

# COLUMBIA RIVER TREATY

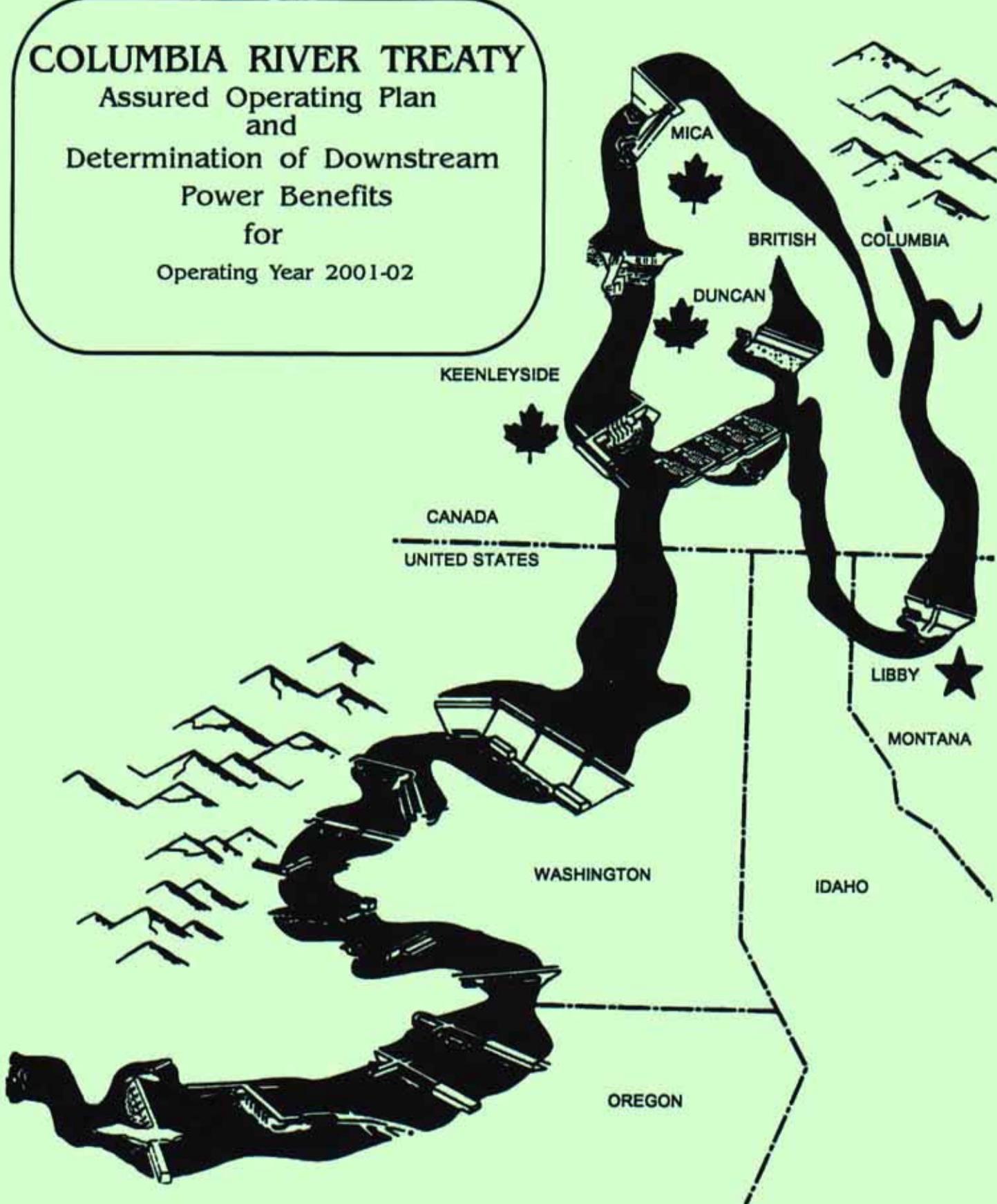
Assured Operating Plan  
and

Determination of Downstream

Power Benefits

for

Operating Year 2001-02



**COLUMBIA RIVER TREATY ENTITY AGREEMENT ON THE  
ASSURED OPERATING PLAN AND  
DETERMINATION OF DOWNSTREAM POWER BENEFITS  
FOR THE 2001-02 OPERATING YEAR**

The Columbia River Treaty between Canada and the United States of America requires that the Entities agree annually on an assured plan of operation for Canadian Treaty storage and on the resulting downstream power benefits six years in advance.

The Entities agree that the attached reports entitled "Columbia River Treaty Assured Operating Plan for Operating Year 2001-02" and "Determination of Downstream Power Benefits for the Assured Operating Plan for Operating Year 2001-02," both dated January 2000, shall be the Assured Operating Plan and Determination of Downstream Power Benefits for the Operating Year 2001-02.

In witness thereof, the Entities have caused this Agreement to be executed.

Executed for the Canadian Entity this 16<sup>th</sup> day of February 2000.

By Brian R.D. Smith,  
Brian R.D. Smith, Chair

Executed for the United States Entity this 16<sup>th</sup> day of February 2000.

By Judith A. Johansen,  
Judith A. Johansen, Chairman

By Carl A. Strock,  
Brigadier General Carl A. Strock, Member

**COLUMBIA RIVER TREATY  
HYDROELECTRIC OPERATING PLAN**

**ASSURED OPERATING PLAN  
FOR OPERATING YEAR 2001-02**

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**HYDROELECTRIC OPERATING PLAN  
ASSURED OPERATING PLAN  
FOR OPERATING YEAR 2001-02**

January 2000

**1. Introduction**

The treaty between Canada and the United States of America relating to the cooperative development of the water resources of the Columbia River Basin (Treaty) requires that each year an Assured Operating Plan (AOP) be agreed to by the Entities for the operation of the Columbia River Treaty storage in Canada during the sixth succeeding year. This plan will provide to the Entities information for the sixth succeeding year for planning the power systems in their respective countries which are dependent on or coordinated with the operation of the Canadian storage projects.

This AOP was prepared in accordance with the Principles and Procedures for the Preparation and Use of Hydroelectric Operating Plans<sup>1</sup> (POP) and in accordance with the following Entity Agreements:

- The "Columbia River Treaty Entity Agreement on Resolving the Dispute on Critical Period Determination, the Capacity Entitlement for the 1998-99, 1990-00, and 2000-01 AOP/DDPB's, and Operating Procedures for the 2001-02 and Future AOP's," signed 29 August 1996;<sup>2</sup>
- Principles<sup>3</sup> and on Changes to Procedures<sup>4</sup> for the Preparation of the Assured Operating Plan and Determination of Downstream Power Benefit Studies, signed 28 July and 12 August 1988, respectively.

POP is based on criteria contained in Annex A and Annex B of the Columbia River Treaty,<sup>5</sup> the Protocol,<sup>6</sup> the Terms of Sale,<sup>7</sup> and the Columbia River Treaty Flood Control Operating Plan.<sup>8</sup>

In accordance with the Protocol VII (2), this AOP provides a reservoir-balance relationship for each month for the whole of the Canadian storage. This relationship is determined from the following:

- (a) The Critical Rule Curve (CRC) for each project, the individual project Upper Rule Curves (URC's), and the related rule curves and data used to compute the individual project Operating Rule Curves (ORC's).
- (b) Operating Rules, that specifically designate criteria for operation of the Canadian storage in accordance with the principles contained in the above references.
- (c) The supporting data and model used to simulate the 30-year operation for the Step I Joint Optimum hydroregulation study.<sup>9</sup>

This AOP includes both English and metric units.<sup>10</sup> For operational purposes, the English units should be used as having a degree of accuracy consistent with previous year's studies. Calculations based on metric units are approximations derived by rounding conversions from English units. Metric values are displayed with either one or two decimal places to assure consistency with English units and does not imply that level of precision. The inclusion of metric units complies with U.S. Federal statutory requirements. Tables referred to in the text are in English units. Metric tables use the same numbering system with the letter "M" after the table number.

## **2. System Regulation Studies**

In accordance with Annex A, paragraph 7, of the Treaty, the Columbia River Treaty Operating Committee conducted system regulation studies reflecting Canadian storage operation for optimum generation in both Canada and the United States. Downstream power benefits were computed with the Canadian storage operation based on the operating rules specified herein.

System Regulation Studies for the AOP were based on 2001-02 estimated loads and resources in the United States Pacific Northwest System and hydro resources in the Columbia River Basin in British Columbia. In accordance with the Protocol VIII, the 2001-02 AOP is based on a 30-year streamflow period and the Entities have agreed to use an operating year of 1 August to 31 July. Historical flows for the period August 1928 through July 1958, modified by estimated irrigation depletions for the 1990 level and including the latest Grand Coulee pumping were used.<sup>11</sup> The 1990 level is considered the best estimate of irrigation depletions for the 2001-02 operating year.

The CRC's were determined from a critical period study of optimum power generation in both Canada and the United States. The study indicated a 42.5-month critical period for the United States system resulting from the low flows during the period from 16 August 1928 through 29 February 1932. With the major exception of Brownlee and Dworshak, it was assumed that all reservoirs, both in the United States and Canada, were full at the beginning of the critical period except where minimum release requirements made this impossible.

In the studies, individual project flood control criteria were followed. Flood Control and Variable Refill Criteria are based on historical inflow volumes. Although only 15.5 million acre-feet (Maf) (19.12 cubic kilometers ( $\text{km}^3$ )) of usable storage is committed for power operation purposes under the Treaty, the Columbia River Treaty Flood Control Operating Plan provides for the full draft of the total 20.5 Maf (25.29  $\text{km}^3$ ) of usable storage for on-call flood control purposes.

## **3. Development of the Assured Operating Plan**

This AOP was developed in accordance with Annex A, paragraph 7 of the Treaty and was designed to produce optimum power generation at-site in Canada and downstream in

Canada and the United States. The Mica Operating criteria specified in Table 1 was evaluated using the two tests described below.

(a) Determination of Optimum Generation in Canada and the United States

To determine whether optimum generation in both Canada and the United States was achieved in the system regulation studies, the firm energy capability, dependable peaking capability, and average annual usable secondary energy were computed for both the Canadian and United States systems.

In the studies for the 2001-02 AOP, the Canadian storage operation was operated to achieve a weighted sum of the three quantities that was greater than the weighted sum achieved under an operation of Canadian storage for optimum generation in the United States of America alone.

In order to achieve a weighted value for the three quantities, the Columbia River Treaty Operating Committee agreed for the 2001-02 AOP that the three quantities would be assigned the following relative values:

| <u>Quantity</u>                              | <u>Relative Value</u> |
|--|-----------------------|
| Firm energy capability (aMW)                 | 3                     |
| Dependable peaking capability (MW)           | 1                     |
| Average annual usable secondary energy (aMW) | 2                     |

After weighting each quantity, the three quantities were added, resulting in a net gain to the combined Canadian and United States systems in the study designed for optimum generation in Canada and the United States.

Table 2 shows the results from studies adopted for the 2001-02 AOP and from studies designed to achieve optimum generation in the United States alone.

(b) Maximum Permitted Reduction in Downstream Power Benefits

Separate Step II system regulation studies were developed reflecting (i) Canadian storage operation for optimum generation in both Canada and the United States, using the Mica Project operating criteria described in section 5(c) below, and (ii) Canadian storage operation for optimum generation in the United States alone. Using these Mica Project operating criteria, there is a 0.4 aMW increase in the Canadian Entitlement for average annual usable energy and no change in the dependable capacity compared to an operation for optimum generation in the United States alone.

Since there is no reduction in entitlement, the Entities have determined that these changes are within the maximum permitted reduction in downstream power benefits specified by the Treaty.

#### **4. Rule Curves**

The operation of Canadian storage during the 2001-02 Operating Year shall be guided by an ORC for the whole of Canadian storage, Flood Control Storage Reservation Curves for the individual projects, CRC's, and operating rules for specific projects. The ORC is derived from the various curves described below. These ORC's are first determined for the individual Canadian projects and then summed to yield the Composite ORC for the whole of Canadian storage, in accordance with paragraph VII(2) of the Protocol.

##### **(a) Critical Rule Curve**

The CRC indicates the end-of-period storage content of Canadian storage during the critical period. It is designed to protect the ability of the United States system to serve firm load with the occurrence of flows during the most adverse historical streamflow period. A tabulation of the CRC's for Duncan, Arrow, Mica, and the Composite CRC's for the whole of Canadian storage is included as Table 3.

##### **(b) Refill Curve**

The Refill Curves are used to develop the ORC's. The end of the refill period is considered to be 31 July. There are two types of refill curves, the Assured Refill Curve (ARC) and the Variable Refill Curve (VRC), which are discussed in the following sections. In each case, adjustment is made for water required for refill of upstream reservoirs when applicable. Tabulations of the VRC's and outflow schedules used in determining the VRC's and ARC's for Mica, Arrow, and Duncan are provided in Tables 4 - 6, respectively.

###### **(1) Assured Refill Curve**

The ARC indicates the end-of-period storage content required to assure refill of Canadian storage based on the 1930-31 water year, which is the system's second lowest historical January through July volume of inflow at The Dalles, Oregon during the 30-year record. A tabulation of the ARC's for Mica, Arrow, and Duncan are included in Tables 4-6. The outflows, or Power Discharge Requirements (PDR's), used in developing these ARC's are also shown in these tables.

###### **(2) Variable Refill Curve**

The VRC is provided as a check to ensure that the ARC is not too conservative. The VRC's give end-of-period storage contents for the period January through July required to refill Canadian storage during the refill period. They were based on historical inflow volumes, upstream storage requirements, and PDR's determined in accordance with the POP. In the system regulation studies, the PDR's were made a function of the unregulated January through July runoff volume at The Dalles, Oregon. The PDR's used in computing the VRC's were interpolated linearly between the values shown in Tables 4-6. In those years when the January to July runoff

volume at The Dalles was less than 80 Maf ( $98.68 \text{ km}^3$ ) or greater than 110 Maf ( $135.69 \text{ km}^3$ ), the discharge used was that specified for 80 and 110 Maf ( $98.68$  and  $135.69 \text{ km}^3$ ), respectively.

VRC's for Mica, Arrow and Duncan for the 30 years of historical record in Tables 4-6 illustrate the probable range of these curves based on historical conditions. In actual operation in 2001-02, the PDR's will be based on the forecast of unregulated runoff at The Dalles.

(c) Limiting Rule Curve (LRC) or Energy Content Curve Lower Limit (ECCLL)

The LRC's indicate 31 January through 15 April end-of-period storage contents. These contents must be maintained to protect the ability of the system to meet firm load during the period January through 30 April in the event that the VRC's permit storage to be emptied and sufficient natural flow is not available to carry the load prior to the start of the freshet. Such rule curves shall limit the VRC to be no lower than the LRC. The LRC is developed for 1936-37 water conditions. The LRC's for Mica, Arrow, and Duncan are shown in Tables 4-6, respectively.

(d) Upper Rule Curve (Flood Control)

The URC's indicate the end-of-period storage content to which each individual Canadian storage project shall be evacuated for flood control. The URC's used in the studies were based upon Flood Control Storage Reservation Diagrams contained in the Columbia River Treaty Flood Control Operating Plan<sup>12</sup> and analysis of system flood control simulations.<sup>13</sup> URC's for Mica, Arrow, and Duncan for the 30-year study period are shown on Tables 7 - 9, respectively. Tables 7 and 8 reflect an agreed transfer of flood control space in Mica and Arrow to maximum drafts of 2.08 Maf and 5.1 Maf ( $257 \text{ km}^3$  and  $6.29 \text{ km}^3$ ) respectively. In actual operation, the URC's will be computed as outlined in the Flood Control Operating Plan, using the latest forecast of runoff available at that time.

(e) Operating Rule Curve

The ORC's define the normal limit of storage draft to produce secondary energy and provide a high probability of refilling the reservoirs. In general, the Operating Plan does not permit serving secondary loads at the risk of failing to refill storage and thereby jeopardizing the firm load carrying capability of the United States or Canadian systems during subsequent years.

During the period 1 August through 31 December, the ORC is defined as the CRC for the first year of the critical period or the ARC, whichever is higher. During the period 1 January through 31 July, the ORC is defined as the higher of the CRC and the ARC; unless the VRC is lower, then it defines the ORC. During the period 1 January through 15 April, the ORC will not be lower than the LRC. The ORC shall be less than or equal to the URC. The composite ORC for the whole of Canadian storage for 30 years of

historical record are included in Table 10 to illustrate the probable future range of these curves based on historical conditions. The lower of the Energy Content Curves for United States reservoirs or the URC's are equivalent to ORC's.

## 5. Operating Rules

A 30-year System Regulation Study<sup>14</sup> was utilized to develop and test the operating rules and rule curves. It contains the agreed-upon operating and CRC's, operating rules and constraints, such as maximum and minimum project elevations, discharges, draft rates, etc. These constraints are included as part of this operating plan, as found in Appendix A1 (English units) or Appendix A2 (Metric units).

The following rules, used in the 30-year System Regulation Study, will apply to the operation of Canadian storage in the 2001-02 Operating Year.

### (a) Operation Above ORC

The whole of the Canadian storage will be drafted to its ORC as required to produce optimum generation in Canada and the United States in accordance with Annex A, paragraph 7, of the Treaty, subject to project physical characteristics, operating constraints, and the criteria for the Mica project listed in section 5(c).

### (b) Operation Below ORC

The whole of Canadian storage will be drafted below its ORC as required to produce optimum generation to the extent that a System Regulation Study determines that proportional draft below the ORC is required to produce the hydro firm energy load carrying capability (FELCC) of the United States system. FELCC is determined by the applicable Critical Period Regulation study. Proportional draft between rule curves will be determined as described in the POP.

Mica Reservoir will, however, continue to be operated in accordance with section 5(c) below, so as to optimize generation at site and at Revelstoke as well as downstream in the United States. In the event the Mica operation results in more or less than the project's proportional share of draft from the whole of Canadian storage, compensating changes will be made from Arrow to the extent possible.

### (c) Mica Project Operation

Mica project operation will be determined by Arrow's storage content at the end of the previous period as shown in Table 1. Mica outflows will be increased above the values shown in the table in the periods from October through June if required to avoid storage above the URC.

Under this AOP, Mica storage releases in excess of 7.0 Maf (8.63 km<sup>3</sup>) that are required to maintain the Mica outflows specified under this plan will be retained in the Arrow reservoir, subject to flood control and other project operating criteria at Arrow. The total combined storage draft from Mica and Arrow will not exceed 14.1 Maf (17.39 km<sup>3</sup>), unless flood control criteria will not permit the additional Mica storage releases to be retained at Arrow. Should storage releases in excess of 14.1 Maf (17.39 km<sup>3</sup>) be made, the target Mica operation will remain as specified in Table 1.

Revelstoke, Upper Bonnington, Lower Bonnington, South Slocan, Brilliant, Seven Mile, and Waneta have been included in the 2001-02 AOP and have been operated as run-of-river projects. Corra Linn and Kootenay Canal were included in the study and operated in accordance with criteria that closely approximates International Joint Commission rules for Kootenay Lake.

## **6. Implementation**

The Entities have agreed that each year a Detailed Operating Plan (DOP) will be prepared for the immediately succeeding operating year. Such DOP's are made under authority of Article XIV 2.(k) of the Columbia River Treaty, which states:

"...the powers and the duties of the entities include:

(k) preparation and implementation of detailed operating plans that may produce results more advantageous to both countries than those that would arise from operation under the plans referred to in Annexes A and B."

The 2001-02 DOP will reflect the latest available load, resource, and other pertinent data to the extent the Entities agree these data should be included in the plan.

The data and criteria contained herein may be reviewed, and updated as agreed by the Entities, to form the basis for a 2001-02 DOP. Failing agreement on updating the data and/or criteria, the 2001-02 DOP will include the rule curves, Mica operating criteria, and other data and criteria provided in this AOP. Actual operation during the 2001-02 Operating Year shall be guided by the DOP.

The values used in the AOP studies to define the various rule curves were period-end values only. In actual operation, it is necessary to operate in such a manner during the course of each period that these period-end values can be achieved in accordance with the operating rules. Due to the normal variation of power load and streamflow during any period, straight-line interpolation between the period-end points should not be assumed.

During the storage drawdown season, Canadian storage should not be drafted below its period-end point at any time during the period unless it can be conservatively demonstrated that sufficient inflow is available, in excess of the minimum outflow required to serve power demand, to refill the reservoir to its end-of-period value as required. During the storage evacuation and refill season, operation will be consistent with the Flood Control Operating

Plan. When refill of Canadian storage is being guided by Flood Control Refill Curves, such curves will be computed on a day-by-day basis using the residual volume-of-inflow forecasts depleted by the volume required for minimum outflow, unless higher flows are required to meet firm load, from each day through the end of the refill season.<sup>15</sup>

## **7. Canadian Entitlement**

On 1 April 1998 and on 1 April 1999, the portions of the Canadian Entitlement to downstream power benefits attributed to the operation of Duncan and Arrow dams, respectively, cease to be covered by the Terms of the Sale of the Canadian Entitlement in the United States of America authorized by an Exchange of Notes between Canada and the United States of America dated 16 September 1964.<sup>16</sup> This AOP has been prepared on the basis that the portion of the Canadian Entitlement attributable to Duncan (i.e., 1.4 Maf/ 15.5 Maf) [1.72 km<sup>3</sup>/ 19.12 km<sup>3</sup>] will be returned to Canada starting 1 April 1998, and the portion attributable to Arrow (i.e., 7.1 Maf/ 15.5 Maf) [8.76 km<sup>3</sup> / 19.12 km<sup>3</sup>] will be returned starting 1 April 1999.

### **(a) Delivery of the Canadian Entitlement**

The Treaty specifies return of the Canadian Entitlement at a point near Oliver, British Columbia, unless otherwise agreed by the Entities. Because no cross border transmission exists at any point on the Canada-United States of America boundary near Oliver, the Entities completed an agreement on Aspects of the Canadian Entitlement Return for 1 April 1998 through 31 March 2003,<sup>17</sup> executed 28 July 1992. This agreement has now been replaced by the Columbia River Treaty Entity Agreement on Aspects of the Delivery of the Canadian Entitlement for 1 April 1998 through 15 September 2024, dated 29 March 1999.<sup>18</sup> This arrangement covers the full 1 August 2001 through 31 July 2002 period covered by this AOP.

### **(b) Capacity/Energy Entitlement Scheduling Guidelines**

The Columbia River Treaty Entity Agreement on Aspects of the Delivery of the Canadian Entitlement for 1 April 1998 through 15 September 2024,<sup>19</sup> specifies the scheduling guidelines for delivery of the Canadian Entitlement.

## **8. Summary of Changes from Previous Year**

Data from the five most recent AOP's are summarized in Table 11. Firm energy shifting was not included in the 1997-98, 1998-99, 1999-00, 2000-01 and the 2001-02 operating plan studies. An explanation of the more important changes compared to last year's studies follows.

(a) Loads and Non-Hydro Resources

Loads for the 2001-02 AOP were based on the 1995 Whitebook medium case forecast developed by BPA in November 1995. Compared to the previous AOP, The Pacific Northwest Area (PNWA) firm energy load increased by 534 aMW. The total exports, not including firm surplus energy, increased by 89 aMW. The increase in exports is mainly due to the increased Canadian Entitlement Return. It was assumed that all of the Entitlement Return was exported to B.C. with one-half of the amount imported back to meet load in the PNWA. The surplus firm energy decreased by 426 aMW and was shaped only in May and June.

The beginning of the Step I critical period study changed from 1 September to 16 August 1928 because of an increase in firm energy load in August compared to loads in the previous year's study.

The total annual energy capability of the thermal installations decreased by 8 aMW. Major thermal resource changes included (see Table 1A of DDPB document):

- Combustion Turbine resources decreased by 139 aMW due to removal of BPA's Tenaska and Idaho's Wood River projects, and removal of maintenance at PGE's Beaver and Unnamed projects;
- Cogeneration decreased 42 aMW due to the removal of the Klickitat SDS Lumber project and a change in the maintenance schedule for PGE's Coyote Springs;
- Boardman Coal increased by 107 aMW due to a change in maintenance schedule and an upgrade;
- Thermal Non-Utility Generation (NUGs) decreased by 34 aMW mostly due to the termination of Springfield's and Clallam County's NUG's, and a decrease in WWP's;
- Thermal Imports increased by 107 aMW due to changes in the Southern California Edison (SCE) to BPA imports, and addition of a new import from Imperial to BPA. Montana Thermal Import decreased and showed different monthly shaping from the previous year's data; and
- Plant Sales increased by 8 aMW due to a change in the maintenance schedule for Boardman, thus PGE's share which was sold to San Diego also increased. This amount is subtracted from the thermal installations.

(b) Operating Procedures

Plant data for Waneta, 7-Mile, Arrow, Rock Island, and the Lower Snake projects were revised. Generation increased due to an upgrade at Waneta and an expansion at 7-Mile. The addition of generators at Arrow is assumed not to be completed by

2002. The generation vs. discharge (MW/cfs) table was updated for Rock Island. The end storage vs. elevation and head vs. H/K (kW/cfs) tables were updated for Ice Harbor. Lower Monumental, Little Goose, and Lower Granite had minor changes to the end storage vs. elevation tables.

The established operating procedures for Base system projects were agreed to by an Entity Agreement signed on 29 August 1996.<sup>20</sup> These requirements are essentially the nonpower requirements included in the 1979-80 and prior AOP/DDPB studies. Major changes from the previous studies included:

- Hungry Horse minimum flow requirement increased to 400 cfs ( $11.33 \text{ m}^3/\text{s}$ ) from 145 cfs ( $4.11 \text{ m}^3/\text{s}$ ), all periods. The requirement to meet Columbia Falls minimum flow of 3500 cfs ( $99.11 \text{ m}^3/\text{s}$ ), and the maximum of 4500 cfs ( $127.43 \text{ m}^3/\text{s}$ ) was eliminated;
- Kerr minimum flow decreased to 1500 cfs ( $42.47 \text{ m}^3/\text{s}$ ) in all periods. In the previous year's AOP, minimum flow ranged from 3200 cfs ( $90.61 \text{ m}^3/\text{s}$ ) in most periods to a high of 7742 cfs ( $219.23 \text{ m}^3/\text{s}$ ) in May;
- Only the 1240 ft (377.95 m) pumping requirement in May remained for Grand Coulee. The 1285 ft (391.67 m) minimum storage for recreation, and 1220ft (371.86 m) minimum for Ferry operations were eliminated;
- All fish spill was eliminated for base system projects (not including fish ladders, lockage, sluiceway); and
- John Day was operated to pre-2001 operation with minimum operating pool of 265-ft (80.77 m).

Other notable changes in non-power constraints for non-base system projects include revision of last year's spill data, and Dworshak outflows. For further details, see Appendix A1 (English units) or Appendix A2 (Metric units).

**REFERENCES**

- 1 "Columbia River Treaty Principles and Procedures for the Preparation and Use of Hydroelectric Operating Plans, Columbia River Treaty Operating Committee," dated December 1991.
- 2 "Columbia River Treaty Entity Agreement on Resolving the Dispute on Critical Period Determination, the Capacity Entitlement for the 1998-99, 1990-00, and 2000-01 AOP/DDPB's, and Operating Procedures for the 2001-02 and Future AOP's," signed 29 August 1996.
- 3 "Columbia River Treaty Entity Agreement on Principles for the Preparation of the Assured Operating Plan and Determination of Downstream Power Benefit Studies," dated 28 July 1988.
- 4 "Columbia River Treaty Entity Agreement on Changes to Procedures for the Preparation of the Assured Operating Plan and Determination of Downstream Power Benefit Studies," dated 12 August 1988.
- 5 "Treaty between the United States of America and Canada relating to Cooperative Development of the Water Resources of the Columbia River Basin," dated 17 January 1961.
- 6 "Protocol - Annex to Exchange of Notes," dated 22 January 1964.
- 7 "Attachment Relating to Terms of Sale - Attachment to Exchange of Notes," dated 22 January 1964.
- 8 "Columbia River Treaty Flood Control Operating Plan," dated October 1972, as amended by the "Review of Flood Control, Columbia River Basin, Columbia River and Tributaries Study, CRT-63," dated June 1991.
- 9 BPA Hydroelectric Power Planning Program, Assured Operating Plan 30-year System Regulation Study 02-41," dated 9 January 1997.
- 10 The conversion factors used are: (a) million acre-feet (Maf) times 1.2335 equals cubic kilometers ( $\text{km}^3$ ); (b) thousand second-foot-days (ksfd) times 2.4466 equals cubic hectometers ( $\text{hm}^3$ ); (c) cubic feet per second (cfs) divided by 35.3147 equals cubic meters per second ( $\text{m}^3/\text{s}$ ); and (d) feet (ft) times 0.3048 equals meters (m).
- 11 "Report on 1990 Level Modified Streamflows, 1928 to 1989, Columbia River and Coastal Basins, prepared for BPA," dated July 1993.
- 12 See footnote 8.

- 13 Summary of "End-of-Period Reservoir Storage Requirement from Columbia River Flood Regulation Studies," dated July 1996.
- 14 See footnote 9.
- 15 See footnote 8.
- 16 Exchange of notes "Regarding the Disposal of the Canadian Entitlement to Downstream Power Benefits," dated 16 September 1964.
- 17 Columbia River Treaty Entity Agreement on Aspects of the Canadian Entitlement Return for 1 April 1998 through 31 March 2003," executed 28 July 1992.
- 18 "Columbia River Treaty Entity Agreement on Aspects of the Delivery of the Canadian Entitlement for April 1, 1998 Through September 15, 2024" between the Canadian Entity and the United States Entity, dated 29 March 1999.
- 19 See footnote 18.
- 20 See footnote 2.

**TABLE 1**  
**(English Units)**  
**MICA PROJECT OPERATING CRITERIA**  
**2001-02 ASSURED OPERATING PLAN**

| <u>Period</u> | <u>Target Operation</u>                                    |                                     |   |                              |   |
|---------------|--|-------------------------------------|---|------------------------------|---|
|               | <u>End of Previous Period Arrow Storage Content (ksfd)</u> | <u>Period Average Outflow (cfs)</u> | <u>End-of-Period Treaty Content 1/ (ksfd)</u> | <u>Minimum Outflow (cfs)</u> | <u>Minimum Treaty Storage Content 2/ (ksfd)</u> |
| August 1-15   | 2600 - FULL<br>1650 - 2600<br>0 - 1650                     | -<br>16000<br>26000                 | 3486.2  | 15000                        | 0.0   |
| August 16-31  | 3400 - FULL<br>1450 - 3400<br>0 - 1450                     | -<br>21000<br>26000                 | 3529.2  | 15000                        | 0.0   |
| September     | 3460 - FULL<br>1810 - 3460<br>0 - 1810                     | -<br>22000<br>27000                 | 3529.2  | 10000                        | 0.0   |
| October       | 3095 - FULL<br>2030 - 3095<br>0 - 2030                     | -<br>21000<br>28000                 | 3396.2  | 10000                        | 0.0   |
| November      | 2900 - FULL<br>2620 - 2900<br>950 - 2620<br>0 - 950        | 20000<br>22000<br>24000<br>29000    |   | 12000                        | 0.0   |
| December      | 3050 - FULL<br>2510 - 3050<br>1000 - 2510<br>0 - 1000      | 22000<br>25000<br>27000<br>29000    |   | 21000                        | 207.0   |
| January       | 2570 - FULL<br>2490 - 2570<br>1512 - 2490<br>0 - 1512      | 24000<br>23000<br>26000<br>28000    |   | 15000                        | 106.2   |
| February      | 1510 - FULL<br>380 - 1510<br>365 - 380<br>0 - 365          | 21000<br>23000<br>21000<br>28000    |   | 15000                        | 0.0   |
| March         | 1285 - FULL<br>740 - 1285<br>675 - 740<br>0 - 675          | 22000<br>20000<br>24000<br>27000    |   | 15000                        | 0.0   |
| April 1-15    | 1655 - FULL<br>1450 - 1655<br>1000 - 1450<br>0 - 1000      | -<br>-<br>18000<br>-                | 326.2<br>16.2<br>0.0                          | 13000                        | 0.0   |
| April 16-30   | 2780 - FULL<br>2590 - 2780<br>800 - 2590<br>0 - 800        | -<br>-<br>10000<br>13000            | 56.2<br>0.0                                   | 10000                        | 0.0   |
| May           | 300 - FULL<br>295 - 300<br>194 - 295<br>0 - 194            | 10000<br>8000<br>14000<br>22000     |   | 8000                         | 0.0   |
| June          | 1280 - FULL<br>1160 - 1280<br>480 - 1160<br>0 - 480        | 10000<br>8000<br>12000<br>17000     |   | 8000                         | 0.0   |
| July          | 1940 - FULL<br>1800 - 1940<br>0 - 1800                     | -<br>17000<br>24000                 | 3456.2  | 8000                         | 0.0   |

**Notes:**

1/ A maximum outflow of 34000 cfs will apply if the target end-of-period storage content @ Mica is less than 3529.2 ksfd in every month except April, May, and June. For these periods, the maximum outflow is 32000 cfs in April 1-15, 27000 cfs in April 16-30, 30000 cfs in May, and 33000 cfs in June.

2/ Mica outflows will be reduced to minimum to maintain the reservoir above the minimum Treaty storage content. This will override any flow target.

