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COMPLETION REPORT
PHASE I
CONTRACT NO. EG-77-S-07-1691

VOLUME A
MAIN REPORT WITH SAMPLE APPENDICES

A RESOURCE SURVEY OF LOW-HEAD HYDROELECTRIC POTENTIAL PACIFIC NORTHWEST REGION

JOHN S. GLADWELL
LEROY F. HEITZ
CALVIN C. WARNICK
IDAHO WATER RESOURCES RESEARCH INSTITUTE

IN COOPERATION WITH

CLAUD C. LOMAX
STATE OF WASHINGTON WATER RESEARCH CENTER

PETER C. KLINGEMAN
OREGON WATER RESOURCES RESEARCH INSTITUTE

ALFRED B. CUNNINGHAM
MONTANA UNIVERSITY JOINT WATER RESOURCES RESEARCH CENTER

THIS PROJECT FUNDED BY THE
UNITED STATES DEPARTMENT OF ENERGY

MARCH 1979

FORWARD

Due to the tremendous volume of information presented in this report, final publication has been split into ten volumes. The first volume (Volume A) contains the main report which describes study methodologies and sample data tables. The remaining nine volumes (Volumes A-J) contain sets of complete data tables for all the streams studied. Page viii of this volume contains a listing of the contents of all of the volumes. A listing of the distribution of the different report volumes is contained on pages 98 and 99 of this report.

Those desiring information from or copies of any of the reach sheets should contact the Idaho Water Resources Research Institute or the water research institute in the particular state in which the stream or streams of interest are located. Institute addresses are shown on the distribution list.

ACKNOWLEDGEMENTS

The authors of this report wish to express their appreciation to those staff members of the water resources institutes of Washington, Oregon, Idaho and Montana and to the other employees of the four Universities that were involved in the study for the assistance rendered in the completion of this project. Because of the large number of individuals involved, it is impossible to list each person separately, but without the aid of these people the completion of this project would have been impossible.

We also wish to express our gratitude to the U.S. Department of Energy whose funding made this project possible. A special vote of thanks goes to Richard McDonald of the Resource Engineering Branch, Department of Geothermal Energy of D.O.E., Charles Gilmore and Michael McLatchy of the Idaho Operations Office of D.O.E. and to George Smith and Steve Metzger of E.G.&G. Idaho, whose cooperation and advice were essential to the completion of the study presented in this report.

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EXECUTIVE SUMMARY

In September of 1977, the University of Idaho Water Resources Research Institute entered into a contract with the then named Energy Research and Development Administration, (now the U.S. Department of Energy) to make a study entitled, "A Resource Survey of Low-Head Hydroelectric Potential Pacific Northwest Region." The University of Idaho Water Resources Research Institute in turn entered into subcontracts with the water resources research institutes of Oregon, Washington and Montana to do portions of the study involving their respective states. The following report is the completion report for the first phase of work under this contract.

The purpose of this first phase study was to evaluate the theoretical low-head hydroelectric potential of the Pacific Northwest Region. For purposes of this study, low-head hydroelectric power was defined as power produced from power sites with gross hydraulic heads ranging from 3m to 20m and with power plant sizes greater than 200 kW.

The study area includes all of the Columbia River system in the United States and all other river basins in Idaho, Oregon and Washington. The total area studied is approximately 292,000 square miles.

The initial study assignment was to define the low-head hydro potential by identifying all possible sites. It was soon realized that the task of identifying every possible low-head hydroelectric site was too formidable under the project time and cost limitation. It was mutually determined that a better approach would be in the first phase (this report) to define the theoretical power potential of the streams by reaches. These have been defined such that each reach contains a reasonably homogeneous stream segment. Corresponding to the flow required to produce 200 kW at 20 meters of head, the uppermost reaches

are bounded by a requirement of 36CFS 50 percent of the time. Reaches were chosen so that major tributaries to the stream would enter at either the upstream or downstream end point of the reaches.

As a means of defining the flows available in the reaches over time, a duration curve approach has been used. The duration curve technique was chosen because it was considered that this method would yield the most information concerning streamflow variability while staying within the time and cost limitations of the study. The basic data used to develop the duration curves for the study reaches were the U.S.G.S. streamflow data. Several different methods were developed to determine characteristic duration curves for reaches that did not contain gage sites. These methods are described in detail in the section of this report entitled Analysis Techniques.

After generating a duration curve for the midpoint of a particular reach, the first step was to compute the theoretical power potential for that particular reach. The plant capacity was computed for five different flow rates corresponding to the 10, 30, 50, 80 and 95 percent exceedance levels. The head used was the total head available in that particular reach. An efficiency of 100% was used in all power and energy computations. Operation was assumed to be run-of-river, the only consideration of storage is where the effect of upstream storage already exists. In those cases the effect is included in the derived duration curve.

The theoretical annual energy available from the previously computed plant capacities was determined by applying an integration technique to the flow duration curve. For each capacity level the plant factor was also calculated. This is the ratio of the energy previously calculated to that which would be produced were that capacity fully productive 100% of the time.

The results of the energy and power computations are displayed on Reach Characteristic Sheets contained in the appendices of this report. They contain information on physical location of the reach, hydrologic and hydraulic characteristics of the reach, flow duration and theoretical power and energy values for the reach. A typical annual hydrograph for each reach and a map showing the reach location are also included.

Table II in the main report contains summaries of the theoretical power and energy values for various streams in the region and also summarizes the potential by state. A summary of these tables follows. The values listed as P_{30}, P_{50} and E_{30} and E_{50} are the theoretically available power and energy values calculated as described above.

SUMMARY OF THEORETICAL MAXIMUM
DEVELOPABLE POWER POTENTIAL

STATE	Power (MW) P_{30}	Power (MW) P_{50}	Energy (GWH) E_{30}	Energy (GWH) E_{50}
Washington	13928	8862	80124	61314
Oregon	12105	6786	64951	46324
Idaho	9147	5443	53365	38338
Montana	3576	2044	19848	14689
Wyoming	620	295	3345	2205
Nevada	15	8	76	53
Total	39391	23439	221709	162923

This phase of the study also identifies in general terms the feasibility and restraint considerations which could affect hydro power development in each of the reaches. Such aspects as land-use restrictions, utility displacement, special fish problems, availability of transmission lines and load considerations were evaluated. These are summarized for each reach in Table II of the various state appendices.

The final aspect of this phase of the study involved ranking the most

promising reaches. The ranking was done based on the information contained in the feasibility, transmission, and load tables and on the flows in the reaches. The rankings for each of the four subunits and for the entire Pacific Northwest study are contained in Table III. Although there seems to be many promising reaches for hydro development in the study area, some of the more promising areas as revealed by the reach ranking include the Willamette River (in Oregon), Clark Fork River (in Montana), Kootenai River (in Idaho and Montana), and Snake River (along the Idaho-Oregon and Idaho-Washington Border and in Idaho and Wyoming).

It must be stressed that the power and energy values presented in this report are theoretical values based on development of total head in a reach at 100% efficiency and the results should be used in that context only.

In continuing phases of this project, the study teams will attempt to evaluate the low head/small hydro potential at existing sites not presently producing hydro power and those sites that have been proposed for hydroelectric development in the past.

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I. INTRODUCTION

In September of 1977, the University of Idaho Water Resources Research Institute entered into a contract with the then named Energy Research and Development Administration, (now the U.S. Department of Energy) to make a study entitled, "A Resource Survey of Low-Head Hydroelectric Potential -- Pacific Northwest Region." The University of Idaho Water Resources Research Institute in turn entered into subcontracts with the water resources research institutes of Oregon, Washington and Montana to do portions of the study involving their respective states.

The first formal meeting of all the state study teams was held during October, 1977. Study methodologies and logistics were discussed at this meeting. A representative of the newly formed Department of Energy which replaced the Energy Research and Development Administration was present at the meeting. On the day following this meeting, members of interested state and federal agencies were invited to a briefing meeting on the study. At this meeting, study objectives and outlines were discussed and comments were received from the agencies. Study team coordination meetings have been held at the end of each quarter to discuss study progress and problems encountered in applying study techniques. Part of the June Quarterly Meeting was used as an agency briefing meeting. Interested agency officials were invited to a general briefing on the progress and early results of the study. Many useful recommendations were made by those attending the meeting.

The purpose of this first phase study was to evaluate the theoretical low-head hydroelectric potential of the Pacific Northwest Region. For purposes of this study, low-head hydroelectric power was defined as power pro-

INTRODUCTION

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The [illegible] of the [illegible] [illegible] of the [illegible] [illegible] duced from power sites with gross hydraulic heads from 3m to 20m and with power plant sizes greater than 200 kW.

The study area includes all of the Columbia River Basin and all other river basins in Idaho, Oregon and Washington. Columbia River Basin areas of the states of Montana, Wyoming, Utah and Nevada are also included in this area. A map of the study area is contained in Figure 1. The total area studied is approximately 292,000 square miles.

The second phase of this study which will be completed by September 1979, will be an evaluation of the small-scale hydro potential at existing dams without power and at already identified potential dam sites in the Pacific Northwest region. The study criteria has been changed somewhat for this phase of the study. Instead of the 3m to 20m limitation as in phase 1, the new criteria will be to make detailed analyses of proposed and existing non-generating dams with generating capabilities of 200 kW to 15MW.

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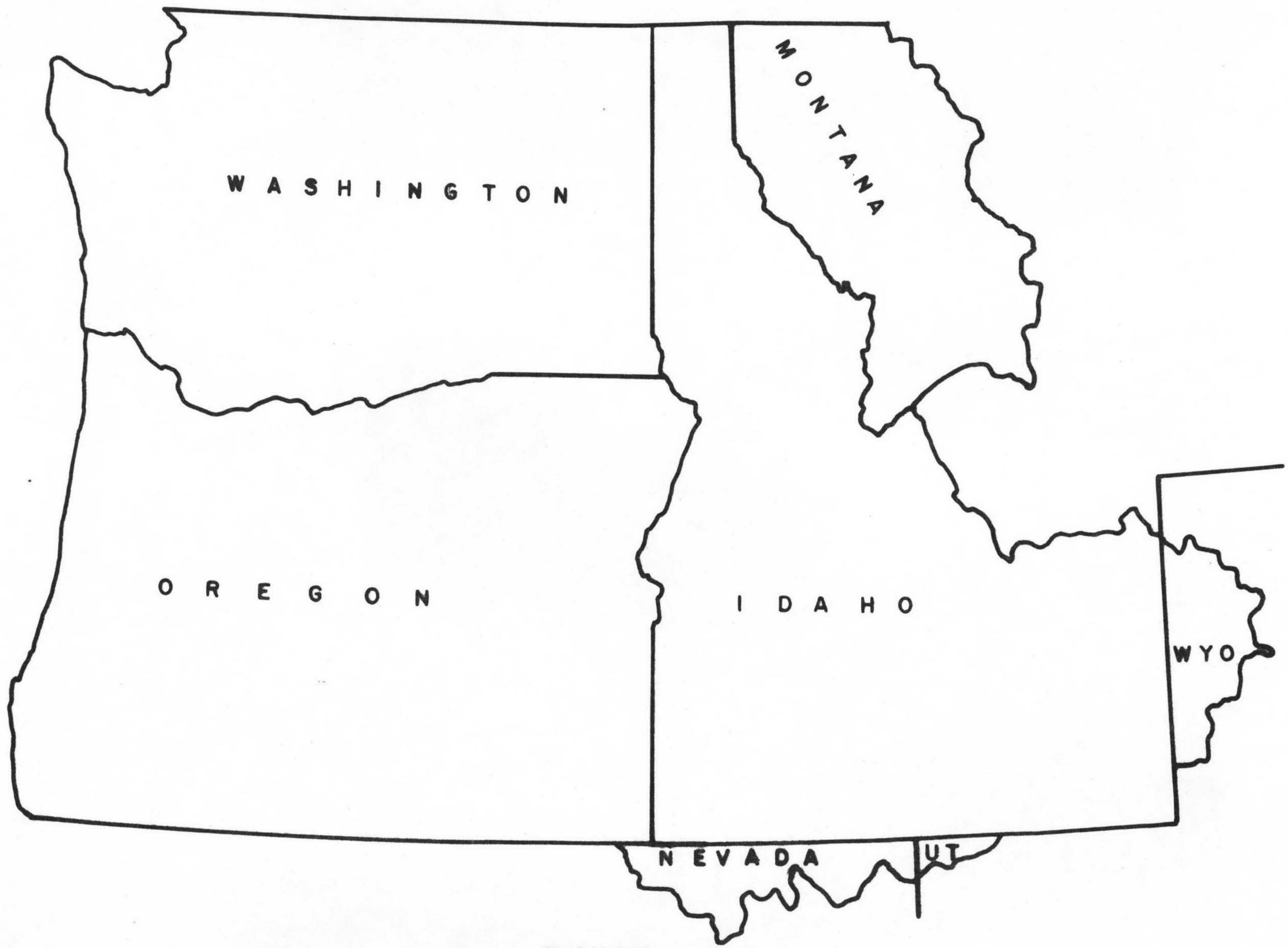


FIGURE I
STUDY AREA MAP

II. ANALYSIS TECHNIQUES

The initial study assignment was to define the low-head hydro potential by identifying all possible sites. It was determined that the task of identifying every possible low-head hydroelectric site was too formidable under the project time and cost limitation. It was determined that a better approach would be to define the theoretical power potential for sections of the streams called reaches. These reaches were arranged so that each reach contained a fairly homogeneous stream segment. Reaches were assigned to all segments of streams that had flow capabilities of 36 CFS at least 50% of the time. This corresponds to the flow required to produce 200 kW at 20 meters of head. Reaches were chosen so that major tributaries to the stream would enter at either the upstream or downstream end point of the reaches.

In order to define the regime of flows available in a reach over time, a duration curve approach was used. A typical duration curve is shown in Figure 2. The abscissa is exceedance percentage and the ordinate scale is flow. The duration curve technique was chosen because it was considered that this method would yield the most information concerning streamflow variability while staying within the time and cost limitations of this study. The duration curves developed for this study will also be very useful to those doing preliminary feasibility studies of hydro sites on any of the streams in the study area, since the availability of these curves will eliminate some of the preliminary hydrology work that would normally be required.

