during 1967. The Power Operating Task Force, in cooperation with the

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(1) See Appendix C, Item 10

Initial Filling Task Force, submitted a Special Operating Program for Duncan reservoir for the period 1 April 1967 through 31 March 1968. This Program, dated 7 March 1967, was approved in May by an Exchange of Notes between Canada and the United States.

The Duncan Special Operating Program provided for the dam to start impounding water about the end of April 1967 and included a trial filling and test operation period to ensure that the dam adjusted satisfactorily to increasing water pressure and that control gates and other hydraulic structures performed correctly.

The Program recognized the energy benefit that would result at downstream United States hydroelectric plants from Duncan reservoir operation during the period covered by the Program. The Canadian Share of the energy benefits was established as 34,770 mw.-days (100 av.mw. less 5 per cent transmission losses, based on the reservoir reaching full supply level by 31 July 1967). The Program also provided for advance delivery of the Canadian Share at Blaine, Washington starting 1 April 1967.

Controlled filling began on 29 April 1967, full supply level was reached on 25 July 1967, and Duncan reservoir was declared operative on 31 July 1967.

By 30 September 1967, the energy delivered to the Canadian Entity as the Canadian Share amounted to approximately 413 million kilowatthours or an average for the six months of about 94 mw. The capacity provided with this energy was that required to import energy. Normally the amount of capacity provided was 180 megawatts, but this varied at times on account of difficulties in the transmission systems of the Entities.

During 1967, work proceeded on system regulation studies that would

be used as one of the bases for the Assured Plans of Operation. A start was also made to check these regulation studies against the proposed flood control plan to determine any conflicts that might exist .

FLOOD CONTROL OPERATING PLANS

The Columbia River Treaty directs that flood control operating plans for each Canadian storage reservoir will be submitted by the United States Entity. The Canadian Entity will operate the reservoirs in accordance with these plans or any variation which the Entities agree. The use of the plans will be based on hydrometeorological information obtained at intervals during the year giving the current storage content and the current forecast of streamflows at the reservoirs and other key points in the Columbia Basin. The general limitations of flood control operation specified in the Treaty are as follows:-

1. Duncan reservoir will be evacuated to provide up to 700,000 acre-feet of storage, if required, for flood control use by 1 April of each year and up to 1,270,000 acre-feet of storage, if required, for flood control use by 1 May of each year.

2. Arrow reservoir will be evacuated to provide up to 7,100,000 acre-feet of storage, if required, for flood control use by 1 May of each year.

3. Mica reservoir will be evacuated to provide up to 80,000 acre-feet of storage, if required, for flood control use by 1 May of each year.

4. The Canadian Entity may exchange flood control storage provided in Arrow reservoir for additional storage provided in Mica reservoir if the Entities agree that the exchange would provide the same effectiveness for control of floods in the Columbia River at The Dalles, Oregon.

The Protocol to the Treaty, dated 22 January 1964, directs that in preparing flood control operating plans every effort will be made to minimize flood damage in both Canada and the United States.

In March 1965, the Entities established an International Task Force to obtain the necessary basic data and review the flood control operating plans under preparation to assure that they achieve optimum coordination with power operating plans and also minimize flood damage in both Canada and the United States.

In addition, the Canadian Section of the Task Force was instructed to arrange for the operation of the storage projects to achieve the flood control objectives.

The initial work of the Task Force was to compile the required streamflow records and other basic information for use in computer flood routing for the whole Columbia River system. Volume runoff forecast procedures were developed for runoff years of past record so that flood control studies could be made on a foresight rather than hindsight method. Preliminary rule curves were also developed for use in the studies.

During 1966, flood routing studies of the Arrow Lakes were carried out for several water years for the 1975 level of project development which included all the Treaty projects. In addition, the 1894, 1948, 1956 and 1961 floods were examined without Libby and Mica included to determine the degree of flood protection to be expected in the interim period until these projects become operative. These studies showed that rule curve revisions were required and these were made.

Early in 1967, flood routing studies were completed for many of the years of the period of study, 1929 - 1964 for 1975 level of system development which included Mica, Libby, Dworshak and High Mountain Sheep projects. In June, seasonal runoff forecasts were simulated for key sites and

installations using the years 1927 through 1965.

By September 1967, a draft of the Flood Control Operating Plan had been distributed to all Task Forces for study. This paper included principles and procedures of flood regulation, operating plans for Canadian Treaty Storage reservoirs and the charts and diagrams proposed as the basis of annual flood regulation. The Power Operating Plans Task Force will incorporate the proposed flood control operating plan into the system regulation studies for power to determine the degree of conflict, if any.

COOPERATION WITH PERMANENT ENGINEERING BOARD

The duties of the Canadian and United States Entities include assisting and cooperating with the Permanent Engineering Board in the discharge of its functions.

In October 1965, the Entities forwarded to the Board a summary report of activities during the first year of Treaty operations.

Eight quarterly reports were forwarded to the Board during 1966 and 1967 covering the period 1 October 1965 through 30 September 1967.

The quarterly reports included sections on:

Hydrometeorological Network;
Project Discharge Capacities;
Initial Filling Programs;
Power Operating Plans;
Flood Control Operating Plans; and
Libby Project Construction Progress

In addition, Columbia Construction quarterly Progress Reports and monthly construction progress charts covering the Canadian Treaty Storage projects were supplied to the Permanent Engineering Board from the start of construction.

Joint meetings of the Permanent Engineering Board and the Entities were held on 9 March 1967 and 4 August 1967.

APPENDIX A

COLUMBIA RIVER TREATY ENTITIES

Canada

DR. H. L. KEENLEYSIDE, CHAIRMAN

Co-chairman,
British Columbia Hydro and
Power Authority,
Vancouver, B. C.