**TABLE 2**  
**COMPARISON OF 2001-02 ASSURED OPERATING PLAN**  
**STUDY RESULTS**

Study 02-41 provides Optimum Generation in Canada and in the United States.  
 Study 02-11 provides Optimum Generation in the United States only.

|   | Study No.<br>02-41 | Study No.<br>02-11 | Net<br>Gain           | Weight | Value |
|---|--------------------|--------------------|-----------------------|--------|-------|
| 1. Firm Energy Capability (aMW)                 |                    |                    |                       |        |       |
| U.S. System 1/                                  | 12020.5            | 12020.3            | 0.2                   |        |       |
| Canada 2/, 3/                                   | 2830.0             | 2781.7             | 48.3                  |        |       |
| Total   | 14850.5            | 14802.0            | 48.5                  | 3      | 145.5 |
| 2. Dependable Peaking Capacity (MW)             |                    |                    |                       |        |       |
| U.S. System 4/                                  | 31244.0            | 31244.0            | 0.0                   |        |       |
| Canada 2/, 5/                                   | 5622.0             | 5597.0             | 25.0                  |        |       |
| Total   | 36866.0            | 36841.0            | 25.0                  | 1      | 25.0  |
| 3. Average Annual Usable Secondary Energy (aMW) |                    |                    |                       |        |       |
| U.S. System 6/                                  | 3243.4             | 3218.5             | 24.9                  |        |       |
| Canada 2/, 7/                                   | 240.9              | 270.6              | -29.7                 |        |       |
| Total   | 3484.3             | 3489.1             | -4.8                  | 2      | -9.6  |
|   |                    |                    | Net Change in Value = |        | 160.9 |

- 
- 1/ U.S. System firm energy capability was determined over the U.S. system critical period beginning 16 August 1928 and ending 29 February 1932.
  - 2/ Canadian system includes Mica, Arrow, Revelstoke, Kootenay Canal, Corra Linn, Upper Bonnington, Lower Bonnington, South Slocan, Brilliant, Seven Mile, and Waneta.
  - 3/ Canadian system firm energy capability was determined over the Canadian system critical period beginning 1 October 1940 and ending 30 April 1946.
  - 4/ U.S. system dependable peaking capability was determined from January 1937.
  - 5/ Canadian system dependable peaking capability was determined from December 1944.
  - 6/ U.S. system 30-year average secondary energy limited to secondary market.
  - 7/ Canadian system 30-year average generation minus firm energy capability.

**TABLE 3**  
 (English Units)  
**CRITICAL RULE CURVES**  
**END OF PERIOD TREATY STORAGE CONTENTS (KSFD)**  
**2001 - 02 ASSURED OPERATING PLAN**

| YEAR             | AUG15  | AUG31  | SEP    | OCT    | NOV    | DEC    | JAN    | FEB    | MAR    | APR15  | APR30 | MAY    | JUN    | JUL    |
|------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|--------|--------|--------|
| <b>MICA</b>      |        |        |        |        |        |        |        |        |        |        |       |        |        |        |
| 1928-29          | 3529.2 | 3529.2 | 3340.9 | 3109.0 | 3007.9 | 2594.8 | 1779.8 | 1221.4 | 1225.8 | 523.5  | 204.3 | 664.5  | 2312.0 | 3374.7 |
| 1929-30          | 3511.0 | 3478.7 | 3110.6 | 2577.7 | 1732.4 | 1675.2 | 712.6  | 565.8  | 561.7  | 39.7   | 12.9  | 651.9  | 1858.2 | 2969.9 |
| 1930-31          | 3118.2 | 3047.5 | 2992.4 | 2567.8 | 1727.1 | 1521.1 | 676.8  | 559.4  | 546.2  | 65.9   | 1.1   | 0.0    | 778.7  | 1703.1 |
| 1931-32          | 1718.6 | 1563.1 | 1511.2 | 1360.4 | 1022.3 | 176.1  | 10.0   | 0.0    | 0.0    | 0.0    | 0.0   | 0.0    | 0.0    | 0.0    |
| <b>ARROW</b>     |        |        |        |        |        |        |        |        |        |        |       |        |        |        |
| 1928-29          | 3579.6 | 3575.0 | 3406.3 | 3222.4 | 2994.6 | 2295.6 | 1542.9 | 1352.6 | 1362.7 | 817.3  | 334.0 | 1075.9 | 2406.5 | 3372.8 |
| 1929-30          | 3543.3 | 3506.7 | 3208.9 | 3199.4 | 2860.8 | 1717.5 | 801.5  | 848.8  | 774.0  | 426.1  | 284.7 | 689.0  | 1801.4 | 3005.2 |
| 1930-31          | 3166.6 | 3092.2 | 3055.2 | 3095.0 | 2869.1 | 1580.3 | 800.8  | 592.5  | 561.0  | 360.7  | 25.2  | 486.8  | 1652.3 | 1698.8 |
| 1931-32          | 1722.3 | 1653.1 | 1607.0 | 1323.7 | 696.9  | 614.5  | 99.1   | 0.0    | 0.0    | 0.0    | 0.0   | 0.0    | 0.0    | 0.0    |
| <b>DUNCAN</b>    |        |        |        |        |        |        |        |        |        |        |       |        |        |        |
| 1928-29          | 705.8  | 702.0  | 665.0  | 640.0  | 472.3  | 420.0  | 240.0  | 170.0  | 123.0  | 117.9  | 126.3 | 243.8  | 518.6  | 705.5  |
| 1929-30          | 705.8  | 684.8  | 685.5  | 660.2  | 476.9  | 240.0  | 63.8   | 40.0   | 2.1    | 11.9   | 21.6  | 118.6  | 329.4  | 523.7  |
| 1930-31          | 586.6  | 653.7  | 660.0  | 640.0  | 470.6  | 240.3  | 61.1   | 40.0   | 1.8    | 8.6    | 8.3   | 70.0   | 307.9  | 510.0  |
| 1931-32          | 480.0  | 450.0  | 430.0  | 250.0  | 100.0  | 2.0    | 1.0    | 0.0    | 0.0    | 0.0    | 0.0   | 0.0    | 0.0    | 0.0    |
| <b>COMPOSITE</b> |        |        |        |        |        |        |        |        |        |        |       |        |        |        |
| 1928-29          | 7814.6 | 7806.2 | 7412.2 | 6971.4 | 6474.8 | 5310.4 | 3562.7 | 2744.0 | 2711.5 | 1458.7 | 664.6 | 1984.2 | 5237.1 | 7453.0 |
| 1929-30          | 7760.1 | 7670.2 | 7005.0 | 6437.3 | 5070.1 | 3632.7 | 1577.9 | 1454.6 | 1337.8 | 477.7  | 319.2 | 1459.5 | 3989.0 | 6498.8 |
| 1930-31          | 6871.4 | 6793.4 | 6707.6 | 6302.8 | 5066.8 | 3321.7 | 1538.7 | 1191.9 | 1109.0 | 435.2  | 34.6  | 556.8  | 2738.9 | 3911.9 |
| 1931-32          | 3920.9 | 3666.2 | 3548.2 | 2934.1 | 1819.2 | 792.6  | 110.1  | 0.0    | 0.0    | 0.0    | 0.0   | 0.0    | 0.0    | 0.0    |

TABLE 4  
(English Units)  
MICA

ASSURED AND VARIABLE REFILL CURVES  
LIMITING RULE CURVE AND POWER DISCHARGE REQUIREMENTS  
2001 - 02 ASSURED OPERATING PLAN

|   | AUG15      | AUG31  | SEP    | OCT    | NOV    | DEC    | JAN    | FEB    | MAR    | APR15  | APR30  | MAY    | JUN    | JUL    |
|---|------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| <b>ASSURED REFILL CURVE (KSFD)</b>                          | 1164.0     | 1728.2 | 2331.5 | 2509.8 | 2575.1 | 2591.6 | 2586.4 | 2099.0 | 1578.8 | 1349.0 | 1127.2 | 1315.1 | 2460.4 | 3529.2 |
| <b>VARIABLE REFILL CURVES (KSFD)</b>                        |            |        |        |        |        |        |        |        |        |        |        |        |        |        |
| 1928-29   |            |        |        |        |        |        | 2977.6 | 2676.1 | 2423.2 | 2297.3 | 2247.9 | 2145.7 | 2830.8 | 3529.2 |
| 1929-30   |            |        |        |        |        |        | 1953.6 | 1612.5 | 1349.0 | 1242.6 | 1325.2 | 1533.1 | 2546.6 | "      |
| 1930-31   |            |        |        |        |        |        | 2213.1 | 1880.9 | 1613.2 | 1484.8 | 1497.9 | 1553.2 | 2621.8 | "      |
| 1931-32   |            |        |        |        |        |        | 833.4  | 704.3  | 659.7  | 582.6  | 647.9  | 1044.4 | 2440.3 | "      |
| 1932-33   |            |        |        |        |        |        | 737.7  | 644.0  | 616.7  | 517.6  | 556.7  | 940.7  | 2276.9 | "      |
| 1933-34   |            |        |        |        |        |        | 651.6  | 399.3  | 0.0    | 0.1    | 0.0    | 886.7  | 2529.6 | "      |
| 1934-35   |            |        |        |        |        |        | 1369.5 | 1181.0 | 1081.9 | 990.8  | 1005.9 | 1230.5 | 2379.5 | "      |
| 1935-36   |            |        |        |        |        |        | 1244.8 | 1033.9 | 901.7  | 787.4  | 828.8  | 1195.2 | 2644.6 | "      |
| 1936-37   |            |        |        |        |        |        | 2965.8 | 2643.7 | 2376.0 | 2239.3 | 2238.2 | 2159.4 | 2863.1 | "      |
| 1937-38   |            |        |        |        |        |        | 1110.9 | 998.8  | 954.6  | 861.5  | 909.7  | 1269.6 | 2531.8 | "      |
| 1938-39   |            |        |        |        |        |        | 2017.2 | 1753.5 | 1499.5 | 1397.2 | 1432.7 | 1576.7 | 2854.6 | "      |
| 1939-40   |            |        |        |        |        |        | 1804.2 | 1496.6 | 1259.7 | 1151.5 | 1209.1 | 1369.6 | 2614.4 | "      |
| 1940-41   |            |        |        |        |        |        | 2395.0 | 2083.7 | 1835.7 | 1726.4 | 1821.0 | 1933.5 | 2844.6 | "      |
| 1941-42   |            |        |        |        |        |        | 1880.0 | 1691.8 | 1567.6 | 1447.6 | 1460.7 | 1654.7 | 2709.1 | "      |
| 1942-43   |            |        |        |        |        |        | 1746.6 | 1612.4 | 1570.6 | 1467.4 | 1563.7 | 1902.4 | 2770.2 | "      |
| 1943-44   |            |        |        |        |        |        | 3080.1 | 2735.3 | 2481.4 | 2347.7 | 2324.8 | 2266.6 | 3001.8 | "      |
| 1944-45   |            |        |        |        |        |        | 2904.1 | 2622.6 | 2403.9 | 2289.7 | 2251.2 | 2172.5 | 2914.7 | "      |
| 1945-46   |            |        |        |        |        |        | 651.6  | 399.3  | 340.9  | 231.9  | 289.8  | 737.6  | 2434.7 | "      |
| 1946-47   |            |        |        |        |        |        | "      | 560.0  | 542.5  | 454.8  | 533.1  | 1004.2 | 2505.2 | "      |
| 1947-48   |            |        |        |        |        |        | "      | 488.3  | 455.5  | 341.9  | 386.3  | 797.9  | 2391.9 | "      |
| 1948-49   |            |        |        |        |        |        | 2293.9 | 2159.4 | 2101.3 | 1997.1 | 2010.2 | 2185.9 | 3163.4 | "      |
| 1949-50   |            |        |        |        |        |        | 953.3  | 804.4  | 748.2  | 638.9  | 682.6  | 1021.0 | 2203.2 | "      |
| 1950-51   |            |        |        |        |        |        | 944.5  | 843.3  | 819.2  | 727.6  | 798.3  | 1141.2 | 2564.7 | "      |
| 1951-52   |            |        |        |        |        |        | 1351.2 | 1207.4 | 1158.2 | 1042.7 | 1076.5 | 1439.2 | 2712.0 | "      |
| 1952-53   |            |        |        |        |        |        | 1632.3 | 1506.5 | 1467.1 | 1363.9 | 1370.6 | 1595.7 | 2678.9 | "      |
| 1953-54   |            |        |        |        |        |        | 651.6  | 399.3  | 378.7  | 283.1  | 332.1  | 713.3  | 2175.3 | "      |
| 1954-55   |            |        |        |        |        |        | 1268.0 | 1170.2 | 1146.9 | 1056.9 | 1095.1 | 1364.8 | 2369.7 | "      |
| 1955-56   |            |        |        |        |        |        | 816.5  | 701.0  | 656.5  | 549.9  | 599.1  | 1038.2 | 2479.2 | "      |
| 1956-57   |            |        |        |        |        |        | 985.0  | 862.3  | 832.6  | 738.0  | 784.6  | 1125.1 | 2809.8 | "      |
| 1957-58   |            |        |        |        |        |        | 818.8  | 709.0  | 685.6  | 596.5  | 661.2  | 1020.9 | 2572.3 | "      |
| <b>LIMITING RULE CURVE (KSFD)</b>                           |            |        |        |        |        |        | 651.6  | 399.3  | 0.0    | 0.1    |        |        |        |        |
| <b>POWER DISCHARGE REQUIREMENTS (CFS):</b>                  |            |        |        |        |        |        |        |        |        |        |        |        |        |        |
| <b>ASSURED REFILL CURVES</b>                                | 3000       | 3000   | 3000   | 3000   | 3000   | 3000   | 3000   | 20000  | 20000  | 20000  | 22000  | 22000  | 22000  | 22000  |
| <b>VARIABLE REFILL CURVES (VOLUME RUNOFF AT THE DALLES)</b> | 80 MAF --  |        |        |        |        |        | 3000   | 10000  | 10000  | 10000  | 12000  | 20000  | 20000  | 20000  |
|   | 95 MAF --  |        |        |        |        |        | 3000   | 3000   | 3000   | 8000   | 10000  | 12000  | 15000  | 18000  |
|   | 110 MAF -- |        |        |        |        |        | 3000   | 3000   | 3000   | 8000   | 10000  | 12000  | 15000  | 18000  |

| TABLE 5<br>(English Units)<br>ARROW  |        |        |        |        |        |        |        |        |        |        |        |        |        |  |
|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--|
| ASSURED AND VARIABLE REFILL CURVES<br>LIMITING RULE CURVE AND POWER DISCHARGE REQUIREMENTS<br>2001 - 02 ASSURED OPERATING PLAN |        |        |        |        |        |        |        |        |        |        |        |        |        |  |
| AUG15  | AUG31  | SEP    | OCT    | NOV    | DEC    | JAN    | FEB    | MAR    | APR15  | APR30  | MAY    | JUN    | JUL    |  |
| <b>ASSURED REFILL CURVE (KSFD)</b>   |        |        |        |        |        |        |        |        |        |        |        |        |        |  |
| 141.3  | 1062.9 | 2293.4 | 2825.7 | 3061.3 | 3526.9 | 3579.6 | 3290.2 | 2807.7 | 2598.0 | 2377.3 | 2750.5 | 3514.2 | 3579.6 |  |
| <b>VARIABLE REFILL CURVES (KSFD)</b>   |        |        |        |        |        |        |        |        |        |        |        |        |        |  |
| 1928-29  |        |        |        |        |        | 3213.3 | 3086.3 | 3030.7 | 2992.8 | 3285.9 | 3450.4 | 3579.6 | 3579.6 |  |
| 1929-30  |        |        |        |        |        | 2216.7 | 1974.8 | 1746.6 | 1619.9 | 2050.2 | 2841.9 | 3578.6 | "      |  |
| 1930-31  |        |        |        |        |        | 2424.9 | 2137.0 | 1886.6 | 1870.6 | 2254.4 | 2676.7 | 3579.6 | "      |  |
| 1931-32  |        |        |        |        |        | 771.0  | 435.5  | 0.0    | 210.5  | 555.5  | 1384.4 | 2904.7 | "      |  |
| 1932-33  |        |        |        |        |        | "      | 682.6  | 667.9  | 702.4  | 927.1  | 1556.5 | 2853.2 | "      |  |
| 1933-34  |        |        |        |        |        | "      | 435.5  | 194.9  | 289.4  | 814.4  | 1970.1 | 3371.3 | "      |  |
| 1934-35  |        |        |        |        |        | 1264.9 | 1161.6 | 1148.5 | 1154.8 | 1333.9 | 1920.6 | 3042.2 | "      |  |
| 1935-36  |        |        |        |        |        | 1397.3 | 1182.1 | 990.0  | 921.6  | 1078.8 | 1931.4 | 3489.4 | "      |  |
| 1936-37  |        |        |        |        |        | 3533.5 | 3352.7 | 3297.2 | 3220.0 | 3522.2 | 3579.6 | 3579.6 | "      |  |
| 1937-38  |        |        |        |        |        | 1290.1 | 1222.3 | 1216.1 | 1284.7 | 1490.0 | 2042.5 | 3213.3 | "      |  |
| 1938-39  |        |        |        |        |        | 2352.7 | 2053.1 | 1764.4 | 1669.7 | 2142.0 | 2761.8 | 3579.6 | "      |  |
| 1939-40  |        |        |        |        |        | 2085.5 | 1832.4 | 1596.9 | 1567.8 | 1916.3 | 2541.9 | "      | "      |  |
| 1940-41  |        |        |        |        |        | 2876.1 | 2617.5 | 2610.6 | 2711.9 | 3304.5 | 3579.6 | "      | "      |  |
| 1941-42  |        |        |        |        |        | 2433.2 | 2280.2 | 2170.6 | 2226.5 | 2630.3 | 3008.1 | "      | "      |  |
| 1942-43  |        |        |        |        |        | 2479.2 | 2344.1 | 2306.1 | 2417.4 | 2870.5 | 3388.4 | "      | "      |  |
| 1943-44  |        |        |        |        |        | 3579.6 | 3579.6 | 3579.6 | 3579.6 | 3579.6 | 3579.6 | "      | "      |  |
| 1944-45  |        |        |        |        |        | 3255.7 | 3207.2 | 3253.3 | 3254.1 | 3527.8 | "      | "      | "      |  |
| 1945-46  |        |        |        |        |        | 771.0  | 592.8  | 579.5  | 617.4  | 864.7  | 1550.7 | 3053.7 | "      |  |
| 1946-47  |        |        |        |        |        | 1178.8 | 1031.3 | 1006.7 | 1063.4 | 1308.6 | 1946.5 | 3181.1 | "      |  |
| 1947-48  |        |        |        |        |        | 931.1  | 873.9  | 850.6  | 854.5  | 1033.1 | 1631.9 | 3056.3 | "      |  |
| 1948-49  |        |        |        |        |        | 1555.9 | 1503.6 | 1967.0 | 2115.3 | 2544.8 | 3078.8 | 3579.6 | "      |  |
| 1949-50  |        |        |        |        |        | 899.0  | 795.7  | 796.4  | 833.4  | 1036.2 | 1573.2 | 2738.6 | "      |  |
| 1950-51  |        |        |        |        |        | 1187.8 | 1131.2 | 1140.8 | 1144.3 | 1375.4 | 1917.9 | 3316.3 | "      |  |
| 1951-52  |        |        |        |        |        | 1237.0 | 1134.4 | 1129.7 | 1139.6 | 1317.6 | 2099.8 | 3430.6 | "      |  |
| 1952-53  |        |        |        |        |        | 1623.0 | 1522.6 | 1515.8 | 1550.7 | 1917.9 | 2381.1 | 3378.4 | "      |  |
| 1953-54  |        |        |        |        |        | 771.0  | 435.5  | 382.0  | 435.4  | 652.6  | 1255.3 | 2727.4 | "      |  |
| 1954-55  |        |        |        |        |        | 949.7  | 910.7  | 926.9  | 943.1  | 1150.7 | 1684.6 | 2704.9 | "      |  |
| 1955-56  |        |        |        |        |        | 771.0  | 572.7  | 562.9  | 595.1  | 830.0  | 1615.7 | 3071.5 | "      |  |
| 1956-57  |        |        |        |        |        | "      | 606.6  | 588.9  | 609.8  | 848.0  | 1456.5 | 3525.5 | "      |  |
| 1957-58  |        |        |        |        |        | "      | 435.5  | 455.6  | 557.8  | 850.9  | 1484.3 | 3187.5 | "      |  |
| <b>LIMITING RULE CURVE (KSFD)</b>  |        |        |        |        |        | 771.0  | 435.5  | 0.0    | 0.6    |        |        |        |        |  |
| <b>POWER DISCHARGE REQUIREMENTS (CFS):</b>   |        |        |        |        |        |        |        |        |        |        |        |        |        |  |
| <b>ASSURED REFILL CURVES</b>   |        |        |        |        |        |        |        |        |        |        |        |        |        |  |
| 5000   | 5000   | 5000   | 5000   | 5000   | 5000   | 5000   | 40000  | 40000  | 40000  | 50000  | 50000  | 51000  | 52000  |  |
| <b>VARIABLE REFILL CURVES (VOLUME RUNOFF AT THE DALLES)</b>  |        |        |        |        |        |        |        |        |        |        |        |        |        |  |
| 80 MAF -   |        |        |        |        |        | 5000   | 18000  | 20000  | 20000  | 22000  | 30000  | 42000  | 44000  |  |
| 95 MAF -   |        |        |        |        |        | 5000   | 5000   | 5000   | 8000   | 20000  | 27000  | 37000  | 37000  |  |
| 110 MAF -  |        |        |        |        |        | 5000   | 5000   | 5000   | 8000   | 20000  | 27000  | 37000  | 37000  |  |

| TABLE 6<br>(English Units)<br>DUNCAN<br>ASSURED AND VARIABLE REFILL CURVES<br>LIMITING RULE CURVE AND POWER DISCHARGE REQUIREMENTS<br>2001 - 02 ASSURED OPERATING PLAN |           |       |       |       |       |       |       |       |       |       |       |       |       |       |
|--|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|  | AUG15     | AUG31 | SEP   | OCT   | NOV   | DEC   | JAN   | FEB   | MAR   | APR15 | APR30 | MAY   | JUN   | JUL   |
| <u>ASSURED REFILL CURVE (KSFD)</u>   | 114.3     | 185.2 | 251.5 | 282.2 | 299.7 | 310.9 | 321.1 | 291.1 | 261.8 | 254.0 | 246.2 | 360.0 | 540.9 | 705.8 |
| <u>VARIABLE REFILL CURVES (KSFD)</u>   |           |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 1928-29  |           |       |       |       |       |       | 449.0 | 439.3 | 442.7 | 449.8 | 454.2 | 490.4 | 616.9 | 705.8 |
| 1929-30  |           |       |       |       |       |       | 447.3 | 437.3 | 440.4 | 447.2 | 465.6 | 511.1 | 628.3 | "     |
| 1930-31  |           |       |       |       |       |       | 391.9 | 383.1 | 389.7 | 401.7 | 412.5 | 460.0 | 616.9 | "     |
| 1931-32  |           |       |       |       |       |       | 64.2  | 56.3  | 70.1  | 87.4  | 136.9 | 274.4 | 529.1 | "     |
| 1932-33  |           |       |       |       |       |       | 59.1  | 16.0  | 0.0   | 0.0   | 0.0   | 96.6  | 394.7 | "     |
| 1933-34  |           |       |       |       |       |       | "     | 63.7  | 82.8  | 106.1 | 182.7 | 334.6 | 587.1 | "     |
| 1934-35  |           |       |       |       |       |       | 165.3 | 163.9 | 180.9 | 192.9 | 216.1 | 323.0 | 526.4 | "     |
| 1935-36  |           |       |       |       |       |       | 121.9 | 115.0 | 121.8 | 131.6 | 157.2 | 295.6 | 560.5 | "     |
| 1936-37  |           |       |       |       |       |       | 396.9 | 387.1 | 392.2 | 399.2 | 404.5 | 452.4 | 599.1 | "     |
| 1937-38  |           |       |       |       |       |       | 134.9 | 134.3 | 146.0 | 162.2 | 198.7 | 330.3 | 553.7 | "     |
| 1938-39  |           |       |       |       |       |       | 243.9 | 240.5 | 249.3 | 260.4 | 281.6 | 371.8 | 599.7 | "     |
| 1939-40  |           |       |       |       |       |       | 227.3 | 229.3 | 245.4 | 266.1 | 288.7 | 373.9 | 588.3 | "     |
| 1940-41  |           |       |       |       |       |       | 309.3 | 308.1 | 320.2 | 342.1 | 371.9 | 451.3 | 612.0 | "     |
| 1941-42  |           |       |       |       |       |       | 272.4 | 273.5 | 285.9 | 298.9 | 322.8 | 418.6 | 591.9 | "     |
| 1942-43  |           |       |       |       |       |       | 265.7 | 260.6 | 270.5 | 281.3 | 316.1 | 441.3 | 586.6 | "     |
| 1943-44  |           |       |       |       |       |       | 465.1 | 460.8 | 469.1 | 478.3 | 484.2 | 523.5 | 647.1 | "     |
| 1944-45  |           |       |       |       |       |       | 382.2 | 378.3 | 387.3 | 396.6 | 403.1 | 452.4 | 605.1 | "     |
| 1945-46  |           |       |       |       |       |       | 59.1  | 16.0  | 12.6  | 24.1  | 65.5  | 220.1 | 522.5 | "     |
| 1946-47  |           |       |       |       |       |       | "     | 40.2  | 51.3  | 65.3  | 108.6 | 263.2 | 535.2 | "     |
| 1947-48  |           |       |       |       |       |       | 92.1  | 88.8  | 101.2 | 111.7 | 145.1 | 280.3 | 545.5 | "     |
| 1948-49  |           |       |       |       |       |       | 320.7 | 312.4 | 318.8 | 326.7 | 352.6 | 454.6 | 647.4 | "     |
| 1949-50  |           |       |       |       |       |       | 123.7 | 116.4 | 125.4 | 134.3 | 165.2 | 289.1 | 489.7 | "     |
| 1950-51  |           |       |       |       |       |       | 59.1  | 42.9  | 58.5  | 68.2  | 110.0 | 254.7 | 520.7 | "     |
| 1951-52  |           |       |       |       |       |       | 153.2 | 147.4 | 159.5 | 169.9 | 202.4 | 339.7 | 565.8 | "     |
| 1952-53  |           |       |       |       |       |       | 152.1 | 146.6 | 157.9 | 169.0 | 199.5 | 318.0 | 532.1 | "     |
| 1953-54  |           |       |       |       |       |       | 59.1  | 16.0  | 0.0   | 0.0   | 36.1  | 181.7 | 462.8 | "     |
| 1954-55  |           |       |       |       |       |       | 89.9  | 86.3  | 97.6  | 110.1 | 142.2 | 267.6 | 466.5 | "     |
| 1955-56  |           |       |       |       |       |       | 59.1  | 16.0  | 9.0   | 19.9  | 59.7  | 228.3 | 518.4 | "     |
| 1956-57  |           |       |       |       |       |       | 104.3 | 94.5  | 103.0 | 114.2 | 150.9 | 281.8 | 582.7 | "     |
| 1957-58  |           |       |       |       |       |       | 59.1  | 16.0  | 19.4  | 33.3  | 73.4  | 219.0 | 534.5 | "     |
| <u>LIMITING RULE CURVE (KSFD)</u>  |           |       |       |       |       |       | 59.1  | 16.0  | 0.0   | 0.0   |       |       |       |       |
| <u>POWER DISCHARGE REQUIREMENTS (CFS):</u>   |           |       |       |       |       |       |       |       |       |       |       |       |       |       |
| ASSURED REFILL CURVES  | 100       | 100   | 100   | 100   | 100   | 100   | 1500  | 1500  | 1500  | 1500  | 1500  | 2000  | 2000  | 2000  |
| VARIABLE REFILL CURVES (VOLUME RUNOFF AT THE DALLES)   | 80 MAF -  |       |       |       |       |       | 100   | 100   | 100   | 100   | 1500  | 1800  | 2700  | 2900  |
|  | 95 MAF -  |       |       |       |       |       | 100   | 100   | 100   | 100   | 400   | 600   | 2700  | 2900  |
|  | 110 MAF - |       |       |       |       |       | 100   | 100   | 100   | 100   | 400   | 600   | 2700  | 2900  |

TABLE 7  
(English Units)  
MICA  
UPPER RULE CURVES (FLOOD CONTROL)  
END OF PERIOD TREATY STORAGE CONTENTS (KSFD)  
2001 - 02 ASSURED OPERATING PLAN

| YEAR    | AUG15  | AUG31  | SEP    | OCT    | NOV    | DEC    | JAN    | FEB    | MAR    | APR15  | APR30  | MAY    | JUN    | JUL    |
|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 1928-29 | 3529.2 | 3529.2 | 3529.2 | 3428.4 | 3428.4 | 3428.4 | 3385.7 | 3347.2 | 3304.6 | 3304.6 | 3304.6 | 3369.1 | 3447.9 | 3529.2 |
| 1929-30 | "      | "      | "      | "      | "      | "      | 3352.6 | 3284.4 | 3208.7 | 3208.7 | 3208.7 | 3300.7 | 3413.2 | "      |
| 1930-31 | "      | "      | "      | "      | "      | "      | 3428.4 | 3428.4 | 3428.4 | 3428.4 | 3428.4 | 3457.3 | 3492.7 | "      |
| 1931-32 | "      | "      | "      | "      | "      | "      | 3105.7 | 2803.2 | 2480.5 | 2480.5 | 2480.5 | 2781.5 | 3149.6 | "      |
| 1932-33 | "      | "      | "      | "      | "      | "      | 3101.7 | 2807.2 | "      | "      | "      | "      | "      | "      |
| 1933-34 | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      |
| 1934-35 | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      |
| 1935-36 | "      | "      | "      | "      | "      | "      | 3105.7 | 2803.2 | "      | "      | "      | "      | "      | "      |
| 1936-37 | "      | "      | "      | "      | "      | "      | 3330.6 | 3242.3 | 3144.5 | 3144.5 | 3144.5 | 3323.3 | 3398.4 | "      |
| 1937-38 | "      | "      | "      | "      | "      | "      | 3101.7 | 2807.2 | 2480.5 | 2480.5 | 2480.5 | 2781.5 | 3149.6 | "      |
| 1938-39 | "      | "      | "      | "      | "      | "      | 3193.8 | 2981.4 | 2746.8 | 2746.8 | 2746.8 | 2971.4 | 3246.0 | "      |
| 1939-40 | "      | "      | "      | "      | "      | "      | 3274.3 | 3130.5 | 2976.4 | 2976.4 | 2976.4 | 3135.1 | 3329.1 | "      |
| 1940-41 | "      | "      | "      | "      | "      | "      | 3428.4 | 3428.4 | 3428.4 | 3428.4 | 3428.4 | 3457.3 | 3492.7 | "      |
| 1941-42 | "      | "      | "      | "      | "      | "      | 3101.7 | 2807.2 | 2480.5 | 2480.5 | 2480.5 | 2781.5 | 3149.6 | "      |
| 1942-43 | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      |
| 1943-44 | "      | "      | "      | "      | "      | "      | 3428.4 | 3428.4 | 3428.4 | 3428.4 | 3428.4 | 3457.3 | 3492.7 | "      |
| 1944-45 | "      | "      | "      | "      | "      | "      | 3193.1 | 2980.2 | 2745.0 | 2745.0 | 2745.0 | 2970.0 | 3245.3 | "      |
| 1945-46 | "      | "      | "      | "      | "      | "      | 3101.7 | 2807.2 | 2480.5 | 2480.5 | 2480.5 | 2781.5 | 3149.6 | "      |
| 1946-47 | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      |
| 1947-48 | "      | "      | "      | "      | "      | "      | 3105.7 | 2803.2 | "      | "      | "      | "      | "      | "      |
| 1948-49 | "      | "      | "      | "      | "      | "      | 3101.7 | 2807.2 | "      | "      | "      | "      | "      | "      |
| 1949-50 | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      |
| 1950-51 | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      |
| 1951-52 | "      | "      | "      | "      | "      | "      | 3105.7 | 2803.2 | "      | "      | "      | "      | "      | "      |
| 1952-53 | "      | "      | "      | "      | "      | "      | 3101.7 | 2807.2 | "      | "      | "      | "      | "      | "      |
| 1953-54 | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      |
| 1954-55 | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      |
| 1955-56 | "      | "      | "      | "      | "      | "      | 3105.7 | 2803.2 | "      | "      | "      | 2695.5 | 3172.7 | "      |
| 1956-57 | "      | "      | "      | "      | "      | "      | 3101.7 | 2807.2 | "      | "      | "      | 2781.5 | 3149.6 | "      |
| 1957-58 | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      |