For purposes of this study it has been assumed that any new low-head hydro projects would operate essentially as run-of-river power plants. Any storage that would be made available at new sites would make more power

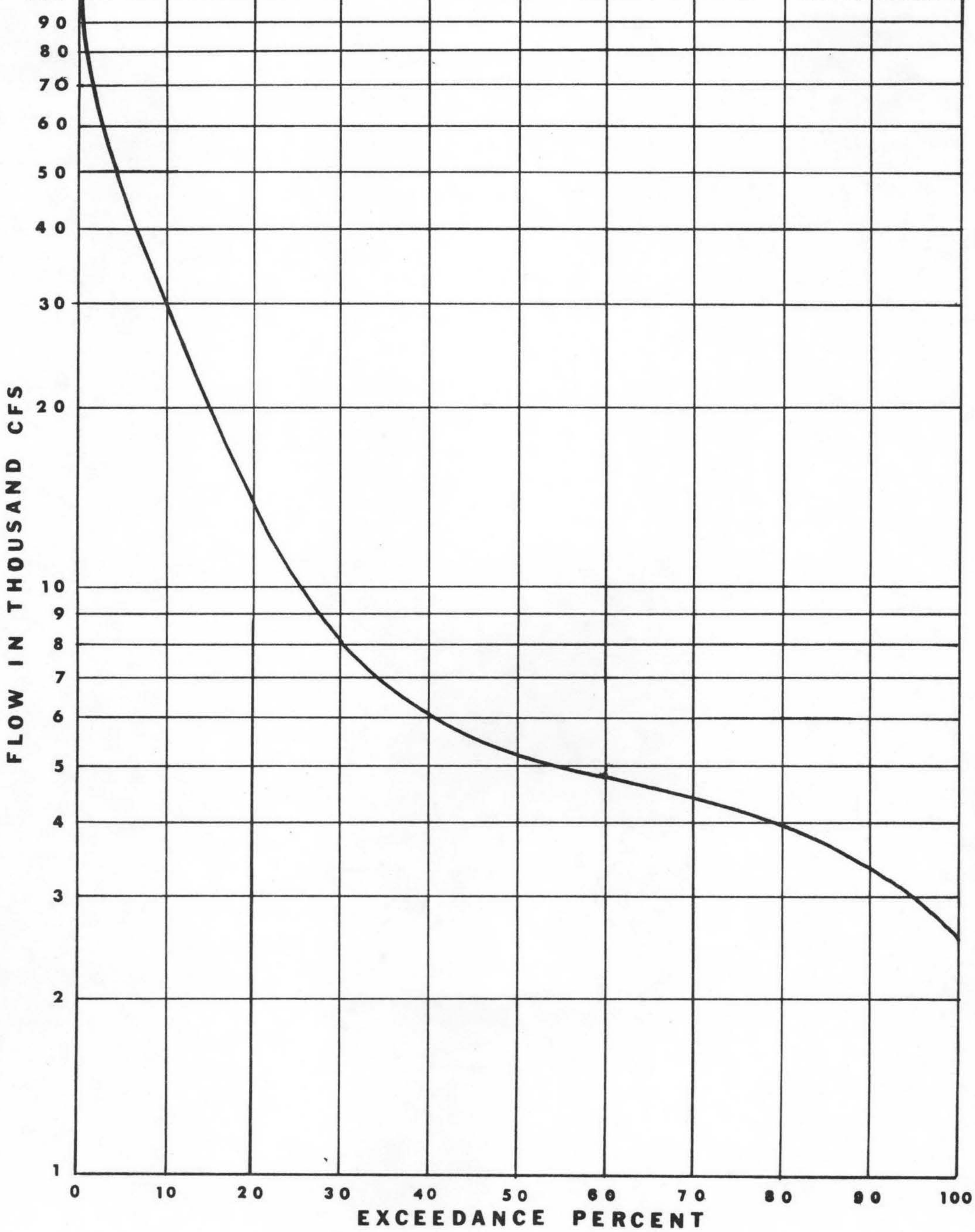


figure 2
TYPICAL DURATION CURVE

available than is computed using the run of river assumption. Therefore, power estimates in this study are conservative as far as the effect of on site storage is concerned.

Duration Curve Development

Since duration curves are normally developed from data at gage locations, methods had to be developed to construct synthetic duration curves for reaches of the stream where no stream gages were available. These techniques for developing synthetic duration curves were developed for both unregulated and regulated streams.

The first techniques that will be described will be those that are applicable to natural, unregulated streams. The approach in this technique was to develop generalized duration curves at known gage locations that could be applied to ungaged locations.

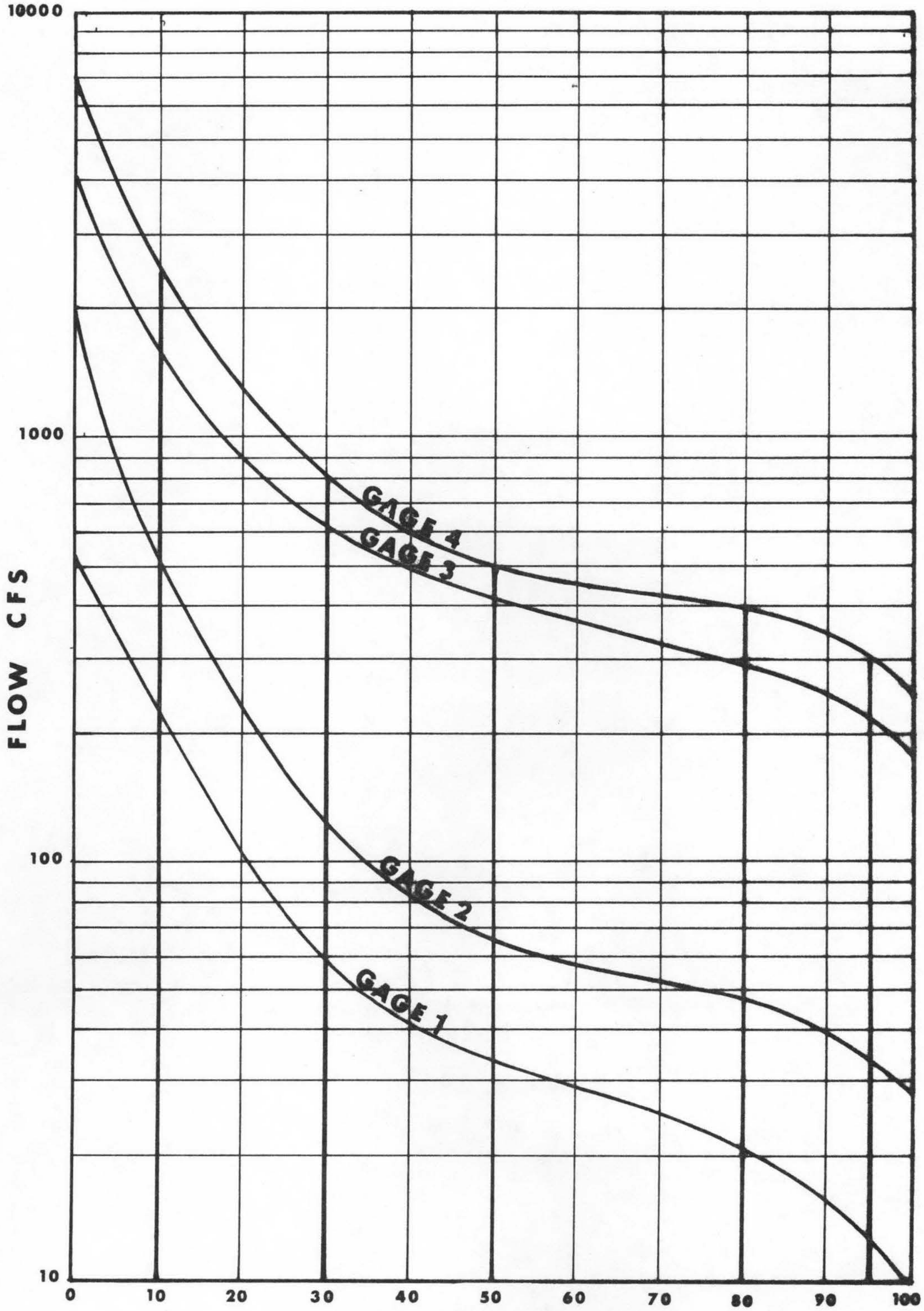
The first step in this procedure was to develop duration curves of daily flows for all gage locations within the basins of interest. For the states of Washington, Oregon and Montana, daily flow duration curves were provided by the U.S. Geological Survey using their computerized streamflow data access system. The duration curves for Idaho gage locations were developed using the University of Idaho's Hydrologic Information Storage and Retrieval System (HISARS) which contains U.S.G.S. streamflow data. In either case, the duration values were determined using the same method. First each daily flow for the period of record was categorized into one of a series of preselected flow intervals. The number of daily flows in each interval was then determined. The exceedance percentage for each interval was computed by first determining the number of flow values contained in intervals with flow magnitudes higher than the interval of interest. This number was divided

by the total number of flows in all intervals to obtain the exceedance percentage. The duration curve was developed by plotting the upper flow value for each interval versus the exceedance percentage for that interval.

The next step in getting the generalized duration curves was approached using several different methods. The Idaho and Oregon study teams used a method which involved developing a family of parametric duration curves. This technique will be referred to at later times as technique "Idaho A."

The first step in this method involved plotting the duration curves for the known gage locations. Flow values for several exceedance values were picked from each of these curves as shown in Figure 3. All the flow values for each exceedance percentage were plotted against average annual runoff (QAA) at the gage. A separate curve was developed for each of the exceedance values. A correlation analysis was performed for each set of curve points to obtain a best fit curve to the data. An example of the final curves developed from this family of curves approach is shown in Figure 4. Because of the variability of the slope of the best fit lines, it would be possible to have intersections of these lines. This was not a problem in any of the basins that were studied since line intersection occurred at points where QAA was greater than that which was experienced anywhere in the basins.

In order to use these curves, all that is required is QAA at the point of interest. The procedure for getting average annual runoff at ungaged points will be discussed later in this report. To construct the required duration curves at the unknown point, a vertical line is made from the known QAA value and the flow values are picked off the particular exceedance percent curve at the intersection points. The flow values can then be plotted against the particular percent exceedance value to get the new synthetic duration curve.



EXCEEDANCE PERCENTAGE

figure 3

BASIN DURATION CURVES

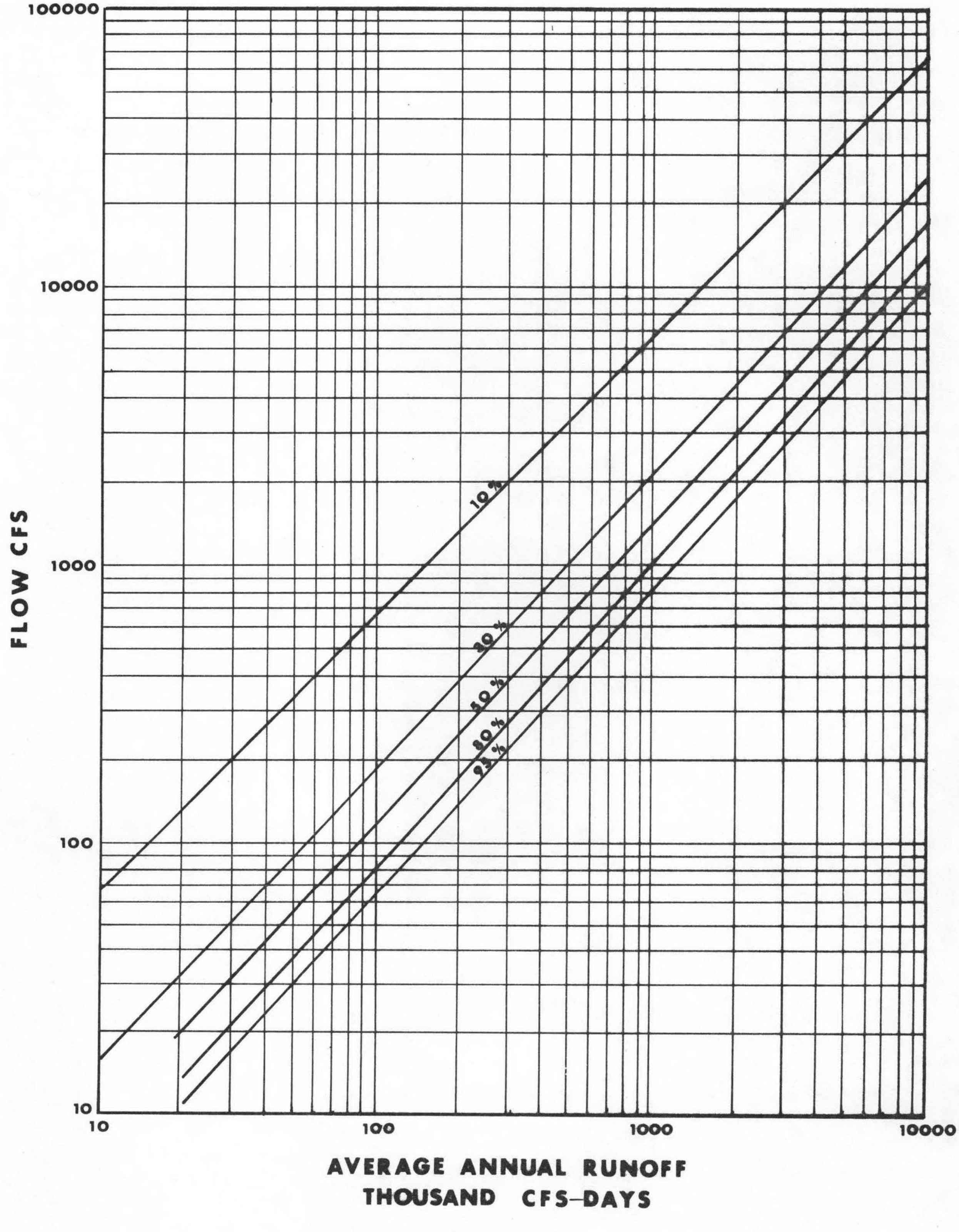


figure 4
PARAMETRIC DURATION CURVES

Instead of a graphical technique, the Oregon study team used a computer subroutine. The parametric flow duration curves developed for each of the 18 major drainage basins (see earlier discussion) were used in a regression analysis to develop equations of the form