United States of America

MR. HENRY R. RICHMOND, CHAIRMAN(1)

Administrator,
Bonneville Power Administration,
Department of the Interior,
Portland, Oregon

BRIDADIER-GENERAL ELMER P. YATES(2)

Division Engineer,
North Pacific Division,
Corps of Engineers, U.S. Army,
Portland, Oregon

Canadian Entity Representatives

MR. W. D. KENNEDY, MANAGER
CANADIAN ENTITY SERVICES

Manager, Major Resources Div.,
British Columbia Hydro and
Power Authority,
Vancouver, B. C.

MR. G. J. A. KIDD

Asst. Manager, Major Resources Div.,
British Columbia Hydro and
Power Authority,
Vancouver, B. C.

United States Entity Coordinators

MR. BERNARD GOLDHAMMER,
COORDINATOR

Asst. Administrator for Power
Management,
Bonneville Power Administration,
Portland, Oregon

MR. GORDON FERNALD, COORDINATOR

Chief, Engineering Div.,
North Pacific Division,
Corps of Engineers, U.S. Army,
Portland, Oregon

MR. H. KROPITZER, SECRETARY

Executive Assistant to the Administrator,
Bonneville Power Administration,
Portland, Oregon

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(1) Vice Mr. David S. Black as of 14 August 1967

(2) Vice Bridadier-General Peter C. Hyzer as of 1 February 1967

APPENDIX B

COLUMBIA RIVER TREATY

INTERNATIONAL TASK FORCES

The official membership of the five International Task Forces at 30 September 1967 was as follows:-

	CANADIAN TASK FORCE	UNITED STATES TASK FORCE
Hydrometeorological System	P. R. Purcell (Chairman)	F. A. Limpert (Chairman)(1)
	J. F. Miles	D. M. Rockwood(2)
	U. Sporns	
Discharge Capacities of Dams	G. J. A. Kidd (Chairman)	C. E. Mohler (Chairman)(1)
	W. H. Fisher	R. G. Lambert(2)
Initial Filling of Reservoirs	J. B. Hedley (Chairman)	C. W. Blake (Chairman)(1)
	W. H. Fisher	C. E. Hildebrand(2)
Power Operating Plans	G. J. A. Kidd (Chairman)	H. M. McIntyre (Chairman)(1)
	W. H. Fisher	K. D. Earls(1)
	J. B. Hedley	D. J. Lewis(2)
	N. S. Kent	C. E. Hildebrand(2)
Flood Control Operating Plans	G. J. A. Kidd (Chairman)	M. L. Nelson (Chairman)(2)
	W. H. Fisher	F. A. Limpert(1)

All Canadian Task Force members represented B. C. Hydro and Power Authority. United States Task Force members represented (1) Bonneville Power Administration or (2) United States Corps of Engineers.

APPENDIX C

COLUMBIA RIVER TREATY

OFFICIAL AGREEMENTS OF THE ENTITIES

Date	Item No.	Description
27 May 1965	1	Duncan Project Discharge Capacity
14 October 1965	2	Arrow Project Discharge Capacity
4 February 1966	3	Recommendation No. 1 for Hydro-meteorological Network
2 May 1966	4	Supplemental Agreement on Duncan Project Discharge Capacity
6 May 1966	5	Recommendation No. 2 for Hydro-meteorological Network
8 November 1966	6	Minimum Weekly Discharge at Duncan Project
4 August 1967	7	Program for Filling Duncan Reservoir
4 August 1967	8	Program for Initial Filling of Arrow Reservoir
4 August 1967	9	Program for Initial Filling of Mica Reservoir
4 August 1967	10	Principles and Procedures for the Preparation and Use of Hydroelectric Operating Plans for Canadian Treaty Storage

APPENDIX D

IMPLEMENTATION OF THE COLUMBIA RIVER TREATY

SELECTED CHRONOLOGY

17 January 1961	Columbia River Treaty signed in Washington, D.C.
8 July 1963	Main Canada-British Columbia Agreement signed.
13 January 1964	Supplementary Canada-British Columbia Agreement signed.
22 January 1964	Notes exchanged by the Governments of Canada and the United States of America concerning the disposition of the Canadian Entitlement to downstream power benefits and the Protocol clarifying the terms of the Columbia River Treaty.
10 June 1964	Columbia River Treaty approved by the Senate of Canada.
10 June 1964	Contract let for clearing of Duncan reservoir site.
13 August 1964	Canadian Entitlement Purchase Agreement signed by Columbia Storage Power Exchange and British Columbia Hydro and Power Authority.
4 September 1964	B. C. Hydro and Power Authority designated by the Government of Canada as the Canadian Entity effective from date of ratification of Treaty.
16 September 1964	Instruments of Ratification of Columbia River Treaty exchanged by the Governments of Canada and the United States of America.
16 September 1964	The Administrator of the Bonneville Power Administration, Department of the Interior, and the Division Engineer, North Pacific Division, Corps of Engineers, Department of the Army, designated by the Government of the United States of America as the United States Entity.
16 September 1964	Notes exchanged by the Governments of Canada and the United States of America authorizing the Canadian Entitlement Purchase Agreement.
16 September 1964	$253.9 million (U.S. funds) delivered to the Government of Canada and $273.29 million (Canadian funds) transferred to the Government of British Columbia as payment in advance for the Canadian Entitlement to downstream power benefits.
16 September 1964	$273.29 million (Canadian funds) transferred to British Columbia Hydro and Power Authority.

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29 April 1967	Controlled filling of Duncan reservoir commenced.
18 May 1967	Notes exchanged by the Governments of Canada and the United States of America authorizing the Special Operating Program for Duncan Reservoir for the period 1 April 1967 to 31 March 1968.
1 July 1967	Duncan storage reservoir declared operative.