TABLE 8  
(English Units)  
ARROW  
UPPER RULE CURVES (FLOOD CONTROL)  
END OF PERIOD TREATY STORAGE CONTENTS (KSFD)  
2001 - 02 ASSURED OPERATING PLAN

| YEAR    | AUG15  | AUG31  | SEP    | OCT    | NOV    | DEC    | JAN    | FEB    | MAR    | APR15  | APR30  | MAY    | JUN    | JUL    |
|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 1928-29 | 3579.6 | 3579.6 | 3579.6 | 3453.6 | 3453.6 | 3075.4 | 3075.4 | 3075.4 | 3075.4 | 3088.5 | 3111.2 | 3235.8 | 3579.6 | 3579.6 |
| 1929-30 | "      | "      | "      | "      | "      | "      | 2998.3 | 2928.3 | 2851.2 | 2870.1 | 2902.9 | 3082.8 | "      | "      |
| 1930-31 | "      | "      | "      | "      | "      | "      | 3075.4 | 3075.4 | 3075.4 | 3088.5 | 3111.2 | 3235.8 | "      | "      |
| 1931-32 | "      | "      | "      | "      | "      | "      | 2371.6 | 1712.7 | 1008.3 | 1016.0 | 1126.6 | 2224.5 | "      | "      |
| 1932-33 | "      | "      | "      | "      | "      | "      | 2363.5 | 1720.2 | "      | 1008.3 | 1036.6 | 1761.7 | 3034.5 | "      |
| 1933-34 | "      | "      | "      | "      | "      | "      | "      | "      | "      | "      | 1784.9 | 2327.4 | 3579.6 | "      |
| 1934-35 | "      | "      | "      | "      | "      | "      | 2371.6 | 1712.7 | "      | "      | 1008.3 | 1725.7 | 3034.5 | "      |
| 1935-36 | "      | "      | "      | "      | "      | "      | 2940.8 | 2818.8 | 2684.1 | 2707.4 | 2755.8 | 3266.2 | "      | "      |
| 1936-37 | "      | "      | "      | "      | "      | "      | 2363.5 | 1720.2 | 1008.3 | 1082.9 | 1278.3 | 1831.1 | 3147.6 | "      |
| 1937-38 | "      | "      | "      | "      | "      | "      | 2584.5 | 2141.3 | 1650.3 | 1719.8 | 1843.2 | 2661.3 | 3579.6 | "      |
| 1938-39 | "      | "      | "      | "      | "      | "      | 2793.3 | 2529.4 | 2247.3 | 2287.2 | 2380.5 | 2913.4 | "      | "      |
| 1939-40 | "      | "      | "      | "      | "      | "      | 3075.4 | 3075.4 | 3075.4 | 3088.5 | 3111.2 | 3235.8 | "      | "      |
| 1940-41 | "      | "      | "      | "      | "      | "      | 2363.5 | 1720.2 | 1008.3 | 1064.9 | 1149.8 | 1934.0 | "      | "      |
| 1941-42 | "      | "      | "      | "      | "      | "      | "      | "      | "      | 1111.2 | 1322.0 | 1440.3 | 2389.1 | "      |
| 1942-43 | "      | "      | "      | "      | "      | "      | 3075.4 | 3075.4 | 3075.4 | 3088.5 | 3111.2 | 3235.8 | 3579.6 | "      |
| 1943-44 | "      | "      | "      | "      | "      | "      | 2582.9 | 2138.0 | 1645.5 | 1672.5 | 1744.1 | 2368.8 | 3347.5 | "      |
| 1944-45 | "      | "      | "      | "      | "      | "      | 2363.5 | 1720.2 | 1008.3 | 1072.6 | 1242.3 | 2201.4 | 3579.6 | "      |
| 1945-46 | "      | "      | "      | "      | "      | "      | "      | "      | "      | 1075.2 | 1360.6 | 2147.4 | "      | "      |
| 1946-47 | "      | "      | "      | "      | "      | "      | 2371.6 | 1712.7 | "      | 1036.6 | 1183.2 | 2216.8 | "      | "      |
| 1947-48 | "      | "      | "      | "      | "      | "      | 2363.5 | 1720.2 | "      | 1144.6 | 1376.0 | 2494.5 | "      | "      |
| 1948-49 | "      | "      | "      | "      | "      | "      | "      | "      | "      | 1008.3 | 1008.3 | 1113.8 | 2232.3 | "      |
| 1949-50 | "      | "      | "      | "      | "      | "      | 2371.6 | 1712.7 | "      | "      | "      | 1355.5 | 3337.9 | "      |
| 1950-51 | "      | "      | "      | "      | "      | "      | 2363.5 | 1720.2 | "      | 1070.0 | 1345.2 | 1792.6 | 3013.9 | "      |
| 1951-52 | "      | "      | "      | "      | "      | "      | "      | "      | "      | 1057.2 | 1172.9 | 1476.3 | "      | "      |
| 1952-53 | "      | "      | "      | "      | "      | "      | 2371.6 | 1712.7 | "      | 1070.0 | 1345.2 | 1792.6 | 3013.9 | "      |
| 1953-54 | "      | "      | "      | "      | "      | "      | 2363.5 | 1720.2 | "      | 1075.2 | 1134.3 | 1628.0 | 1898.0 | "      |
| 1954-55 | "      | "      | "      | "      | "      | "      | "      | "      | "      | 1075.2 | 1090.6 | 1653.7 | 3224.8 | "      |
| 1955-56 | "      | "      | "      | "      | "      | "      | 2371.6 | 1712.7 | "      | 1008.3 | 1216.6 | 1990.6 | 2993.4 | "      |
| 1956-57 | "      | "      | "      | "      | "      | "      | 2363.5 | 1720.2 | "      | 1077.8 | 1224.3 | 2651.4 | 3579.6 | "      |
| 1957-58 | "      | "      | "      | "      | "      | "      | "      | "      | "      | 1046.9 | 1190.9 | 2242.5 | "      | "      |

TABLE 9  
(English Units)  
DUNCAN  
UPPER RULE CURVES (FLOOD CONTROL)  
END OF PERIOD TREATY STORAGE CONTENTS (KSFD)  
2001 - 02 ASSURED OPERATING PLAN

| YEAR    | AUG15 | AUG31 | SEP   | OCT   | NOV   | DEC   | JAN   | FEB   | MAR   | APR15 | APR30 | MAY   | JUN   | JUL   |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1928-29 | 705.8 | 705.8 | 705.8 | 705.8 | 705.8 | 504.1 | 418.3 | 340.8 | 340.8 | 348.1 | 360.5 | 443.7 | 574.4 | 705.8 |
| 1929-30 | "     | "     | "     | "     | "     | "     | 408.4 | 322.1 | 322.1 | 329.8 | 342.8 | 430.3 | 567.7 | "     |
| 1930-31 | "     | "     | "     | "     | "     | "     | 391.0 | 288.9 | 288.9 | 297.2 | 311.4 | 406.4 | 555.7 | "     |
| 1931-32 | "     | "     | "     | "     | "     | "     | 277.3 | 65.5  | 65.5  | 80.9  | 109.1 | 281.3 | 609.8 | "     |
| 1932-33 | "     | "     | "     | "     | "     | "     | 273.7 | "     | "     | 75.1  | 94.3  | 191.6 | 573.3 | "     |
| 1933-34 | "     | "     | "     | "     | "     | "     | "     | "     | "     | 65.5  | 127.0 | 339.6 | 605.3 | "     |
| 1934-35 | "     | "     | "     | "     | "     | "     | "     | "     | "     | "     | 83.5  | 187.2 | 488.1 | "     |
| 1935-36 | "     | "     | "     | "     | "     | "     | 277.3 | "     | "     | 71.3  | 119.3 | 351.7 | 705.8 | "     |
| 1936-37 | "     | "     | "     | "     | "     | "     | 377.7 | 263.6 | 263.6 | 272.5 | 287.5 | 388.3 | 546.6 | "     |
| 1937-38 | "     | "     | "     | "     | "     | "     | 293.0 | 102.3 | 102.3 | 113.1 | 119.2 | 245.3 | 551.9 | "     |
| 1938-39 | "     | "     | "     | "     | "     | "     | 288.0 | 92.7  | 92.7  | 109.3 | 132.6 | 399.3 | 705.8 | "     |
| 1939-40 | "     | "     | "     | "     | "     | "     | 303.2 | 115.4 | 115.4 | 127.2 | 150.9 | 410.6 | "     | "     |
| 1940-41 | "     | "     | "     | "     | "     | "     | 345.5 | 202.1 | 202.1 | 212.2 | 229.3 | 344.2 | 524.5 | "     |
| 1941-42 | "     | "     | "     | "     | "     | "     | 328.5 | 169.9 | 169.9 | 179.0 | 201.5 | 438.9 | 705.8 | "     |
| 1942-43 | "     | "     | "     | "     | "     | "     | 333.0 | 178.4 | 178.4 | 192.2 | 221.1 | 289.2 | 653.1 | "     |
| 1943-44 | "     | "     | "     | "     | "     | "     | 416.4 | 334.7 | 334.7 | 342.1 | 354.7 | 439.4 | 572.2 | "     |
| 1944-45 | "     | "     | "     | "     | "     | "     | 384.9 | 277.3 | 277.3 | 278.6 | 279.4 | 493.7 | 705.8 | "     |
| 1945-46 | "     | "     | "     | "     | "     | "     | 273.7 | 65.5  | 65.5  | 75.7  | 95.6  | 322.3 | 647.5 | "     |
| 1946-47 | "     | "     | "     | "     | "     | "     | "     | "     | "     | 77.0  | 102.0 | 314.0 | 629.6 | "     |
| 1947-48 | "     | "     | "     | "     | "     | "     | 277.3 | "     | "     | 65.5  | 65.5  | 300.5 | 705.8 | "     |
| 1948-49 | "     | "     | "     | "     | "     | "     | 371.1 | 251.0 | 251.0 | 256.9 | 277.0 | 434.3 | "     | "     |
| 1949-50 | "     | "     | "     | "     | "     | "     | 273.7 | 65.5  | 65.5  | 65.5  | 65.5  | 183.9 | 525.3 | "     |
| 1950-51 | "     | "     | "     | "     | "     | "     | "     | "     | "     | "     | "     | 285.1 | 534.2 | "     |
| 1951-52 | "     | "     | "     | "     | "     | "     | 277.3 | "     | "     | "     | 67.4  | 92.4  | 255.0 | "     |
| 1952-53 | "     | "     | "     | "     | "     | "     | 273.7 | "     | "     | 71.9  | 84.7  | 234.6 | 522.7 | "     |
| 1953-54 | "     | "     | "     | "     | "     | "     | "     | "     | "     | 73.2  | 84.1  | 237.1 | 547.6 | "     |
| 1954-55 | "     | "     | "     | "     | "     | "     | "     | "     | "     | 71.9  | 80.9  | 154.5 | 488.8 | "     |
| 1955-56 | "     | "     | "     | "     | "     | "     | 277.3 | "     | "     | 65.5  | 84.7  | 266.6 | 585.4 | "     |
| 1956-57 | "     | "     | "     | "     | "     | "     | 273.7 | "     | "     | 74.5  | 89.9  | 376.1 | 655.8 | "     |
| 1957-58 | "     | "     | "     | "     | "     | "     | "     | "     | "     | 77.0  | 96.3  | 359.4 | 705.8 | "     |

TABLE 10  
(English Units)  
COMPOSITE OPERATING RULE CURVES  
FOR THE WHOLE OF CANADIAN STORAGE  
END OF PERIOD TREATY STORAGE CONTENTS (KSFD)  
2001 - 02 ASSURED OPERATING PLAN

| YEAR    | AUG15  | AUG31  | SEP    | OCT    | NOV    | DEC    | JAN    | FEB    | MAR    | APR15  | APR30  | MAY    | JUN    | JUL    |
|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 1928-29 | 7814.6 | 7806.2 | 7412.2 | 6971.4 | 6541.5 | 6090.2 | 5982.9 | 5465.5 | 4648.3 | 4201.0 | 3750.7 | 4425.6 | 6515.5 | 7814.6 |
| 1929-30 | "      | "      | "      | "      | "      | "      | 4491.4 | 3878.4 | 3357.4 | 3116.5 | 3423.6 | 4425.6 | 6515.5 | "      |
| 1930-31 | "      | "      | "      | "      | "      | "      | 4959.1 | 4306.8 | 3727.2 | 3473.6 | 3627.8 | 4351.8 | 6515.5 | "      |
| 1931-32 | "      | "      | "      | "      | "      | "      | 1668.6 | 1196.1 | 725.2  | 854.0  | 1312.5 | 2703.2 | 5874.1 | "      |
| 1932-33 | "      | "      | "      | "      | "      | "      | 1567.8 | 1342.6 | 1284.6 | 1220.0 | 1483.8 | 2593.8 | 5524.8 | "      |
| 1933-34 | "      | "      | "      | "      | "      | "      | 1481.7 | 898.5  | 260.4  | 355.0  | 941.4  | 2991.4 | 6372.6 | "      |
| 1934-35 | "      | "      | "      | "      | "      | "      | 2799.7 | 2408.1 | 2155.7 | 2064.6 | 2097.7 | 3143.4 | 5902.1 | "      |
| 1935-36 | "      | "      | "      | "      | "      | "      | 2764.0 | 2281.5 | 1957.2 | 1780.3 | 2026.9 | 3422.2 | 6490.7 | "      |
| 1936-37 | "      | "      | "      | "      | "      | "      | 5848.3 | 5181.4 | 4524.7 | 4201.0 | 3750.7 | 4425.6 | 6515.5 | "      |
| 1937-38 | "      | "      | "      | "      | "      | "      | 2535.9 | 2323.4 | 2065.2 | 2057.5 | 2307.2 | 3346.0 | 6148.9 | "      |
| 1938-39 | "      | "      | "      | "      | "      | "      | 4613.8 | 3899.3 | 3242.5 | 3128.0 | 3103.0 | 4336.4 | 6515.5 | "      |
| 1939-40 | "      | "      | "      | "      | "      | "      | 4117.0 | 3444.4 | 2972.0 | 2846.5 | 3194.4 | 4217.0 | 6515.5 | "      |
| 1940-41 | "      | "      | "      | "      | "      | "      | 5580.4 | 4903.3 | 4391.5 | 4159.2 | 3733.8 | 4409.8 | 6499.1 | "      |
| 1941-42 | "      | "      | "      | "      | "      | "      | 4515.9 | 3581.9 | 2745.8 | 2592.9 | 2478.5 | 3609.1 | 6515.5 | "      |
| 1942-43 | "      | "      | "      | "      | "      | "      | 4375.8 | 3511.0 | 2757.3 | 2652.4 | 2670.3 | 3044.6 | 5390.4 | "      |
| 1943-44 | "      | "      | "      | "      | "      | "      | 5982.9 | 5465.5 | 4648.3 | 4201.0 | 3750.7 | 4425.6 | 6515.5 | "      |
| 1944-45 | "      | "      | "      | "      | "      | "      | 5490.4 | 4514.3 | 3486.1 | 3275.5 | 3117.5 | 4043.9 | 6348.8 | "      |
| 1945-46 | "      | "      | "      | "      | "      | "      | 1481.7 | 1008.1 | 933.0  | 873.4  | 1220.0 | 2508.4 | 6010.9 | "      |
| 1946-47 | "      | "      | "      | "      | "      | "      | 1889.5 | 1631.5 | 1600.5 | 1583.5 | 1943.7 | 3213.9 | 6176.7 | "      |
| 1947-48 | "      | "      | "      | "      | "      | "      | 1674.8 | 1427.7 | 1371.6 | 1261.9 | 1484.9 | 2710.1 | 5989.1 | "      |
| 1948-49 | "      | "      | "      | "      | "      | "      | 4170.5 | 3853.6 | 2838.1 | 2747.6 | 2749.4 | 4169.6 | 6515.5 | "      |
| 1949-50 | "      | "      | "      | "      | "      | "      | 1976.0 | 1665.6 | 1610.1 | 1537.8 | 1756.4 | 2318.7 | 4925.2 | "      |
| 1950-51 | "      | "      | "      | "      | "      | "      | 2191.4 | 2017.4 | 1886.0 | 1801.4 | 1872.1 | 2751.4 | 6297.4 | "      |
| 1951-52 | "      | "      | "      | "      | "      | "      | 2741.4 | 2407.3 | 2232.0 | 2178.2 | 2461.5 | 3200.1 | 5729.3 | "      |
| 1952-53 | "      | "      | "      | "      | "      | "      | 3407.4 | 3094.6 | 2540.9 | 2478.1 | 2384.8 | 3026.0 | 5997.0 | "      |
| 1953-54 | "      | "      | "      | "      | "      | "      | 1481.7 | 850.8  | 760.7  | 718.5  | 1020.8 | 2150.3 | 4536.1 | "      |
| 1954-55 | "      | "      | "      | "      | "      | "      | 2307.6 | 2146.4 | 2139.3 | 2071.9 | 2266.6 | 3123.3 | 5541.1 | "      |
| 1955-56 | "      | "      | "      | "      | "      | "      | 1646.6 | 1289.7 | 1228.4 | 1164.9 | 1488.8 | 2882.2 | 5972.2 | "      |
| 1956-57 | "      | "      | "      | "      | "      | "      | 1860.3 | 1534.4 | 1487.0 | 1422.3 | 1722.5 | 2863.4 | 6515.5 | "      |
| 1957-58 | "      | "      | "      | "      | "      | "      | 1648.9 | 1160.5 | 1160.6 | 1187.6 | 1585.5 | 2724.2 | 6182.4 | "      |

Note: The above ORC's are limited to individual project flood control rule curves.

**TABLE 11**  
**(English Units)**  
**COMPARISON OF**  
**RECENT ASSURED OPERATING PLAN STUDIES**

|   | 1997-98 | 1998-99 | 1999-00 | 2000-01 | 2001-02 |
|---|---------|---------|---------|---------|---------|
| <b>MICA TARGET OPERATION<br/>(ksfd[xxxx.x] or cfs [xxxxx])</b>        |         |         |         |         |         |
| AUG 15  | 3456.2  | 3456.2  | 3456.2  | 3486.2  | 3486.2  |
| AUG 31  | FULL    | FULL    | FULL    | FULL    | FULL    |
| SEP   | FULL    | FULL    | FULL    | FULL    | FULL    |
| OCT   | 15000   | 11000   | 3428.2  | 3386.2  | 3396.2  |
| NOV   | 19000   | 3256.2  | 3176.2  | 3056.2  | 20000   |
| DEC   | 23000   | 2676.2  | 24000   | 25000   | 22000   |
| JAN   | 24000   | 24000   | 25000   | 26000   | 24000   |
| FEB   | 22000   | 22000   | 22000   | 23000   | 21000   |
| MAR   | 19000   | 22000   | 21000   | 22000   | 22000   |
| APR 15  | 106.2   | 86.2    | 156.2   | 26000   | 326.2   |
| APR 30  | 0.0     | 56.2    | 106.2   | 106.2   | 56.2    |
| MAY   | 10000   | 10000   | 10000   | 8000    | 10000   |
| JUN   | 10000   | 10000   | 10000   | 8000    | 10000   |
| JUL   | 3356.2  | 3406.2  | 3456.2  | 3456.2  | 3456.2  |
| <b>COMPOSITE CRC1 CANADIAN TREATY STORAGE CONTENT (ksfd)</b>          |         |         |         |         |         |
| 1928 AUG 31   | 7814.6  | 7814.6  | 7814.6  | 7814.6  | 7806.2  |
| 1928 DEC  | 5755.8  | 6250.9  | 5618.4  | 5402.7  | 5310.4  |
| 1929 APR15  | 678.7   | 1676.3  | 1763.1  | 1597.9  | 1458.7  |
| 1929 JUL  | 6863.4  | 7005.8  | 6916.0  | 7116.1  | 7453.0  |
| <b>COMPOSITE 50-YR AVERAGE CANADIAN TREATY STORAGE CONTENT (ksfd)</b> |         |         |         |         |         |
| AUG 31  | 7212.1  | 7323.8  | 7295.4  | 7389.8  | 7412.3  |
| DEC   | 5224.7  | 5584.3  | 5283.1  | 5157.8  | 5236.9  |
| APR15   | 729.7   | 888.6   | 1424.0  | 1150.7  | 1135.3  |
| JUL   | 7117.9  | 7110.7  | 7099.3  | 7273.7  | 7358.2  |
| <b>STEP I GAINS AND LOSSES DUE TO REOPERATION (MW)</b>                |         |         |         |         |         |
| U.S. Firm Energy  | -0.9    | -5.1    | -1.5    | -0.3    | 0.2     |
| U.S. Dependable Peaking Capacity                                      | -4.0    | 27.0    | 0.0     | -2.0    | 0.0     |
| U.S. Avg. Annual Usable Secondary Energy                              | 13.9    | 18.9    | 19.5    | 16.2    | 24.9    |
| BCH Firm Energy   | 46.7    | 26.7    | 102.2   | 60.8    | 48.3    |
| BCH Dependable Peaking Capacity                                       | 19.0    | 18.0    | -3.0    | -36.0   | 25.0    |
| BCH Avg. Annual Usable Secondary Energy                               | -43.5   | -18.5   | -42.9   | -43.6   | -29.7   |
| <b>COORDINATED HYDRO MODEL LOAD (MW)</b>                              |         |         |         |         |         |
| AUG 15  | 10223   | 10083   | 9793    | 10043   | 10422   |
| AUG 31  | 10259   | 10203   | 9925    | 10125   | 10439   |
| SEP   | 10121   | 9957    | 9630    | 10095   | 10434   |
| OCT   | 10153   | 9963    | 9764    | 10046   | 10388   |
| NOV   | 11452   | 11305   | 11297   | 11381   | 11626   |
| DEC   | 12582   | 12787   | 12766   | 12836   | 13012   |
| JAN   | 13477   | 13640   | 13725   | 13484   | 13382   |
| FEB   | 12664   | 12638   | 12674   | 12765   | 12502   |
| MAR   | 11948   | 11994   | 12113   | 11807   | 11667   |
| APR 15  | 12643   | 11671   | 11099   | 11332   | 11187   |
| APR 30  | 13437   | 12425   | 12672   | 13025   | 12575   |
| MAY   | 16270   | 15701   | 17263   | 14347   | 14647   |
| JUN   | 13781   | 14662   | 14699   | 11925   | 12590   |
| JUL   | 10366   | 10594   | 9894    | 11275   | 10493   |
| ANNUAL AVERAGE  | 12171   | 12117   | 12131   | 11850   | 11919   |

**TABLE 1M**  
**(Metric Units)**  
**MICA PROJECT OPERATING CRITERIA**  
**2001-02 ASSURED OPERATING PLAN**

| <u>Period</u> | <u>End of Previous Period Arrow</u> | <u>Target Operation</u>              |  |        | <u>Minimum Outflow (m³/s)</u> | <u>Minimum Treaty Storage Content 2/ (hm³)</u> |
|---------------|-------------------------------------|--------------------------------------|--|--------|-------------------------------|--|
|               | <u>Storage Content (hm³)</u>        | <u>Period Average Outflow (m³/s)</u> | <u>End-of-Period Treaty Content 1/ (hm³)</u> |        |                               |  |
| August 1-15   | 6361.2 - FULL                       | -                                    | 8529.3                                       | 424.75 | 0.0                           |  |
|               | 4036.9 - 6361.2                     | 453.07                               |  |        |                               |  |
|               | 0.0 - 4036.9                        | 736.24                               |  |        |                               |  |
| August 16-31  | 8318.4 - FULL                       | -                                    | 8634.5                                       | 424.75 | 0.0                           |  |
|               | 3547.6 - 8318.4                     | 594.65                               |  |        |                               |  |
|               | 0.0 - 3547.6                        | 736.24                               |  |        |                               |  |
| September     | 8465.2 - FULL                       | -                                    | 8634.5                                       | 283.17 | 0.0                           |  |
|               | 4428.3 - 8465.2                     | 622.97                               |  |        |                               |  |
|               | 0.0 - 4428.3                        | 764.55                               |  |        |                               |  |
| October       | 7572.2 - FULL                       | -                                    | 8309.1                                       | 283.17 | 0.0                           |  |
|               | 4966.6 - 7572.2                     | 594.65                               |  |        |                               |  |
|               | 0.0 - 4966.6                        | 792.87                               |  |        |                               |  |
| November      | 7095.1 - FULL                       | 566.34                               |  | 339.80 | 0.0                           |  |
|               | 6410.1 - 7095.1                     | 622.97                               |  |        |                               |  |
|               | 2324.3 - 6410.1                     | 679.60                               |  |        |                               |  |
|               | 0.0 - 2324.3                        | 821.19                               |  |        |                               |  |
| December      | 7462.1 - FULL                       | 622.97                               |  | 594.65 | 506.4                         |  |
|               | 6141.0 - 7462.1                     | 707.92                               |  |        |                               |  |
|               | 2446.6 - 6141.0                     | 764.55                               |  |        |                               |  |
|               | 0.0 - 2446.6                        | 821.19                               |  |        |                               |  |
| January       | 6287.8 - FULL                       | 679.60                               |  | 424.75 | 259.8                         |  |
|               | 6092.0 - 6287.8                     | 651.29                               |  |        |                               |  |
|               | 3699.3 - 6092.0                     | 736.24                               |  |        |                               |  |
|               | 0.0 - 3699.3                        | 792.87                               |  |        |                               |  |
| February      | 3694.4 - FULL                       | 594.65                               |  | 424.75 | 0.0                           |  |
|               | 929.7 - 3694.4                      | 651.29                               |  |        |                               |  |
|               | 893.0 - 929.7                       | 594.65                               |  |        |                               |  |
|               | 0.0 - 893.0                         | 792.87                               |  |        |                               |  |
| March         | 3143.9 - FULL                       | 622.97                               |  | 424.75 | 0.0                           |  |
|               | 1810.5 - 3143.9                     | 566.34                               |  |        |                               |  |
|               | 1651.5 - 1810.5                     | 679.60                               |  |        |                               |  |
|               | 0.0 - 1651.5                        | 764.55                               |  |        |                               |  |
| April 1-15    | 4049.1 - FULL                       | -                                    | 798.1  | 368.12 | 0.0                           |  |
|               | 3547.6 - 4049.1                     | -                                    | 39.6   |        |                               |  |
|               | 2446.6 - 3547.6                     | 509.70                               |  |        |                               |  |
|               | 0.0 - 2446.6                        | -                                    | 0.0  |        |                               |  |
| April 16-30   | 6801.5 - FULL                       | -                                    | 137.5  | 283.17 | 0.0                           |  |
|               | 6336.7 - 6801.5                     | -                                    | 0.0  |        |                               |  |
|               | 1957.3 - 6336.7                     | 283.17                               |  |        |                               |  |
|               | 0.0 - 1957.3                        | 368.12                               |  |        |                               |  |
| May           | 734.0 - FULL                        | 283.17                               |  | 226.53 | 0.0                           |  |
|               | 721.7 - 734.0                       | 226.53                               |  |        |                               |  |
|               | 474.6 - 721.7                       | 396.44                               |  |        |                               |  |
|               | 0.0 - 474.6                         | 622.97                               |  |        |                               |  |
| June          | 3131.6 - FULL                       | 283.17                               |  | 226.53 | 0.0                           |  |
|               | 2838.1 - 3131.6                     | 226.53                               |  |        |                               |  |
|               | 1174.4 - 2838.1                     | 339.80                               |  |        |                               |  |
|               | 0.0 - 1174.4                        | 481.39                               |  |        |                               |  |
| July          | 4746.4 - FULL                       | -                                    | 8455.9                                       | 226.53 | 0.0                           |  |
|               | 4403.9 - 4746.4                     | 481.39                               |  |        |                               |  |
|               | 0.0 - 4403.9                        | 679.60                               |  |        |                               |  |

## Notes:

1/ A maximum outflow of 962.77 m³/s will apply if the target end-of-period storage content @ Mica is less than 8634.5 hm³ in every month except April, May, and June. For these periods, the maximum outflow is 906.14 m³/s in April 1-15,

764.55 m³/s in April 16-30, 849.50 m³/s in May, and 934.46 m³/s in June.

2/ Mica outflows will be reduced to minimum to maintain the reservoir above the minimum Treaty storage content. This will override any flow target.

**TABLE 3M**  
 (Metric Units)  
**CRITICAL RULE CURVES**  
**END OF PERIOD TREATY STORAGE CONTENTS (hm<sup>3</sup>)**  
**2001 - 02 ASSURED OPERATING PLAN**

| YEAR             | AUG15   | AUG31   | SEP     | OCT     | NOV     | DEC     | JAN    | FEB    | MAR    | APR15  | APR30  | MAY    | JUN     | JUL     |
|------------------|---------|---------|---------|---------|---------|---------|--------|--------|--------|--------|--------|--------|---------|---------|
| <b>MICA</b>      |         |         |         |         |         |         |        |        |        |        |        |        |         |         |
| 1928-29          | 8634.5  | 8634.5  | 8173.8  | 7606.5  | 7359.1  | 6348.4  | 4354.5 | 2988.3 | 2999.0 | 1280.8 | 499.8  | 1625.8 | 5656.5  | 8256.5  |
| 1929-30          | 8590.0  | 8511.0  | 7610.4  | 6306.6  | 4238.5  | 4098.5  | 1743.4 | 1384.3 | 1374.3 | 97.1   | 31.6   | 1594.9 | 4546.3  | 7266.2  |
| 1930-31          | 7629.0  | 7456.0  | 7321.2  | 6282.4  | 4225.5  | 3721.5  | 1655.9 | 1368.6 | 1336.3 | 161.2  | 2.7    | 0.0    | 1905.2  | 4166.8  |
| 1931-32          | 4204.7  | 3824.3  | 3697.3  | 3328.4  | 2501.2  | 430.8   | 24.5   | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0     | 0.0     |
| <b>ARROW</b>     |         |         |         |         |         |         |        |        |        |        |        |        |         |         |
| 1928-29          | 8757.8  | 8746.6  | 8333.9  | 7883.9  | 7326.6  | 5616.4  | 3774.9 | 3309.3 | 3334.0 | 1999.6 | 817.2  | 2632.3 | 5887.7  | 8251.9  |
| 1929-30          | 8669.0  | 8579.5  | 7850.9  | 7827.7  | 6999.2  | 4202.0  | 1960.9 | 2076.7 | 1893.7 | 1042.5 | 696.5  | 1685.7 | 4407.3  | 7352.5  |
| 1930-31          | 7747.4  | 7565.4  | 7474.9  | 7572.2  | 7019.5  | 3817.4  | 1959.2 | 1449.6 | 1372.5 | 882.5  | 61.7   | 1191.0 | 4042.5  | 4156.3  |
| 1931-32          | 4213.8  | 4044.5  | 3931.7  | 3238.6  | 1705.0  | 1503.4  | 242.5  | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0     | 0.0     |
| <b>DUNCAN</b>    |         |         |         |         |         |         |        |        |        |        |        |        |         |         |
| 1928-29          | 1726.8  | 1717.5  | 1627.0  | 1565.8  | 1155.5  | 1027.6  | 587.2  | 415.9  | 300.9  | 288.5  | 309.0  | 596.5  | 1268.8  | 1726.1  |
| 1929-30          | 1726.8  | 1675.4  | 1677.1  | 1615.2  | 1166.8  | 587.2   | 156.1  | 97.9   | 5.1    | 29.1   | 52.8   | 290.2  | 805.9   | 1281.3  |
| 1930-31          | 1435.2  | 1599.3  | 1614.8  | 1565.8  | 1151.4  | 587.9   | 149.5  | 97.9   | 4.4    | 21.0   | 20.3   | 171.3  | 753.3   | 1247.8  |
| 1931-32          | 1174.4  | 1101.0  | 1052.0  | 611.7   | 244.7   | 4.9     | 2.4    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0     | 0.0     |
| <b>COMPOSITE</b> |         |         |         |         |         |         |        |        |        |        |        |        |         |         |
| 1928-29          | 19119.2 | 19098.6 | 18134.7 | 17056.2 | 15841.2 | 12992.4 | 8716.5 | 6713.5 | 6634.0 | 3568.9 | 1626.0 | 4854.5 | 12813.1 | 18234.5 |
| 1929-30          | 18985.9 | 18765.9 | 17138.4 | 15749.5 | 12404.5 | 8887.8  | 3860.5 | 3558.8 | 3273.1 | 1168.7 | 781.0  | 3570.8 | 9759.5  | 15900.0 |
| 1930-31          | 16811.6 | 16620.7 | 16410.8 | 15420.4 | 12396.4 | 8126.9  | 3764.6 | 2916.1 | 2713.3 | 1064.8 | 84.7   | 1362.3 | 6701.0  | 9570.9  |
| 1931-32          | 9592.9  | 8969.7  | 8681.0  | 7178.6  | 4450.9  | 1939.2  | 269.4  | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0     | 0.0     |