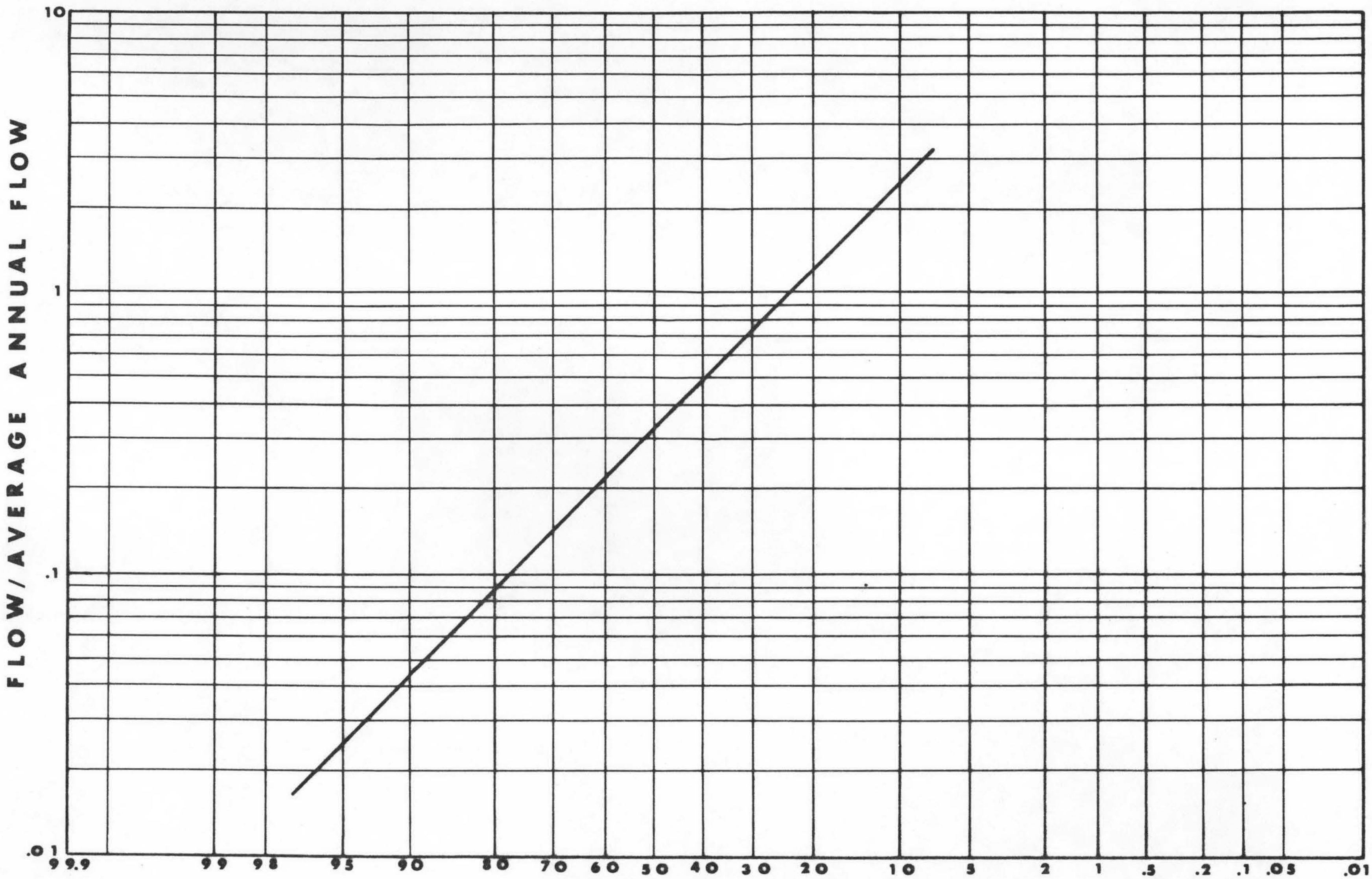
$$Q_i = A_i[QAA]^{B_i}$$

where: A and B are constants determined by regression analysis and i represents the 10, 30, 50, 80 and 95 exceedance percentages.

A second technique used to generate the required generalized duration curves was developed by the Washington study team. This technique will be referred to at later times as technique "WSU".

The first step in this technique was to plot the flow duration data provided by the U.S.G.S. on log probability paper with the "Exceedance Q" / QAA as the ordinate and the "Exceedance Percentage" as the abscissa. An example of this plot is shown in Figure 5. An examination of these plots showed that the data banded rather well with the 25% exceedance point being essentially common for all data. However, on individual station comparisons within a basin the 80% to 90% exceedance data scattered from ±40% to ±200% about a mean curve.

The conclusion was drawn that no single curve would fit all data in a basin and that the time required for a regression analysis and judgment of how many curves to use and where to use them required more time and money than was available. The procedure selected was to use the U.S.G.S. data for the required exceedance values and assign each station its logical area of influence within the basin. A table of Exceedance % vs. $Q_{\%}$/QAA was prepared for every station. The QAA value for the period of record was used for this calculation.



EXCEEDANCE PERCENTAGE

figure 5

DIMENSIONLESS DURATION CURVE

WASHINGTON METHOD

A third slightly different technique was developed by the Montana study team. This technique will be referred to as technique "Montana A." The first step in this technique involved plotting the flow duration curves in dimensionless form for the known gage locations. Once the individual flow duration curves were plotted, they were subjected to a smoothing procedure to develop average curve profiles representative of conditions in specific sub-reaches. The specific steps involved in this procedure were as follows:

1. Flow values obtained from the U.S.G.S. data were first non-dimensionalized by expressing them as ratios of Q/Q_{10}.
2. Flow duration curves for all gaged sites were next plotted in dimensionless form using probability of exceedance values of 95, 90, 80, 75, 50, 25, and 10 years. Plotting was accomplished by way of a special plotting subroutine on the XDS Sigma 7 computer together with a Cal Comp plotter. A sample of these dimensionless curves is shown in Figure 6.
3. Where possible, several dimensionless flow duration curves were smoothed or averaged by visual inspection and the resulting smoothed profile assumed to be representative of conditions in hydrologically similar subreaches of a given river basin. At least two factors were found to have a significant effect upon the shaping of the dimensionless flow duration curves. These factors were: (1) the magnitude of the mean annual stream flow at a given site and (2) the degree of regulation or other human influence occurring in the reaches above the specific site. The smoothing process undertaken here allowed river reaches possessing similar flow duration curve characteristics to be represented by a single average flow duration curve.

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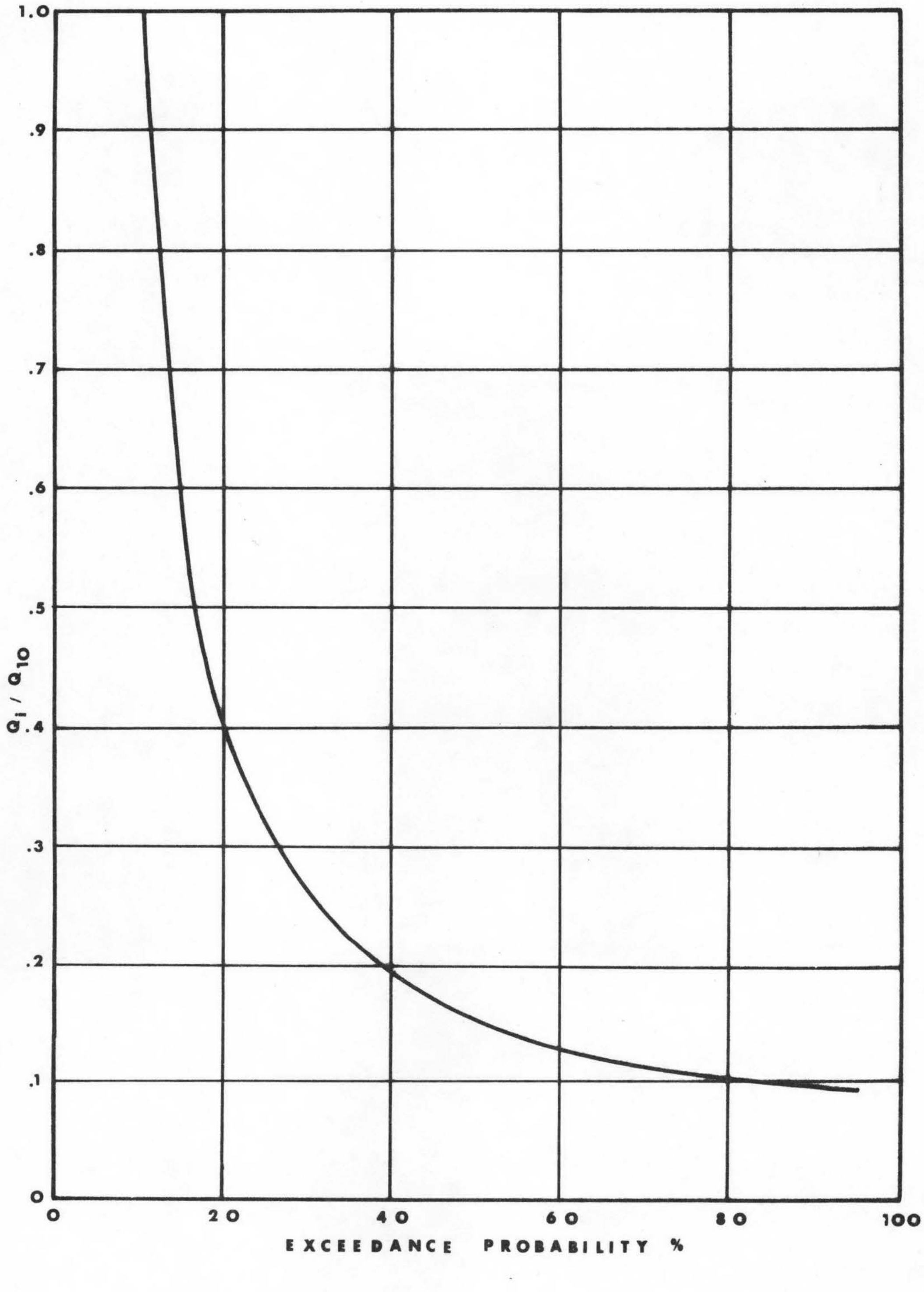

figure 6
DIMENSIONLESS DURATION CURVE
MONTANA METHOD

4. The averaged dimensionless flow duration curve was next used to synthesize flow duration curve profiles for ungaged sites. This was accomplished by first estimating the average annual flow, QAA, for the reach using techniques that will be described later. The Q_{10} value was then estimated by a Q_{10} vs QAA regression equation that was developed for the Columbia Basin in Montana. The regression equation that was developed is:

$$Q_{10} = 2.98 \text{ QAA}$$

Next, the Q_{10} values were multiplied by the ordinates of the dimensionless flow duration curve to obtain the ordinates of the synthetic flow duration curve for the given reach.

The method of obtaining duration curves for regulated sections of streams in many cases is different than that used on natural streams. Regulated stream flow data for the major streams in the region were obtained from the Bonneville Power Administration. These data were developed in connection with power studies that they were making. These studies were monthly operational studies in which the streamflows for the period 1930 through 1968 were adjusted to reflect a 1978 level of depletion for irrigation and reservoir evaporation. These flows were then used in a system-power and streamflow-simulation model using 1978 loads with reasonable secondary-power demands. An output of flows was developed for most major power producing dam sites in the region. Duration curve development using this data will be referred to as technique "BPA".

One special use of the BPA data was made for the Clearwater River in Idaho. In this case the North Fork of the Clearwater River, a large tributary to the main stem of the river, is controlled by Dworshak Reservoir. BPA regulated data were available only for the North Fork and not for the main stem.

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To get controlled flows in the main stem first the unregulated North Fork inflow was subtracted from the gaged flows downstream of the confluence of the North Fork and the mainstem. Next the BPA regulated flow data for the North Fork were added to the resulting difference. The regulated flow values were then processed through a duration value computation program to determine a regulated duration curve. This technique will be referred to later as "BPA special".

Regulated flow data for some Idaho streams were obtained from the Idaho Department of Water Resources (IDWR). These data were generated on a monthly basis using a reach loss-gain model developed by the Idaho Department of Water Resources. Depletions used in the model were based on 1975 levels of development. Actual reach duration curves were found by interpolating between points where duration curves were known. Duration curve development using this method will be referred to as technique "Idaho B".

A second method used to generate reach duration curves also used the IDWR data but in a different manner than the interpolation technique used in the "Idaho B" method. In reaches where there was inadequate regulated flow data available from the Idaho Department of Water Resources, it was necessary to synthesize flows both downstream and upstream of the IDWR regulated flow data points. The technique developed was to use the IDWR data as a starting point and to develop flows downstream and upstream by either adding or subtracting tributary inflow between the points of interest.

The following method was used to generate the tributary inflow data for the period of record of interest:

1. Select a gaging station which overlaps as long as possible with the period of record for the IDWR data and would substantially reflect the response of natural tributaries which are flowing into the main stream.

2. For each month of overlapping record determine the total flow (cfs-days) that had passed the gage over the entire overlapping period of record. Divide the flow in each month by the total flow to determine the percentages of total flow that occured in each month.

3. Assume that the inflow from the tributaries is distributed in the same fashion as the representative gage. The total average tributary inflow was found by using Normal Annual Precipitation Maps using the method described in the following section titled Average Annual Runoff. The total runoff inflow for the period was found by multiplying the average annual runoff for the tributary area by the number of complete years of record that the natural gage and the regulated flow data overlapped. The monthly distribution of this total flow was accomplished by multiplying the ratios found in step 2 by this total flow.

The distributed natural flows were then added to or subtracted from the IDWR regulated flows depending on whether the reach of interest was upstream or downstream of the known regulated flow point. The resultant monthly flows for the overlap period were then processed through a duration program to get the duration values at the desired points. The process was repeated for as many reaches as was desired upstream or downstream for the known regulated flow point. A computer program was developed to make the required computations for the simulations. The program is very generalized and can be used to simulate an entire river system if desired. The inflow model method using the IDWR regulated flows will be referred to as method "Idaho C".

In some basins where there was regulation but no IDWR or BPA regulated flow data was available the best U.S.G.S. gage records were used. In these cases the period of record for the gages that was used was chosen so that this record best reflected the regulation that would be expected with today's conditions. Two methods of using the U.S.G.S. data were used in Idaho. The first was straight interpolation between gage locations. This will be referred to as method "Idaho D". The second method was to use the inflow model described above but the U.S.G.S. data were used as starting points instead of the IDWR

regulated-flow data. The method will be referred to as method "Idaho E".