TABLE 4M  
(Metric Units)  
MICA

ASSURED AND VARIABLE REFILL CURVES  
LIMITING RULE CURVE AND POWER DISCHARGE REQUIREMENTS  
2001 - 02 ASSURED OPERATING PLAN

|   | AUG15                  | AUG31  | SEP    | OCT    | NOV    | DEC    | JAN    | FEB    | MAR    | APR15  | APR30  | MAY    | JUN    | JUL    |
|---|------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| <b>ASSURED REFILL CURVE (hm<sup>3</sup>)</b>                |                        |        |        |        |        |        |        |        |        |        |        |        |        |        |
|   | 2847.8                 | 4228.2 | 5704.2 | 6140.5 | 6300.2 | 6340.6 | 6327.9 | 5135.4 | 3862.7 | 3300.5 | 2757.8 | 3217.5 | 6019.6 | 8634.5 |
| <b>VARIABLE REFILL CURVES (hm<sup>3</sup>)</b>              |                        |        |        |        |        |        |        |        |        |        |        |        |        |        |
| 1928-29   |                        |        |        |        |        |        | 7285.0 | 6547.3 | 5928.6 | 5620.6 | 5499.7 | 5249.7 | 6925.8 | 8634.5 |
| 1929-30   |                        |        |        |        |        |        | 4779.7 | 3945.1 | 3300.5 | 3040.1 | 3242.2 | 3750.9 | 6230.5 |        |
| 1930-31   |                        |        |        |        |        |        | 5414.6 | 4601.8 | 3946.9 | 3632.7 | 3664.8 | 3800.1 | 6414.5 |        |
| 1931-32   |                        |        |        |        |        |        | 2039.0 | 1723.1 | 1614.0 | 1376.5 | 1585.2 | 2555.2 | 5970.4 |        |
| 1932-33   |                        |        |        |        |        |        | 1804.9 | 1575.6 | 1508.8 | 1266.4 | 1362.0 | 2301.5 | 5570.7 |        |
| 1933-34   |                        |        |        |        |        |        | 1594.2 | 976.9  | 0.0    | 0.2    | 0.0    | 1680.1 | 6188.9 |        |
| 1934-35   |                        |        |        |        |        |        | 3350.6 | 2889.4 | 2647.0 | 2424.1 | 2461.0 | 3010.5 | 5821.7 |        |
| 1935-36   |                        |        |        |        |        |        | 3045.5 | 2529.5 | 2206.1 | 1926.5 | 2027.7 | 2924.2 | 6470.3 |        |
| 1936-37   |                        |        |        |        |        |        | 7256.1 | 6468.1 | 5813.1 | 5478.7 | 5476.0 | 5283.2 | 7004.9 |        |
| 1937-38   |                        |        |        |        |        |        | 2717.9 | 2443.7 | 2335.5 | 2107.7 | 2225.7 | 3106.2 | 6194.3 |        |
| 1938-39   |                        |        |        |        |        |        | 4935.3 | 4290.1 | 3668.7 | 3418.4 | 3505.2 | 3857.6 | 6984.1 |        |
| 1939-40   |                        |        |        |        |        |        | 4414.2 | 3661.6 | 3082.0 | 2817.3 | 2958.2 | 3350.9 | 6396.4 |        |
| 1940-41   |                        |        |        |        |        |        | 5859.6 | 5098.0 | 4491.2 | 4223.8 | 4455.3 | 4730.5 | 6959.6 |        |
| 1941-42   |                        |        |        |        |        |        | 4599.6 | 4139.2 | 3835.3 | 3541.7 | 3573.7 | 4048.4 | 6628.1 |        |
| 1942-43   |                        |        |        |        |        |        | 4273.2 | 3944.9 | 3842.6 | 3590.1 | 3825.7 | 4654.4 | 6777.6 |        |
| 1943-44   |                        |        |        |        |        |        | 7535.8 | 6692.2 | 6071.0 | 5743.9 | 5687.9 | 5545.5 | 7344.2 |        |
| 1944-45   |                        |        |        |        |        |        | 7105.2 | 6416.5 | 5881.4 | 5602.0 | 5507.8 | 5315.2 | 7131.1 |        |
| 1945-46   |                        |        |        |        |        |        | 1594.2 | 976.9  | 834.0  | 567.4  | 709.0  | 1804.6 | 5956.7 |        |
| 1946-47   |                        |        |        |        |        |        | "      | 1370.1 | 1327.3 | 1112.7 | 1304.3 | 2456.9 | 6129.2 |        |
| 1947-48   |                        |        |        |        |        |        | "      | 1194.7 | 1114.4 | 836.5  | 945.1  | 1952.1 | 5852.0 |        |
| 1948-49   |                        |        |        |        |        |        | 5612.3 | 5283.2 | 5141.0 | 4886.1 | 4918.2 | 5348.0 | 7739.6 |        |
| 1949-50   |                        |        |        |        |        |        | 2332.3 | 1968.0 | 1830.5 | 1563.1 | 1670.0 | 2498.0 | 5390.3 |        |
| 1950-51   |                        |        |        |        |        |        | 2310.8 | 2063.2 | 2004.3 | 1780.1 | 1953.1 | 2792.1 | 6274.8 |        |
| 1951-52   |                        |        |        |        |        |        | 3305.8 | 2954.0 | 2833.7 | 2551.1 | 2633.8 | 3521.1 | 6635.2 |        |
| 1952-53   |                        |        |        |        |        |        | 3993.6 | 3685.8 | 3589.4 | 3336.9 | 3353.3 | 3904.0 | 6554.2 |        |
| 1953-54   |                        |        |        |        |        |        | 1594.2 | 976.9  | 926.5  | 692.6  | 812.5  | 1745.2 | 5322.1 |        |
| 1954-55   |                        |        |        |        |        |        | 3102.3 | 2863.0 | 2806.0 | 2585.8 | 2679.3 | 3339.1 | 5797.7 |        |
| 1955-56   |                        |        |        |        |        |        | 1997.6 | 1715.1 | 1606.2 | 1345.4 | 1465.8 | 2540.1 | 6065.6 |        |
| 1956-57   |                        |        |        |        |        |        | 2409.9 | 2109.7 | 2037.0 | 1805.6 | 1919.6 | 2752.7 | 6874.5 |        |
| 1957-58   |                        |        |        |        |        |        | 2003.3 | 1734.6 | 1677.4 | 1459.4 | 1617.7 | 2497.7 | 6293.4 |        |
| <b>LIMITING RULE CURVE (hm<sup>3</sup>)</b>                 |                        |        |        |        |        |        |        |        |        |        |        |        |        |        |
|   | 1594.2                 |        |        |        |        |        | 976.9  | 0.0    | 0.2    |        |        |        |        |        |
| <b>POWER DISCHARGE REQUIREMENTS (m<sup>3</sup>/s):</b>      |                        |        |        |        |        |        |        |        |        |        |        |        |        |        |
| <b>ASSURED REFILL CURVES</b>                                |                        |        |        |        |        |        |        |        |        |        |        |        |        |        |
|   | 84.95                  | 84.95  | 84.95  | 84.95  | 84.95  | 84.95  | 84.95  | 566.34 | 566.34 | 566.34 | 622.97 | 622.97 | 622.97 | 622.97 |
| <b>VARIABLE REFILL CURVES (VOLUME RUNOFF AT THE DALLES)</b> |                        |        |        |        |        |        |        |        |        |        |        |        |        |        |
|   | 98.68 km <sup>3</sup>  | --     |        |        |        |        | 84.95  | 283.17 | 283.17 | 283.17 | 339.80 | 566.34 | 566.34 | 566.34 |
|   | 117.18 km <sup>3</sup> | --     |        |        |        |        | 84.95  | 84.95  | 84.95  | 226.53 | 283.17 | 339.80 | 424.75 | 509.70 |
|   | 135.69 km <sup>3</sup> | --     |        |        |        |        | 84.95  | 84.95  | 84.95  | 226.53 | 283.17 | 339.80 | 424.75 | 509.70 |

| TABLE 5M<br>(Metric Units)<br>ARROW  |        |        |        |        |        |        |         |         |         |         |         |         |         |  |
|--|--------|--------|--------|--------|--------|--------|---------|---------|---------|---------|---------|---------|---------|--|
| ASSURED AND VARIABLE REFILL CURVES<br>LIMITING RULE CURVE AND POWER DISCHARGE REQUIREMENTS<br>2001 - 02 ASSURED OPERATING PLAN |        |        |        |        |        |        |         |         |         |         |         |         |         |  |
| AUG15  | AUG31  | SEP    | OCT    | NOV    | DEC    | JAN    | FEB     | MAR     | APR15   | APR30   | MAY     | JUN     | JUL     |  |
| <b>ASSURED REFILL CURVE (hm<sup>3</sup>)</b>   |        |        |        |        |        |        |         |         |         |         |         |         |         |  |
| 345.7  | 2600.5 | 5611.0 | 6913.4 | 7489.8 | 8628.9 | 8757.8 | 8049.8  | 6869.3  | 6356.3  | 5816.3  | 6729.4  | 8597.8  | 8757.8  |  |
| <b>VARIABLE REFILL CURVES (hm<sup>3</sup>)</b>   |        |        |        |        |        |        |         |         |         |         |         |         |         |  |
| 1928-29  |        |        |        |        |        | 7861.7 | 7550.9  | 7414.9  | 7322.2  | 8039.3  | 8441.7  | 8757.8  | 8757.8  |  |
| 1929-30  |        |        |        |        |        | 5423.4 | 4831.5  | 4273.2  | 3963.2  | 5016.0  | 6953.0  | 8755.4  |         |  |
| 1930-31  |        |        |        |        |        | 5932.8 | 5228.4  | 4615.8  | 4576.6  | 5515.6  | 6548.8  | 8757.8  |         |  |
| 1931-32  |        |        |        |        |        | 1886.3 | 1065.5  | 0.0     | 515.0   | 1359.1  | 3387.1  | 7106.6  |         |  |
| 1932-33  |        |        |        |        |        | -      | 1670.0  | 1634.1  | 1718.5  | 2268.2  | 3808.1  | 6980.6  |         |  |
| 1933-34  |        |        |        |        |        | -      | 1065.5  | 476.8   | 708.0   | 1992.5  | 4820.0  | 8248.2  |         |  |
| 1934-35  |        |        |        |        |        | 3094.7 | 2842.0  | 2809.9  | 2825.3  | 3263.5  | 4698.9  | 7443.0  |         |  |
| 1935-36  |        |        |        |        |        | 3418.6 | 2892.1  | 2422.1  | 2254.8  | 2639.4  | 4725.4  | 8537.2  |         |  |
| 1936-37  |        |        |        |        |        | 8645.1 | 8202.7  | 8066.9  | 7878.1  | 8617.4  | 8757.8  | 8757.8  |         |  |
| 1937-38  |        |        |        |        |        | 3156.4 | 2990.5  | 2975.3  | 3143.1  | 3645.4  | 4997.2  | 7861.7  |         |  |
| 1938-39  |        |        |        |        |        | 5756.1 | 5023.1  | 4316.8  | 4085.1  | 5240.6  | 6757.0  | 8757.8  |         |  |
| 1939-40  |        |        |        |        |        | 5102.4 | 4483.1  | 3907.0  | 3835.8  | 4688.4  | 6219.0  | -       |         |  |
| 1940-41  |        |        |        |        |        | 7036.7 | 6404.0  | 6387.1  | 6634.9  | 8084.8  | 8757.8  | -       |         |  |
| 1941-42  |        |        |        |        |        | 5953.1 | 5578.7  | 5310.6  | 5447.4  | 6435.3  | 7359.6  | -       |         |  |
| 1942-43  |        |        |        |        |        | 6065.6 | 5735.1  | 5642.1  | 5914.4  | 7023.0  | 8290.1  | -       |         |  |
| 1943-44  |        |        |        |        |        | 8757.8 | 8757.8  | 8757.8  | 8757.8  | 8757.8  | 8757.8  | -       |         |  |
| 1944-45  |        |        |        |        |        | 7965.4 | 7846.7  | 7959.5  | 7961.5  | 8631.1  | -       | -       |         |  |
| 1945-46  |        |        |        |        |        | 1886.3 | 1450.3  | 1417.8  | 1510.5  | 2115.6  | 3793.9  | 7471.2  |         |  |
| 1946-47  |        |        |        |        |        | 2884.1 | 2523.2  | 2463.0  | 2601.7  | 3201.6  | 4762.3  | 7782.9  |         |  |
| 1947-48  |        |        |        |        |        | 2278.0 | 2138.1  | 2081.1  | 2090.6  | 2527.6  | 3992.6  | 7477.5  |         |  |
| 1948-49  |        |        |        |        |        | 3806.7 | 3678.7  | 4812.5  | 5175.3  | 6226.1  | 7532.6  | 8757.8  |         |  |
| 1949-50  |        |        |        |        |        | 2199.5 | 1946.8  | 1948.5  | 2039.0  | 2535.2  | 3849.0  | 6700.3  |         |  |
| 1950-51  |        |        |        |        |        | 2906.1 | 2767.6  | 2791.1  | 2799.6  | 3365.1  | 4692.3  | 8113.7  |         |  |
| 1951-52  |        |        |        |        |        | 3026.4 | 2775.4  | 2763.9  | 2788.1  | 3223.6  | 5137.4  | 8393.3  |         |  |
| 1952-53  |        |        |        |        |        | 3970.8 | 3725.2  | 3708.6  | 3793.9  | 4692.3  | 5825.6  | 8265.6  |         |  |
| 1953-54  |        |        |        |        |        | 1886.3 | 1065.5  | 934.6   | 1065.2  | 1596.7  | 3071.2  | 6672.9  |         |  |
| 1954-55  |        |        |        |        |        | 2323.5 | 2228.1  | 2267.8  | 2307.4  | 2815.3  | 4121.5  | 6617.8  |         |  |
| 1955-56  |        |        |        |        |        | 1886.3 | 1401.2  | 1377.2  | 1456.0  | 2030.7  | 3953.0  | 7514.7  |         |  |
| 1956-57  |        |        |        |        |        | -      | 1484.1  | 1440.8  | 1491.9  | 2074.7  | 3563.5  | 8625.5  |         |  |
| 1957-58  |        |        |        |        |        | -      | 1065.5  | 1114.7  | 1364.7  | 2081.8  | 3631.5  | 7798.5  |         |  |
| <b>LIMITING RULE CURVE (hm<sup>3</sup>)</b>  |        |        |        |        |        | 1886.3 | 1065.5  | 0.0     | 1.5     |         |         |         |         |  |
| <b>POWER DISCHARGE REQUIREMENTS (m<sup>3</sup>/s):</b>   |        |        |        |        |        |        |         |         |         |         |         |         |         |  |
| <b>ASSURED REFILL CURVES</b>   |        |        |        |        |        |        |         |         |         |         |         |         |         |  |
| 141.58   | 141.58 | 141.58 | 141.58 | 141.58 | 141.58 | 141.58 | 1132.67 | 1132.67 | 1132.67 | 1415.84 | 1415.84 | 1444.16 | 1472.47 |  |
| <b>VARIABLE REFILL CURVES (VOLUME RUNOFF AT THE DALLES)</b>  |        |        |        |        |        |        |         |         |         |         |         |         |         |  |
| 98.68 km <sup>3</sup> -  | 141.58 | 509.70 | 566.34 | 566.34 | 622.97 | 849.50 | 1189.31 | 1245.94 |         |         |         |         |         |  |
| 117.18 km <sup>3</sup> -   | 141.58 | 141.58 | 141.58 | 226.53 | 566.34 | 764.55 | 1047.72 | 1047.72 |         |         |         |         |         |  |
| 135.69 km <sup>3</sup> -   | 141.58 | 141.58 | 141.58 | 226.53 | 566.34 | 764.55 | 1047.72 | 1047.72 |         |         |         |         |         |  |

TABLE 6M  
(Metric Units)  
DUNCAN

ASSURED AND VARIABLE REFILL CURVES  
LIMITING RULE CURVE AND POWER DISCHARGE REQUIREMENTS  
2001 - 02 ASSURED OPERATING PLAN

|   | AUG15                  | AUG31 | SEP   | OCT   | NOV   | DEC   | JAN    | FEB    | MAR    | APR15  | APR30  | MAY    | JUN    | JUL    |
|---|------------------------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|
| <b>ASSURED REFILL CURVE (hm<sup>3</sup>)</b>                |                        |       |       |       |       |       |        |        |        |        |        |        |        |        |
|   | 279.6                  | 453.1 | 615.3 | 690.4 | 733.2 | 760.6 | 785.6  | 712.2  | 640.5  | 621.4  | 602.4  | 880.8  | 1323.4 | 1726.8 |
| <b>VARIABLE REFILL CURVES (hm<sup>3</sup>)</b>              |                        |       |       |       |       |       |        |        |        |        |        |        |        |        |
| 1928-29   |                        |       |       |       |       |       | 1098.5 | 1074.8 | 1083.1 | 1100.5 | 1111.2 | 1199.8 | 1509.3 | 1726.8 |
| 1929-30   |                        |       |       |       |       |       | 1094.4 | 1069.9 | 1077.5 | 1094.1 | 1139.1 | 1250.5 | 1537.2 |        |
| 1930-31   |                        |       |       |       |       |       | 958.8  | 937.3  | 953.4  | 982.8  | 1009.2 | 1125.4 | 1509.3 |        |
| 1931-32   |                        |       |       |       |       |       | 157.1  | 137.7  | 171.5  | 213.8  | 334.9  | 671.3  | 1294.5 |        |
| 1932-33   |                        |       |       |       |       |       | 144.6  | 39.1   | 0.0    | 0.0    | 0.0    | 236.3  | 965.7  |        |
| 1933-34   |                        |       |       |       |       |       |        | 155.8  | 202.6  | 259.6  | 447.0  | 818.6  | 1436.4 |        |
| 1934-35   |                        |       |       |       |       |       | 404.4  | 401.0  | 442.6  | 471.9  | 528.7  | 790.3  | 1287.9 |        |
| 1935-36   |                        |       |       |       |       |       | 298.2  | 281.4  | 298.0  | 322.0  | 384.6  | 723.2  | 1371.3 |        |
| 1936-37   |                        |       |       |       |       |       | 971.1  | 947.1  | 959.6  | 976.7  | 989.6  | 1106.8 | 1465.8 |        |
| 1937-38   |                        |       |       |       |       |       | 330.0  | 328.6  | 357.2  | 396.8  | 486.1  | 808.1  | 1354.7 |        |
| 1938-39   |                        |       |       |       |       |       | 596.7  | 588.4  | 609.9  | 637.1  | 689.0  | 909.6  | 1467.2 |        |
| 1939-40   |                        |       |       |       |       |       | 556.1  | 561.0  | 600.4  | 651.0  | 706.3  | 914.8  | 1439.3 |        |
| 1940-41   |                        |       |       |       |       |       | 756.7  | 753.8  | 783.4  | 837.0  | 909.9  | 1104.2 | 1497.3 |        |
| 1941-42   |                        |       |       |       |       |       | 666.5  | 669.1  | 699.5  | 731.3  | 789.8  | 1024.1 | 1448.1 |        |
| 1942-43   |                        |       |       |       |       |       | 650.1  | 637.6  | 661.8  | 688.2  | 773.4  | 1079.7 | 1435.2 |        |
| 1943-44   |                        |       |       |       |       |       | 1137.9 | 1127.4 | 1147.7 | 1170.2 | 1184.6 | 1280.8 | 1583.2 |        |
| 1944-45   |                        |       |       |       |       |       | 935.1  | 925.5  | 947.6  | 970.3  | 986.2  | 1106.8 | 1480.4 |        |
| 1945-46   |                        |       |       |       |       |       | 144.6  | 39.1   | 30.8   | 59.0   | 160.3  | 538.5  | 1278.3 |        |
| 1946-47   |                        |       |       |       |       |       |        | 98.4   | 125.5  | 159.8  | 265.7  | 643.9  | 1309.4 |        |
| 1947-48   |                        |       |       |       |       |       | 225.3  | 217.3  | 247.6  | 273.3  | 355.0  | 685.8  | 1334.6 |        |
| 1948-49   |                        |       |       |       |       |       | 784.6  | 764.3  | 780.0  | 799.3  | 862.7  | 1112.2 | 1583.9 |        |
| 1949-50   |                        |       |       |       |       |       | 302.6  | 284.8  | 306.8  | 328.6  | 404.2  | 707.3  | 1198.1 |        |
| 1950-51   |                        |       |       |       |       |       | 144.6  | 105.0  | 143.1  | 166.9  | 269.1  | 623.1  | 1273.9 |        |
| 1951-52   |                        |       |       |       |       |       | 374.8  | 360.6  | 390.2  | 415.7  | 495.2  | 831.1  | 1384.3 |        |
| 1952-53   |                        |       |       |       |       |       | 372.1  | 358.7  | 386.3  | 413.5  | 488.1  | 778.0  | 1301.8 |        |
| 1953-54   |                        |       |       |       |       |       | 144.6  | 39.1   | 0.0    | 0.0    | 88.3   | 444.5  | 1132.3 |        |
| 1954-55   |                        |       |       |       |       |       | 219.9  | 211.1  | 238.8  | 269.4  | 347.9  | 654.7  | 1141.3 |        |
| 1955-56   |                        |       |       |       |       |       | 144.6  | 39.1   | 22.0   | 48.7   | 146.1  | 558.6  | 1268.3 |        |
| 1956-57   |                        |       |       |       |       |       | 255.2  | 231.2  | 252.0  | 279.4  | 369.2  | 689.5  | 1425.6 |        |
| 1957-58   |                        |       |       |       |       |       | 144.6  | 39.1   | 47.5   | 81.5   | 179.6  | 535.8  | 1307.7 |        |
| <b>LIMITING RULE CURVE (hm<sup>3</sup>)</b>                 |                        |       |       |       |       |       |        |        |        |        |        |        |        |        |
|   |                        |       |       |       |       |       | 144.6  | 39.1   | 0.0    | 0.0    |        |        |        |        |
| <b>POWER DISCHARGE REQUIREMENTS (m<sup>3</sup>/s):</b>      |                        |       |       |       |       |       |        |        |        |        |        |        |        |        |
| <b>ASSURED REFILL CURVES</b>                                |                        |       |       |       |       |       |        |        |        |        |        |        |        |        |
|   | 2.83                   | 2.83  | 2.83  | 2.83  | 2.83  | 2.83  | 2.83   | 42.48  | 42.48  | 42.48  | 42.48  | 42.48  | 56.63  | 56.63  |
| <b>VARIABLE REFILL CURVES (VOLUME RUNOFF AT THE DALLES)</b> |                        |       |       |       |       |       |        |        |        |        |        |        |        |        |
|   | 98.68 km <sup>3</sup>  | -     | 2.83  | 2.83  | 2.83  | 2.83  | 2.83   | 42.48  | 42.48  | 42.48  | 42.48  | 50.97  | 76.46  | 82.12  |
|   | 117.18 km <sup>3</sup> | -     | 2.83  | 2.83  | 2.83  | 2.83  | 2.83   |        | 11.33  | 16.99  | 16.99  | 76.46  | 82.12  |        |
|   | 135.69 km <sup>3</sup> | --    | 2.83  | 2.83  | 2.83  | 2.83  | 2.83   | 2.83   | 11.33  | 16.99  | 16.99  | 76.46  | 82.12  |        |

TABLE 7M  
 (Metric Units)  
**MICA**  
 UPPER RULE CURVES (FLOOD CONTROL)  
 END OF PERIOD TREATY STORAGE CONTENTS ( $\text{hm}^3$ )  
 2001 - 02 ASSURED OPERATING PLAN

| YEAR    | AUG15  | AUG31  | SEP    | OCT    | NOV    | DEC    | JAN    | FEB    | MAR    | APR15  | APR30  | MAY    | JUN    | JUL    |
|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 1928-29 | 8634.5 | 8634.5 | 8634.5 | 8387.9 | 8387.9 | 8387.9 | 8283.5 | 8189.3 | 8085.0 | 8085.0 | 8085.0 | 8242.8 | 8435.6 | 8634.5 |
| 1929-30 | -      | -      | -      | -      | -      | -      | 8202.5 | 8035.6 | 7850.4 | 7850.4 | 7850.4 | 8075.5 | 8350.7 | -      |
| 1930-31 | -      | -      | -      | -      | -      | -      | 8387.9 | 8387.9 | 8387.9 | 8387.9 | 8387.9 | 8458.6 | 8545.2 | -      |
| 1931-32 | -      | -      | -      | -      | -      | -      | 7598.4 | 6858.3 | 6068.8 | 6068.8 | 6068.8 | 6805.2 | 7705.8 | -      |
| 1932-33 | -      | -      | -      | -      | -      | -      | 7588.6 | 6868.1 | -      | -      | -      | -      | -      | -      |
| 1933-34 | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      |
| 1934-35 | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      |
| 1935-36 | -      | -      | -      | -      | -      | -      | 7598.4 | 6858.3 | -      | -      | -      | -      | -      | -      |
| 1936-37 | -      | -      | -      | -      | -      | -      | 8148.6 | 7932.6 | 7693.3 | 7693.3 | 7693.3 | 8130.8 | 8314.5 | -      |
| 1937-38 | -      | -      | -      | -      | -      | -      | 7588.6 | 6868.1 | 6068.8 | 6068.8 | 6068.8 | 6805.2 | 7705.8 | -      |
| 1938-39 | -      | -      | -      | -      | -      | -      | 7814.0 | 7294.3 | 6720.3 | 6720.3 | 6720.3 | 7269.8 | 7941.7 | -      |
| 1939-40 | -      | -      | -      | -      | -      | -      | 8010.9 | 7659.1 | 7282.1 | 7282.1 | 7282.1 | 7670.3 | 8145.0 | -      |
| 1940-41 | -      | -      | -      | -      | -      | -      | 8387.9 | 8387.9 | 8387.9 | 8387.9 | 8387.9 | 8458.6 | 8545.2 | -      |
| 1941-42 | -      | -      | -      | -      | -      | -      | 7588.6 | 6868.1 | 6068.8 | 6068.8 | 6068.8 | 6805.2 | 7705.8 | -      |
| 1942-43 | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      |
| 1943-44 | -      | -      | -      | -      | -      | -      | 8387.9 | 8387.9 | 8387.9 | 8387.9 | 8387.9 | 8458.6 | 8545.2 | -      |
| 1944-45 | -      | -      | -      | -      | -      | -      | 7812.2 | 7291.4 | 6715.9 | 6715.9 | 6715.9 | 7266.4 | 7940.0 | -      |
| 1945-46 | -      | -      | -      | -      | -      | -      | 7588.6 | 6868.1 | 6068.8 | 6068.8 | 6068.8 | 6805.2 | 7705.8 | -      |
| 1946-47 | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      |
| 1947-48 | -      | -      | -      | -      | -      | -      | 7598.4 | 6858.3 | -      | -      | -      | -      | -      | -      |
| 1948-49 | -      | -      | -      | -      | -      | -      | 7588.6 | 6868.1 | -      | -      | -      | -      | -      | -      |
| 1949-50 | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      |
| 1950-51 | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      |
| 1951-52 | -      | -      | -      | -      | -      | -      | 7598.4 | 6858.3 | -      | -      | -      | -      | -      | -      |
| 1952-53 | -      | -      | -      | -      | -      | -      | 7588.6 | 6868.1 | -      | -      | -      | -      | -      | -      |
| 1953-54 | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      |
| 1954-55 | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      |
| 1955-56 | -      | -      | -      | -      | -      | -      | 7598.4 | 6858.3 | -      | -      | -      | 6594.8 | 7762.3 | -      |
| 1956-57 | -      | -      | -      | -      | -      | -      | 7588.6 | 6868.1 | -      | -      | -      | 6805.2 | 7705.8 | -      |
| 1957-58 | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      |

TABLE 8M  
 (Metric Units)  
 ARROW  
 UPPER RULE CURVES (FLOOD CONTROL)  
 END OF PERIOD TREATY STORAGE CONTENTS ( $\text{hm}^3$ )  
 2001 - 02 ASSURED OPERATING PLAN

| YEAR    | AUG15  | AUG31  | SEP    | OCT    | NOV    | DEC    | JAN    | FEB    | MAR    | APR15  | APR30  | MAY    | JUN    | JUL    |
|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 1928-29 | 8757.8 | 8757.8 | 8757.8 | 8449.6 | 8449.6 | 7524.3 | 7524.3 | 7524.3 | 7524.3 | 7556.3 | 7611.9 | 7916.7 | 8757.8 | 8757.8 |
| 1929-30 | .      | .      | .      | .      | .      | 7335.6 | 7164.4 | 6975.7 | 7022.0 | 7102.2 | 7542.4 | .      | .      | .      |
| 1930-31 | .      | .      | .      | .      | .      | 7524.3 | 7524.3 | 7524.3 | 7556.3 | 7611.9 | 7916.7 | .      | .      | .      |
| 1931-32 | .      | .      | .      | .      | .      | 5802.4 | 4190.3 | 2466.9 | 2485.7 | 2756.3 | 5442.5 | .      | .      | .      |
| 1932-33 | .      | .      | .      | .      | .      | 5782.5 | 4208.6 | .      | 2466.9 | 2536.1 | 4310.2 | 7424.2 | .      | .      |
| 1933-34 | .      | .      | .      | .      | .      | .      | .      | .      | 4366.9 | 5694.2 | 8757.8 | .      | .      | .      |
| 1934-35 | .      | .      | .      | .      | .      | .      | .      | .      | 2466.9 | 4222.1 | 7424.2 | .      | .      | .      |
| 1935-36 | .      | .      | .      | .      | .      | 5802.4 | 4190.3 | .      | 2617.9 | 3360.4 | 5222.3 | 8757.8 | .      | .      |
| 1936-37 | .      | .      | .      | .      | .      | 7195.0 | 6896.5 | 6566.9 | 6623.9 | 6742.3 | 7991.1 | .      | .      | .      |
| 1937-38 | .      | .      | .      | .      | .      | 5782.5 | 4208.6 | 2466.9 | 2649.4 | 3127.5 | 4480.0 | 7700.9 | .      | .      |
| 1938-39 | .      | .      | .      | .      | .      | 6323.2 | 5238.9 | 4037.6 | 4207.7 | 4509.6 | 6511.1 | 8757.8 | .      | .      |
| 1939-40 | .      | .      | .      | .      | .      | 6834.1 | 6188.4 | 5498.2 | 5595.9 | 5824.1 | 7127.9 | .      | .      | .      |
| 1940-41 | .      | .      | .      | .      | .      | 7524.3 | 7524.3 | 7524.3 | 7556.3 | 7611.9 | 7916.7 | .      | .      | .      |
| 1941-42 | .      | .      | .      | .      | .      | 5782.5 | 4208.6 | 2466.9 | 2605.4 | 2813.1 | 4731.7 | .      | .      | .      |
| 1942-43 | .      | .      | .      | .      | .      | .      | .      | .      | 2718.7 | 3234.4 | 3523.8 | 5845.2 | .      | .      |
| 1943-44 | .      | .      | .      | .      | .      | 7524.3 | 7524.3 | 7524.3 | 7556.3 | 7611.9 | 7916.7 | 8757.8 | .      | .      |
| 1944-45 | .      | .      | .      | .      | .      | 6319.3 | 5230.8 | 4025.9 | 4091.9 | 4267.1 | 5795.5 | 8190.0 | .      | .      |
| 1945-46 | .      | .      | .      | .      | .      | 5782.5 | 4208.6 | 2466.9 | 2624.2 | 3039.4 | 5385.9 | 8757.8 | .      | .      |
| 1946-47 | .      | .      | .      | .      | .      | .      | .      | .      | 2630.6 | 3328.8 | 5253.8 | .      | .      | .      |
| 1947-48 | .      | .      | .      | .      | .      | 5802.4 | 4190.3 | .      | 2536.1 | 2894.8 | 5423.6 | .      | .      | .      |
| 1948-49 | .      | .      | .      | .      | .      | 5782.5 | 4208.6 | .      | 2800.4 | 3366.5 | 6103.0 | .      | .      | .      |
| 1949-50 | .      | .      | .      | .      | .      | .      | .      | .      | 2466.9 | 2466.9 | 2725.0 | .      | .      | .      |
| 1950-51 | .      | .      | .      | .      | .      | .      | .      | .      | .      | .      | 3316.4 | 8166.5 | .      | .      |
| 1951-52 | .      | .      | .      | .      | .      | 5802.4 | 4190.3 | .      | 2617.9 | 3291.2 | 4385.8 | 7373.8 | .      | .      |
| 1952-53 | .      | .      | .      | .      | .      | 5782.5 | 4208.6 | .      | 2586.5 | 2869.6 | 3611.9 | .      | .      | .      |
| 1953-54 | .      | .      | .      | .      | .      | .      | .      | .      | .      | 2775.2 | 3983.1 | 4643.6 | .      | .      |
| 1954-55 | .      | .      | .      | .      | .      | .      | .      | .      | 2630.6 | 2668.3 | 4045.9 | 7889.8 | .      | .      |
| 1955-56 | .      | .      | .      | .      | .      | 5802.4 | 4190.3 | .      | 2466.9 | 2976.5 | 4870.2 | 7323.7 | .      | .      |
| 1956-57 | .      | .      | .      | .      | .      | 5782.5 | 4208.6 | .      | 2636.9 | 2995.4 | 6486.9 | 8757.8 | .      | .      |
| 1957-58 | .      | .      | .      | .      | .      | .      | .      | .      | 2561.3 | 2913.7 | 5486.5 | .      | .      | .      |

TABLE 9M  
(Metric Units)  
DUNCAN  
UPPER RULE CURVES (FLOOD CONTROL)  
END OF PERIOD TREATY STORAGE CONTENTS ( $\text{hm}^3$ )  
2001 - 02 ASSURED OPERATING PLAN

| YEAR    | AUG15  | AUG31  | SEP    | OCT    | NOV    | DEC    | JAN    | FEB   | MAR   | APR15 | APR30 | MAY    | JUN    | JUL    |
|---------|--------|--------|--------|--------|--------|--------|--------|-------|-------|-------|-------|--------|--------|--------|
| 1928-29 | 1726.8 | 1726.8 | 1726.8 | 1726.8 | 1726.8 | 1233.3 | 1023.4 | 833.8 | 833.8 | 851.7 | 882.0 | 1085.6 | 1405.3 | 1726.8 |
| 1929-30 | .      | .      | .      | .      | .      | .      | 999.2  | 788.0 | 788.0 | 806.9 | 838.7 | 1052.8 | 1388.9 | .      |
| 1930-31 | .      | .      | .      | .      | .      | .      | 956.6  | 706.8 | 706.8 | 727.1 | 761.9 | 994.3  | 1359.6 | .      |
| 1931-32 | .      | .      | .      | .      | .      | .      | 678.4  | 160.3 | 160.3 | 197.9 | 266.9 | 688.2  | 1491.9 | .      |
| 1932-33 | .      | .      | .      | .      | .      | .      | 669.6  | .     | .     | 183.7 | 230.7 | 468.8  | 1402.6 | .      |
| 1933-34 | .      | .      | .      | .      | .      | .      | .      | .     | .     | 160.3 | 310.7 | 830.9  | 1480.9 | .      |
| 1934-35 | .      | .      | .      | .      | .      | .      | .      | .     | .     | .     | 204.3 | 458.0  | 1194.2 | .      |
| 1935-36 | .      | .      | .      | .      | .      | .      | 678.4  | .     | .     | 174.4 | 291.9 | 860.5  | 1726.8 | .      |
| 1936-37 | .      | .      | .      | .      | .      | .      | 924.1  | 644.9 | 644.9 | 666.7 | 703.4 | 950.0  | 1337.3 | .      |
| 1937-38 | .      | .      | .      | .      | .      | .      | 716.9  | 250.3 | 250.3 | 276.7 | 291.6 | 600.2  | 1350.3 | .      |
| 1938-39 | .      | .      | .      | .      | .      | .      | 704.6  | 226.8 | 226.8 | 267.4 | 324.4 | 976.9  | 1726.8 | .      |
| 1939-40 | .      | .      | .      | .      | .      | .      | 741.8  | 282.3 | 282.3 | 311.2 | 369.2 | 1004.6 | .      | .      |
| 1940-41 | .      | .      | .      | .      | .      | .      | 845.3  | 494.5 | 494.5 | 519.2 | 561.0 | 842.1  | 1283.2 | .      |
| 1941-42 | .      | .      | .      | .      | .      | .      | 803.7  | 415.7 | 415.7 | 437.9 | 493.0 | 1073.8 | 1726.8 | .      |
| 1942-43 | .      | .      | .      | .      | .      | .      | 814.7  | 436.5 | 436.5 | 470.2 | 540.9 | 707.6  | 1597.9 | .      |
| 1943-44 | .      | .      | .      | .      | .      | .      | 1018.8 | 818.9 | 818.9 | 837.0 | 867.8 | 1075.0 | 1399.9 | .      |
| 1944-45 | .      | .      | .      | .      | .      | .      | 941.7  | 678.4 | 678.4 | 681.6 | 683.6 | 1207.9 | 1726.8 | .      |
| 1945-46 | .      | .      | .      | .      | .      | .      | 669.6  | 160.3 | 160.3 | 185.2 | 233.9 | 788.5  | 1584.2 | .      |
| 1946-47 | .      | .      | .      | .      | .      | .      | .      | .     | .     | 188.4 | 249.6 | 768.2  | 1540.4 | .      |
| 1947-48 | .      | .      | .      | .      | .      | .      | 678.4  | .     | .     | 160.3 | 160.3 | 735.2  | 1726.8 | .      |
| 1948-49 | .      | .      | .      | .      | .      | .      | 907.9  | 614.1 | 614.1 | 628.5 | 677.7 | 1062.6 | .      | .      |
| 1949-50 | .      | .      | .      | .      | .      | .      | 669.6  | 160.3 | 160.3 | 160.3 | 160.3 | 449.9  | 1285.2 | .      |
| 1950-51 | .      | .      | .      | .      | .      | .      | .      | .     | .     | .     | .     | 697.5  | 1307.0 | .      |
| 1951-52 | .      | .      | .      | .      | .      | .      | 678.4  | .     | .     | .     | 164.9 | 226.1  | 623.9  | .      |
| 1952-53 | .      | .      | .      | .      | .      | .      | 669.6  | .     | .     | 175.9 | 207.2 | 574.0  | 1278.8 | .      |
| 1953-54 | .      | .      | .      | .      | .      | .      | .      | .     | .     | 179.1 | 205.8 | 580.1  | 1339.8 | .      |
| 1954-55 | .      | .      | .      | .      | .      | .      | .      | .     | .     | 175.9 | 197.9 | 378.0  | 1195.9 | .      |
| 1955-56 | .      | .      | .      | .      | .      | .      | 678.4  | .     | .     | 160.3 | 207.2 | 652.3  | 1432.2 | .      |
| 1956-57 | .      | .      | .      | .      | .      | .      | 669.6  | .     | .     | 182.3 | 219.9 | 920.2  | 1604.5 | .      |
| 1957-58 | .      | .      | .      | .      | .      | .      | .      | .     | .     | 188.4 | 235.6 | 879.3  | 1726.8 | .      |

TABLE 10M  
(Metric Units)  
COMPOSITE OPERATING RULE CURVES  
FOR THE WHOLE OF CANADIAN STORAGE  
END OF PERIOD TREATY STORAGE CONTENTS (hm<sup>3</sup>)  
2001 - 02 ASSURED OPERATING PLAN

| <u>YEAR</u> | <u>AUG15</u> | <u>AUG31</u> | <u>SEP</u> | <u>OCT</u> | <u>NOV</u> | <u>DEC</u> | <u>JAN</u> | <u>FEB</u> | <u>MAR</u> | <u>APR15</u> | <u>APR30</u> | <u>MAY</u> | <u>JUN</u> | <u>JUL</u> |
|-------------|--------------|--------------|------------|------------|------------|------------|------------|------------|------------|--------------|--------------|------------|------------|------------|
| 1928-29     | 19119.2      | 19098.6      | 18134.7    | 17056.2    | 16004.4    | 14900.3    | 14637.8    | 13371.9    | 11372.5    | 10278.2      | 9176.5       | 10827.7    | 15940.8    | 19119.2    |
| 1929-30     | -            | -            | -          | -          | -          | -          | 10988.7    | 9488.9     | 8214.2     | 7624.8       | 8376.2       | 10827.7    | 15940.8    | -          |
| 1930-31     | -            | -            | -          | -          | -          | -          | 12132.9    | 10537.0    | 9119.0     | 8498.5       | 8875.8       | 10647.1    | 15940.8    | -          |
| 1931-32     | -            | -            | -          | -          | -          | -          | 4082.4     | 2926.4     | 1774.3     | 2089.4       | 3211.2       | 6613.6     | 14371.6    | -          |
| 1932-33     | -            | -            | -          | -          | -          | -          | 3835.8     | 3284.8     | 3142.9     | 2984.9       | 3630.3       | 6346.0     | 13517.0    | -          |
| 1933-34     | -            | -            | -          | -          | -          | -          | 3625.1     | 2198.3     | 637.1      | 868.5        | 2303.2       | 7318.8     | 15591.2    | -          |
| 1934-35     | -            | -            | -          | -          | -          | -          | 6849.7     | 5891.7     | 5274.1     | 5051.3       | 5132.2       | 7690.6     | 14440.1    | -          |
| 1935-36     | -            | -            | -          | -          | -          | -          | 6762.4     | 5581.9     | 4788.5     | 4355.7       | 4959.0       | 8372.8     | 15880.1    | -          |
| 1936-37     | -            | -            | -          | -          | -          | -          | 14308.5    | 12676.8    | 11070.1    | 10278.2      | 9176.5       | 10827.7    | 15940.8    | -          |
| 1937-38     | -            | -            | -          | -          | -          | -          | 6204.3     | 5684.4     | 5052.7     | 5033.9       | 5644.8       | 8186.3     | 15043.9    | -          |
| 1938-39     | -            | -            | -          | -          | -          | -          | 11288.1    | 9540.0     | 7933.1     | 7653.0       | 7591.8       | 10609.4    | 15940.8    | -          |
| 1939-40     | -            | -            | -          | -          | -          | -          | 10072.7    | 8427.1     | 7271.3     | 6964.2       | 7815.4       | 10317.3    | 15940.8    | -          |
| 1940-41     | -            | -            | -          | -          | -          | -          | 13653.0    | 11996.4    | 10744.2    | 10175.9      | 9135.1       | 10789.0    | 15900.7    | -          |
| 1941-42     | -            | -            | -          | -          | -          | -          | 11048.6    | 8763.5     | 6717.9     | 6343.8       | 6063.9       | 8830.0     | 15940.8    | -          |
| 1942-43     | -            | -            | -          | -          | -          | -          | 10705.8    | 8590.0     | 6746.0     | 6489.4       | 6533.2       | 7448.9     | 13188.2    | -          |
| 1943-44     | -            | -            | -          | -          | -          | -          | 14637.8    | 13371.9    | 11372.5    | 10278.2      | 9176.5       | 10827.7    | 15940.8    | -          |
| 1944-45     | -            | -            | -          | -          | -          | -          | 13432.8    | 11044.7    | 8529.1     | 8013.8       | 7627.3       | 9893.8     | 15533.0    | -          |
| 1945-46     | -            | -            | -          | -          | -          | -          | 3625.1     | 2466.4     | 2282.7     | 2136.9       | 2984.9       | 6137.1     | 14706.3    | -          |
| 1946-47     | -            | -            | -          | -          | -          | -          | 4622.9     | 3991.6     | 3915.8     | 3874.2       | 4755.5       | 7883.1     | 15111.9    | -          |
| 1947-48     | -            | -            | -          | -          | -          | -          | 4097.6     | 3493.0     | 3355.8     | 3087.4       | 3633.0       | 6630.5     | 14652.9    | -          |
| 1948-49     | -            | -            | -          | -          | -          | -          | 10203.5    | 9428.2     | 6943.7     | 6722.3       | 6726.7       | 10201.3    | 15940.8    | -          |
| 1949-50     | -            | -            | -          | -          | -          | -          | 4834.5     | 4075.1     | 3939.3     | 3762.4       | 4297.2       | 5672.9     | 12050.0    | -          |
| 1950-51     | -            | -            | -          | -          | -          | -          | 5361.5     | 4935.8     | 4614.3     | 4407.3       | 4580.3       | 6731.6     | 15407.2    | -          |
| 1951-52     | -            | -            | -          | -          | -          | -          | 6707.1     | 5889.7     | 5460.8     | 5329.2       | 6022.3       | 7829.4     | 14017.3    | -          |
| 1952-53     | -            | -            | -          | -          | -          | -          | 8336.5     | 7571.2     | 6216.6     | 6062.9       | 5834.7       | 7403.4     | 14672.3    | -          |
| 1953-54     | -            | -            | -          | -          | -          | -          | 3625.1     | 2081.6     | 1861.1     | 1757.9       | 2497.5       | 5260.9     | 11098.0    | -          |
| 1954-55     | -            | -            | -          | -          | -          | -          | 5645.8     | 5251.4     | 5234.0     | 5069.1       | 5545.5       | 7641.5     | 13556.9    | -          |
| 1955-56     | -            | -            | -          | -          | -          | -          | 4028.6     | 3155.4     | 3005.4     | 2850.0       | 3642.5       | 7051.6     | 14611.6    | -          |
| 1956-57     | -            | -            | -          | -          | -          | -          | 4551.4     | 3754.1     | 3638.1     | 3479.8       | 4214.3       | 7005.6     | 15940.8    | -          |
| 1957-58     | -            | -            | -          | -          | -          | -          | 4034.2     | 2839.3     | 2839.5     | 2905.6       | 3879.1       | 6665.0     | 15125.9    | -          |

Note: The above ORC's are limited to individual project flood control rule curves.

**TABLE 11M**  
**(Metric Units)**  
**COMPARISON OF**  
**RECENT ASSURED OPERATING PLAN STUDIES**

|   | 1997-98 | 1998-99 | 1999-00 | 2000-01 | 2001-02 |
|---|---------|---------|---------|---------|---------|
| <b>MICA TARGET OPERATION</b><br>(hm <sup>3</sup> [xxxx.x] or m <sup>3</sup> /s [xxxx.xx]) |         |         |         |         |         |
| AUG 15  | 8455.9  | 8455.9  | 8455.9  | 8529.3  | 8529.3  |
| AUG 31  | FULL    | FULL    | FULL    | FULL    | FULL    |
| SEP   | FULL    | FULL    | FULL    | FULL    | FULL    |
| OCT   | 424.75  | 311.49  | 8387.4  | 8284.7  | 8309.1  |
| NOV   | 538.02  | 7966.6  | 7770.9  | 7477.3  | 566.34  |
| DEC   | 651.29  | 6547.6  | 679.60  | 707.92  | 622.97  |
| JAN   | 679.60  | 679.60  | 707.92  | 736.24  | 679.60  |
| FEB   | 622.97  | 622.97  | 622.97  | 651.29  | 594.65  |
| MAR   | 538.02  | 622.97  | 594.65  | 622.97  | 622.97  |
| APR 15  | 259.8   | 210.9   | 382.2   | 736.24  | 798.1   |
| APR 30  | 0.0     | 137.5   | 259.8   | 259.8   | 137.5   |
| MAY   | 283.17  | 283.17  | 283.17  | 226.53  | 283.17  |
| JUN   | 283.17  | 283.17  | 283.17  | 226.53  | 283.17  |
| JUL   | 8211.3  | 8333.6  | 8455.9  | 8455.9  | 8455.9  |
| <b>COMPOSITE CRC1 CANADIAN TREATY STORAGE CONTENT (hm<sup>3</sup>)</b>                    |         |         |         |         |         |
| 1928 AUG 31   | 19119.2 | 19119.2 | 19119.2 | 19119.2 | 19098.6 |
| 1928 DEC  | 14082.1 | 15293.5 | 13746.0 | 13218.2 | 12992.4 |
| 1929 APR15  | 1660.5  | 4101.2  | 4313.6  | 3909.4  | 3568.9  |
| 1929 JUL  | 16792.0 | 17140.4 | 16920.7 | 17410.3 | 18234.5 |
| <b>COMPOSITE 50-YR AVERAGE CANADIAN TREATY STORAGE CONTENT (hm<sup>3</sup>)</b>           |         |         |         |         |         |
| AUG 31  | 17645.1 | 17918.4 | 17848.9 | 18079.9 | 18134.9 |
| DEC   | 12782.8 | 13662.5 | 12925.6 | 12619.1 | 12812.6 |
| APR15   | 1785.3  | 2174.0  | 3484.0  | 2815.3  | 2777.6  |
| JUL   | 17414.7 | 17397.0 | 17369.1 | 17795.8 | 18002.6 |
| <b>STEP I GAINS AND LOSSES DUE TO REOPERATION (MW)</b>                                    |         |         |         |         |         |
| U.S. Firm Energy  | -0.9    | -5.1    | -1.5    | -0.3    | 0.2     |
| U.S. Dependable Peaking Capacity  | -4.0    | 27.0    | 0.0     | -2.0    | 0.0     |
| U.S. Avg. Annual Usable Secondary Energy  | 13.9    | 18.9    | 19.5    | 16.2    | 24.9    |
| BCH Firm Energy   | 46.7    | 26.7    | 102.2   | 60.8    | 48.3    |
| BCH Dependable Peaking Capacity   | 19.0    | 18.0    | -3.0    | -36.0   | 25.0    |
| BCH Avg. Annual Usable Secondary Energy   | -43.5   | -18.5   | -42.9   | -43.6   | -29.7   |
| <b>COORDINATED HYDRO MODEL LOAD (MW)</b>  |         |         |         |         |         |
| AUG 15  | 10223   | 10083   | 9793    | 10043   | 10422   |
| AUG 31  | 10259   | 10203   | 9925    | 10125   | 10439   |
| SEP   | 10121   | 9957    | 9630    | 10095   | 10434   |
| OCT   | 10153   | 9963    | 9764    | 10046   | 10388   |
| NOV   | 11452   | 11305   | 11297   | 11381   | 11626   |
| DEC   | 12582   | 12787   | 12766   | 12836   | 13012   |
| JAN   | 13477   | 13640   | 13725   | 13484   | 13382   |
| FEB   | 12664   | 12638   | 12674   | 12765   | 12502   |
| MAR   | 11948   | 11994   | 12113   | 11807   | 11667   |
| APR 15  | 12643   | 11671   | 11099   | 11332   | 11187   |
| APR 30  | 13437   | 12425   | 12672   | 13025   | 12575   |
| MAY   | 16270   | 15701   | 17263   | 14347   | 14647   |
| JUN   | 13781   | 14662   | 14699   | 11925   | 12590   |
| JUL   | 10366   | 10594   | 9894    | 11275   | 10493   |
| ANNUAL AVERAGE  | 12171   | 12117   | 12131   | 11850   | 11919   |

**Appendix A1****(English Units)****Project Operating Procedures****2001-02 Assured Operating Plan and Determination of Downstream Power Benefits****Definition of split months:**

Apr (April 1-30); Apr 15 (April 1-April 15); Apr30 (April 15-April 30); Aug (August 1-31); Aug 15 (August 1-15); Aug 31 (August 16-31).

| <u>Project</u>           | <u>Name (Number)</u> | <u>Constraint Type</u> | <u>Requirements</u>                       | <u>Source</u>  |
|--------------------------|----------------------|------------------------|---|--|
| <b>Canadian Projects</b> |                      |                        |   |  |
| Mica (1890)              |                      | Minimum Flow           | 3000 cfs                                  | In place in AOP79, AOP80, AOP84  |
| Arrow (1831)             |                      | Minimum Flow           | 5000 cfs                                  | In place in AOP79, AOP80, AOP84  |
|                          |                      | Draft Limit            | 1 ft/day                                  |  |
| Duncan (1681)            |                      | Minimum Flow           | 100 cfs                                   | In place in AOP79, AOP80, AOP84  |
|                          |                      | Maximum Flow           | 10000 cfs                                 | In place in AOP79, AOP80, AOP84  |
|                          |                      | Draft Limit            | 1 ft/day                                  |  |
|                          |                      | Other                  | Operate to meet IJC orders for Corra Linn | CRTOC agreement on procedures to implement 1938 IJC order  |
| <b>Base System</b>       |                      |                        |   |  |
| Hungry Horse (1530)      |                      | Minimum Flow           | 400 cfs                                   | Minimum project discharge<br>In place in AOP79, AOP80, AOP84   |
|                          |                      | Maximum Flow           |   | None   |
|                          |                      | Minimum Content        |   | None   |
|                          |                      | Other                  | No VECC limit                             | VECC limit not in place in AOP79   |
| Kerr (1510)              |                      | Minimum Flow           | 1500 cfs                                  | All periods<br>In place in AOP80, AOP84  |
|                          |                      | Maximum Flow           |   | None   |
|                          |                      | Minimum Content        | 614.7 ksfd<br>426.3 ksfd                  | 2893.0 ft<br>2890.0 ft<br>Jun - Sep<br>May<br>MPC 2-1-92, PNCA submittal similar operation, Jun-Aug 15, in AOP80 |
|                          |                      |                        | 0.0 ksfd                                  | 2883.0 ft<br>Empty Apr 15<br>FERC, AOP80   |
|                          |                      | Other                  | 0.0 ksfd                                  | Conditions permitting, should be on or about, empty Mar and Apr 15<br>FERC, AOP80                                |

**Appendix A1**  
**(English Units)**  
**Project Operating Procedures**  
**2001-02 Assured Operating Plan and Determination of Downstream Power Benefits**

**Definition of split months:**

Apr (April 1-30); Apr 15 (April 1-April 15); Apr30 (April 15-April 30); Aug (August 1-31); Aug 15 (August 1-15); Aug 31 (August 16-31).

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| <b>Project</b><br><b>Name (Number)</b> | <b>Constraint Type</b> | <b>Requirements</b> |  |  | <b>Source</b>                                       |
|--|------------------------|---------------------|--|--|---|
| <b>Thompson Falls (1490)</b>           |                        |                     | None Noted   |  |   |
| Noxon Rapids (1480)                    | Minimum Content        |                     |  |  |   |
|  | For Step I:            | 116.3 ksfd          | 2331.0 ft  | May - Aug 31,                              | In place in AOP84,<br>similar operation in<br>AOP80 |
|  |                        | 112.3 ksfd          | 2330.0 ft  | Sep - Jan,                                 |   |
|  |                        | 78.7 ksfd           | 2321.0 ft  | Feb,                                       |   |
|  |                        | 26.5 ksfd           | 2305.0 ft  | Mar,                                       |   |
|  |                        | 0.0 ksfd            | 2295.0 ft  | Empty Apr 15, Apr 30,<br>and for end of CP |   |
| Minimum & Maximum Content              |                        |                     |  |  |   |
|  | For Step II & III:     | 116.3 ksfd          | 2331.0 ft  | All periods                                | In place in AOP79,<br>AOP84                         |
| <b>Cabinet Gorge (1475)</b>            |                        |                     | None Noted   |  |   |
| Albeni Falls (1465)                    | Minimum Flow           | 4000 cfs            |  | All periods                                | In place in AOP80,<br>AOP84                         |
| Minimum Content                        |                        |                     | (Dec may fill on restriction, note below)  |  |   |
|  |                        | 582.4 ksfd          | 2062.5 ft  | Jun - Aug 31                               | In place in AOP80,<br>AOP84                         |
|  |                        | 465.7 ksfd          | 2060.0 ft  | Sep  |   |
|  |                        | 190.4 ksfd          | 2054.0 ft  | Oct  |   |
|  |                        | 57.6 ksfd           | 2051.0 ft  | Nov-Apr 15                                 |   |
|  |                        | 190.4 ksfd          | 2054.0 ft  | Apr 30 (empty at end of CP)                |   |
|  |                        | 279.0 ksfd          | 2056.0 ft  | May  |   |
| For Step I & II:                       |                        |                     | Optimum to run CP & LT to Jul-Oct SMINs.   |  |   |
| For Step III:                          |                        |                     | Keep full at beginning of CP. Optimum to run higher than SMIN in CP & LT<br>(except when occasionally drafting below SMIN to meet load).   |  |   |
|  |                        | 439.5 ksfd          | 2059.4 ft  | May  |   |
|  |                        | 582.4 ksfd          | 2062.5 ft  | Sep  |   |
|  |                        | 465.7 ksfd          | 2060.0 ft  | Oct  |   |
| <b>Kokanee Spawning</b>                |                        |                     | Draft no more than 1 ft below Nov 20 elevation through Dec 31.<br>If project fills, draft no more than 0.5 ft.<br>Dec 31 - Mar 31 operate between SMIN and URC within above noted<br>draft limits. |  |   |
|  |                        |                     | In place before<br>AOP80 and<br>supported by<br>minimum contents<br>noted above.   |  |   |
| Other Spill                            |                        | 50 cfs              |  | All periods                                |   |

**Appendix A1**  
**(English Units)**  
**Project Operating Procedures**  
**2001-02 Assured Operating Plan and Determination of Downstream Power Benefits**

**Definition of split months:**

Apr (April 1-30); Apr 15 (April 1-April 15); Apr30 (April 15-April 30); Aug (August 1-31); Aug 15 (August 1-15); Aug 31 (August 16-31).

| <u>Project Name (Number)</u> | <u>Constraint Type</u> | <u>Requirements</u>    |                          |   | <u>Source</u>                                  |
|------------------------------|------------------------|------------------------|--------------------------|---|--|
| <b>Box Canyon (1460)</b>     |                        |                        |                          | None Noted  |  |
| Grand Coulee (1280)          | Minimum Flow           | 30000 cfs              |                          | All periods   | In place in AOP79, AOP80, AOP84                |
|                              | Minimum Content        | 843.9 ksfd<br>0.0 ksfd | 1240.0 ft<br>1208.0 ft   | May<br>Empty at end of CP   | Retain as a power operation (for pumping)      |
|                              | Step II & III only     | 2557.1 ksfd            | 1288.0 ft                | Aug-Nov   |  |
| Maximum Content              |                        |                        |                          |   |  |
|                              | Step I only:           |                        | 2 ft<br>3 ft             | Operating room Sep - Nov<br>Operating room Dec - Feb  | In place in AOP89. Retain as a power operation |
|                              | Draft Limit            |                        | 1.3 ft/day<br>1.5 ft/day | (bank sloughage)<br>(Constraint submitted as 1.5 ft/day interpreted as 1.3 ft/day mo. ave.) |  |
| Chief Joseph (1270)          | Other Spill            | 500 cfs                |                          | All periods   |  |
| Wells (1220)                 | Other Spill            | 1200 cfs               |                          | All periods   | With fish ladder                               |
|                              | Fish Spill             |                        |                          | Removed   |  |
| Rocky Reach (1200)           | Fish Bypass            |                        |                          | Bypass not modeled (installation date set to year 2010 in input file).                      |  |
|                              | Other Spill            | 200 cfs                |                          | Aug 31 - Apr 15 (leakage)   |  |
|                              | Fish Spill             |                        |                          | Removed   |  |
| Rock Island (1170)           | Fish Bypass            |                        |                          | Bypass not modeled (installation date set to year 2010 in input file).                      |  |
|                              | Fish Spill             |                        |                          | Removed   |  |
| Wanapum (1165)               | Fish Bypass            |                        |                          | Bypass not modeled (installation date set to year 2010 in input file).                      |  |
|                              | Other Spill            | 2200 cfs               |                          | All periods   | With fish ladder                               |
|                              | Fish Spill             |                        |                          | Removed   |  |
| Priest Rapids (1160)         | Minimum Flow           |                        |                          | Limit removed   |  |
|                              | Fish Bypass            |                        |                          | Bypass not modeled (installation date set to year 2010 in input file).                      |  |
|                              | Other Spill            | 2200 cfs               |                          | All periods   | With fish ladder                               |
|                              | Fish Spill             |                        |                          | Removed   |  |

**Appendix A1  
(English Units)**  
**Project Operating Procedures**  
**2001-02 Assured Operating Plan and Determination of Downstream Power Benefits**

**Definition of split months:**

Apr (April 1-30); Apr 15 (April 1-April 15); Apr30 (April 15-April 30); Aug (August 1-31); Aug 15 (August 1-15); Aug 31 (August 16-31).

| <u>Project</u><br><u>Name (Number)</u> | <u>Constraint Type</u> | <u>Requirements</u>    | <u>Source</u>   |
|--|------------------------|------------------------|---|
| Brownlee (767)                         | Minimum Flow           | 5000 cfs               | All periods<br>In place in AOP79, AOP80, AOP84  |
|  | Power Operation        |                        | Agree to use "old" power operation (first codes) provided by IPC and used in AOP since AOP97.<br>More recent information for BRN from IPC operates the project variably (depending on inflow estimates) and for flow augmentation and water temperature control (S. Davis communication with IPC, 1992 and 1994). |
| Oxbow (765)                            | Other Spill            | 100 cfs                | All periods   |
| Ice Harbor (502)                       | Fish Bypass            |                        | Bypass not modeled (installation date set to year 2010 in input file).  |
|  | Other Spill            | 740 cfs                | All periods   |
|  | Incremental Spill      |                        | None  |
|  | Fish Spill             |                        | None  |
|  | Minimum Flow           |                        | None  |
|  | Other                  | 204.8 ksfd             | 440.0 ft<br>Run at all periods  |
| McNary (488)                           | Other Spill            | 3475 cfs               | All periods   |
|  | Incremental Spill      |                        | None  |
| John Day (440)                         | Fish Bypass            |                        | Bypass not modeled (installation date set to year 2010 in input file).  |
|  | Other Spill            | 800 cfs                | All periods   |
|  | Incremental Spill      |                        | None  |
|  | Fish Spill             |                        | Removed   |
|  | Minimum Flow           | 50000 cfs<br>12500 cfs | Mar - Nov<br>Dec - Feb  |
|  | Other                  | 190.0 ksfd             | 265.0 ft<br>Use JDA as a run-of-river plant.  |

**Appendix A1  
(English Units)**  
**Project Operating Procedures**  
**2001-02 Assured Operating Plan and Determination of Downstream Power Benefits**

**Definition of split months:**

Apr (April 1-30); Apr 15 (April 1-April 15); Apr30 (April 15-April 30); Aug (August 1-31); Aug 15 (August 1-15); Aug 31 (August 16-31).

| <u>Project Name (Number)</u>      | <u>Constraint Type</u> | <u>Requirements</u>    |                        | <u>Source</u>  |
|-----------------------------------|------------------------|------------------------|------------------------|--|
| The Dalles (365)                  | Fish Bypass            |                        |                        | Bypass not modeled (installation date set to year 2010 in input file).                           |
|                                   | Other Spill            | 1300 cfs               | All periods            |  |
|                                   | Incremental Spill      |                        | None                   |  |
|                                   | Fish Spill             |                        | Removed                |  |
|                                   | Minimum Flow           | 50000 cfs<br>12500 cfs | Mar - Nov<br>Dec - Feb |  |
| Bonneville (320)                  | Fish Bypass            |                        |                        | Bypass not modeled (installation date set to year 2010 in input file).                           |
|                                   | Other Spill            | 8040 cfs               | All periods            |  |
|                                   | Incremental Spill      |                        | None                   |  |
|                                   | Fish Spill             |                        | Removed                |  |
|                                   | Minimum Flow           | 5000 cfs               | All periods            | BCHydro agreements 1969  |
| Kootenay Lake (Corra Linn (1665)) | Other                  |                        | Operate to IJC orders. | CRTOC agreement on procedures to implement 1938 IJC order  |
|                                   |                        |                        |                        |  |
| Chelan (1210)                     | Minimum Flow           | 50 cfs                 | All periods            | In place in AOP79, AOP80, AOP84  |
|                                   | Minimum Content        | 308.5 ksfd             | 1098.0 ft              | Jul - Sep (except as needed to empty at end of critical period). In place in AOP79, AOP80, AOP84 |
|                                   | Minimum Flow           | 50 cfs                 | All periods            | In place in AOP79, AOP80, AOP84  |
| Couer d'Alene L (1341)            | Minimum Content        | 112.5 ksfd             | 2128.0 ft              | May - Aug<br>In place in AOP79   |

**Appendix A1**  
**(English Units)**  
**Project Operating Procedures**  
**2001-02 Assured Operating Plan and Determination of Downstream Power Benefits**

**Definition of split months:**

Apr (April 1-30); Apr 15 (April 1-April 15); Apr30 (April 15-April 30); Aug (August 1-31); Aug 15 (August 1-15); Aug 31 (August 16-31).

| <u>Project</u>                            | <u>Name (Number)</u> | <u>Constraint Type</u>  | <u>Requirements</u>                                       | <u>Source</u>   |
|---|----------------------|---|---|---|
| <b><u>Other Major Step I Projects</u></b> |                      |   |   |   |
| Libby (1760)                              |                      |   |   |   |
| Without sturgeon                          | Minimum Flow         | 4000 cfs  | All periods   | In place in AOP79 and AOP86                                       |
|   | Other Spill          | 200 cfs   | All periods   |   |
|   | Minimum Content      | By contract year: Aug-Jul i.e., 1929 = Aug 1928 - Jul 1929<br>776.9 ksfd      2363.0 ft      1929 Dec<br>676.5 ksfd      2355.0 ft      1929 Jan<br>603.6 ksfd      2349.0 ft      1929 Feb<br>2147.7 ksfd      2443.0 ft      1929 Jul   |   | 2-1-93 PNCA submittal, in place in AOP99 (w/o sturgeon)           |
|   |                      | 652.0 ksfd      2353.0 ft      1930 Dec<br>433.2 ksfd      2334.0 ft      1930 Jan<br>389.3 ksfd      2330.0 ft      1930 Feb<br>348.5 ksfd      2326.0 ft      1930 Mar<br>297.4 ksfd      2321.0 ft      1930 Apr 15<br>444.2 ksfd      2335.0 ft      1930 Apr 30<br>499.1 ksfd      2340.0 ft      1930 May<br>1344.6 ksfd      2402.0 ft      1930 Jun<br>1771.9 ksfd      2425.0 ft      1930 Jul |   |   |
|   |                      | 317.8 ksfd      2323.0 ft      1931 Dec<br>192.2 ksfd      2310.0 ft      1931 Jan<br>103.1 ksfd      2300.0 ft      1931 Feb-Apr 30<br>192.2 ksfd      2310.0 ft      1931 May<br>676.5 ksfd      2355.0 ft      1931 Jun<br>868.0 ksfd      2370.0 ft      1931 Jul   |   |   |
|   |                      | 174.4 ksfd      2308.0 ft      1932 Dec<br>103.1 ksfd      2300.0 ft      1932 Jan<br>0.0 ksfd      2287.0 ft      Empty at end of CP***  |   |   |
|   |                      | 776.9 ksfd      2363.0 ft      All Dec  |   |   |
|   | Maximum Summer Draft | 5 ft  |   |   |
|   | Other                | Operate to meet IJC orders for Corra Linn   | CRTOC agreement on procedures to implement 1938 IJC order | 2-1-94 PNCA submittal, in place in AOP00 and AOP01 (w/o sturgeon) |

**Appendix A1**  
**(English Units)**  
**Project Operating Procedures**  
**2001-02 Assured Operating Plan and Determination of Downstream Power Benefits**

**Definition of split months:**

Apr (April 1-30); Apr 15 (April 1-April 15); Apr30 (April 15-April 30); Aug (August 1-31); Aug 15 (August 1-15); Aug 31 (August 16-31).

| <b>Project<br/>Name (Number)</b> | <b>Constraint Type</b> | <b>Requirements</b>   |                         |   | <b>Source</b>                            |
|----------------------------------|------------------------|---|-------------------------|---|--|
| Dworshak (535)                   | Minimum Flow           | 1500 cfs  |                         | All periods   | 2-1-96 PNCA<br>submittal                 |
|                                  | Maximum Flow           | 14000 cfs   |                         | All periods   | 2-1-96 PNCA<br>submittal                 |
|                                  |                        | 25000 cfs   |                         | (up to for flood control)                               |  |
|                                  | Minimum Elev           | 395.8 ksfd  | 1520.0 ft               | SMIN Apr-Aug 31   |  |
|                                  | Start 4 yr CP at:      | 392.6 ksfd  | 1519.5 ft               | (1/2 ft lower)  |  |
|                                  | End 4 yr CP at:        | 330.3 ksfd  | 1509.7 ft               | (19.5 ft higher)  |  |
|                                  | Other                  | Run on minimum flow or flood control observing maximum & minimum flow requirements all periods except to meet LWG outflows: |                         |   | 2-1-96 PNCA<br>submittal                 |
|                                  | LWG Target Flow        | 85000 cfs<br>50000 cfs  | to<br>to                | 100000 cfs<br>55000 cfs                                 | Apr 10 - Jun 20, and<br>Jun 21 - Aug 31. |
|                                  | Other Spill            | 100 cfs   |                         |   |  |
| Lower Granite (520)              | Bypass Date            |   |                         | None  |  |
|                                  | Other Spill            | 670 cfs   |                         | All periods   |  |
|                                  | Incremental Spill      |   |                         | Removed   |  |
|                                  | Fish Spill             |   | 16.0%<br>40.0%<br>26.7% | Apr 15<br>Apr 30 & May<br>Jun                           | 2-1-96 PNCA<br>submittal                 |
|                                  | Maximum Spill          | 20000 cfs   |                         |   |  |
|                                  | Minimum Flow           | 11500 cfs   |                         | Mar-Nov   |  |
|                                  | Other                  | 221.8 ksfd<br>245.8 ksfd  | 733 ft<br>738 ft        | Run at (MOP) Apr 30 - Oct.<br>Run at all other periods. |  |
| Little Goose (518)               | Bypass Date            |   |                         | None  |  |
|                                  | Other Spill            | 630 cfs   |                         | All periods   |  |
|                                  | Incremental Spill      |   |                         | Removed   |  |
|                                  | Fish Spill             |   | 16.0%<br>40.0%<br>26.7% | Apr 15<br>Apr 30 & May<br>Jun                           | 2-1-96 PNCA<br>submittal                 |
|                                  | Maximum Spill          | 20000 cfs   |                         |   |  |
|                                  | Minimum Flow           | 11500 cfs   |                         | Mar - Nov   |  |
|                                  | Other                  | 260.2 ksfd<br>285.0 ksfd  | 633.0 ft<br>638.0 ft    | Run at Apr 15 - Aug 31.<br>Run at all other periods.    |  |

**Appendix A1  
(English Units)**  
**Project Operating Procedures**  
**2001-02 Assured Operating Plan and Determination of Downstream Power Benefits**

**Definition of split months:**

Apr (April 1-30); Apr 15 (April 1-April 15); Apr30 (April 15-April 30); Aug (August 1-31); Aug 15 (August 1-15); Aug 31 (August 16-31).