With exception of one reach on the Spokane River, it was found that the BPA regulated flow data for the State of Washington did not differ significantly from the U.S.G.S. gage records. Also for some cases regulated flow data were not available to develop flow duration curves. Therefore method "WSU", which is described in the section on natural flow-duration curves, was used for all streams in Washington whether or not flows were regulated.

Since the Montana duration curve takes into account degree of regulation in the stream no special technique was used to develop regulated curves for streams in that State.

Average Annual Runoff

The technique for obtaining average annual runoff for the ungaged portions of the river basin was essentially the same in all study areas and involved determination of average annual precipitation volume. The first step was to obtain the best available Normal Annual Precipitation (NAP) maps for the particular study areas. The sources of these maps are listed in Table 1, "Hydrologic Potential Analysis Techniques." An example of one of these maps is shown in Figure 7. This example map was obtained from the Pacific Northwest River Basins Commission from a study entitled "Columbia-North Pacific Region Comprehensive Framework Study."

The scale of base maps used varied with hydrologic productivity of the area of interest. In the high runoff areas, 7 1/2 minute quadrangle maps were used where ever available; otherwise, 15 minute maps were used to identify all the streams that could produce the minimum power output of 200 kW at the maximum head of 20 meters. These high runoff areas were primarily the coastal basins of Washington and Oregon. In the less productive sections of the

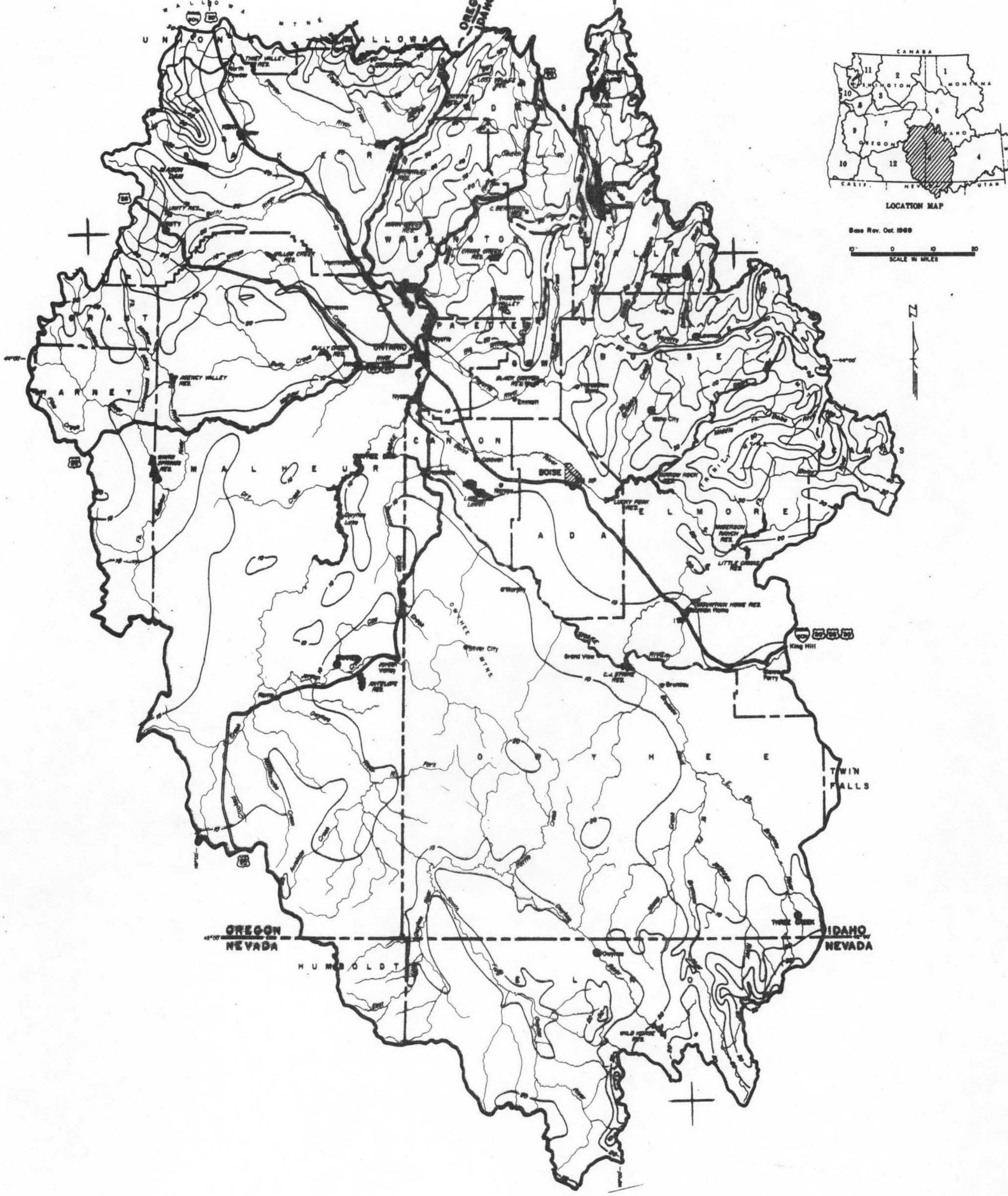

figure 7

NORMAL ANNUAL PRECIPITATION MAP

study regions, map scales of 1-250,000 proved to be quite adequate. U.S.G.S. topographic maps were used to develop basin description maps. Each sub-basin outline with reach end-point locations was delineated on the topographic maps. Following this, the drainage divides were delineated for each reach. In some cases, part of this work had been done previously by the U.S.G.S. and by using projection techniques the basin boundaries could be transferred from the U.S.G.S. basin maps to a suitable scale map with only minor corrections required.

The next step involved getting the NAP map's scale to match the scale of the maps which were used to delineate the various reaches. This problem was solved by using optical projection techniques. Two slightly different techniques were used. The first involved making 35 mm slides of portions of the original NAP maps. By projecting the slides through a normal slide projector, scales of sub-basin and NAP maps could be matched very easily. The second technique involved using large (8-1/2" x 11") transparencies of the NAP maps. These transparencies were projected onto the sub-basin maps using a standard overhead projector. Either of these methods resulted in good scale and placement accuracy when care was taken in adjusting the location and magnification of the projection.

The next step was to measure the areas between the isohyetal lines within each individual reach area. Several techniques were explored to accomplish this task. Use of an electronic planimeter or electronic digitizer-computer combination has proven to be very accurate and by far the quickest method for obtaining these values. Each of the areas was assigned an average precipitation amount based on the values of the surrounding isohyetal lines. The areas were then multiplied by the average precipitation to obtain the study region [illegible] 1:250,000 [illegible] (U.S.G.S.). [illegible] topographic maps were used [illegible]. [illegible] outline [illegible] and [illegible] [illegible] [illegible] components of this work [illegible] by using [illegible] techniques [illegible] from these [illegible] [illegible] this study [illegible].

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total annual precipitation volume input to each individual reach area. Because of the various map scales used, different conversion factors were required to get the precipitation input volume into conventional units. If a 1 to 250,000 map scale was used and the planimetered areas were measured in inches a conversion factor of 419.4 was applied to the precipitation area product to obtain a result with the units of CFS-days/year. If different map scales or different area measuring units were used or different precipitation input units were desired, the conversion factor was adjusted accordingly. These precipitation inputs were summed in a downstream direction to get the total precipitation input for the basin upstream of the mouth of each reach. This summation will be referred to as $\sum PA$ later in this report.

Next, the ratio of annual precipitation input to annual runoff, "K factor," was determined. Since the U.S.G.S. stream gaging station records have different time bases and the NAP maps are based on a particular time period, it was desirable to settle on one common time base. The time base selected was the same as the time period used in developing the NAP maps that were used in a particular area. This permitted use of the isohyetal map without modification.

Justification for adjusting stream flows to the common time base was confirmed by situations where upstream average flows were greater than the downstream averages. Adjustments were applied to gages in the Palouse and Puyallup Basins in Washington with corrections ranging up to 25% for the Palouse and up to 10% for the Puyallup. Because of wet and dry trends, all stream gage records without complete records for the same period as the NAP map period require adjusting even with records for long periods of runoff. Stream record adjustment and a common time base will also facilitate further runoff value adjustments should different precipitation rates or trends be anticipated in future dam-site analysis and development.

When gaging stations had records for the NAP map period, QAA values were calculated for that span of years. However, if any part of the NAP map period record was missing from the gage record the following procedure was used.

A reference station with a long period of record spanning the NAP map period and earlier years, if possible, was selected. The choice was limited to stations typical for the drainage area, free of significant flow regulation, and free of abnormal conditions. In some cases the reference station had to be selected from those in an adjacent basin. Values of QAA for the adjusted stations that agree with the period for which the NAP map was made were obtained from the following equation:

$$QAA_{\text{NAP period Adj. Sta.}} = QAA_{\text{NAP Period Ref. Sta.}} \left[\frac{QAA_{\text{Comparison yrs. Adj. Sta.}}}{QAA_{\text{Comparison yrs. Ref. Sta.}}}\right]$$

Next, the ratios of average annual precipitation input to adjusted average annual runoff (K) were computed for each gage station. Adjusting these K values to be applicable to the ungaged areas of the basin was approached in a different manner by the different study teams.

The Washington study team used the following approach. K values for areas above the farthest upstream gage were taken to be the same as at that gage.

For drainage areas between two U.S.G.S. stations, K was calculated by:

$$K = \frac{QAA_{\text{downstream sta.}} - QAA_{\text{upstream sta.}}}{\sum PA \text{ contributing the difference}}$$

For basins where no U.S.G.S. gaging stations were established, a K value was selected from the surrounding basins on the basis of similarity of conditions affecting the precipitation and runoff.

[illegible]

calculations [illegible] years. However, [illegible] of the [illegible]

recent [illegible] from [illegible]

[illegible]

[illegible]

Regulations [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

For the [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

The Idaho study team used a slightly different technique. K values for reaches between gage locations were calculated by linear interpolation of the known gage K values. K values for reaches upstream of gages were found by extrapolation of K value data from adjacent areas with similar hydrologic conditions and from interpretation of factors that would effect the rainfall runoff relationship, e.g. aspect of basin, mean elevation of basin, and slope of basin. A certain amount of sound engineering judgment is required in applying this technique especially when extrapolations are being made from the known gage data. A good knowledge of the general hydrology of the area is also important in this process.

The Montana study team used a slightly different technique to predict the average annual streamflow at ungaged points. Their technique consisted of correlating observed average annual flow values (QAA) for gaged drainage basins with an index variable indicative of average annual precipitation conditions over the basins. This analysis resulted in the development of the following prediction equation for the Columbia Basin within Montana.

$$QAA = 0.326\ [\sum PA]^{0.982}$$

where: QAA = Average Annual Streamflow (CFS)

A = drainage basin area between adjacent precipitation isohyets (sq. mi.)

P = the normal annual precipitation for that part of the drainage basin represented by A. (inches)

The procedure developed for delineating A and P consisted of superposition of average annual precipitation contours onto U.S.G.S. 1-250,000 scale topographic maps. Here the average annual precipitation contours were obtained from U.S. Soil Conservation service precipitation contour maps for Montana. Individual values of A were then found by planimetering areas within the drainage basins between adjacent isohyets. P was then taken to be the average

of the adjacent precipitation isohyetal values. Once the index variable, $\sum PA$, was found for a given drainage basin mean annual flow for the site could be estimated from the above equation.

The Oregon study team used a method involving correlation analysis between average annual flow at each gaging station, and the product of drainage area and normal annual precipitation for the area tributary to the station. This was done for each of the 18 major basins in the state or for hydrologically similar portions thereof. This analysis resulted in the development of prediction equations of the form

$$Q_{AA} = A[(P)\cdot(DA)]^B$$

where: A,B are constants determined by regression analysis

P = normal annual precipitation for the drainage area

DA = drainage basin area tributary to the gaging station.

To apply the equation to reaches, the corresponding P and DA values were determined at each end of the reach, the average annual discharge was then calculated at each end, and these were averaged to obtain the mean value of average annual discharge for the reach.

Power Computations

After generating a duration curve for a particular reach, the next step was to compute the theoretical power potential for that particular reach. The plant capacity was computed for five different flow rates corresponding to the 10, 30, 50, 80 and 95 percent exceedance levels. The basic power equation used was:

$$P = \frac{QH}{11800} e$$

where:

P = power in megawatts

of the support [illegible] corrected [illegible] for the [illegible] [illegible] could be [illegible] from the [illegible].

[illegible] analysis between [illegible]

[illegible]

[illegible] from [illegible]

where [illegible] and [illegible]

[illegible] analyzed by section [illegible]

[illegible] P and K' values were [illegible] [illegible] value of [illegible]

[illegible]

[illegible]

[illegible]

Q = flow in CFS
H = head available in the reach in feet
e = efficiency
11800 = conversion factor

The Q value used was that flow which would be available at the midpoint of the reach. In all but the farthest upstream reach the head used was the total usable head in the reach which was computed by subtracting the elevation of the downstream point of the reach from the elevation of the upstream point of the reach. In the farthest upstream reaches of a stream, an additional 20 meters of head was added to the total head available in that reach. This was done to account for the fact that there is sufficient discharge at the farthest upstream point in a reach to generate the minimum power with 20 meters of head. The efficiency used for all power computations was 1.0. It is recognized that no hydro power generating system could operate at this efficiency. Since it would be impossible to predict the actual efficiencies that would be used, it was felt that using a common efficiency of 1.0 would be better than trying to second guess what the actual power generation system efficiency would be. The user can then apply his own particular efficiencies directly to the values represented in the tables and figures to find his own estimate of the actual power generated.