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| <b>Project<br/>Name (Number)</b> | <b>Constraint Type</b> | <b>Requirements</b>      |                         |  | <b>Source</b>                      |
|----------------------------------|------------------------|--------------------------|-------------------------|--|------------------------------------|
| Lower Monumental<br>(504)        | Bypass Date            |                          |                         |  | A bypass date of 2010 was assumed. |
|                                  | Other Spill            | 750 cfs                  | All periods             |  |                                    |
|                                  | Fish Spill             |                          | 16.2%<br>40.5%<br>27.0% | Apr 15<br>Apr 30 & May<br>Jun                        | 2-1-96 PNCA<br>submittal           |
|                                  | Maximum Spill          | 15000 cfs                |                         |  |                                    |
|                                  | Minimum Flow           | 11500 cfs                | Mar-Nov                 |  |                                    |
|                                  | Other                  | 179.5 ksfd<br>190.1 ksfd | 537.0 ft<br>540.0 ft    | Run at Apr 15 - Aug 31.<br>Run at all other periods. |                                    |
| Cushman (2206)                   | Other Spill            | 100 cfs                  |                         |  |                                    |
| White River (2160)               | Other Spill            | 130 cfs                  | All periods             |  |                                    |
| Round Butte (390)                | Other Spill            | 200 cfs                  | All periods             |  |                                    |

**Appendix A2  
(Metric Units)**

**Project Operating Procedures**

**2001-02 Assured Operating Plan and Determination of Downstream Power Benefits**

**Definition of split months:**

Apr (April 1-30); Apr 15 (April 1-April 15); Apr30 (April 15-April 30); Aug (August 1-31); Aug 15 (August 1-15); Aug 31 (August 16-31).

| <u>Project</u>           | <u>Name (Number)</u> | <u>Constraint Type</u> | <u>Requirements</u>                              | <u>Source</u>  |
|--------------------------|----------------------|------------------------|--|--|
| <b>Canadian Projects</b> |                      |                        |  |  |
| Mica (1890)              | Minimum Flow         |                        | 84.95 m <sup>3</sup> /s                          | In place in AOP79,<br>AOP80, AOP84   |
| Arrow (1831)             | Minimum Flow         |                        | 141.58 m <sup>3</sup> /s                         | In place in AOP79,<br>AOP80, AOP84   |
|                          | Draft Limit          |                        | 0.30 m/day                                       |  |
| Duncan (1681)            | Minimum Flow         |                        | 2.83 m <sup>3</sup> /s                           | In place in AOP79,<br>AOP80, AOP84   |
|                          | Maximum Flow         |                        | 283.17 m <sup>3</sup> /s                         | In place in AOP79,<br>AOP80, AOP84   |
|                          | Draft Limit          |                        | 0.30 m/day                                       |  |
|                          | Other                |                        | Operate to meet IJC orders for Corra Linn        | CRTOC agreement on procedures to implement 1938 IJC order  |
| <b>Base System</b>       |                      |                        |  |  |
| Hungry Horse (1530)      | Minimum Flow         |                        | 11.33 m <sup>3</sup> /s                          | Minimum project discharge<br>In place in AOP79,<br>AOP80, AOP84  |
|                          | Maximum Flow         |                        |  | None   |
|                          | Minimum Content      |                        |  | None   |
|                          | Other                |                        | No VECC limit                                    | VECC limit not in place in AOP79   |
| Kerr (1510)              | Minimum Flow         |                        | 42.47 m <sup>3</sup> /s                          | All periods<br>In place in AOP80,<br>AOP84   |
|                          | Maximum Flow         |                        |  | None   |
|                          | Minimum Content      |                        | 1503.9 hm <sup>3</sup><br>1043.0 hm <sup>3</sup> | 881.79 m<br>880.87 m<br>Jun - Sep<br>May<br>MPC 2-1-92, PNCA submittal similar operation, Jun-Aug 15, in AOP80 |
|                          |                      |                        | 0.0 hm <sup>3</sup>                              | 878.74 m<br>Empty Apr 15<br>FERC, AOP80  |

**Appendix A2  
(Metric Units)**  
**Project Operating Procedures**  
**2001-02 Assured Operating Plan and Determination of Downstream Power Benefits**

**Definition of split months:**

Apr (April 1-30); Apr 15 (April 1-April 15); Apr30 (April 15-April 30); Aug (August 1-31); Aug 15 (August 1-15); Aug 31 (August 16-31).

---

| <u>Project Name (Number)</u> | <u>Constraint Type</u>    | <u>Requirements</u>   |  |   | <u>Source</u>  |
|------------------------------|---------------------------|---|--|---|--|
|                              | Other                     | 0.0 hm <sup>3</sup>   |  | Conditions permitting, should be on or about, empty Mar and Apr 15                        | FERC, AOP80  |
| Thompson Falls               |                           | None Noted  |  |   |  |
| Noxon Rapids (1480)          | Minimum Content           |   |  |   |  |
|                              | For Step I:               | 284.5 hm <sup>3</sup><br>274.8 hm <sup>3</sup><br>192.5 hm <sup>3</sup><br>64.8 hm <sup>3</sup><br>0.0 hm <sup>3</sup>  | 710.49 m<br>710.18 m<br>707.44 m<br>702.56 m<br>699.52 m             | May - Aug 31,<br>Sep - Jan,<br>Feb,<br>Mar,<br>Empty Apr 15, Apr 30,<br>and for end of CP | In place in AOP84,<br>similar operation in<br>AOP80                              |
|                              | Minimum & Maximum Content |   |  |   |  |
|                              | For Step II & III:        | 284.5 hm <sup>3</sup>   | 710.49 m   | All periods   | In place in AOP79,<br>AOP84  |
| Cabinet Gorge (1475)         |                           | None Noted  |  |   |  |
| Albeni Falls (1465)          | Minimum Flow              | 113.27 m <sup>3</sup> /s  |  | All periods   | In place in AOP80,<br>AOP84  |
|                              | Minimum Content           | (Dec may fill on restriction, note below)   |  |   |  |
|                              |                           | 1424.9 hm <sup>3</sup><br>1139.4 hm <sup>3</sup><br>465.8 hm <sup>3</sup><br>140.9 hm <sup>3</sup><br>465.8 hm <sup>3</sup><br>682.6 hm <sup>3</sup>  | 628.65 m<br>627.89 m<br>626.06 m<br>625.14 m<br>626.06 m<br>626.67 m | Jun - Aug 31<br>Sep<br>Oct<br>Nov-Apr 15<br>Apr 30 (empty at end of CP)<br>May            | In place in AOP80,<br>AOP84  |
|                              | For Step I & II:          | Optimum to run CP & LT to Jul-Oct SMINs.  |  |   |  |
|                              | For Step III:             | Keep full at beginning of CP. Optimum to run higher than SMIN in CP & LT (except when occasionally drafting below SMIN to meet load).   |  |   |  |
|                              |                           | 1075.3 hm <sup>3</sup><br>1424.9 hm <sup>3</sup><br>1139.4 hm <sup>3</sup>  | 627.71 m<br>628.65 m<br>627.89 m                                     | May<br>Sep<br>Oct   |  |
| Kokanee Spawning             |                           | Draft no more than 0.30 m below Nov 20 elevation through Dec 31.<br>If project fills, draft no more than 0.15 m.<br>Dec 31 - Mar 31 operate between SMIN and URC within above noted draft limits. |  |   | In place before<br>AOP80 and<br>supported by<br>minimum contents<br>noted above. |
| Other Spill                  |                           | 1.42 m <sup>3</sup> /s  |  | All periods   |  |

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**Definition of split months:**

Apr (April 1-30); Apr 15 (April 1-April 15); Apr30 (April 15-April 30); Aug (August 1-31); Aug 15 (August 1-15); Aug 31 (August 16-31).

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| <u>Project</u><br><u>Name (Number)</u> | <u>Constraint Type</u>          | <u>Requirements</u>                           |                          |  | <u>Source</u>                                   |
|--|---------------------------------|---|--------------------------|--|---|
| <b>Box Canyon (1460)</b>               |                                 |   |                          | None Noted   |   |
| Grand Coulee (1280)                    | Minimum Flow                    | 849.50 m <sup>3</sup> /s                      |                          | All periods  | In place in AOP79,<br>AOP80, AOP84              |
|  | Minimum Content                 | 2064.7 hm <sup>3</sup><br>0.0 hm <sup>3</sup> | 377.95 m<br>368.20 m     | May<br>Empty at end of CP  | Retain as a power<br>operation (for<br>pumping) |
|  | Step II & III only              | 6256.2 hm <sup>3</sup>                        | 392.58 m                 | Aug-Nov  |   |
|  | Maximum Content<br>Step I only: |   | 0.61 m<br>0.91 m         | Operating room Sep - Nov<br>Operating room Dec - Feb   | In place in AOP89.<br>Retain as a power         |
|  | Draft Limit                     |   | 0.40 m/day<br>0.46 m/day | (bank sloughage)<br>(Constraint submitted as 0.46 m/day<br>interpreted as 0.40 m/day mo. ave.) |   |
| Chief Joseph (1270)                    | Other Spill                     | 14.16 m <sup>3</sup> /s                       |                          | All periods  |   |
| Wells (1220)                           | Other Spill                     | 33.98 m <sup>3</sup> /s                       |                          | All periods  | With fish ladder                                |
|  | Fish Spill                      |   |                          | Removed  |   |
| Rocky Reach (1200)                     | Fish Bypass                     |   |                          | Bypass not modeled (installation date<br>set to year 2010 in input file).                      |   |
|  | Other Spill                     | 5.66 m <sup>3</sup> /s                        |                          | Aug 31 - Apr 15 (leakage)  |   |
|  | Fish Spill                      |   |                          | Removed  |   |
| Rock Island (1170)                     | Fish Bypass                     |   |                          | Bypass not modeled (installation date<br>set to year 2010 in input file).                      |   |
|  | Fish Spill                      |   |                          | Removed  |   |
| Wanapum (1165)                         | Fish Bypass                     |   |                          | Bypass not modeled (installation date<br>set to year 2010 in input file).                      |   |
|  | Other Spill                     | 62.30 m <sup>3</sup> /s                       |                          | All periods  | With fish ladder                                |
|  | Fish Spill                      |   |                          | Removed  |   |
| Priest Rapids (1160)                   | Minimum Flow                    |   |                          | Limit removed  |   |
|  | Fish Bypass                     |   |                          | Bypass not modeled (installation date<br>set to year 2010 in input file).                      |   |
|  | Other Spill                     | 62.30 m <sup>3</sup> /s                       |                          | All periods  | With fish ladder                                |
|  | Fish Spill                      |   |                          | Removed  |   |

**Appendix A2  
(Metric Units)**  
**Project Operating Procedures**  
**2001-02 Assured Operating Plan and Determination of Downstream Power Benefits**

**Definition of split months:**

Apr (April 1-30); Apr 15 (April 1-April 15); Apr30 (April 15-April 30); Aug (August 1-31); Aug 15 (August 1-15); Aug 31 (August 16-31).

| <b>Project<br/>Name (Number)</b> | <b>Constraint Type</b> | <b>Requirements</b>                                   | <b>Source</b>   |
|----------------------------------|------------------------|---|---|
| <b>Brownlee (767)</b>            | Minimum Flow           | 141.58 m <sup>3</sup> /s                              | All periods   |
|                                  | Power Operation        |   | Agree to use "old" power operation (first codes) provided by IPC and used in AOP since AOP97.<br><br>More recent information for BRN from IPC operates the project variably (depending on inflow estimates) and for flow augmentation and water temperature control (S. Davis communication with IPC, 1992 and 1994). |
| <b>Oxbow (765)</b>               | Other Spill            | 2.83 m <sup>3</sup> /s                                | All periods   |
| <b>Ice Harbor (502)</b>          | Fish Bypass            |   | Bypass not modeled (installation date set to year 2010 in input file).  |
|                                  | Other Spill            | 20.95 m <sup>3</sup> /s                               | All periods   |
|                                  | Incremental Spill      |   | None  |
|                                  | Fish Spill             |   | None  |
|                                  | Minimum Flow           |   | None  |
| <b>McNary (488)</b>              | Other                  | 501.1 hm <sup>3</sup>                                 | 134.11 m  |
|                                  | Other Spill            | 98.40 m <sup>3</sup> /s                               | All periods   |
|                                  | Incremental Spill      |   | None  |
|                                  | Fish Bypass            |   | Bypass not modeled (installation date set to year 2010 in input file).  |
|                                  | Other Spill            | 22.65 m <sup>3</sup> /s                               | All periods   |
| <b>John Day (440)</b>            | Incremental Spill      |   | None  |
|                                  | Fish Spill             |   | Removed   |
|                                  | Minimum Flow           | 1415.83 m <sup>3</sup> /s<br>353.96 m <sup>3</sup> /s | Mar - Nov<br>Dec - Feb  |
|                                  | Other                  | 464.9 hm <sup>3</sup>                                 | 80.77 m   |
|                                  |                        |   | Use JDA as a run-of-river plant.  |
| <b>The Dalles (365)</b>          | Fish Bypass            |   | Bypass not modeled (installation date set to year 2010 in input file).  |
|                                  | Other Spill            | 36.81 m <sup>3</sup> /s                               | All periods   |
|                                  | Incremental Spill      |   | None  |
|                                  | Fish Spill             |   | Removed   |
|                                  | Minimum Flow           | 1415.83 m <sup>3</sup> /s<br>353.96 m <sup>3</sup> /s | Mar - Nov<br>Dec - Feb  |

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Apr (April 1-30); Apr 15 (April 1-April 15); Apr30 (April 15-April 30); Aug (August 1-31); Aug 15 (August 1-15); Aug 31 (August 16-31).

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| <u>Project<br/>Name (Number)</u>     | <u>Constraint Type</u> | <u>Requirements</u>      |          |  | <u>Source</u>   |
|--------------------------------------|------------------------|--------------------------|----------|--|---|
| Bonneville (320)                     | Fish Bypass            |                          |          | Bypass not modeled (installation date set to year 2010 in input file). |   |
|                                      | Other Spill            | 227.67 m <sup>3</sup> /s |          | All periods  |   |
|                                      | Incremental Spill      |                          |          | None   |   |
|                                      | Fish Spill             |                          |          | Removed  |   |
| Kootenay Lake<br>(Corra Linn (1665)) | Minimum Flow           | 141.58 m <sup>3</sup> /s |          | All periods  | BCHydro agreements 1969                                   |
|                                      | Other                  |                          |          | Operate to IJC orders.   | CRTOC agreement on procedures to implement 1938 IJC order |
| Chelan (1210)                        | Minimum Flow           | 1.42 m <sup>3</sup> /s   |          | All periods  | In place in AOP79, AOP80, AOP84                           |
|                                      | Minimum Content        | 754.8 hm <sup>3</sup>    | 334.67 m | Jul - Sep (except as needed to empty at end of critical period).       | In place in AOP79, AOP80, AOP84                           |
| Couser d'Alene L.<br>(1341)          | Minimum Flow           | 1.42 m <sup>3</sup> /s   |          | All periods  | In place in AOP79, AOP80, AOP84                           |
|                                      | Minimum Content        | 275.2 hm <sup>3</sup>    | 648.61 m | May - Aug  | In place in AOP79   |

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| <u>Project</u><br><u>Name (Number)</u> | <u>Constraint Type</u> | <u>Requirements</u>  | <u>Source</u>  |
|--|------------------------|--|--|
| <b>Other Major Step I Projects</b>     |                        |  |  |
| Libby (1760)<br>Without sturgeon       | Minimum Flow           | 113.27 m <sup>3</sup> /s   | All periods<br>In place in AOP79<br>and AOP86  |
|  | Other Spill            | 5.66 m <sup>3</sup> /s   | All periods  |
|  | Minimum Content        | By contract year: Aug-Jul i.e., 1929 = Aug 1928 - Jul 1929<br>1900.8 hm <sup>3</sup> 720.24 m      1929 Dec<br>1655.1 hm <sup>3</sup> 717.80 m      1929 Jan<br>1476.8 hm <sup>3</sup> 715.98 m      1929 Feb<br>5254.6 hm <sup>3</sup> 744.63 m      1929 Jul<br><br>1595.2 hm <sup>3</sup> 717.19 m      1930 Dec<br>1059.9 hm <sup>3</sup> 711.40 m      1930 Jan<br>952.5 hm <sup>3</sup> 710.18 m      1930 Feb<br>852.6 hm <sup>3</sup> 708.96 m      1930 Mar<br>727.6 hm <sup>3</sup> 707.44 m      1930 Apr 15<br>1086.8 hm <sup>3</sup> 711.71 m      1930 Apr 30<br>1221.1 hm <sup>3</sup> 713.23 m      1930 May<br>3289.7 hm <sup>3</sup> 732.13 m      1930 Jun<br>4335.1 hm <sup>3</sup> 739.14 m      1930 Jul<br><br>777.5 hm <sup>3</sup> 708.05 m      1931 Dec<br>470.2 hm <sup>3</sup> 704.09 m      1931 Jan<br>252.2 hm <sup>3</sup> 701.04 m      1931 Feb-Apr 30<br>470.2 hm <sup>3</sup> 704.09 m      1931 May<br>1655.1 hm <sup>3</sup> 717.80 m      1931 Jun<br>2123.6 hm <sup>3</sup> 722.38 m      1931 Jul<br><br>426.7 hm <sup>3</sup> 703.48 m      1932 Dec<br>252.2 hm <sup>3</sup> 701.04 m      1932 Jan<br>0.0 hm <sup>3</sup> 697.08 m      Empty at end of CP***<br><br>1900.8 hm <sup>3</sup> 720.24 m      All Dec | 2-1-93 PNCA<br>submittal, in place<br>in AOP99<br>(w/o sturgeon)   |
|  | Maximum Summer Draft   | 1.52 m   | July 1930 - No more than 912.8 hm <sup>3</sup> lower than July 1929<br>July 1931 - No more than 2097.0 hm <sup>3</sup> lower than July 1930<br>March - Implement PNCA 6(c)2(c) |
|  | Other                  | Operate to meet IJC orders for Corra Linn  | 2-1-94 PNCA<br>submittal, in place<br>in AOP00 and<br>AOP01 (w/o<br>sturgeon)<br><br>CRTC agreement<br>on procedures to<br>implement 1938 IJC<br>order                         |

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Apr (April 1-30); Apr 15 (April 1-April 15); Apr30 (April 15-April 30); Aug (August 1-31); Aug 15 (August 1-15); Aug 31 (August 16-31).

| <b>Project<br/>Name (Number)</b> | <b>Constraint Type</b> | <b>Requirements</b>   |  |   | <b>Source</b>            |
|----------------------------------|------------------------|---|--|---|--------------------------|
| Dworshak (535)                   | Minimum Flow           | 42.47 m <sup>3</sup> /s   |  | All periods   | 2-1-96 PNCA<br>submittal |
|                                  | Maximum Flow           | 396.43 m <sup>3</sup> /s  |  | All periods   | 2-1-96 PNCA<br>submittal |
|                                  |                        | 707.91 m <sup>3</sup> /s  |  | (up to for flood control)                               |                          |
|                                  | Minimum Elev           | 968.4 hm <sup>3</sup>   | 463.30 m   | SMIN Apr-Aug 31   |                          |
|                                  | Start 4 yr CP at:      | 960.5 hm <sup>3</sup>   | 463.14 m   | (0.15 m lower),   |                          |
|                                  | End 4 yr CP at:        | 808.1 hm <sup>3</sup>   | 460.16 m   | (5.94 m higher).  |                          |
|                                  | Other                  | Run on minimum flow or flood control observing maximum & minimum flow requirements all periods except to meet LWG outflows: |  |   | 2-1-96 PNCA<br>submittal |
|                                  | LWG Target Flow        | 2406.91 m <sup>3</sup> /s<br>1415.83 m <sup>3</sup> /s  | 2831.66 m <sup>3</sup> /s<br>1557.41 m <sup>3</sup> /s | Apr 10 - Jun 20, and<br>Jun 21 - Aug 31.                |                          |
|                                  | Other Spill            | 2.83 m <sup>3</sup> /s  |  |   |                          |
| Lower Granite (520)              | Bypass Date            |   |  | None  |                          |
|                                  | Other Spill            | 18.97 m <sup>3</sup> /s   |  | All periods   |                          |
|                                  | Incremental Spill      |   |  | Removed   |                          |
|                                  | Fish Spill             |   | 16.0%<br>40.0%<br>26.7%                                | Apr 15<br>Apr 30 & May<br>Jun                           | 2-1-96 PNCA<br>submittal |
|                                  | Maximum Spill          | 566.33 m <sup>3</sup> /s  |  |   |                          |
|                                  | Minimum Flow           | 325.64 m <sup>3</sup> /s  |  | Mar-Nov   |                          |
|                                  | Other                  | 542.7 hm <sup>3</sup><br>601.4 hm <sup>3</sup>  | 223.42 m<br>224.94 m                                   | Run at (MOP) Apr 30 - Oct.<br>Run at all other periods. |                          |
| Little Goose (518)               | Bypass Date            |   |  | None  |                          |
|                                  | Other Spill            | 17.84 m <sup>3</sup> /s   |  | All periods   |                          |
|                                  | Incremental Spill      |   |  | Removed   |                          |
|                                  | Fish Spill             |   | 16.0%<br>40.0%<br>26.7%                                | Apr 15<br>Apr 30 & May<br>Jun                           | 2-1-96 PNCA<br>submittal |
|                                  | Maximum Spill          | 566.33 m <sup>3</sup> /s  |  |   |                          |
|                                  | Minimum Flow           | 325.64 m <sup>3</sup> /s  |  | Mar - Nov   |                          |
|                                  | Other                  | 636.6 hm <sup>3</sup><br>697.3 hm <sup>3</sup>  | 192.94 m<br>194.46 m                                   | Run at Apr 15 - Aug 31.<br>Run at all other periods.    |                          |

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(Metric Units)**  
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**Definition of split months:**

Apr (April 1-30); Apr 15 (April 1-April 15); Apr30 (April 15-April 30); Aug (August 1-31); Aug 15 (August 1-15); Aug 31 (August 16-31).

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| <u>Project</u><br><u>Name (Number)</u> | <u>Constraint Type</u> | <u>Requirements</u>                            |                                    | <u>Source</u>  |
|--|------------------------|--|------------------------------------|--|
| Lower Monumental (504)                 | Bypass Date            |  | A bypass date of 2010 was assumed. |  |
|  | Other Spill            | 21.24 m <sup>3</sup> /s                        | All periods                        |  |
|  | Fish Spill             | 16.2%<br>40.5%<br>27.0%                        | Apr 15<br>Apr 30 & May<br>Jun      | 2-1-96 PNCA submittal                                |
|  | Maximum Spill          | 424.75 m <sup>3</sup> /s                       |                                    |  |
|  | Minimum Flow           | 325.64 m <sup>3</sup> /s                       | Mar-Nov                            |  |
|  | Other                  | 439.2 hm <sup>3</sup><br>465.1 hm <sup>3</sup> | 163.68 m<br>164.59 m               | Run at Apr 15 - Aug 31.<br>Run at all other periods. |
| Cushman (2206)                         | Other Spill            | 2.83 m <sup>3</sup> /s                         |                                    |  |
| White River (2160)                     | Other Spill            | 3.68 m <sup>3</sup> /s                         | All periods                        |  |
| Round Butte (390)                      | Other Spill            | 5.66 m <sup>3</sup> /s                         | All periods                        |  |

**COLUMBIA RIVER TREATY  
DETERMINATION OF DOWNSTREAM POWER  
BENEFITS**

**FOR THE ASSURED OPERATING PLAN  
FOR OPERATING YEAR 2001-02**

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**DETERMINATION OF DOWNSTREAM POWER BENEFITS (DDPB)  
FOR THE ASSURED OPERATING PLAN  
FOR OPERATING YEAR 2001-02**

January 2000

**1. Introduction**

The treaty between Canada and the United States of America relating to the cooperative development of the water resources of the Columbia River Basin (Treaty) requires that downstream power benefits from the operation of Canadian Treaty storage be determined in advance by the two Entities. The purpose of this document is to describe the results of the downstream power benefit computations developed from the 2001-02 Assured Operating Plan (AOP).

The procedures followed in the benefit studies are those provided in Article VII; Annex A, paragraph 7, and Annex B of the Treaty; in paragraphs VIII, IX, and X of the Protocol; and in the following Entity agreements:

- The "Columbia River Treaty Entity Agreement on Resolving the Dispute on Critical Period Determination, the Capacity Entitlement for the 1998-99, 1999-00, and 2000-01 AOP/DDPB's, and Operating Procedures for the 2001-02 and Future AOP's," signed 29 August 1996;
- The "Columbia River Treaty Principles and Procedures for Preparation and Use of Hydroelectric Operating Plans" (POP), dated December 1991; and
- The Entity Agreements, signed 28 July and 12 August 1988, on Principles and on Changes to Procedures for the Preparation of the Assured Operating Plan and Determination of Downstream Power Benefit Studies (1988 Entity Agreements).

The Canadian Entitlement Benefits were computed from the following studies:<sup>1</sup>

Step I -- Operation of the total United States of America planned hydro and thermal system, with 15.5 million acre-feet (Maf) (19.12 cubic-kilometers ( $\text{km}^3$ )) of Canadian storage operated for flood control and optimum power generation in both countries.

Step II -- Operation of the Step I thermal system, the United States base hydro system, and 15.5 Maf (19.12  $\text{km}^3$ ) of Canadian storage operated for flood control and optimum power generation in both countries.

Step III -- Operation of the Step I thermal system and the United States base hydro system operated for flood control and optimum power generation in the United States.

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<sup>1</sup> The Treaty defines the Canadian storage precisely in English units. The metric conversion is a rounded approximation.

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As part of the DDPB for the operating year 2001-02, separate determinations were carried out relating to the limit of year-to-year change in benefits attributable to the operation of Canadian Treaty storage in operating plans designed to achieve optimum power generation at-site in Canada and downstream in Canada and the United States of America (Joint Optimum).

Since the Canadian Entitlement Purchase Agreement was based on the operation of Canadian Treaty storage for optimum power generation in the U.S. only (U.S. Optimum), the decrease in the downstream power benefits resulting from the operation of Canadian Treaty storage for Joint Optimum power generation, was separately determined.

## **2. Results of Canadian Entitlement Computations**

The Canadian Entitlement to the downstream power benefits in the United States of America attributable to operation in accordance with Treaty Annex A, paragraph 7, for optimum power generation in Canada and the United States of America, which is one-half the total computed downstream power benefits, was computed to be (See Table 5 Joint Optimum):

$$\begin{array}{ll} \text{Dependable Capacity} & = 1427.1 \text{ MW} \\ \text{Average Annual Usable Energy} & = 532.6 \text{ aMW} \end{array}$$

All downstream power benefits computations are rounded to the nearest tenth of a megawatt.

## **3. Computation of Maximum Allowable Reduction in Downstream Power Benefits**

In accordance with the Treaty Annex A, paragraph 7 and Part III, paragraph 15c(2) of POP, the computation of the maximum allowable reduction in downstream power benefits and the resulting minimum permitted Canadian Entitlement to downstream power benefits for the 2001-02 operating year are based on the formula: Minimum Canadian Entitlement = X - (Y - Z). The quantities X, Y, and Z, expressed in terms of entitlement to downstream power benefits, are computed as follows:

X = One-half of the downstream power benefits derived from the difference between the 2000-01 Step II Joint Optimum study and the Step III study.

Y = One-half of the downstream power benefits derived from the difference between the 2000-01 Step II U.S. Optimum study and the Step III study.

Z = One-half of the downstream power benefits derived from the difference between the 2001-02 Step II U.S. Optimum study with 15 Maf (18.50 km<sup>3</sup>) of Canadian storage and the Step III study.

The purpose of this formula is to set a lower limit on the Canadian Entitlement for the re-operation of Canadian storage. This minimum is based on the previous operating year Canadian Entitlement, plus the removal of 0.5 Maf (0.62 km<sup>3</sup>) of

Canadian storage, and taking out the effect due to changes in loads, resources, and other operating procedures.

The quantities X and Y were computed in the 2000-01 DDPB Table 5. The quantity Z is computed in Table 5 of this report. The computation of the Minimum Canadian Entitlement is as follows:

$$\begin{aligned}\text{Dependable Capacity} &= 1447.3 - (1447.3 - 1403.0) = 1403.0 \text{ MW} \\ \text{Average Annual Usable Energy} &= 508.4 - (507.7 - 520.8) = 521.5 \text{ aMW}\end{aligned}$$

The computed Canadian Entitlement exceeds these amounts.

#### 4. Effect on Sale of Canadian Entitlement

The Canadian Entitlement to downstream power benefits was purchased by the Columbia Storage Power Exchange (CSPE) pursuant to the Canadian Entitlement Purchase Agreement (CEPA) dated 13 August 1964, for a period of thirty years following the completion of each Canadian storage project. The purchase of the Canadian Entitlement by the United States under CEPA expires 31 March 1998 for Duncan, 31 March 1999 for Arrow, and 31 March 2003 for Mica.

The studies developed for this sale included the assumption of operation of Treaty storage for optimum power generation only in the United States of America (U.S. Optimum). The Canadian Entitlement determined from the 2001-02 AOP for this condition was:

$$\begin{aligned}\text{Dependable Capacity} &= 1427.1 \text{ MW} \\ \text{Average Annual Usable Energy} &= 532.2 \text{ aMW}\end{aligned}$$

Because the 2001-02 AOP was designed to achieve optimum power generation at-site in Canada and downstream in Canada and the United States of America, Section 7 of the Agreement requires that "any reduction in the Canadian Entitlement resulting from action taken pursuant to paragraph 7 of Annex A of the Treaty shall be determined in accordance with Subsection (3) of Section 6 of this Agreement." A comparison of the Canadian Entitlement for optimum power in Canada and the United States with the Canadian Entitlement to downstream power benefits shown above indicates an increase in the energy Entitlement of 0.4 aMW and no change in the capacity.

Since the sale of the downstream power benefits attributable to Duncan and Arrow expires 31 March 1998 and 31 March 1999 respectively, the United States Entity is entitled to that portion of the decrease in Canadian Entitlement attributed to Mica. Because there was no decrease in Canadian Entitlement, the United States Entity is not entitled to any compensation attributed to the re-operation of Mica. Accordingly, the Entities are agreed that the United States Entity is not entitled to receive any energy or dependable capacity during the period 1 April 2001 through 31 March 2002, from B.C. Hydro & Power Authority, in accordance with Sections 7 and 10 of the CEPA.

**5. Canadian Entitlement Return**

As noted above, the sale of the Canadian Entitlement attributable to Duncan storage and Arrow storage terminates on 31 March 1998 and 31 March 1999 respectively, under Section 2.1(a) of the CEPA. Under Section 2.3 of this agreement, the percentage of the downstream power benefits allocable to each Canadian storage project is the percentage of the total of the Canadian storages provided by that storage as set out in Article II of the Treaty.