The theoretical annual energy available from the power plants sized at the specific exceedance values of Q was computed by integrating the area under the curve of Q versus exceedance and multiplying this by the head available and the proper conversion factors to get the average energy output per year. Figure 8 shows the area under the curve at the 30% exceedance value. Another value that is computed is the plant factor. This is the ratio of the actual energy generated computed by using the area under the duration curve to the energy that would be generated if the plant was operated at full capacity for a given exceedance value of discharge 100% of the time. Figure 8 shows the relationship between

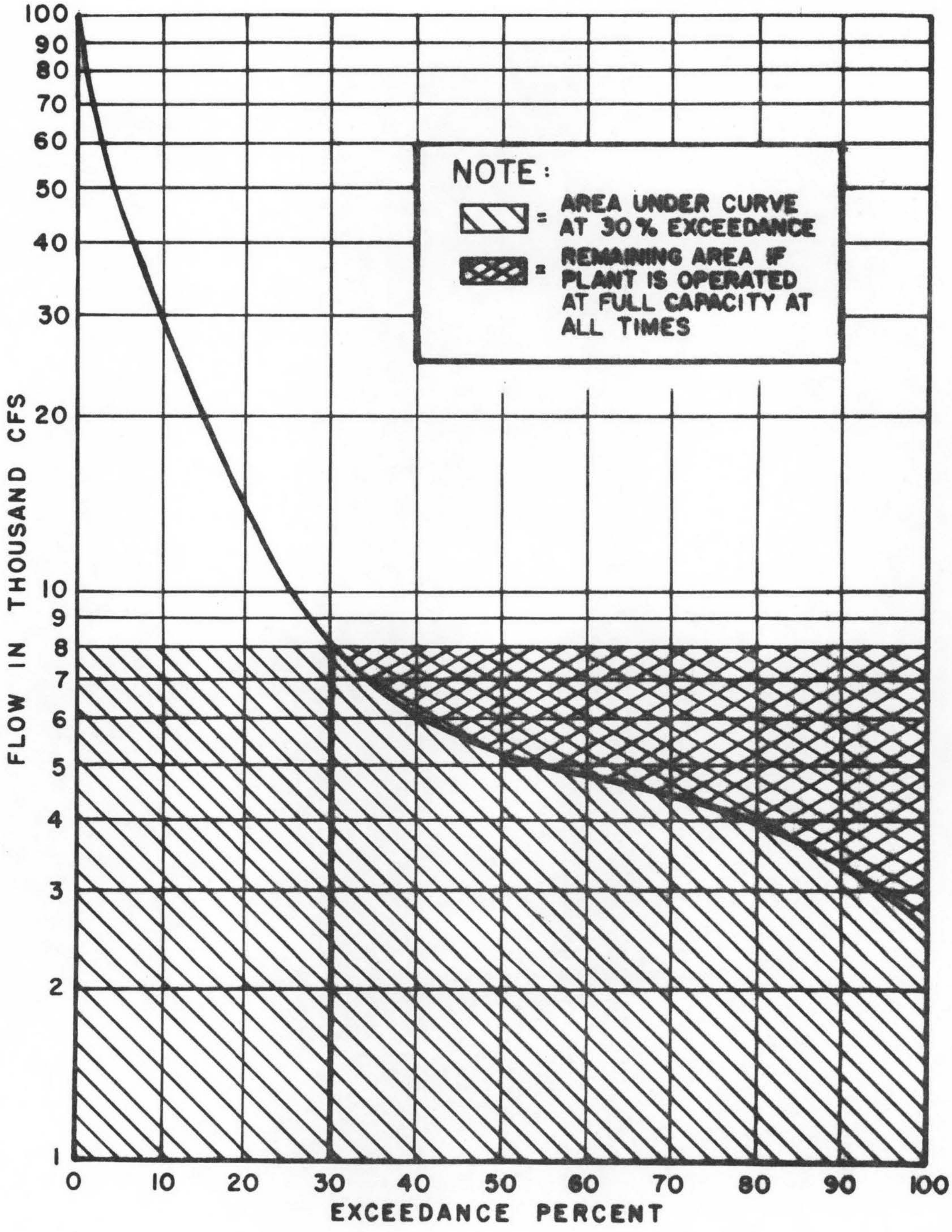

figure 8
ENERGY AND PLANT FACTOR RELATIONSHIP

the actual power generated and the power with 100% generation.

The power and energy values computed for each reach are theoretical values based on total head available in the reach. These values should not be confused with the power available at existing or proposed sites in a reach. The correlation between the theoretical values and that available at existing or proposed sites is dependent on such factors as total head and reservoir storage at the existing and proposed sites and the location of these sites in the reach.

III. PRESENTATION OF DATA TABLES

This section of the report will be primarily used to describe the various tables and appendices that are used to display the results of the studies made in connection with this project.

The first table that will be described will be Table I, "Analysis Techniques Table." The purpose of this table is to identify some of the more important data sources and analysis techniques that were applied to a particular basin. The first column, "Basin Name" is self-explanatory. The next column under "Basin Characteristics" is used to describe what the flow classification is; e.g. whether it was a natural flow system or whether there was regulation for irrigation, power production, flood control, etc. The regulation type column is simply used to list the type of regulation on the stream, if any. The "Source of Flow Data" column is used to document the source of flow data used in a particular basin. The "Duration Curve Development" column and the "Duration Curve for Regulated Stream" column are used to identify what technique was used to generate the duration curves for a particular basin. The different techniques have been described in the chapter on analysis techniques and each technique has been assigned an identifier which is listed in this column. The column entitled "Map Scale Used" is used to describe the scale of maps used in the analysis techniques. The column entitled "NAP Maps" is used to identify the source of the normal annual precipitation maps used in determining the average annual runoff.

The next table that will be discussed is Table II, "Maximum Developable Power Potential." Summaries of theoretical power potential are presented for each major basin in each state and also a summary for each state and the entire Pacific Northwest Study Region is presented. The power and energy values

listed are merely a summation of the values computed for each reach within a particular area. The state totals for Washington, Oregon and Idaho were adjusted so that the power and energy totals for the Snake River common boundary reaches are shared on a 50 percent each basis between the bordering states. Columbia Basin reaches that are in Wyoming and Nevada are contained in the Idaho Summary Table. No entries for Utah are made since no Columbia Basin streams in that state met the minimum power requirement.

The next three data tables that will be described are contained in the appendices of this report. Appendix I, II, and III contain all the reach data tables for reaches of streams meeting the minimum flow requirements in the State of Washington, Oregon and Idaho respectively. Appendix III also contains reach data tables for all Columbia basin streams meeting the minimum flow requirements in Nevada and Wyoming. Appendix IV contains data tables for all Columbia River Basin streams in Montana meeting the minimum flow requirements. Appendix Table I is the Reach Index table. This table is provided to expedite finding the location of a particular Reach Hydro-Potential Characteristic Sheet in the appendix. The items contained in this table are the stream name, reach numbers for that particular stream and the inclusive page numbers for the Reach Hydro-Potential Characteristic Sheets for that particular stream.

The next table that will be discussed is appendix Table II, the Feasibility, Transmission and Load Restraint table. The first column of this table contains the Reach Identification number. This is the same number that is described on page 31 in the section on the reach hydro potential characteristic tables. The next section of the table is entitled "Feasibility Restraints." Under this heading there are four columns of items that could cause problems related to the development of a low-head hydro project in a particular reach.

listed are merely a [illegible]

particular [illegible]

adjusted to the [illegible]

[illegible]

In all cases it was assumed that the low-head potential would be developed using some sort of dam. In some cases if other techniques such as a long penstock with a relatively minor diversion structure were used some of the adverse effects listed in the table could be reduced or eliminated. An "X" marked in a column means that this particular item could be a problem in that reach. Column 1 of this group is entitled "Land Use Restrictions." A check in this column indicates that one or more of the following land use restrictions were in force in the area: wild and scenic rivers (in this case either an "instant river" or a "study category river"); national recreation areas; national parks; national wilderness areas; known reserved natural areas; or identified archeological sites. In many cases available information concerning identified archeological sites was very limited. Because of this limitation some reaches that were not flagged as containing archeological sites may well contain sites that would be revealed with more detailed studies.

Column 2 of this group is entitled "Utility Displacement." A check in this column indicates a potential problem if a hydro development would cause relocation of one or more of the following: major highways, railroads, power lines, telephone lines or gas and oil lines. Location of these items was obtained from U.S.G.S. maps or other easily accessible mapping. A ground reconnaissance was not carried out for each reach.

Column 3 of this group is entitled "Building Displacement." A check in this column indicates that a low-head hydro development may require relocation of residence or commercial buildings. Location of buildings in possible inundated areas was made by inspection of U.S.G.S. quad maps. A ground

reconnaissance was not carried out for each reach. In general, no check was recorded unless more than four residences or commercial buildings per mile in any section of a reach seemed to be in danger of inundation.

Under the column labeled "Fish Problem," a check was recorded if the reach supports a known run of salmonids or if a sturgeon population which is an endangered species is present.

The next major heading is "Transmission and Load Considerations." The first two columns under this heading are concerned with transmission facilities. The first item gives the distance from the center of the reach to the nearest power line shown on detailed transmission line maps published by the Bonneville Power Administration. The second column is used to identify the size of the transmission line and the utility operating the line shown on the maps. The next two columns are concerned with Load Considerations. The first column identifies the type of local load that was present in the area that was closer than the transmission line identified above. The type of load was shown by a number representing the following:

1) Known local residential load
2) Known local industrial load
3) Known local water pumping load

Again, there was no ground reconnaissance made for each reach to identify these loads. Load information was obtained from available maps. The last column under load factors contains the distance in miles from the center of the reach to the nearest town with a population greater than 1000 people. U.S.G.S. maps were used to determine these distances.

Appendix Table II immediately follows Table I in all of the appendices with exception of Appendix II which is the Oregon appendix. This appendix is organized by major basins and Table II is contained seperately in the section for each basin.

The next item that will be discussed will be the reach Hydro-Potential Characteristic sheets. These sheets contain the vital statistics for all the reaches that were studied.

The first item on this table is the reach identification number, which is a 19 digit number used to identify each reach in the study. The number is constructed as shown below:

```
(1) (2) (3) (4) (5)  (6)
 XX-XXX-XXX-XXX-XXX-XXXXX
```

(1) State Identifier: 01 = Washington, 02 = Oregon,
03 = Idaho, 04 = Montana,
05 = Nevada, 06 = Wyoming.

(2) This group contains the numbers of all rivers discharging directly into the Pacific Ocean or first order streams in closed basin systems.

(3)(4)(5) These groups contain the numbers of rivers that are tributary to the rivers listed in the previous group.

(6) This group contains the actual number assigned to a particular reach.

The first major grouping of items on the characteristics sheets is the locations group. This group is there to help the reader identify the location of the reach. The state item lists the state or states in which the reach is contained. The county item identifies the county or counties in which a particular reach is contained. The township and range portion describe the township and range in which the midpoint of the reach is contained. The latitude and longitude is the approximate latitude and longitude of the midpoint of the reach. The stream and major basin items are the name of the stream and major basin on which the reach is located. The river mile item is the river miles for the farthest upstream and downstream points of the reach.

The next major grouping on the characteristics sheets is the hydrologic

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

and hydraulic characteristics. This group along with the next three groups contains results of the hydrologic analysis portion of the study. The first items in this group are upstream and downstream elevations which are listed for each reach. These are the elevations of the farthest upstream and downstream points in the reach. The total available head is also shown. In most cases this was merely the upstream elevation minus the downstream elevation for the reach. In the reaches located farthest upstream on a stream, an additional 20 meters of head was added to compensate for the fact that a dam could be constructed at the farthest upstream point and still be capable of generating the minimum power requirement of 200 kW. The next item is average slope in the reach. This is simply:

(upstream elevation - downstream elevation)/length of the reach

The next item is the drainage area above the mouth of the reach. This is the drainage area above the farthest downstream point in the reach. The inflow classification item reflects whether flow in the reach is naturally, unaffected by regulation, or whether it is regulated by upstream management for flood control, power production, irrigation, etc.

Major group III contains the flow and theoretical maximum potential power production in the reach. The flows which are shown in the table are those which would be average for the reach for the given exceedance values. The power and energy values computed were based on these flows combined with the total head available for the reach. These power and energy values are theoretical in nature and the total theoretical potential is not the same as what would be obtained from potential and existing sites in the reach. The analysis techniques used in computing the plant size annual energy output and load factor are explained in the section on analysis techniques.

The next item is a typical annual hydrograph for the reach. The abscissa

for this graph is time in months and the ordinate is average monthly flow divided by average annual flow. The values presented in the graph were obtained from analyzing the record of a stream gage that would be characteristic for the reach. To obtain the approximate annual distribution of discharges for the reach, all that is required is to multiply the graph ratios by the average annual flow which is listed on the graph. In the case of Washington reaches, the average annual flow is listed above the graph as QMR. In some cases there may appear to be a discrepancy between the distribution of flows shown in the power table and the distribution of flows as represented on the average annual hydrographs. The reason for this apparent discrepancy is due to the fact that the hydrograph ratios are for the most representative gage in the area, and the flow values at this gage may or may not have a distribution of flows that is in complete agreement with the reach duration values.

The upper map shown on the reach characteristic sheets is merely a locator map to show the approximate location of the reach. The lower map shows the actual location of the reach. The reach is denoted by a heavy dark line traced over the reach. The arrowhead denotes the direction of flow and the downstream point of the reach. The page number assigned to the reach characteristics table was handled slightly differently by the different state study teams. The Idaho and Montana table page numbers are simply the letter "I" or "M" respectively followed by a number indicating the numerical sequence of that particular sheet. The Washington reach characteristic sheet page number begins with the letter "W" followed by a number indicating the Washington State Water Resources Inventory Area that the reach is contained in followed by the numerical sequence number of that table.

The Oregon page number system is identical to the Washington system with the exceptions that the identifying letter is "O" and the numerical sequence number is initialized to 1 at the beginning of each new major basin.

TABLE I
HYDROELECTRIC POTENTIAL
ANALYSIS TECHNIQUES
Washington

BASIN NAME	BASIN CHARACTERISTICS		HYDROELECTRIC POTENTIAL ANALYSIS TECHNIQUES				
	FLOW CLASSIFI-CATION	REGULATION TYPE	SOURCE OF FLOW DATA	DURATION CURVE DEVELOPMENT	MAP SCALES USED	SOURCE OF MAP MAPS	DURATION CURVE FOR REGULATED STREAM
Nooksack R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Silesia R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Chilliwack R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Sumas R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Samish	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Skagit R	Regulated	Power	USGS	WSU	7.5' & 15'	SCS	NA
Stillaguamish R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Snohomish R	Regulated	Power	USGS	WSU	7.5' & 15'	SCS	NA
Sammamish R	Regulated	Power/Pot.W	USGS	WSU	7.5' & 15'	SCS	NA
Cedar R	Regulated	Power/Pot.W	USGS	WSU	7.5' & 15'	SCS	NA
Green R	Regulated	Power/Pot.W	USGS	WSU	7.5' & 15'	SCS	NA
Puyallup R	Regulated	Power	USGS	WSU	7.5' & 15'	SCS	NA
Nisqually R	Regulated	Power	USGS	WSU	7.5' & 15'	SCS	NA
Chambers R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Deschutes R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Sherwood Cr	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Gosnell Cr	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Kennedy Cr	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Goldsborough Cr	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Tahuya R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Lilliwaup Cr	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Dosewallips R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Ducksbush R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Hamma Hamma R	Natural		USGS	WSU	7.5' & 15'	SCS	NA

USGS = U.S. Geological Survey

Pot. W = Potable Water Supply

TABLE I
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ANALYSIS TECHNIQUES
Washington

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	FLOW CLASSIFI-CATION	REGULATION TYPE	SOURCE OF FLOW DATA	DURATION CURVE DEVELOPMENT	MAP SCALES USED	SOURCE OF MAP MAPS	DURATION CURVE FOR REGULATED STREAM
Skokomish R	Regulated	Power	USGS	WSU	7.5' & 15'	SCS	NA
Little Quileene	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Big Quileene	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Elwha R	Regulated	Potable W	USGS	WSU	7.5' & 15'	SCS	NA
Morse Cr	Regulated	Potable W	USGS	WSU	7.5' & 15'	SCS	NA
Dungeness R	Regulated	Irrigation	USGS	WSU	7.5' & 15'	SCS	NA
Sekiu R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Hoko R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Clallam R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Pysht R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Deep Cr	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Lyre R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Sooes R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Ozette Cr	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Quillayute R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Dickey R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Goodman Cr	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Hoh R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Cedar Cr	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Mosquito Cr	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Queets R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Raft R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Quinault R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Moclips R	Natural		USGS	WSU	7.5' & 15'	SCS	NA

USGS = U.S. Geological Survey

TABLE I
HYDROELECTRIC POTENTIAL
ANALYSIS TECHNIQUES
Washington

BASIN NAME	BASIN CHARACTERISTICS		HYDROELECTRIC POTENTIAL ANALYSIS TECHNIQUES				
	FLOW CLASSIFI-CATION	REGULATION TYPE	SOURCE OF FLOW DATA	DURATION CURVE DEVELOPMENT	MAP SCALES USED	SOURCE OF MAP MAPS	DURATION CURVE FOR REGULATED STREAM
Copalis R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Humptulips R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Hoquiam R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Wishkah R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Elk R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Johns R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Chehalis R	Regulated	Power/Irri.	USGS	WSU	7.5' & 15'	SCS	NA
North R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Smith Cr	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Willapa Cr	Natural		USGS	WSU	7.5' & 15'	SCS	NA
North Nemah R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Bear R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Naselle R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Palix R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Grays R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Skamokawa R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Elochoman R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Mill Cr	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Abernathy Cr	Natural		USGS	WSU	7.5' & 15'	SCS	NA
German Cr	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Coal Cr	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Cowlitz R	Regulated	Power	USGS	WSU	7.5' & 15'	SCS	NA
Kaloma R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Lewis R	Regulated	Power	USGS	WSU	7.5' & 15'	SCS	NA

USGS = U.S. Geological Survey

TABLE I

HYDROELECTRIC POTENTIAL

ANALYSIS TECHNIQUES

Washington

BASIN NAME	BASIN CHARACTERISTICS		HYDROELECTRIC POTENTIAL ANALYSIS TECHNIQUES				
	FLOW CLASSIFI-CATION	REGULATION TYPE	SOURCE OF FLOW DATA	DURATION CURVE DEVELOPMENT	MAP SCALES USED	SOURCE OF MAP MAPS	DURATION CURVE FOR REGULATED STREAM
Salmon Cr	Natural		USGS	WSU	7.5' & 15'	SCS	NA
LaCamas Cr	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Washougal R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Hamilton Cr	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Rock Cr	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Wind R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Little White Salmon	Regulated	Power	USGS	WSU	7.5' & 15'	SCS	NA
White Salmon R	Regulated	Power	USGS	WSU	7.5' & 15'	SCS	NA
Klickitat R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Walla Walla R	Regulated	Irrigation	USGS	WSU	7.5' & 15'	SCS	NA
Palouse R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Grande Ronde R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Asotin Cr	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Tucannon R	Regulated	Irrigation	USGS	WSU	7.5' & 15'	SCS	NA
Yakima R	Regulated	Irrigation	USGS	WSU	7.5' & 15'	SCS	NA
Columbia R	Regulated	Irri./Power	USGS	WSU	7.5' & 15'	SCS	NA
Crab Cr	Regulated	Irrigation	USGS	WSU	7.5' & 15'	SCS	NA
Wenatchee R	Regulated	Irri./Power	USGS	WSU	7.5' & 15'	SCS	NA
Entiat R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Chelan R	Regulated	Power	USGS	WSU	7.5' & 15'	SCS	NA
Pasayten	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Methow R	Regulated	Irrigation	USGS	WSU	7.5' & 15'	SCS	NA
Okanogan R	Regulated	Irri./Power	USGS	WSU	7.5' & 15'	SCS	NA
Newpelem R	Natural		USGS	WSU	7.5' & 15'	SCS	NA

USGS = U.S. Geological Survey

TABLE I
HYDROELECTRIC POTENTIAL
ANALYSIS TECHNIQUES
Washington

BASIN NAME	BASIN CHARACTERISTICS		HYDROELECTRIC POTENTIAL ANALYSIS TECHNIQUES				
	FLOW CLASSIFI-CATION	REGULATION TYPE	SOURCE OF FLOW DATA	DURATION CURVE DEVELOPMENT	MAP SCALES USED	SOURCE OF MAP MAPS	DURATION CURVE FOR REGULATED STREAM
Sanpoil R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Spokane R	Regulated	Power	USGS	WSU	7.5' & 15'	SCS	BPA
Colville R	Regulated	Power	USGS	WSU	7.5' & 15'	SCS	NA
Kettle R	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Big Sheep Cr	Natural		USGS	WSU	7.5' & 15'	SCS	NA
Pend Oreille R	Regulated	Power	USGS	WSU	7.5' & 15'	SCS	NA

USGS = U.S. Geological Survey

TABLE I
HYDROELECTRIC POTENTIAL
ANALYSIS TECHNIQUES
OREGON

BASIN NAME	BASIN CHARACTERISTICS		HYDROELECTRIC POTENTIAL ANALYSIS TECHNIQUES				
	FLOW CLASSIFI-CATION	REGULATION 1 TYPE	SOURCE OF FLOW DATA	DURATION CURVE DEVELOPMENT	MAP SCALES USED	SOURCE OF MAP MAPS	DURATION CURVE FOR REGULATED STREAM
1. North Coast Basin							
Nestucca R.	Natural & Regulated	M&I	USGS/OWRD[2]	Idaho A	1:240,000 1:62,500 1:24,000	OWRD	USGS
Other Streams	Natural	none	"	"	"	"	"
2A. Upper Willamette Basin							
Willamette R. Main Stem (R0021 - R0024)	Natural & Regulated	MP	USGS/OWRD[2]	Idaho A	1:250,000 1:64,500 1:24,000	OWRD	USGS
Long Tom R.	"	"	"	"	"	"	"
McKenzie R.	"	"	"	"	"	"	"
Coast Fork Willamette R.	"	"	"	"	"	"	"
Middle Fork Willamette R.	"	"	"	"	"	"	"

[1]FC = Flood Control; I = Irrigation; MP = Multiple Purpose; M&I = Municipal and/or Industrial; N = Navigation; P = Power; R = Recreation.

[2]USGS = U.S. Geological Survey; OWRD = Oregon Water Resources Department

TABLE I
HYDROELECTRIC POTENTIAL
ANALYSIS TECHNIQUES
OREGON

BASIN NAME	BASIN CHARACTERISTICS		HYDROELECTRIC POTENTIAL ANALYSIS TECHNIQUES				
	FLOW CLASSIFI-CATION	REGULATION TYPE[1]	SOURCE OF FLOW DATA	DURATION CURVE DEVELOPMENT	MAP SCALES USED	SOURCE OF MAP MAPS	DURATION CURVE FOR REGULATED STREAM
2B. Mid-Willamette Basin							
Willamette R. Main Stem (R0005 - R0020)	Natural & Regulated	MP	USGS/OWRD[2]	Idaho A	1:360,000 1:64,500 1:24,000	OWRD	USGS
Yamhill R.	"	I, M&I	"	"	"	"	"
Rickreall Cr.	"	M&I	"	"	"	"	"
Santiam R.	"	MP	"	"	"	"	"
Other Streams	Natural	none	"	"	"	"	"
2C. Lower Willamette Basin							
Scapoose Cr.	Natural	none	USGS/OWRD[2]	Idaho A	1:250,000 1:64,500 1:24,000	OWRD	USGS
Willamette R. Main Stem (R0001 - R0004)	Natural & Regulated	MP	"	"	"	"	"
Clackamas R.	"	P,R	"	"	"	"	"
Tualatin R.	"	I	"	"	"	"	"

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TABLE I
HYDROELECTRIC POTENTIAL
ANALYSIS TECHNIQUES
OREGON

BASIN NAME	BASIN CHARACTERISTICS		HYDROELECTRIC POTENTIAL ANALYSIS TECHNIQUES				
	FLOW CLASSIFI-CATION	REGULATION 1 TYPE	SOURCE OF FLOW DATA	DURATION CURVE DEVELOPMENT	MAP SCALES USED	SOURCE OF NAP MAPS	DURATION CURVE FOR REGULATED STREAM
3. Sandy Basin							
Sandy R. Main Stem	Natural & Regulated	M&I,P	USGS/OWRD[2]	Idaho A	1:250,000 1:64,500 1:24,000	OWRD	USGS
Bull Run R.	"	"	"	"	"	"	"
Other Streams	Natural	none	"	"	"	"	"
4. Hood Basin							
All Streams	Natural	none	USGS/OWRD[2]	Idaho A	1:125,000 1:64,500 1:24,000	OWRD	USGS
5. Deschutes Basin							
Deschutes R. Main Stem	Natural & Regulated	I,P	USGS/OWRD[2]	Idaho A	1:350,000 1:64,500 1:24,000	OWRD	USGS
Crooked R.	"	I	"	"	"	"	"
Little Deschutes R.	"	"	"	"	"	"	"
Other Streams	Natural	none	"	"	"	"	"

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TABLE I
HYDROELECTRIC POTENTIAL
ANALYSIS TECHNIQUES
OREGON

BASIN NAME	BASIN CHARACTERISTICS		HYDROELECTRIC POTENTIAL ANALYSIS TECHNIQUES				
	FLOW CLASSIFI-CATION	REGULATION TYPE[1]	SOURCE OF FLOW DATA	DURATION CURVE DEVELOPMENT	MAP SCALES USED	SOURCE OF MAP MAPS	DURATION CURVE FOR REGULATED STREAM
6. John Day Basin							
John Day R. Main Stem	Natural & Regulated	I	USGS/OWRD[2]	Idaho A	1:300,000 1:64,500 1:24,000	OWRD	USGS
North Fork John Day R.	"	"	"	"	"	"	"
Other Streams	Natural	none	"	"	"	"	"
7. Umatilla Basin							
Umatilla R. Main Stem	Natural & Regulated	I,R	USGS/OWRD[2]	Idaho A	1:200,000 1:24,000	OWRD	USGS
Other Streams	Natural	none	"	"	"	"	"
8. Grande Ronde Basin							
Grande Ronde R. Main Stem	Natural & Regulated	I	USGS/OWRD[2]	Idaho A	1:220,000 1:64,500 1:24,000	OWRD	USGS
(cont.)							

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HYDROELECTRIC POTENTIAL
ANALYSIS TECHNIQUES
OREGON

BASIN NAME	BASIN CHARACTERISTICS		HYDROELECTRIC POTENTIAL ANALYSIS TECHNIQUES				
	FLOW CLASSIFI-CATION	REGULATION TYPE 1	SOURCE OF FLOW DATA	DURATION CURVE DEVELOPMENT	MAP SCALES USED	SOURCE OF MAP MAPS	DURATION CURVE FOR REGULATED STREAM
(8. Grande Ronde Basin cont.)							
Wallowa R.	"	I, M&I	"	"	"	"	"
Other Streams	Natural	none	"	"	"	"	"
9. Powder Basin							
Pine Cr.	Natural	none	USGS/OWRD[2]	Idaho A	1:190,000 1:64,500 1:24,000	OWRD	USGS
Powder R. Main Stem	Natural & Regulated	I	"	"	"	"	"
Eagle Cr.	Natural	none	"	"	"	"	"
Burnt R.	Regulated	I	"	"	"	"	"
10. Malheur Basin							
Malheur R. Main Stem (cont.)	Natural & Regulated	I	USGS/OWRD[2]	Idaho A	1:300,000 1:64,500 1:24,000	OWRD	USGS

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HYDROELECTRIC POTENTIAL
ANALYSIS TECHNIQUES
OREGON

BASIN NAME	BASIN CHARACTERISTICS		HYDROELECTRIC POTENTIAL ANALYSIS TECHNIQUES				
	FLOW CLASSIFI-CATION	REGULATION TYPE[1]	SOURCE OF FLOW DATA	DURATION CURVE DEVELOPMENT	MAP SCALES USED	SOURCE OF NAP MAPS	DURATION CURVE FOR REGULATED STREAM
(10. Malheur Basin cont.)							
North Fork Malheur R.	"	"	"	"	"	"	"
11. Owyhee Basin							
Owyhee R. Main Stem	Natural & Regulated	I	USGS/OWRD[2]	Idaho A	1:250,000 1:62,500 1:24,000	OWRD	USGS
Crooked Cr.	Natural	none	"	"	"	"	"
Jordon Cr.	Regulated	I	"	"	"	"	"
12. Malheur Lake Basin							
Silvies R.	Natural	none	USGS/OWRD[2]	Idaho A	1:330,000 1:64,500 1:24,000	OWRD	USGS
Donner & Blitzen R.	"	"	"	"	"	"	"

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HYDROELECTRIC POTENTIAL
ANALYSIS TECHNIQUES
OREGON

BASIN NAME	BASIN CHARACTERISTICS		HYDROELECTRIC POTENTIAL ANALYSIS TECHNIQUES				
	FLOW CLASSIFI-CATION	REGULATION TYPE [1]	SOURCE OF FLOW DATA	DURATION CURVE DEVELOPMENT	MAP SCALES USED	SOURCE OF NAP MAPS	DURATION CURVE FOR REGULATED STREAM
13. Goose & Summer Lakes Basin							
Chewaucan R.	Natural	none	USGS/OWRD[2]	Idaho A	1:315,000 1:64,500 1:24,000	OWRD	USGS
14. Klamath Basin							
Jenny Cr.	Regulated	I	USGS/OWRD[2]	Idaho A	1:280,000 1:64,500 1:24,000	OWRD	USGS
Klamath R.	"	I,P	"	"	"	"	"
Sprague R.	Natural & Regulated	I	"	"	"	"	"
Williamson R.	"	"	"	"	"	"	"
15. Rogue Basin							
Rogue R. Main Stem (cont.)	Natural & Regulated	MP	USGS/OWRD[2]	Idaho A	1:260,000 1:64,500	OWRD	USGS