The storage volume in Duncan is 1.4 Maf (1.73 km<sup>3</sup>), in Arrow is 7.1 Maf (8.76 km<sup>3</sup>), and the whole of Canadian storage is 15.5 Maf (19.12 km<sup>3</sup>). Therefore, the obligation of the United States to deliver Canadian Entitlement to Canada for operating year 2001-02 beginning 1 August 2001 and ending 31 July 2002, based on the Joint Optimum power studies, for benefits attributable to Duncan and Arrow is computed below.

a) Energy Entitlement Returned

Average Annual Usable Energy =  
$$532.6 \text{ aMW} * (8.5 \text{ Maf}/15.5 \text{ Maf}) = 292.1 \text{ aMW}$$
$$532.6 \text{ aMW} * (10.48 \text{ km}^3/19.12 \text{ km}^3) = 292.1 \text{ aMW}$$

b) Capacity Entitlement Returned

Dependable Capacity =  
$$1427.1 \text{ MW} * (8.5 \text{ Maf}/15.5 \text{ Maf}) = 782.6 \text{ MW}$$
$$1427.1 \text{ MW} * (10.48 \text{ km}^3/19.12 \text{ km}^3) = 782.6 \text{ MW}$$

**6. Summary of Canadian Entitlement Computations**

The following tables and chart summarize the study results.

Table 1. Determination of Firm Hydro Loads for Step I Studies:

This table shows the loads and resources used in the Step I studies and the computation of the coordinated hydro firm load for the Step I hydroregulation study. This table follows the definition of Step I loads and resources as defined by Treaty Annex B, paragraph 7, and clarified by the 1988 Entity Agreements. Table 1A shows the Step I energy loads and resources while Table 1B shows the Step I peak loads and resources.

Table 2. Determination of Thermal Displacement Market:

This table shows the computation of the thermal displacement market for the downstream power benefit determination of average annual usable energy. The thermal displacement market was limited to the existing and scheduled thermal energy capability including thermal imports after allowance for energy reserves, minimum thermal

generation, and reductions for the thermal resources used outside the Pacific Northwest Area (PNWA).

Table 3. Determination of Loads for 2001-02 Step II and Step III Studies:

This table shows the computation of the Step II and III loads. The monthly loads for Step II and III studies have the same ratio between each month and the annual average as does the PNWA load. The PNWA firm loads on this table were based on the BPA 1995 Whitebook load forecast. The Grand Coulee pumping load is also included in this estimate. The method for computing the firm load for the Step II and III studies is described in the 1988 Entity Agreements and in POP.

Table 4. Summary of Power Regulations from 2001-02 01 Assured Operating Plan:

This table summarizes the results of the Step I, II, and III power regulation studies for each project and the total system. The determination of the Step I, II, and III loads and thermal installations is shown in Tables 1 and 3.

Table 5. Computation of Canadian Entitlement For 2001-02 01 Assured Operating Plan:

- A. Optimum Generation in Canada and the U.S.
- B. Optimum Generation in the U.S. Only
- C. Optimum Generation in the U.S. and a 0.5 Maf (0.62 km<sup>3</sup>) Reduction in Total Canadian Treaty Storage

The essential elements used in the computation of the Canadian Entitlement to downstream power benefits, the minimum permitted downstream power benefits, and the reduction in downstream power benefits attributable to the operation of Canadian Treaty storage for optimum power generation in the United States of America only are shown on this table.

Table 6. Comparison of Recent DDPB Studies

Chart 1. Duration Curves of 30 Years Monthly Hydro Generation:

This chart shows duration curves of the hydro generation from the Step II and III studies, which graphically illustrates the change in average annual usable energy. Usable Energy is firm energy plus usable secondary energy. Secondary energy is the energy capability each month that exceeds the firm hydro loads shown in Table 3. The usable secondary energy in average megawatts for the Step II and III studies is computed in accordance with Annex B, paragraphs 3(b) and 3(c), as the portion of secondary energy which can displace thermal resources that were used to meet PNWA loads plus the other usable secondary generation. The Entities have agreed that "the other usable

"secondary" is computed on the basis of 40 percent of the secondary energy remaining after thermal displacement.

## **7. Summary of Changes from Previous Year**

Data from the five most recent DDPB's are summarized in Table 6. Firm energy shifting was not included in any of these operating plan studies. An explanation of the more important changes compared to last year's studies follows.

### **(a) Loads and Non-Hydro Resources**

Loads for the 2001-02 AOP were based on the 1995 Whitebook medium case forecast developed by BPA in November 1995. Compared to the previous AOP, the PNWA firm energy load increased by 534 aMW. The total exports, not including firm surplus energy, increased by 89 aMW. The increase in exports is mainly due to the increased Canadian Entitlement Return. It was assumed that all of the Entitlement Return was exported to B.C. with one-half of the amount imported back to meet load in the PNWA. The surplus firm energy decreased by 426 aMW and was shaped to meet load only in May and June.

The estimated increase in the Step I load due to the return of the Canadian Entitlement Return exported to Canada assumed in the studies; and the computed Canadian Entitlement Return attributed to Duncan and Arrow for the period 1 August 2001 through 31 July 2002, are shown below for the Joint Optimum studies. The Entitlement Return which was assumed to be imported to meet load in the PNWA is also shown in the table.

|               | Energy Entitlement Returned (aMW) |          | Capacity Returned (MW) |          |
|---------------|-----------------------------------|----------|------------------------|----------|
|               | Estimated                         | Computed | Estimated              | Computed |
| Export to BC  | 276.2                             | 292.1    | 783.0                  | 782.6    |
| Import to PNW | 138.1                             | --       | 391.5                  | --       |

Iterative studies to correct the load estimate were not performed because updating the Canadian Entitlement Return estimates would not significantly affect the results of the studies.

The total annual energy capability of the thermal installations decreased by 8 aMW. Major thermal resource changes included:

- Combustion Turbine resources decreased by 139 aMW due to removal of BPA's Tenaska and Idaho's Wood River projects, and removal of maintenance at PGE's Beaver and Unnamed projects;
- Cogeneration decreased 42 aMW due to the removal of the Klickitat SDS Lumber project and a change in the maintenance schedule for PGE's Coyote Springs;

- Boardman Coal increased by 107 aMW due to a change in maintenance schedule and an upgrade;
- Thermal Non-Utility Generation (NUG) decreased by 34 aMW mostly due to the termination of Springfield's and Clallam County's NUG's, and a decrease in WWP's;
- Thermal Imports increased by 107 aMW due to changes in the Southern California Edison (SCE) to BPA imports, and a new import from Imperial to BPA. Montana Thermal Import decreased and showed different monthly shaping from the previous year's data; and
- Plant Sales increased by 8 aMW due to a change in the maintenance schedule for Boardman, thus PGE's share that was sold to San Diego also increased. This amount is subtracted from the thermal installations.

(b) Operating Procedures

Plant data for Waneta, 7-Mile, Arrow, Rock Island, and Ice Harbor were revised. Generation increased due to an upgrade at Waneta and an expansion at 7-Mile. The addition of generators at Arrow is assumed not to be completed by 2002. The generation vs. discharge (MW/cfs) table was updated for Rock Island. The end storage vs. elevation and head vs. H/K (kW/cfs) tables were updated for Ice Harbor.

The established operating procedures for Base system projects were agreed to by an Entity Agreement signed on 29 August 1996. These requirements are essentially the nonpower requirements included in the 1979-80 and prior AOP/DDPB studies. Major changes from the previous studies included (See Appendixes A1 and A2):

- Hungry Horse minimum flow requirement increased to 400 cfs ( $11.33 \text{ m}^3/\text{s}$ ) from 145 cfs ( $4.11 \text{ m}^3/\text{s}$ ) in all periods. The requirement to meet Columbia Falls minimum flow of 3500 cfs ( $99.11 \text{ m}^3/\text{s}$ ), and the maximum of 4500 cfs ( $127.42 \text{ m}^3/\text{s}$ ) was eliminated;
- Kerr minimum flow decreased to 1500 cfs ( $42.48 \text{ m}^3/\text{s}$ ) in all periods. In the previous year's AOP, minimum flow ranged from 3200 cfs ( $90.61 \text{ m}^3/\text{s}$ ) in most periods to a high of 7742 cfs ( $219.23 \text{ m}^3/\text{s}$ ) in May;
- Only the 1240 feet (ft) (377.95 m) pumping requirement in May remained for Grand Coulee. The 1285 ft (391.67 m) minimum storage for recreation and 1220 ft (371.86 m) minimum for Ferry operations were eliminated;
- All fish spill was eliminated for base system projects (not including fish ladders, lockage, sluiceway);
- John Day was operated to pre-2001 operation with minimum operating pool of 265 ft (80.77 m).

(c) Step III Critical Streamflow Period

The Step III study critical stream flow period was a 6-1/2 month critical period, 1 October 1936 through 15 April 1937. There was no unshapeable surplus firm energy in October as there was in the 2000-01 study. The critical period ended 1/2 period sooner because of the change in the thermal maintenance schedule.

(d) Downstream Power Benefits Computation

The Capacity Entitlement decreased from 1447.3 MW in the 2000-01 DDPB to 1427.1 MW in the 2001-02 DDPB for a loss of 20.2 MW. This was mainly due to an increase in the average critical period load factor.

The Canadian Energy Entitlement increased from 508.4 aMW in the 2000-01 DDPB to 532.6 aMW in the 2001-02 DDPB, an increase of 24.2 aMW. The following parameters were identified as having the most significant impacts.

Thermal Displacement Market

The Thermal Displacement Market increased by 314 aMW in the AOP02 compared to the AOP01. This is mainly due to a decrease in average Annual System Sales of 426 aMW. The increased Thermal Displacement Market caused the Energy Entitlement to decrease by approximately 9 aMW.

Grand Coulee ORC

Grand Coulee operated as an annual project because the March Assured Rule Curve (ARC) was empty, and other projects had to draft below their ARC's to meet firm load. As an annual project Coulee does not have a Variable Refill Curve, and the resulting ORC's were generally higher January through June than the ORC's in the previous study. This caused a significant increase in the Energy Entitlement.

**TABLE 1A**  
**2001-02 ASSURED OPERATING PLAN**  
**DETERMINATION OF FIRM ENERGY HYDRO LOADS FOR STEP I STUDIES (aMW) 1/**

|   | Aug15 | Aug31 | Sept  | Oct   | Nov    | Dec    | Jan    | Feb    | March  | Apr15 | Apr30 | May   | June  | July   | Annual Average | CP Ave 2/ (42.5 Mon) |
|---|-------|-------|-------|-------|--------|--------|--------|--------|--------|-------|-------|-------|-------|--------|----------------|----------------------|
| <b>1. Pacific Northwest Area (PNWA) Load</b>  | 20337 | 20259 | 19827 | 20487 | 22412  | 23992  | 24603  | 23533  | 22215  | 21019 | 21116 | 20496 | 20351 | 20512  | 21641.7        | 21742.4              |
| a) Annual Load Shape in Percent   | 93.97 | 93.61 | 91.61 | 94.66 | 103.56 | 110.86 | 113.68 | 108.74 | 102.65 | 97.12 | 97.57 | 94.70 | 94.04 | 94.78  | 100.0          | 100.5                |
| <b>2. Flows-Out of firm power from PNWA</b>   |       |       |       |       |        |        |        |        |        |       |       |       |       |        |                |                      |
| a) Firm Exports 3/  | 1349  | 1349  | 1367  | 1071  | 1030   | 1031   | 1004   | 980    | 1018   | 1020  | 1058  | 1132  | 1448  | 1399   | 1156.3         | 1148.0               |
| b) Exclude Plant Sales  | -102  | -102  | -102  | -102  | -102   | -102   | -102   | -102   | -102   | -102  | -102  | -102  | -102  | -102   | -101.9         | -101.9               |
| c) Firm Surplus   | 0     | 0     | 0     | 0     | 0      | 0      | 0      | 0      | 0      | 0     | 0     | 1877  | 1877  | 0      | 313.7          | 265.7                |
| d) ...Total   | 1247  | 1247  | 1265  | 969   | 929    | 929    | 902    | 878    | 916    | 918   | 954   | 2907  | 3223  | 1297   | 1368.1         | 1311.8               |
| <b>3. Load served by Flows-In of firm power except Step I thermal installations</b> |       |       |       |       |        |        |        |        |        |       |       |       |       |        |                |                      |
| a) Non-thermal firm imports 4/  | -158  | -158  | -153  | -159  | -174   | -185   | -198   | -207   | -199   | -168  | -168  | -166  | -176  | -164   | -175.4         | -175.7               |
| b) Seasonal Exchange Imports  | 0     | 0     | 0     | 0     | -280   | -286   | -286   | -286   | -30    | -6    | -6    | 0     | 0     | 0      | -96.6          | -108.4               |
| d) ...Total   | -158  | -158  | -153  | -159  | -454   | -471   | -484   | -493   | -229   | -174  | -174  | -166  | -176  | -164   | -272.0         | -284.2               |
| <b>4. Load served by non-Step I resources located within the PNWA</b>               |       |       |       |       |        |        |        |        |        |       |       |       |       |        |                |                      |
| a) Hydro Independents (1929 water)  | -1260 | -1201 | -1068 | -1133 | -1153  | -1046  | -1087  | -814   | -957   | -1268 | -1327 | -1794 | -1603 | -1281  | -1207.6        | -1063.2              |
| b) Non-Step I Coordinated Hydro (1929 water)  | -536  | -464  | -561  | -962  | -960   | -1076  | -1210  | -659   | -708   | -872  | -846  | -659  | -1038 | -633   | -819.7         | -851.3               |
| c) Non-Thermal PURPA/NUGS   | -164  | -164  | -152  | -145  | -143   | -140   | -116   | -118   | -123   | -139  | -138  | -148  | -150  | -145   | -140.3         | -139.9               |
| e) Miscellaneous Resources  | -46   | -46   | -51   | -59   | -71    | -80    | -81    | -78    | -68    | -62   | -62   | -57   | -54   | -47    | -62.4          | -63.2                |
| f) ...Total (1929 water)  | -2006 | -1875 | -1831 | -2299 | -2327  | -2342  | -2494  | -1667  | -1856  | -2341 | -2374 | -2657 | -2844 | -2105  | -2229.9        | -2117.5              |
| <b>5. Total Step I System Firm Loads (1929 water)</b>                               | 19421 | 19473 | 19108 | 18999 | 20559  | 22107  | 22527  | 22250  | 21046  | 19423 | 19522 | 20580 | 20553 | 19539  | 20507.9        | 20652.5              |
| <b>6. Step I Thermal Installations</b>  |       |       |       |       |        |        |        |        |        |       |       |       |       |        |                |                      |
| a) Large Thermal (includes plant sales)   | 4670  | 4670  | 4670  | 4670  | 4670   | 4670   | 4670   | 4670   | 4483   | 4136  | 3419  | 2578  | 4229  | 4670   | 4366.8         | 4413.3               |
| b) Small Thermal  | 32    | 32    | 32    | 32    | 33     | 33     | 33     | 33     | 32     | 32    | 32    | 32    | 32    | 32     | 32.4           | 32.4                 |
| c) Combustion Turbines  | 1924  | 1840  | 1821  | 2061  | 2019   | 2061   | 2061   | 2061   | 1604   | 1612  | 1888  | 1944  | 2053  | 1980.7 | 1966.8         |                      |
| d) Cogeneration (includes plant sales)  | 1538  | 1538  | 1527  | 1528  | 1529   | 1531   | 1532   | 1531   | 1531   | 1541  | 1450  | 935   | 1538  | 1538   | 1478.8         | 1486.8               |
| e) Thermal PURPA/NUGS   | 246   | 246   | 227   | 217   | 214    | 211    | 174    | 178    | 185    | 208   | 208   | 221   | 224   | 218    | 210.4          | 209.9                |
| f) Thermal classified as Renewables   | 52    | 52    | 52    | 52    | 52     | 52     | 52     | 52     | 52     | 52    | 52    | 52    | 52    | 52     | 52.1           | 52.1                 |
| g) Thermal Firm Imports   | 1206  | 1249  | 1016  | 1123  | 1763   | 2002   | 2222   | 2269   | 1879   | 1648  | 1134  | 1006  | 1098  | 1268   | 1518.2         | 1544.7               |
| h) Exclude Seas Exch Imports (see 3b) 5/  | 0     | 0     | 0     | 0     | -280   | -286   | -286   | -286   | -30    | -6    | 0     | 0     | 0     | 0      | -96.6          | -108.4               |
| i) Exclude Plant Sales (see 2b) 6/  | -102  | -102  | -102  | -102  | -102   | -102   | -102   | -102   | -102   | -102  | -102  | -102  | -102  | -102   | -101.9         | -101.9               |
| j) ...Total   | 9567  | 9526  | 9244  | 9581  | 9898   | 10172  | 10356  | 10406  | 10092  | 9115  | 7800  | 6612  | 9017  | 9730   | 9420.9         | 9495.5               |
| <b>7. Total Step I Hydro Load (1929 water) 7/</b>                                   | 9854  | 9948  | 9864  | 9417  | 10661  | 11936  | 12171  | 11844  | 10953  | 10308 | 11722 | 13968 | 11536 | 9809   | 11087.0        | 11157.0              |
| a) Hydro Maintenance as a load  | 32    | 27    | 9     | 9     | 4      | 0      | 0      | 0      | 5      | 7     | 8     | 20    | 16    | 51     | 12.7           | 11.6                 |
| b) Coordinated Hydro Model Load (1929 water) 8/                                     | 10422 | 10439 | 10434 | 10388 | 11626  | 13012  | 13382  | 12502  | 11667  | 11187 | 12575 | 14647 | 12590 | 10493  | 11919.3        | 12019.8              |

1/ Step I Loads and Resources for the U.S. Optimum Study (02-11) as defined by Treaty Annex B-7 and clarified by the 1988 Entity Agreements. Total regional firm load plus pumping.

2/ The Step I critical period begins 16 August 1928 and ends 29 February 1932.

3/ Includes 276 aMW uniform export of Canadian Entitlement. All is returned to Canada and one-half is imported to the region.

4/ Includes 138 aMW uniform import of Canadian Entitlement. The remaining is Skagit River Treaty.

5/ The Seasonal Exchange Imports are included in Thermal Firm Imports, line 6(g).

6/ Plant sales include Longview Fibre (Cogeneration, line 6(d)) and 15 percent of Boardman (Large Thermal, line 6(a)).

7/ Regulated hydro load for U.S. projects located upstream of Bonneville Dam, line 5 minus line 6(j).

8/ The Coordinated Hydro Model Load is the Step I Hydro Load plus Hydro Maintenance plus Non-Step I Coordinated Hydro.

**TABLE 1B**  
**2001-02 ASSURED OPERATING PLAN**  
**DETERMINATION OF FIRM PEAK HYDRO LOADS FOR STEP I STUDIES (MW) 1/**

|   | Aug15 | Aug31 | Sept  | Oct   | Nov   | Dec   | Jan   | Feb   | March | Apr15 | Apr30 | May   | June  | July  |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| <b>1. Pacific Northwest Area (PNWA) Load</b>  | 25099 | 25054 | 24908 | 27406 | 29519 | 32007 | 32717 | 32128 | 29711 | 28109 | 28191 | 26564 | 25620 | 25168 |
| a) Load Shape in Percent  | 80.86 | 80.86 | 79.60 | 74.75 | 75.92 | 74.96 | 75.20 | 73.25 | 74.77 | 74.73 | 74.73 | 77.16 | 79.43 | 81.50 |
| <b>2. Flows-Out of firm power from PNWA</b>   | 3295  | 3295  | 3297  | 2690  | 1735  | 1723  | 1723  | 1799  | 1774  | 1766  | 1816  | 2090  | 3322  | 3337  |
| a) Firm Exports 2/  | -116  | -116  | -116  | -116  | -116  | -116  | -116  | -116  | -116  | -116  | -116  | -45   | -116  | -116  |
| b) Exclude Plant Sales  | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 2433  | 2363  | 0     |
| c) Firm Surplus   | 3179  | 3179  | 3181  | 2574  | 1619  | 1607  | 1607  | 1683  | 1658  | 1650  | 1700  | 4478  | 5569  | 3221  |
| d) ...Total   | -538  | -538  | -538  | -538  | -1127 | -1141 | -1163 | -1187 | -662  | -550  | -550  | -538  | -538  | -538  |
| <b>3. Load served by Flows-In of firm power except Step I thermal installations</b> | 1926  | 1911  | 1839  | 1792  | 1725  | 1695  | 1635  | 1761  | 1846  | 1970  | 1994  | 2171  | 2197  | 2032  |
| a) Non-thermal firm imports 3/  | 0     | 0     | 0     | 0     | -601  | -601  | -601  | -601  | -46   | -12   | -12   | 0     | 0     | 0     |
| b) Seasonal Exchange Imports  | -169  | -169  | -158  | -151  | -148  | -145  | -121  | -123  | -130  | -144  | -144  | -153  | -154  | -150  |
| c) ...Total   | -33   | -33   | -36   | -37   | -339  | -341  | -340  | -339  | -340  | -40   | -40   | -39   | -38   | -34   |
| <b>4. Loads served by non-Step I resources located withinin the PNWA</b>            | -4566 | -4569 | -4541 | -4456 | -4620 | -4543 | -4314 | -4222 | -4327 | -4144 | -4274 | -4295 | -4719 | -4727 |
| a) Hydro Independents (1937 water)  | 23174 | 23125 | 23010 | 24986 | 25392 | 27931 | 28848 | 28403 | 26381 | 25065 | 25067 | 26209 | 25932 | 23124 |
| <b>5. Total Step I System Firm Loads (1937 water)</b>                               | 5349  | 5349  | 5349  | 5349  | 5349  | 5349  | 5349  | 5349  | 5084  | 4872  | 3876  | 3091  | 4333  | 5349  |
| <b>6. Step I Thermal Installations</b>  | 38    | 38    | 38    | 38    | 41    | 41    | 41    | 41    | 38    | 38    | 38    | 38    | 38    | 38    |
| a) Large Thermal (includes plant sales)   | 2213  | 2035  | 2151  | 2452  | 2461  | 2466  | 2469  | 2484  | 2458  | 1597  | 1558  | 2047  | 2224  | 2220  |
| b) Small Thermal  | 1604  | 1604  | 1593  | 1594  | 1595  | 1597  | 1598  | 1597  | 1597  | 1607  | 1607  | 1059  | 1444  | 1604  |
| c) Combustion Turbines  | 253   | 253   | 237   | 227   | 222   | 218   | 182   | 185   | 195   | 216   | 216   | 229   | 230   | 225   |
| d) Cogeneration (includes plant sales)  | 52    | 52    | 52    | 52    | 52    | 52    | 53    | 53    | 53    | 53    | 53    | 53    | 53    | 53    |
| e) Thermal PURPA/NUGS   | 1479  | 1479  | 1135  | 1366  | 1948  | 2235  | 2459  | 2426  | 1908  | 1545  | 1270  | 1624  | 1629  | 1494  |
| f) Thermals classified as Renewables  | 0     | 0     | 0     | 0     | -601  | -601  | -601  | -601  | -46   | -12   | -12   | 0     | 0     | 0     |
| g) Thermal Firm Imports   | -116  | -116  | -116  | -116  | -116  | -116  | -116  | -116  | -116  | -116  | -116  | -45   | -116  | -116  |
| h) Exclude Seas Exch Imports (see 3b) 4/  | 10872 | 10694 | 10438 | 10961 | 10950 | 11240 | 11433 | 11397 | 11171 | 9800  | 8490  | 8095  | 9835  | 10866 |
| i) Exclude Plant Sales (see 2b) 5/  | 12302 | 12432 | 12572 | 14025 | 14442 | 16691 | 17415 | 17006 | 15210 | 15265 | 16577 | 18114 | 16098 | 12258 |
| j) ...Total   | 4629  | 4066  | 3787  | 3208  | 2935  | 2037  | 1561  | 2295  | 2646  | 2751  | 2483  | 2360  | 2204  | 3725  |
| <b>7. Total Step I Hydro Load (1937 water) 6/</b>                                   | 19369 | 18954 | 18867 | 19710 | 19784 | 21090 | 21194 | 21301 | 19866 | 20006 | 21156 | 22406 | 20632 | 18494 |
| a) Hydro Maintenance as a load  | 391.5 | 391.5 | 391.5 | 391.5 | 391.5 | 391.5 | 391.5 | 391.5 | 391.5 | 391.5 | 391.5 | 391.5 | 391.5 | 391.5 |
| b) Coordinated Hydro Model Load (1937 water) 7/                                     | 19369 | 18954 | 18867 | 19710 | 19784 | 21090 | 21194 | 21301 | 19866 | 20006 | 21156 | 22406 | 20632 | 18494 |

1/ Step I Loads and Resources for the U.S. Optimum study (02-11) as defined by Treaty Annex B-7 and clarified by the 1988 Entity Agreements. Total regional firm load plus pumping.

2/ Includes 783 MW uniform export of Canadian Entitlement. All is returned to Canada and one-half is imported to the region.

3/ Includes 391.5 MW uniform import of Canadian Entitlement. The remaining is Skagit River Treaty.

4/ The Seasonal Exchange Imports are included in Thermal Firm Imports, line 6(g).

5/ Plant sales include Longview Fibre (Cogeneration, line 6(d)) and 15 percent of Boardman (Large Thermal, line 6(a)).

6/ Regulated hydro load for U.S. projects located upstream of Bonneville Dam, line 5 minus line 6(j).

7/ The Coordinated Hydro Model Load is the Step I Hydro Load plus Hydro Maintenance plus Non-Step I Coordinated Hydro.

**TABLE 2**  
**2001-02 ASSURED OPERATING PLAN**  
**DETERMINATION OF THERMAL DISPLACEMENT MARKET**  
**(Energy in aMW)**

|  | Aug15 | Aug31 | Sept | Oct  | Nov  | Dec  | Jan   | Feb   | Mar   | Apr15 | Apr30 | May  | June | July | Annual Average<br>(42.5 Mon) | CP Ave |
|--|-------|-------|------|------|------|------|-------|-------|-------|-------|-------|------|------|------|------------------------------|--------|
| <b>1. STEP I THERMAL INSTALLATIONS</b>       | 9567  | 9526  | 9244 | 9581 | 9618 | 9886 | 10070 | 10120 | 10062 | 9109  | 7794  | 6612 | 9017 | 9730 | 9324.3                       | 9387.1 |
| <b>2. MINIMUM THERMAL GENERATION</b>         |       |       |      |      |      |      |       |       |       |       |       |      |      |      |                              |        |
| a) Large Thermal Min. Generation             | 147   | 147   | 456  | 456  | 456  | 456  | 456   | 456   | 456   | 147   | 147   | 147  | 147  | 147  | 326.5                        | 342.5  |
| b) Cogen & Small Thermal Min. Gen            | 453   | 453   | 455  | 458  | 460  | 461  | 461   | 460   | 460   | 459   | 459   | 223  | 455  | 453  | 437.8                        | 441.0  |
| c) NUGS Thermal Min. Generation              | 82    | 82    | 76   | 72   | 71   | 70   | 58    | 59    | 62    | 69    | 69    | 74   | 75   | 73   | 70.1                         | 70.0   |
| d) ...Total Minimum Generation               | 682   | 682   | 987  | 986  | 987  | 987  | 975   | 975   | 978   | 675   | 675   | 444  | 677  | 673  | 834.4                        | 853.4  |
| <b>3. DISPLACEABLE THERMAL RESOURCES</b>     | 8885  | 8844  | 8257 | 8595 | 8630 | 8899 | 9095  | 9145  | 9085  | 8434  | 7119  | 6168 | 8340 | 9058 | 8489.9                       | 8533.7 |
| <b>4. SYSTEM SALES</b>                       |       |       |      |      |      |      |       |       |       |       |       |      |      |      |                              |        |
| a) Total Exports                             | 1349  | 1349  | 1367 | 1071 | 1030 | 1031 | 1004  | 980   | 1018  | 1020  | 1056  | 1132 | 1448 | 1399 | 1156.3                       | 1148.0 |
| b) Exclude Can Entitlement (out of the PNWA) | -276  | -276  | -276 | -276 | -276 | -276 | -276  | -276  | -276  | -276  | -276  | -276 | -276 | -276 | -276.2                       | -276.2 |
| c) Exclude Plant Sales Exports               | -102  | -102  | -102 | -102 | -102 | -102 | -102  | -102  | -102  | -102  | -102  | -102 | -102 | -102 | -101.9                       | -101.9 |
| d) Exclude Seasonal Exchange Exports         | -272  | -272  | -283 | -15  | 0    | 0    | 0     | 0     | 0     | 0     | 0     | 0    | -283 | -283 | -94.8                        | -90.5  |
| e) Firm Surplus Sales                        | 0     | 0     | 0    | 0    | 0    | 0    | 0     | 0     | 0     | 0     | 1877  | 1877 | 0    | 0    | 313.7                        | 265.7  |
| f) ...Total System Sales                     | 700   | 700   | 706  | 678  | 652  | 653  | 626   | 602   | 639   | 642   | 678   | 2631 | 2664 | 738  | 997.1                        | 945.0  |
| g) Uniform Average Annual System Sales       | 997   | 997   | 997  | 997  | 997  | 997  | 997   | 997   | 997   | 997   | 997   | 997  | 997  | 997  | 997.1                        | 997.1  |
| <b>5. THERMAL DISPLACEMENT MARKET</b>        | 7888  | 7847  | 7260 | 7598 | 7633 | 7901 | 8098  | 8148  | 8088  | 7436  | 6122  | 5171 | 7343 | 8060 | 7492.8                       | 7536.5 |

**Notes:**

- Line 1 The Total Step I Thermal Installations listed here are lower by the amount shown on Table 1A, line 6(j) due to the omission of the Seasonal Exchange imports.
- Line 2a Large Thermal minimum generation includes Centralia and Jim Bridger.
- Line 2b Cogen & Small Thermal Minimum Generation Includes Spokane Muni Solid Waste, Tacoma Steam Plant , Vale, EWEB Weyerhauser cogen, and PP&L cogen plants.
- Line 2c 60% of the total NUGS is thermal. Non-displaceable NUGS generation is 1/3 of the thermal NUGS.
- Line 2d Total Minimum Thermal Generation, the sum of lines 2(a) through line 2(c).
- Line 3 Step I Thermal Installations that are displaceable, line 1 minus line 2(d).
- Line 4a Total Exports from Table 1A, line 2(a).
- Line 4c Plant sales include Longview Fibre and approximately 15 percent of Boardman.
- Line 4d Seasonal exchanges with extraregional utilities.
- Line 4f System Sales are total exports excluding plant sales, seasonal exchanges, and the Canadian Entitlement. The sum of lines 4(a) through line 4(e).
- Line 4g Average Annual System Sales shaped uniformly per 1988 Entity Agreement assumption that shaping is supported by hydro system.
- Line 5 PNWA Thermal Displacement Market is the Total Displaceable Thermal Resources used to meet PNWA firm loads, line 3 minus line 4(g).

**TABLE 3**  
**2001-02 ASSURED OPERATING PLAN**  
**DETERMINATION OF LOADS FOR STEP II AND STEP III STUDIES**

| PACIFIC NORTHWEST AREA (PNWA) LOAD |                              |                          |                | Energy Capability of Thermal Installations 2/<br>(aMW) | STEP II STUDY          |                        | STEP III STUDY         |                        |        |                 |
|------------------------------------|------------------------------|--------------------------|----------------|--|------------------------|------------------------|------------------------|------------------------|--------|-----------------|
| Period                             | PNWA Energy Load 1/<br>(aMW) | Annual Energy Load Shape | Peak Load (MW) | Load Factor (Percent)                                  | Total Load 3/<br>(aMW) | Hydro Load 4/<br>(aMW) | Total Load 3/<br>(aMW) | Hydro Load 4/<br>(aMW) | Period |                 |
| August 1-15                        | 20337                        | 93.97                    | 25099          | 80.86  | 9567                   | 17187.3                | 7620.6                 | 14939.2                | 5372.5 | August 1-15     |
| August 16-31                       | 20259                        | 93.61                    | 25054          | 80.86  | 9526                   | 17121.4                | 7595.6                 | 14881.9                | 5356.2 | August 16-31    |
| September                          | 19827                        | 91.61                    | 24908          | 79.60  | 9244                   | 16756.3                | 7512.4                 | 14564.6                | 5320.7 | September       |
| October                            | 20487                        | 94.66                    | 27406          | 74.75  | 9581                   | 17313.9                | 7732.5                 | 15049.2                | 5467.9 | October         |
| November                           | 22412                        | 103.56                   | 29519          | 75.92  | 9618                   | 18940.9                | 9323.3                 | 16463.4                | 6845.8 | November        |
| December                           | 23992                        | 110.86                   | 32007          | 74.96  | 9886                   | 20276.6                | 10390.8                | 17624.4                | 7738.6 | December        |
| January                            | 24603                        | 113.68                   | 32717          | 75.20  | 10070                  | 20793.0                | 10723.0                | 18073.3                | 8003.3 | January         |
| February                           | 23533                        | 108.74                   | 32128          | 73.25  | 10120                  | 19888.3                | 9767.9                 | 17286.9                | 7166.5 | February        |
| March                              | 22215                        | 102.65                   | 29711          | 74.77  | 10062                  | 18774.5                | 8712.2                 | 16318.8                | 6256.5 | March           |
| April 1-15                         | 21019                        | 97.12                    | 28109          | 74.73  | 9109                   | 17763.9                | 8655.0                 | 15440.4                | 6331.4 | April 1-15      |
| April 16-30                        | 21116                        | 97.57                    | 28191          | 74.73  | 7794                   | 17845.7                | 10051.3                | 15511.4                | 7717.1 | April 16-30     |
| May                                | 20496                        | 94.70                    | 26564          | 77.16  | 6612                   | 17321.7                | 10709.7                | 15056.0                | 8444.0 | May             |
| June                               | 20351                        | 94.04                    | 25620          | 79.43  | 9017                   | 17199.6                | 8182.6                 | 14949.8                | 5932.9 | June            |
| July                               | 20512                        | 94.78                    | 25168          | 81.50  | 9730                   | 17335.2                | 7605.0                 | 15067.8                | 5337.6 | July            |
| Annual Average 7/                  | 21641.7                      | 100.00                   |                | 76.87  | 9324.3                 | 18290.2                | 8965.9                 | 15897.9                | 6573.5 | Annual Average  |
| S I CP Average (42.5)              | 21742.4                      |                          |                | 76.74  | 9387.1                 | 18502.7                | 9055.6                 | 16693.3                | 6865.3 | CP avg (6.5 mo) |
| S II CP Average (20)               | 21893.1                      |                          |                |  | 9447.1                 |                        |                        |                        |        |                 |
| S III CP Average (6.5)             | 22724.5                      |                          |                |  | 9828.0                 |                        |                        |                        |        |                 |
|                                    |                              |                          |                |  |                        | Input 5/ →             | 9055.6                 | Input 6/ →             | 6865.3 |                 |
| August 1-31                        | 20296.4                      | 93.8                     | 25099.2        | 80.86  | 9545.6                 | 17153.3                | 7607.7                 | 14909.6                | 5364.0 | August 1-31     |
| April 1-30                         | 21067.4                      | 97.3                     | 28190.9        | 74.73  | 8451.6                 | 17804.8                | 9353.2                 | 15475.9                | 7024.3 | April 1-30      |

1/ The PNWA load does not include the exports, but does include pumping. The computation of the load shape for Step II/III studies used these loads.

2/ The thermal installations include all thermal used to meet the Step I system load. (Table 2, line 1).

3/ The total firm load for the Step II/III studies is computed to have the same shape as the load of the PNWA.

4/ The hydro load is equal to the total load minus the Step I study thermal installations.

5/ Input is the assumed critical period (CP) average generation for the Step II hydro studies and is used to calculate the residual hydro loads.

6/ Input is the assumed Step III 6.5-month CP average generation.

7/ The Annual Average is for 2001-02 operating year, not a leap year.

**TABLE 4**  
**(English Units)**  
**SUMMARY OF POWER REGULATIONS**  
**FROM 2001-02 ASSURED OPERATING PLAN**

| PROJECTS   | BASIC                | DATA                                  | STEP I            |                              |                                 | STEP II           |                              |                                 | STEP III                       |                   |                              |                                 |
|--|----------------------|---------------------------------------|-------------------|------------------------------|---------------------------------|-------------------|------------------------------|---------------------------------|--------------------------------|-------------------|------------------------------|---------------------------------|
|  | NUMBER OF UNITS      | MAXIMUM INSTALLED PEAKING CAPACITY MW | USABLE STORAGE km | JANUARY 1937 PEAKING CAP. MW | Critical Period Average Gen. MW | USABLE STORAGE km | JANUARY 1945 PEAKING CAP. MW | Critical Period Average Gen. MW | 30 YEAR AVERAGE ANNUAL GEN. MW | USABLE STORAGE km | JANUARY 1937 PEAKING CAP. MW | Critical Period Average Gen. MW |
| <b>HYDRO RESOURCES</b>                             |                      |                                       |                   |                              |                                 |                   |                              |                                 |                                |                   |                              |                                 |
| CANADIAN   |                      |                                       |                   |                              |                                 |                   |                              |                                 |                                |                   |                              |                                 |
| Mica   |                      | 7000                                  |                   |                              |                                 |                   |                              |                                 |                                |                   |                              |                                 |
| Arrow  |                      | 7100                                  |                   |                              |                                 |                   |                              |                                 |                                |                   |                              |                                 |
| Duncan   |                      | 1400                                  |                   |                              |                                 |                   |                              |                                 |                                |                   |                              |                                 |
| Subtotal   |                      | 15500                                 |                   |                              |                                 |                   |                              |                                 |                                |                   |                              |                                 |
| BASE SYSTEM  |                      |                                       |                   |                              |                                 |                   |                              |                                 |                                |                   |                              |                                 |
| Hungry Horse                                       | 4                    | 428                                   | 3072              | 323                          | 103                             | 3008              | 188                          | 117                             | 104                            | 3008              | 304                          | 221                             |
| Kerr   | 3                    | 160                                   | 1219              | 156                          | 120                             | 1219              | 153                          | 112                             | 123                            | 1219              | 153                          | 126                             |
| Thompson Falls                                     | 6                    | 85                                    | 0                 | 85                           | 54                              | 0                 | 85                           | 53                              | 58                             | 0                 | 85                           | 61                              |
| Noxon Rapids                                       | 5                    | 554                                   | 231               | 549                          | 152                             | 0                 | 554                          | 134                             | 201                            | 0                 | 554                          | 162                             |
| Cabinet Gorge                                      | 4                    | 239                                   | 0                 | 239                          | 100                             | 0                 | 239                          | 90                              | 117                            | 0                 | 239                          | 103                             |
| Albeni Falls                                       | 3                    | 50                                    | 1155              | 22                           | 23                              | 1155              | 20                           | 23                              | 21                             | 1155              | 12                           | 16                              |
| Box Canyon   | 4                    | 74                                    | 0                 | 71                           | 45                              | 0                 | 70                           | 45                              | 48                             | 0                 | 69                           | 52                              |
| Grand Coulee                                       | 24+3SS               | 6684                                  | 5185              | 6369                         | 1968                            | 5072              | 6369                         | 1783                            | 2353                           | 5072              | 5732                         | 1196                            |
| Chief Joseph                                       | 27                   | 2614                                  | 0                 | 2614                         | 1117                            | 0                 | 2614                         | 1017                            | 1363                           | 0                 | 2614                         | 717                             |
| Wells  | 10                   | 840                                   | 0                 | 840                          | 420                             | 0                 | 840                          | 390                             | 488                            | 0                 | 840                          | 281                             |
| Chelan   | 2                    | 54                                    | 677               | 51                           | 39                              | 678               | 51                           | 38                              | 43                             | 678               | 51                           | 44                              |
| Rocky Reach  | 11                   | 1267                                  | 0                 | 1267                         | 575                             | 0                 | 1267                         | 533                             | 692                            | 0                 | 1267                         | 376                             |
| Rock Island  | 18                   | 513                                   | 0                 | 513                          | 256                             | 0                 | 513                          | 240                             | 301                            | 0                 | 513                          | 171                             |
| Wanapum  | 10                   | 986                                   | 0                 | 986                          | 518                             | 0                 | 986                          | 482                             | 603                            | 0                 | 986                          | 331                             |
| Prest Rapids                                       | 10                   | 912                                   | 0                 | 912                          | 510                             | 0                 | 912                          | 477                             | 574                            | 0                 | 912                          | 338                             |
| Brownlee   | 5                    | 675                                   | 975               | 675                          | 240                             | 974               | 675                          | 313                             | 316                            | 974               | 675                          | 269                             |
| Oxbow  | 4                    | 220                                   | 0                 | 220                          | 99                              | 0                 | 220                          | 124                             | 128                            | 0                 | 220                          | 114                             |
| Ice Harbor   | 6                    | 693                                   | 0                 | 693                          | 212                             | 0                 | 693                          | 232                             | 303                            | 0                 | 693                          | 161                             |
| McNary   | 14                   | 1127                                  | 0                 | 1127                         | 653                             | 0                 | 1127                         | 638                             | 802                            | 0                 | 1127                         | 469                             |
| John Day   | 16                   | 2484                                  | 535               | 2484                         | 944                             | 0                 | 2484                         | 922                             | 1254                           | 0                 | 2484                         | 669                             |
| The Dalles   | 22+2F                | 2074                                  | 0                 | 2074                         | 748                             | 0                 | 2074                         | 732                             | 993                            | 0                 | 2074                         | 553                             |
| Bonneville   | 18+2F                | 1147                                  | 0                 | 1147                         | 595                             | 0                 | 1147                         | 581                             | 731                            | 0                 | 1147                         | 436                             |
| Kootenay Lake                                      | 0                    | 0                                     | 673               | 0                            | 0                               | 673               | 0                            | 0                               | 0                              | 673               | 0                            | 0                               |
| Coeur d'Alene Lake                                 | 0                    | 0                                     | 223               | 0                            | 0                               | 223               | 0                            | 0                               | 0                              | 223               | 0                            | 0                               |
| Total Base and Canadian System Hydro <sup>1/</sup> |                      | 23880                                 | 29445             | 23417                        | 9491                            | 28500             | 23280                        | 9056                            | 11613                          | 13000             | 22750                        | 6865                            |
| ADDITIONAL STEP I PROJECTS                         |                      |                                       |                   |                              |                                 |                   |                              |                                 |                                |                   |                              |                                 |
| Libby  | 5                    | 600                                   | 4980              | 542                          | 195                             |                   |                              |                                 |                                |                   |                              |                                 |
| Boundary   | 6                    | 1055                                  | 0                 | 855                          | 368                             |                   |                              |                                 |                                |                   |                              |                                 |
| Spokane River Plants                               | 24                   | 173                                   | 104               | 166                          | 99                              |                   |                              |                                 |                                |                   |                              |                                 |
| Hells Canyon                                       | 3                    | 450                                   | 0                 | 410                          | 192                             |                   |                              |                                 |                                |                   |                              |                                 |
| Dworschak  | 3                    | 450                                   | 2015              | 438                          | 128                             |                   |                              |                                 |                                |                   |                              |                                 |
| Lower Granite                                      | 6                    | 932                                   | 0                 | 930                          | 188                             |                   |                              |                                 |                                |                   |                              |                                 |
| Little Goose                                       | 6                    | 932                                   | 0                 | 928                          | 186                             |                   |                              |                                 |                                |                   |                              |                                 |
| Lower Monumental                                   | 6                    | 932                                   | 0                 | 922                          | 195                             |                   |                              |                                 |                                |                   |                              |                                 |
| Petton, Rereg., & RB                               | 7                    | 423                                   | 274               | 418                          | 127                             |                   |                              |                                 |                                |                   |                              |                                 |
| Total added Step I                                 |                      | 5947                                  | 7373              | 5610                         | 1678                            |                   |                              |                                 |                                |                   |                              |                                 |
| THERMAL INSTALLATION <sup>2/</sup>                 |                      |                                       |                   | 11433                        | 9496                            |                   | 11433                        | 9447                            |                                | 11433             | 9828                         |                                 |
| RESERVES, HYDRO MAINTENANCE <sup>3/</sup>          |                      |                                       |                   | -4179                        | -12                             |                   | -2212                        | 0                               |                                | -1923             | 0                            |                                 |
| TOTAL RESOURCES                                    |                      |                                       |                   | 36282                        | 20653                           |                   | 32501                        | 18503                           |                                | 32260             | 16693                        |                                 |
| STEP I, II, & III LOADS <sup>4/</sup>              |                      |                                       |                   | 28848                        | 20653                           |                   | 27650                        | 18503                           |                                | 24034             | 16693                        |                                 |
| SURPLUS  |                      |                                       |                   | 7434                         | 0                               |                   | 4851                         | 0                               |                                | 8226              | 0                            |                                 |
| CRITICAL PERIOD                                    | Starts               |                                       |                   | August 16, 1928              |                                 |                   | September 1, 1943            |                                 |                                | October 1, 1936   |                              |                                 |
|  | Ends                 |                                       |                   | February 29, 1932            |                                 |                   | April 30, 1945               |                                 |                                | April 15, 1937    |                              |                                 |
|  | Length (Months)      |                                       |                   | 42.5 Months                  |                                 |                   | 20 Months                    |                                 |                                | 5.5 Months        |                              |                                 |
|  | Study Identification |                                       |                   | 02-41                        |                                 |                   | 02-42                        |                                 |                                | 02-13             |                              |                                 |

<sup>1/</sup> The above totals are correct, but may not equal the sum of the above values due to rounding.

<sup>2/</sup> From Tables 1 and 3.

<sup>3/</sup> Peak reserves for Step I, II, III are 8 percent of January peak load from Table 3. Energy reserve deductions only include the hydro maintenance for Step I study (reserves have been included in thermal plant energy capability) from Table 1A, line 7(a).

<sup>4/</sup> Step I energy load from Table 1A, line 5 and January peak load from Table 1B, line 5. Step II & III energy load from Table 3. Step II & III peak load is equal to the step II or step III annual average load multiplied by the ratio of the PNWA January peak load to the PNW annual average load.

**TABLE 4M**  
**(Metric Units)**  
**SUMMARY OF POWER REGULATIONS**  
**FROM 2001-02 ASSURED OPERATING PLAN**

| PROJECTS                                   | BASIC                 | DATA  | STEP I                               |  |   | STEP II                              |  |   | STEP III 4/                                |                                      |  |   |
|--|-----------------------|---|--------------------------------------|--|---|--------------------------------------|--|---|--|--------------------------------------|--|---|
|  | NUMBER<br>OF<br>UNITS | NOMINAL<br>INSTALLED<br>PEAKING<br>CAPACITY<br>MW | USABLE<br>STORAGE<br>hm <sup>3</sup> | JANUARY<br>1937<br>PEAKING<br>CAP.<br>MW | Critical<br>Period<br>AVERAGE<br>GEN.<br>MW | USABLE<br>STORAGE<br>hm <sup>3</sup> | JANUARY<br>1945<br>PEAKING<br>CAP.<br>MW | Critical<br>Period<br>AVERAGE<br>GEN.<br>MW | 30 YEAR<br>AVERAGE<br>ANNUAL<br>GEN.<br>MW | USABLE<br>STORAGE<br>hm <sup>3</sup> | JANUARY<br>1937<br>PEAKING<br>CAP.<br>MW | Critical<br>Period<br>AVERAGE<br>GEN.<br>MW |
| <b>HYDRO RESOURCES</b>                     |                       |   |                                      |  |   |                                      |  |   |  |                                      |  |   |
| <b>CANADIAN</b>                            |                       |   |                                      |  |   |                                      |  |   |  |                                      |  |   |
| Mica                                       |                       | 8635  |                                      |  | 8635  |                                      |  |   |  |                                      |  |   |
| Arrow                                      |                       | 8758  |                                      |  | 8758  |                                      |  |   |  |                                      |  |   |
| Duncan                                     |                       | 1727  |                                      |  | 1727  |                                      |  |   |  |                                      |  |   |
| Subtotal                                   |                       | 19119   |                                      |  | 19119                                       |                                      |  |   |  |                                      |  |   |
| <b>BASE SYSTEM</b>                         |                       |   |                                      |  |   |                                      |  |   |  |                                      |  |   |
| Hungry                                     | 4                     | 428   | 3789                                 | 323                                      | 103   | 3710                                 | 188                                      | 117   | 104  | 3710                                 | 304                                      | 221   |
| Kerr                                       | 3                     | 160   | 1504                                 | 156                                      | 120   | 1504                                 | 153                                      | 112   | 123  | 1504                                 | 153                                      | 126   |
| Thompson                                   | 5                     | 85  | 0                                    | 85                                       | 54  | 0                                    | 85                                       | 53  | 58   | 0                                    | 85                                       | 61  |
| Noxon F                                    | 5                     | 554   | 285                                  | 549                                      | 152   | 0                                    | 554                                      | 134   | 201  | 0                                    | 554                                      | 162   |
| Cabinet                                    | 4                     | 239   | 0                                    | 239                                      | 100   | 0                                    | 239                                      | 90  | 117  | 0                                    | 239                                      | 103   |
| Albeni F                                   | 3                     | 50  | 1425                                 | 22                                       | 23  | 1425                                 | 20                                       | 23  | 21   | 1425                                 | 12                                       | 16  |
| Box Cai                                    | 4                     | 74  | 0                                    | 71                                       | 45  | 0                                    | 70                                       | 45  | 48   | 0                                    | 69                                       | 52  |
| Grand C                                    | 24+3SS                | 6684  | 6396                                 | 6369                                     | 1968  | 6256                                 | 6369                                     | 1763  | 2353                                       | 6256                                 | 5732                                     | 1196  |
| Chief Jct                                  | 27                    | 2614  | 0                                    | 2614                                     | 1117  | 0                                    | 2614                                     | 1017  | 1363                                       | 0                                    | 2614                                     | 717   |
| Wells                                      | 10                    | 840   | 0                                    | 840                                      | 420   | 0                                    | 840                                      | 390   | 488  | 0                                    | 840                                      | 281   |
| Chelan                                     | 2                     | 54  | 835                                  | 51                                       | 39  | 834                                  | 51                                       | 38  | 43   | 834                                  | 51                                       | 44  |
| Rocky F                                    | 11                    | 1267  | 0                                    | 1267                                     | 575   | 0                                    | 1267                                     | 533   | 692  | 0                                    | 1267                                     | 376   |
| Rock Isl                                   | 18                    | 513   | 0                                    | 513                                      | 256   | 0                                    | 513                                      | 240   | 301  | 0                                    | 513                                      | 171   |
| Wanapitae                                  | 10                    | 986   | 0                                    | 986                                      | 518   | 0                                    | 986                                      | 482   | 603  | 0                                    | 986                                      | 331   |
| Priest R                                   | 10                    | 912   | 0                                    | 912                                      | 510   | 0                                    | 912                                      | 477   | 574  | 0                                    | 912                                      | 338   |
| Brownie                                    | 5                     | 675   | 1203                                 | 675                                      | 240   | 1201                                 | 675                                      | 313   | 316  | 1201                                 | 675                                      | 269   |
| Oxbow                                      | 4                     | 220   | 0                                    | 220                                      | 99  | 0                                    | 220                                      | 124   | 128  | 0                                    | 220                                      | 114   |
| Ice Hart                                   | 6                     | 693   | 0                                    | 693                                      | 212   | 0                                    | 693                                      | 232   | 303  | 0                                    | 693                                      | 161   |
| McNary                                     | 14                    | 1127  | 0                                    | 1127                                     | 653   | 0                                    | 1127                                     | 638   | 802  | 0                                    | 1127                                     | 469   |
| John Day                                   | 16                    | 2484  | 660                                  | 2484                                     | 944   | 0                                    | 2484                                     | 922   | 1254                                       | 0                                    | 2484                                     | 669   |
| The Dal                                    | 22+2F                 | 2074  | 0                                    | 2074                                     | 748   | 0                                    | 2074                                     | 732   | 993  | 0                                    | 2074                                     | 553   |
| Bonneville                                 | 18+2F                 | 1147  | 0                                    | 1147                                     | 595   | 0                                    | 1147                                     | 581   | 731  | 0                                    | 1147                                     | 436   |
| Kootenay                                   | 0                     | 0   | 830                                  | 0  | 0   | 830                                  | 0  | 0   | 0  | 830                                  | 0  | 0   |
| Coeur d'Alene                              | 0                     | 0   | 275                                  | 0  | 0   | 275                                  | 0  | 0   | 0  | 275                                  | 0  | 0   |
| Total Base and C                           | 23880                 | 36320   | 23417                                | 9491                                     | 35155                                       | 23280                                | 9056                                     | 11613                                       | 16036                                      | 22750                                | 6865                                     | 11058                                       |
| <b>ADDITIONAL STEP I PROJECTS</b>          |                       |   |                                      |  |   |                                      |  |   |  |                                      |  |   |
| Libby                                      | 5                     | 600   | 6143                                 | 542                                      | 195   |                                      |  |   |  |                                      |  |   |
| Boundary                                   | 6                     | 1055  | 0                                    | 855                                      | 368   |                                      |  |   |  |                                      |  |   |
| Spokane                                    | 24                    | 173   | 128                                  | 166                                      | 99  |                                      |  |   |  |                                      |  |   |
| Hells Canyon                               | 3                     | 450   | 0                                    | 410                                      | 192   |                                      |  |   |  |                                      |  |   |
| Dworsch                                    | 3                     | 450   | 2486                                 | 438                                      | 126   |                                      |  |   |  |                                      |  |   |
| Lower Columbia                             | 6                     | 932   | 0                                    | 930                                      | 188   |                                      |  |   |  |                                      |  |   |
| Little Granite                             | 6                     | 932   | 0                                    | 928                                      | 186   |                                      |  |   |  |                                      |  |   |
| Lower Klamath                              | 6                     | 932   | 0                                    | 922                                      | 195   |                                      |  |   |  |                                      |  |   |
| Pelton                                     | 7                     | 423   | 338                                  | 418                                      | 127   |                                      |  |   |  |                                      |  |   |
| Subtotal                                   | 5947                  | 9095  | 5610                                 | 1678                                     |   |                                      |  |   |  |                                      |  |   |
| <b>NOT APPLICABLE TO STEP II &amp; III</b> |                       |   |                                      |  |   |                                      |  |   |  |                                      |  |   |
| <b>THERMAL INSTALLATION 2/</b>             |                       |   |                                      |  |   |                                      |  |   |  |                                      |  |   |
| <b>RESERVES, HYDRO MAINTENANCE 3/</b>      |                       |   |                                      |  |   |                                      |  |   |  |                                      |  |   |
| <b>TOTAL RESOURCES</b>                     |                       |   | -4179                                | -12                                      |   | -2212                                | 0  |   |  | -1923                                | 0  |   |
|  |                       |   | 36282                                | 20653                                    |   | 32501                                | 18503                                    |   |  | 32260                                | 16693                                    |   |
| <b>STEP I, II, &amp; III LOADS 4/</b>      |                       |   |                                      |  |   |                                      |  |   |  |                                      |  |   |
| <b>SURPLUS</b>                             |                       |   | 28848                                | 20653                                    |   | 27650                                | 18503                                    |   |  | 24034                                | 16693                                    |   |
| <b>CRITICAL I: Starts</b>                  |                       |   | August 16, 1928                      |  |   | September 1, 1943                    |  |   |  | October 1, 1936                      |  |   |
| <b>Ends</b>                                |                       |   | February 29, 1932                    |  |   | April 30, 1945                       |  |   |  | April 15, 1937                       |  |   |
| <b>Length (Months)</b>                     |                       |   | 42.5 Months                          |  |   | 20 Months                            |  |   |  | 6.5 Months                           |  |   |
| <b>Study Identification</b>                |                       |   | 02-41                                |  |   | 02-42                                |  |   |  | 02-13                                |  |   |

1/ The above totals are correct, but may not equal the sum of the above values due to rounding.

2/ From Tables 1 and 3.

3/ Peak reserves for Step I, II, III are 8 percent of January peak load from Table 3. Energy reserve deductions only include the hydro maintenance for Step I study (reserves have been included in thermal plant energy capability) from Table 1A, line 7(a).

4/ Step I energy load from Table 1A, line 5 and January peak load from Table 1B, line 5. Step II &amp; III energy load from Table 3. Step II &amp; III peak load is equal to the step II or step III annual average load multiplied by the ratio of the PNW January peak load to the PNW annual average load.

**TABLE 5**  
**(English & Metric Units)**  
**COMPUTATION OF CANADIAN ENTITLEMENT FOR**  
**2001-02 ASSURED OPERATING PLAN**

- A. Joint Optimum Power Generation in Canada and the U.S. (From 02-42)
- B. Optimum Power Generation in the U.S. Only (From 02-12)
- C. Optimum Power Generation in the U.S. and a 0.5 Million Acre-Feet (0.6 km<sup>3</sup>) Reduction in Total Canadian Treaty Storage (From 02-22)

| <b>CAPACITY ENTITLEMENT</b>   |         |         |         |
|---|---------|---------|---------|
|   | (A)     | (B)     | (C)     |
| <b>Determination of Dependable Capacity Credited to Canadian Storage (MW)</b> |         |         |         |
| Step II - Critical Period Average Generation 1/                               | 9055.6  | 9055.6  | 9018.7  |
| Step III - Critical Period Average Generation 2/                              | 6865.3  | 6865.3  | 6865.3  |
| Gain Due to Canadian Storage  | 2190.3  | 2190.3  | 2153.4  |
| Average Critical Period Load Factor in percent 3/                             | 76.74   | 76.74   | 76.74   |
| Dependable Capacity Gain 4/   | 2854.2  | 2854.2  | 2806.1  |
| Canadian Share of Dependable Capacity 5/                                      | 1427.1  | 1427.1  | 1403.0  |
| <b>ENERGY ENTITLEMENT</b>   |         |         |         |
| <b>Determination of Increase in Average Annual Usable Energy (aMW)</b>        |         |         |         |
| Step II (with Canadian Storage) 1/  | (A)     | (B)     | (C)     |
| Annual Firm Hydro Energy 6/   | 8966.5  | 8966.5  | 8930.0  |
| Thermal Displacement Energy 7/  | 2306.6  | 2304.3  | 2311.5  |
| Other Usable Secondary Energy 8/  | 135.8   | 137.4   | 143.8   |
| System Annual Average Usable Energy   | 11408.9 | 11408.2 | 11385.3 |
| Step III (without Canadian Storage) 2/  |         |         |         |
| Annual Firm Hydro Energy 6/   | 6573.9  | 6573.9  | 6573.9  |
| Thermal Displacement Energy 7/  | 3294.0  | 3294.0  | 3294.0  |
| Other Usable Secondary Energy 8/  | 475.9   | 475.9   | 475.9   |
| System Annual Average Usable Energy   | 10343.8 | 10343.8 | 10343.8 |
| Average Annual Usable Energy Gain 9/  | 1065.1  | 1064.4  | 1041.5  |
| Canadian Share of Average Annual Energy Gain 5/                               | 532.6   | 532.2   | 520.8   |

1/ Step II values were obtained from the 02-42, 02-12, and 02-22 studies, respectively.

2/ Step III values were obtained from the 02-13 study and Table 3.

3/ Critical period load factor from Table 3.

4/ Dependable Capacity Gain credited to Canadian storage equals gain in critical period average generation divided by the average critical period load factor.

5/ One-half of Dependable Capacity or Usable Energy Gain.

6/ From 30-year average firm load served, which includes 7 leap years (29 days in February).

7/ Average secondary generation limited to Potential Thermal Displacement market.

8/ Forty percent (40%) of the remaining secondary energy.

9/ Difference between Step II and Step III Annual Average Usable Energy.

**TABLE 6**  
**(English & Metric Units)**  
**COMPARISON OF RECENT DDPB STUDIES**

|   | 1997-98 | 1998-99   | 1999-00 | 2000-01 | 2001-02     |
|---|---------|-----------|---------|---------|-------------|
| <b>AVERAGE PNWA ENERGY LOAD</b>                                   |         |           |         |         |             |
| Annual Load (MW)  | 20387.3 | 20479.6   | 20817.8 | 21107.8 | 21641.7     |
| Annual/January Load (%)   | 86.9    | 86.3      | 85.9    | 87.4    | 88.0        |
| Critical Period (CP) Load Factor (%)                              | 75.2    | 75.6      | 75.3    | 75.1    | 76.7        |
| Annual Firm Exports   | 926.3   | 1075.3    | 1202.7  | 1067.1  | 1156.3      |
| Annual Firm Surplus (MW) <u>1/</u>                                | 433.2   | 534.6     | 708.1   | 739.7   | 313.7       |
| <b>THERMAL INSTALLATIONS (MW) <u>2/</u></b>                       |         |           |         |         |             |
| January Peak Capability   | 10514   | 11003     | 11341   | 11520   | 11433       |
| CP Energy   | 8141    | 8462      | 9019    | 9521    | 9496        |
| CP Minimum Generation   | 632     | 789       | 1071    | 858     | 853         |
| Average Annual System Export Sales                                | 1133    | 1265      | 1392    | 1413    | 997         |
| Average Annual Displaceable Market                                | 6105    | 6345      | 6490    | 7179    | 7493        |
| <b>HYDRO CAPACITY (MW)</b>  |         |           |         |         |             |
| Total Installed   | 29786   | 29786     | 29786   | 29836   | 29827       |
| Base System   | 23856   | 23856     | 23856   | 23889   | 23880       |
| <b>STEP I/II/III CP (MONTHS)</b>                                  | 42/20/6 | 42/20/6.5 | 42/20/7 | 42/20/7 | 42.5/20/6.5 |
| <b>BASE STREAMFLOWS AT THE DALLES (cfs) <u>3/</u></b>             |         |           |         |         |             |
| Step I 50-yr. Average Streamflow                                  | 180748  | 181664    | 181664  | 181663  | 181663      |
| Step I CP Average   | 114127  | 114496    | 114496  | 114496  | 114401      |
| Step II CP Average  | 101008  | 101537    | 101525  | 101525  | 101525      |
| Step III CP Average   | 64870   | 58483     | 64960   | 64959   | 58482       |
| <b>BASE STREAMFLOWS AT THE DALLES (m<sup>3</sup>/s) <u>3/</u></b> |         |           |         |         |             |
| Step I 50-yr. Average Streamflow                                  | 5118.20 | 5144.15   | 5144.15 | 5144.12 | 5144.12     |
| Step I CP Average   | 3231.71 | 3242.16   | 3242.16 | 3242.16 | 3239.46     |
| Step II CP Average  | 2860.22 | 2875.20   | 2874.86 | 2874.86 | 2874.86     |
| Step III CP Average   | 1836.92 | 1656.05   | 1839.46 | 1839.43 | 1656.01     |
| <b>CAPACITY BENEFITS (MW)</b>                                     |         |           |         |         |             |
| Step II CP Generation   | 9018.0  | 9064.1    | 9080.4  | 9032.9  | 9055.6      |
| Step III CP Generation  | 7169.4  | 6773.9    | 6878.8  | 6859.6  | 6865.3      |
| Step II Gain over Step III  | 1848.6  | 2290.2    | 2201.7  | 2173.3  | 2190.3      |
| <b>CANADIAN ENTITLEMENT</b>                                       | 1229.6  | 1514.7    | 1461.9  | 1447.3  | 1427.1      |
| Change due to Mica Reoperation                                    | 0.0     | -0.4      | 0.2     | 0.0     | 0.0         |
| Benefit in Sales Agreement  | 471.0   | 416.0     | 200.0   | 192.0   | 187.0       |
| <b>ENERGY BENEFITS (aMW)</b>                                      |         |           |         |         |             |
| Step II Annual Firm Hydro   | 8963.0  | 9000.0    | 8990.3  | 8967.3  | 8966.5      |
| Step II Thermal Displacement                                      | 2037.7  | 2101.3    | 2129.5  | 2183.3  | 2306.6      |
| Step II Other Usable Secondary                                    | 194.9   | 188.3     | 193.5   | 148.7   | 135.8       |
| Step II System Annual Average Usable                              | 11195.6 | 11289.6   | 11313.3 | 11299.3 | 11408.9     |
| Step III Annual Firm Hydro  | 6579.0  | 6502.1    | 6422.2  | 6541.1  | 6573.9      |
| Step III Thermal Displacement                                     | 2902.9  | 3066.8    | 3182.0  | 3239.8  | 3294.0      |
| Step III Other Usable Secondary                                   | 607.2   | 595.3     | 590.1   | 501.5   | 475.9       |
| Step III System Annual Average Usable                             | 10089.1 | 10164.2   | 10194.3 | 10282.4 | 10343.8     |
| <b>CANADIAN ENTITLEMENT</b>                                       | 553.3   | 562.7     | 559.5   | 508.4   | 532.6       |
| Change due to Mica Reoperation                                    | -2.8    | -4.1      | -0.8    | 0.7     | 0.4         |
| ENTITLEMENT in Sales Agreement                                    | 246.0   | 215.0     | 103.0   | 99.0    | 95.0        |
| <b>STEP II PEAK CAPABILITY (MW)</b>                               | 31647   | 32074     | 32421   | 32481   | 32501       |
| <b>STEP II PEAK LOAD (MW)</b>                                     | 26587   | 27317     | 28386   | 28779   | 27650       |
| <b>STEP III PEAK CAPABILITY (MW)</b>                              | 31456   | 31793     | 32206   | 32268   | 32260       |
| <b>STEP III PEAK LOAD (MW)</b>                                    | 22859   | 23391     | 24318   | 24983   | 24034       |

FOOTNOTES FOR TABLE 6

1. Average annual firm surplus is the additional shaped load including the surplus shaped in the following periods:

| <u>AOP Study</u> | <u>Amount Shaped (MW)</u>                                   |
|------------------|---|
| 1997-98          | 3000 May and<br>2171 June.                                  |
| 1998-99          | 3199 May and June.  |
| 1999-00          | 4237 May and June.  |
| 2000-01          | 471 1 August through 30 April and<br>1537 May through July. |
| 2001-02          | 1877 May and June.  |

2. Thermal installations include thermal imports, all existing and planned thermal resources, combustion turbines, cogeneration, renewable thermal, thermal NUG/PURPA, minus seasonal exchange imports and plant sales.
3. The 1990 level modified flows were used and no additional irrigation depletions were anticipated for the 2001-02 level. There is, however, an adjustment for Grand Coulee pumping and return flow.

CHART 1

2001-02 DDBP STUDY

DURATION CURVES OF 30 YEAR MONTHLY HYDRO GENERATION (aMW)