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TABLE I

HYDROELECTRIC POTENTIAL

ANALYSIS TECHNIQUES

OREGON

BASIN NAME	BASIN CHARACTERISTICS		HYDROELECTRIC POTENTIAL ANALYSIS TECHNIQUES				
	FLOW CLASSIFI-CATION	REGULATION TYPE[1]	SOURCE OF FLOW DATA	DURATION CURVE DEVELOPMENT	MAP SCALES USED	SOURCE OF NAP MAPS	DURATION CURVE FOR REGULATED STREAM
(15. Rogue Basin cont.)							
Applegate R.	"	I	"	"	"	"	"
Evans Cr.	"	"	"	"	"	"	"
Bear Cr.	"	"	"	"	"	"	"
Big Butte Cr.	"	I, M&I	"	"	"	"	"
Little Butte Cr.	"	"	"	"	"	"	"
Other Streams	Natural	none	"	"	"	"	"
16. Umpqua Basin							
North Umpqua R. & Tribs.	Natural & Regulated	P,R	USGS/OWRD[2]	Idaho A	1:260,000 1:62,500	OWRD	USGS
Other Streams	Natural	none	"	"	"	"	"
17. South Coast Basin							
All Streams	Natural	none	USGS/OWRD[2]	Idaho A	1:200,000 1:62,500 1:24,000	OWRD	USGS

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TABLE I
HYDROELECTRIC POTENTIAL
ANALYSIS TECHNIQUES
OREGON

BASIN NAME	BASIN CHARACTERISTICS		HYDROELECTRIC POTENTIAL ANALYSIS TECHNIQUES				
	FLOW CLASSIFI-CATION	REGULATION TYPE[1]	SOURCE OF FLOW DATA	DURATION CURVE DEVELOPMENT	MAP SCALES USED	SOURCE OF NAP MAPS	DURATION CURVE FOR REGULATED STREAM
18. Mid-Coast Basin							
Siletz R.	Natural & Regulated	M&I	USGS/OWRD[2]	Idaho A	1:180,000 1:62,500	OWRD	USGS
Other Streams	Natural	none	"	"	"	"	"

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TABLE I
HYDROELECTRIC POTENTIAL
ANALYSIS TECHNIQUES
Idaho

BASIN NAME	BASIN CHARACTERISTICS		HYDROELECTRIC POTENTIAL ANALYSIS TECHNIQUES				
	FLOW CLASSIFI-CATION	REGULATION TYPE	SOURCE OF FLOW DATA	DURATION CURVE DEVELOPMENT	MAP SCALES USED	SOURCE OF MAP MAPS	DURATION CURVE FOR REGULATED STREAM
Bear River	Regulated	Flood-Control Irrigation Power	USGS IDWR Utah Power and Light	NA	1:250,000 1:62,500 1:24,000	PNWRBC	Idaho B Idaho C Idaho D
Kootenai	Regulated and Natural	Flood-Control Power	USGS	Idaho A	1:250,000 1:62,500 1:24,000	PNWRBC	Montana A
Pend O'Reille	Regulated and Natural	Power Recreation	USGS IDWR	Idaho A	1:250,000 1:62,500 1:24,000	PNWRBC	Idaho C
Spokane	Regulated and Natural	Irrigation Power Recreation	USGS BPA	Idaho A	1:250,000 1:62,500 1:24,000	PNWRBC	BPA
Snake River Main Stem	Regulated and Natural	Irrigation Power Flood-Control Recreation	USGS IDWR	Idaho A	1:250,000 1:62,500 1:24,000	PNWRBC	Idaho B Idaho C

USGS = U.S. Geological Survey IDWR = Idaho Department of Water Resources BPA = Bonneville Power Administration

TABLE I

HYDROELECTRIC POTENTIAL

ANALYSIS TECHNIQUES

Idaho

BASIN NAME	BASIN CHARACTERISTICS		HYDROELECTRIC POTENTIAL ANALYSIS TECHNIQUES				
	FLOW CLASSIFI-CATION	REGULATION TYPE	SOURCE OF FLOW DATA	DURATION CURVE DEVELOPMENT	MAP SCALES USED	SOURCE OF MAP MAPS	DURATION CURVE FOR REGULATED STREAM
Palouse	Natural	None	USGS	WSU	1:250,000 1:62,500 1:24,000	PNWRBC	NA
Clearwater	Regulated and Natural	Flood-Control Power Recreation	USGS BPA	Idaho A	1:250,000 1:62,500 1:24,000	PNWRBC	BPA (Special)
Salmon	Regulated and Natural	Irrigation	USGS	Idaho A	1:250,000 1:62,500 1:24,000	PNWRBC	WSU
Wildhorse	Natural	None	USGS	Idaho A	1:250,000 1:62,500 1:24,000	PNWRBC	NA
Weiser	Regulated and Natural	Irrigation	USGS IDWR	Idaho A Idaho D Idaho E	1:250,000 1:62,500 1:24,000	PNWRBC	Idaho D Idaho E

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TABLE I
HYDROELECTRIC POTENTIAL
ANALYSIS TECHNIQUES
Idaho

BASIN NAME	BASIN CHARACTERISTICS		HYDROELECTRIC POTENTIAL ANALYSIS TECHNIQUES				
	FLOW CLASSIFI-CATION	REGULATION TYPE	SOURCE OF FLOW DATA	DURATION CURVE DEVELOPMENT	MAP SCALES USED	SOURCE OF MAP MAPS	DURATION CURVE FOR REGULATED STREAM
Payette	Regulated and Natural	Irrigation Power	USGS IDWR	Idaho A Idaho E	1:250,000 1:62,500 1:24,000	PNWRBC	Idaho B Idaho C
Boise	Regulated and Natural	Irrigation Power Recreation Flood-Control	USGS IDWR	Idaho A	1:250,000 1:62,500 1:24,000	PNWRBC	Idaho B Idaho C
Owyhee	Natural and Regulated	Irrigation	USGS	Idaho D	1:250,000 1:62,500 1:24,000	PNWRBC	Idaho D
Bruneau	Natural and Regulated	Irrigation	USGS	Idaho D	1:250,000 1:62,500 1:24,000	PNWRBC	Idaho D
Wood River	Natural and Regulated	Irrigation	USGS IDWR	Idaho A	1:250,000 1:62,500 1:24,500	PNWRBC	Idaho B Idaho D

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TABLE I
HYDROELECTRIC POTENTIAL
ANALYSIS TECHNIQUES
Idaho

BASIN NAME	BASIN CHARACTERISTICS		HYDROELECTRIC POTENTIAL ANALYSIS TECHNIQUES				
	FLOW CLASSIFI-CATION	REGULATION TYPE	SOURCE OF FLOW DATA	DURATION CURVE DEVELOPMENT	MAP SCALES USED	SOURCE OF MAP MAPS	DURATION CURVE FOR REGULATED STREAM
Salmon Falls Creek	Regulated	Irrigation	USGS	NA	1:250,000 1:62,500 1:24,000	PNWRBC	Idaho D
Box Canyon Springs	Regulated	Irrigation	USGS	NA	1:250,000 1:24,000	PNWRBC	Idaho D
Deep Creek	Regulated	Irrigation	ARS	NA	1:250,000 1:24,000	PNWRBC	Idaho D
Lost River	Regulated	Irrigation	USGS	NA	1:250,000 1:62,500 1:24,000	PNWRBC	Idaho D
Mud Creek	Regulated	Irrigation	ARS	NA	1:250,000 1:62,500 1:24,000	PNWRBC	Idaho D
Niagara Springs	Regulated	Irrigation	ARS	NA	1:250,000 1:62,500 1:24,000	PNWRBC	Idaho D

USGS = U.S. Geological Survey

ARS = Agricultural Research Service

TABLE I
HYDROELECTRIC POTENTIAL
ANALYSIS TECHNIQUES
Idaho

BASIN NAME	BASIN CHARACTERISTICS		HYDROELECTRIC POTENTIAL ANALYSIS TECHNIQUES				
	FLOW CLASSIFI-CATION	REGULATION TYPE	SOURCE OF FLOW DATA	DURATION CURVE DEVELOPMENT	MAP SCALES USED	SOURCE OF MAP MAPS	DURATION CURVE FOR REGULATED STREAM
Cedar Draw	Regulated	Irrigation	ARS	NA	1:250,000 1:62,500 1:24,000	PNWRBC	Idaho D
Rock Creek	Regulated	Irrigation	USGS	NA	1:250,000 1:24,000	PNWRBC	Idaho D
Portneuf	Regulated	Water-Supply and Irrigation	USGS IDWR	NA	1:250,00 1:62,500 1:24,000	PNWRBC	Idaho B
Mud Lake	Regulated	Irrigation	USGS	NA	1:250,000 1:62,500 1:24,000	PNWRBC	Idaho D
Blackfoot	Regulated and Natural	Water-Supply Irrigation	USGS IDWR	Idaho A	1,250,000 1:62,500 1:24,000	PNWRBC	Idaho B
Willow Creek	Regulated	Flood-Control Irrigation	USGS IDWR	NA	1:250,000 1:62,500 1:24,000	PNWRBC	Idaho B Idaho D

ARS = Agricultural Research Service USGS = U.S. Geological Survey IDWR = Idaho Deparmtent of Water Resources

TABLE I
HYDROELECTRIC POTENTIAL
ANALYSIS TECHNIQUES
Idaho

BASIN NAME	BASIN CHARACTERISTICS		HYDROELECTRIC POTENTIAL ANALYSIS TECHNIQUES				
	FLOW CLASSIFI-CATION	REGULATION TYPE	SOURCE OF FLOW DATA	DURATION CURVE DEVELOPMENT	MAP SCALES USED	SOURCE OF MAP MAPS	DURATION CURVE FOR REGULATED STREAM
Henry's Fork	Natural and Regulated	Irrigation Flood-Control Power	USGS IDWR	WSU Idaho D	1:250,000 1:62,500 1:24,000	PNWRBC	Idaho B Idaho C Idaho D Idaho E
Salt River	Natural and Regulated	Irrigation	USGS	Idaho A	1:250,000 1:62,500 1:24,000	PNWRBC	Idaho D
Greys River	Minor Regulation	Irrigation	USGS	Idaho A	1:250,000 1:62,500 1:24,000	PNWRBC	NA
Tributaries to Snake River Above Palisades Reservoir	Natural	None	USGS	Idaho A	1:250,000 1:62,500 1:24,000	PNWRBC	NA

USGS = U.S. Geological Survey

IDWR = Idaho Department of Water Resources

TABLE I
HYDROELECTRIC POTENTIAL
ANALYSIS TECHNIQUES
Montana

BASIN NAME	BASIN CHARACTERISTICS		HYDROELECTRIC POTENTIAL ANALYSIS TECHNIQUES				
	FLOW CLASSIFICATION	REGULATION TYPE	SOURCE OF FLOW DATA	DURATION CURVE DEVELOPMENT	MAP SCALES USED	SOURCE OF MAP MAPS	DURATION CURVE FOR REGULATED STREAM
Clark Fork River	Unregulated and Regulated	Power, Flood Control	U.S.G.S.	Montana A	1-250000 1-62500	USDA SCS	N.A.
Kootenai River	Unregulated and Regu-	Power, Flood Control	U.S.G.S.	Montana A	1-250000 1-62500	USDA SCS	N.A.
Blackfoot River	Unregulated and Regulated	Irrigation	U.S.G.S.	Montana A	1-250000 1-62500	USDA SCS	N.A.
Bitterroot River	Unregulated and Regulated	Irrigation	U.S.G.S.	Montana A	1-250000 1-62500	USDA SCS	N.A.
Flathead River	Unregulated and Regulated	Power, Flood Control	U.S.G.S.	Montana A	1-250000 1-62500	USDA SCS	N.A.

U.S.G.S. = U.S. Geological Survey

TABLE II

MAXIMUM DEVELOPABLE POWER POTENTIAL

Washington

AREA OF INTEREST	POWER (MW)					ENERGY (GWh)				
	P_{10}	P_{30}	P_{50}	P_{80}	P_{95}	E_{10}	E_{30}	E_{50}	E_{80}	E_{95}
Nooksack R	991.62	601.36	429.76	251.53	162.69	4362.09	3726.68	3115.47	2108.64	1426.11
Silesia Cr	47.43	21.23	116.80	2.91	1.74	150.50	106.00	72.74	24.11	9.18
Chilliwack R	52.85	23.57	12.97	3.23	1.95	166.90	118.39	80.59	26.69	17.05
Sumas R	2.24	1.39	1.00	0.58	0.31	10.02	8.68	7.26	4.81	3.40
Samish R	10.92	5.71	3.27	0.70	0.39	37.19	28.42	22.14	5.87	3.47
Skagit R	5011.08	2186.23	1429.62	837.48	552.11	15904.08	13094.19	10457.06	7035.66	5650.11
Stillaguamish R	769.02	408.43	258.71	95.13	40.76	2815.09	2220.89	1697.64	771.48	357.21
Snohomish R	2621.32	1430.12	888.57	409.65	211.71	9972.06	7972.06	6071.12	3369.18	1855.76
Sammamish R	5.05	2.81	1.61	0.71	0.50	18.94	15.21	11.00	5.97	4.27
Cedar R	133.35	64.12	43.51	19.70	11.30	437.10	370.00	294.94	163.79	98.82
Green R	282.24	197.39	90.69	34.65	21.33	1376.71	1064.88	601.45	289.34	186.83
Puyallup R	1031.03	634.81	454.94	269.59	181.61	4605.40	4001.00	3298.63	2264.26	1592.43
Nisqually R	488.66	296.71	200.54	102.48	64.95	1991.93	1725.30	1409.87	856.94	539.97
Chambers Cr	2.77	1.71	1.05	0.53	0.37	11.42	9.57	7.29	4.48	3.27
Deschutes R	40.90	18.69	10.95	4.28	3.04	137.50	99.30	72.70	36.20	26.55
Sherwood Cr	0.98	0.48	0.27	0.11	0.08	3.36	2.51	1.77	0.90	0.70
Gosnell Cr	2.73	1.33	0.74	0.30	0.22	9.34	6.97	4.95	2.51	1.96
Goldsborough Cr	5.95	2.89	1.61	0.72	0.49	20.35	15.22	10.72	5.43	4.25
Tahuya R	6.12	2.41	1.30	0.61	0.46	18.80	12.90	8.96	5.18	4.03
Lilliwaup Cr	9.59	4.68	2.69	1.02	0.49	32.80	25.00	17.90	8.28	4.26
Dosewallips R	173.03	104.31	70.99	35.85	24.31	729.50	620.50	503.50	310.20	212.58
Duckabush R	114.22	68.34	45.19	22.61	11.89	470.30	395.70	312.90	186.19	104.23
Hamma Hamma R	83.23	46.16	37.60	13.91	6.91	324.98	264.33	209.14	114.39	60.34
Skokomish R	218.19	111.09	69.77	26.56	13.71	781.16	606.47	462.56	218.76	120.15
Little Quilcene	9.69	5.78	4.06	2.19	1.04	41.57	34.42	28.49	17.99	9.16
Big Quilcene R	33.67	20.08	14.12	7.59	3.63	144.52	119.65	98.96	62.61	31.71
Elwha R	392.25	244.95	157.40	94.53	62.65	1679.35	1424.83	1166.84	786.61	516.88
Morse Cr	25.10	14.09	9.65	4.56	2.55	101.00	82.70	66.80	37.50	22.30

TABLE II

MAXIMUM DEVELOPABLE POWER POTENTIAL

Washington

AREA OF INTEREST	POWER (MW)					ENERGY (GWh)				
	P_{10}	P_{30}	P_{50}	P_{80}	P_{95}	E_{10}	E_{30}	E_{50}	E_{80}	E_{95}
Willapa Cr	42.15	17.14	8.25	1.97	0.97	123.88	82.08	50.86	16.21	8.35
North Nemah R	4.12	1.68	0.82	0.24	0.13	12.26	8.27	5.21	2.00	1.13
Bear R	2.14	0.99	0.49	0.15	0.07	6.75	4.86	3.14	1.23	0.61
Naselle R	46.75	18.98	9.18	2.48	1.37	138.58	92.54	57.62	20.56	12.01
Palix R	4.19	2.10	1.22	0.44	0.27	14.70	11.00	7.92	3.64	2.40
Grays R	85.33	35.65	18.32	5.38	2.78	257.99	175.98	115.52	44.20	18.13
Skamokawa R	6.76	2.95	1.54	0.41	0.22	20.72	14.49	9.63	3.41	1.93
Elochoman R	29.70	12.98	6.80	1.82	0.97	91.19	63.70	42.38	14.99	8.50
Mill Cr	4.10	1.94	0.76	0.20	0.10	12.60	8.82	4.76	1.68	0.89
Abernathy Cr	6.19	2.75	1.23	0.31	0.17	18.34	12.99	7.64	2.58	1.47
German Cr	12.10	5.35	2.39	0.61	0.33	35.90	25.30	14.90	5.02	2.88
Coal Cr	1.80	0.80	0.36	0.09	0.05	5.36	3.78	2.22	0.75	0.43
Cowlitz R	2194.10	1169.36	714.33	308.19	194.28	8034.49	6448.07	4909.73	2582.90	1703.27
Kalama R	201.08	104.97	63.02	25.76	17.17	722.61	570.92	419.97	216.50	150.55
Lewis R	738.79	377.56	223.39	80.90	48.58	2604.44	2000.66	1464.91	673.14	424.90
Salmon Cr	9.77	3.84	1.74	0.33	0.19	27.40	17.78	10.35	2.69	1.59
LaCamas Cr	6.31	2.83	1.47	0.43	0.19	19.87	13.88	9.13	3.48	1.63
Washougal R	166.31	76.63	41.06	10.02	5.65	524.60	376.00	252.13	82.30	49.45
Hamilton Cr	4.32	2.27	1.23	0.21	0.10	14.40	11.20	7.45	1.71	0.84
Rock Cr	34.30	18.10	9.80	1.68	0.76	114.30	88.90	59.30	13.59	6.71
Wind R	256.32	145.64	90.50	30.12	20.11	964.71	781.26	585.67	252.96	176.04
Ltl White Salmon	116.86	71.86	50.66	20.54	11.63	489.00	365.10	341.10	169.31	101.72
White Salmon	319.58	193.81	122.68	81.47	58.57	1407.34	1177.68	932.83	689.69	513.60
Klickitat R	624.76	331.09	213.39	142.10	109.72	2512.77	2029.14	1614.82	1217.16	949.03
Walla Walla R	115.21	58.29	29.36	11.54	6.74	394.78	296.26	194.19	96.87	659.20
Palouse R	187.60	60.40	18.50	4.82	1.40	474.00	260.50	113.70	38.90	12.28
Grande Ronde R	461.40	215.67	102.09	48.66	36.83	1547.80	1116.40	718.60	412.80	322.43
Asotin Cr	14.36	7.26	4.77	3.49	2.99	58.00	45.80	12.71	29.95	16.14

TABLE II

MAXIMUM DEVELOPABLE POWER POTENTIAL

Washington

AREA OF INTEREST	POWER (MW)					ENERGY (GWh)				
	P_{10}	P_{30}	P_{50}	P_{80}	P_{95}	E_{10}	E_{30}	E_{50}	E_{80}	E_{95}
Dungeness R	140.57	82.40	55.43	32.86	22.41	590.90	498.17	387.12	276.15	132.34
Sekiu R	4.53	1.96	0.91	0.22	0.11	13.49	9.27	5.63	1.81	0.97
Hoko R	20.86	9.04	4.12	1.04	0.51	62.27	42.78	25.99	8.33	4.48
Clallam R	3.07	1.33	0.61	0.15	0.07	9.14	6.28	3.82	1.22	0.66
Pysht R	6.51	2.82	1.30	0.31	0.16	19.42	13.34	8.11	2.60	1.39
Deep Cr	2.32	0.98	0.53	0.10	0.06	6.92	4.71	3.18	0.85	0.49
Lyre R	27.93	17.05	12.04	4.42	2.38	115.00	96.80	80.10	36.47	20.57
Sooes R	7.33	2.85	1.30	0.31	0.14	20.53	13.48	7.95	2.50	1.24
Ozette Cr	4.89	1.90	0.86	0.21	0.09	13.69	8.98	5.30	1.66	0.83
Quillayute R	498.34	216.57	133.49	41.50	17.07	1618.00	1159.91	861.07	336.76	150.67
Dickey R	20.00	7.83	3.56	0.82	0.37	56.46	36.87	21.76	6.62	3.19
Goodman Cr	9.06	3.96	2.07	0.70	0.34	28.63	19.79	13.33	5.59	3.01
Hoh R	417.46	242.89	181.03	115.62	77.91	1843.60	1567.89	1351.12	972.92	682.64
Cedar R	2.17	0.95	0.49	0.16	0.08	6.85	4.74	3.19	1.34	0.72
Mosquito Cr	2.66	1.16	0.60	0.20	0.10	8.29	5.80	3.91	1.64	0.88
Queets R	649.19	294.45	175.79	75.80	37.92	2186.65	1593.75	1180.69	617.63	332.21
Raft R	18.08	7.89	4.12	1.38	0.68	56.96	39.54	26.61	11.15	5.99
Quinault R	530.44	306.99	212.23	106.47	54.97	2194.50	1819.24	1486.22	872.71	481.99
Moclips R	8.65	3.83	2.21	0.74	0.41	28.02	20.15	14.32	4.23	3.55
Copalis R	4.20	1.86	1.07	0.36	0.20	13.58	9.76	6.94	2.93	1.72
Humptulips R	169.04	74.82	43.16	14.40	7.93	548.25	393.49	279.94	118.51	66.41
Hoquium R	9.76	4.32	2.50	0.84	0.45	31.66	22.69	16.14	6.85	4.01
Wishkah R	21.62	10.24	6.53	2.35	1.43	75.78	56.21	43.39	19.50	12.59
Elk R	1.15	0.45	0.21	0.04	0.03	3.22	2.12	1.29	0.39	0.23
Johns River	2.54	0.99	0.47	0.10	0.06	7.12	4.68	2.86	0.86	0.50
Chehalis R	676.48	296.32	155.97	49.87	27.03	2112.57	1471.99	995.78	411.99	236.80
North R	41.95	18.47	9.00	2.13	1.11	128.50	88.24	55.58	17.69	9.65
Smith Cr	12.49	4.89	1.96	0.51	0.19	35.07	22.29	12.18	4.14	1.63

TABLE II

MAXIMUM DEVELOPABLE POWER POTENTIAL

Washington

AREA OF INTEREST	POWER (MW)					ENERGY (GWh)				
	P_{10}	P_{30}	P_{50}	P_{80}	P_{95}	E_{10}	E_{30}	E_{50}	E_{80}	E_{95}
Tucannon R	27.37	15.44	9.52	5.77	3.89	110.49	90.71	69.29	48.58	34.13
Yakima	1623.43	732.79	458.97	126.90	90.20	5680.49	4390.36	2935.31	1221.74	677.56
Columbia R	762.00	573.00	487.00	396.00	341.00	4540.00	4220.00	3930.00	3400.00	2990.00
Crab Cr	4.57	3.21	2.74	1.41	1.19	24.13	21.40	19.17	12.22	10.51
Wenatchee R	1435.38	526.47	266.94	134.47	94.56	4285.77	2678.71	1871.41	1236.39	818.20
Entiat R	201.92	49.25	24.83	14.19	10.64	512.70	266.41	180.24	120.57	93.20
Chelan R	739.44	296.70	141.15	61.77	39.31	2265.09	1506.63	957.03	516.92	344.41
Pasayten R	34.52	7.69	3.68	2.29	1.72	84.77	41.11	26.98	19.54	15.08
Methow R	615.35	149.53	70.76	46.86	35.93	1528.40	805.33	529.66	402.20	351.86
Okanogan R	280.21	68.73	38.78	24.42	17.36	742.40	391.99	288.28	206.62	152.16
Nespelem R	22.71	4.56	2.31	1.67	1.29	56.00	25.50	17.76	14.17	11.25
Sanpoil R	69.52	20.05	12.24	7.53	4.69	200.96	117.66	90.10	63.64	41.06
Spokane R	313.48	151.37	70.65	32.00	20.63	1051.92	750.99	480.14	267.27	180.60
Colville R	9.53	4.17	2.67	1.78	1.26	35.08	25.57	20.01	15.04	11.09
Kettle R	184.00	35.83	13.41	6.63	4.10	414.10	172.66	92.42	55.62	36.03
Big Sheep Cr	63.90	13.99	5.64	2.53	1.36	145.60	67.40	37.50	21.27	14.91
Pend Oreille R	34.60	10.00	5.06	2.53	1.57	94.00	52.60	35.50	21.30	15.73
Snake R	310.38	182.65	133.11	92.63	75.29	1415.13	1191.35	1017.81	787.29	654.41
TOTAL	28307.23	13928.40	8861.75	4443.07	2905.73	102024.84	80124.47	61313.91	37499.61	26628.64

TABLE II

MAXIMUM DEVELOPABLE POWER POTENTIAL

OREGON

AREA OF INTEREST	POWER (MW)					ENERGY (GWh)				
	P_{10}	P_{30}	P_{50}	P_{80}	P_{95}	E_{10}	E_{30}	E_{50}	E_{80}	E_{95}
1. North Coast	970.24	377.74	172.67	37.84	19.97	2336.27	1798.20	1079.64	311.89	174.90
2. Willamette	7036.17	3484.58	2040.66	781.32	517.59	24906.06	18785.83	13726.39	6555.69	4543.90
3. Sandy	790.59	445.45	265.67	84.91	51.30	2970.91	2366.23	1736.28	707.01	449.42
4. Hood	265.17	138.34	78.91	37.97	25.61	982.67	760.46	552.22	319.11	224.35
5. Deschutes	1936.76	1283.35	981.49	713.48	585.16	9836.16	8691.40	7633.72	6101.70	5125.98
6. John Day	1193.75	475.44	193.95	78.27	31.52	3537.97	2279.49	1293.12	634.46	276.13
7. Umatilla	274.29	132.64	54.46	16.18	1.67	865.92	617.75	343.80	125.85	14.60
8. Grand Ronde	1663.19	573.98	255.21	132.31	95.33	4843.60	2935.31	1818.32	1118.45	835.07
9. Powder	181.65	64.24	28.09	10.54	4.94	518.49	312.79	186.15	86.19	43.25
10. Malheur	62.99	27.84	13.72	6.37	3.65	205.76	144.15	94.75	52.90	32.01
11. Owyhee	528.02	125.05	47.11	24.41	16.85	1313.91	607.90	334.83	205.56	147.59
12. Malheur Lake	9.59	2.49	1.16	0.48	0.21	24.87	12.43	7.78	3.91	1.34
13. Goose&SummerL	9.68	2.83	1.34	0.73	0.47	26.82	14.83	9.62	6.13	4.14
14. Klamath	2441.81	1311.35	678.76	67.90	37.75	8241.56	6261.02	4051.44	561.84	330.69
15. Rogue	2875.26	1462.19	787.13	281.28	165.05	10058.14	7582.45	5217.03	2336.73	1445.85
16. Umpqua	2000.27	912.05	444.36	135.17	85.79	6435.89	4529.31	2890.53	1130.01	751.55
17. South Coast	1092.38	373.01	131.01	20.53	9.81	2906.18	1645.83	799.01	168.12	85.96
18. Mid-Coast	738.37	272.38	116.76	25.82	13.74	2092.48	1276.06	730.78	212.99	120.37
State Total*	25023.80	12105.02	6786.55	2812.39	1954.17	87482.88	64951.45	46323.65	23675.56	17114.74

*This total includes Potential from the Snake River in Oregon and 1/2 of the Potential from the Common Idaho - Oregon Boundary Reaches. See page 70 for total values for these Snake River reaches.

TABLE II

MAXIMUM DEVELOPABLE POWER POTENTIAL

OREGON

AREA OF INTEREST	POWER (MW)					ENERGY (GWh)				
	P_{10}	P_{30}	P_{50}	P_{80}	P_{95}	E_{10}	E_{30}	E_{50}	E_{80}	E_{95}
1. North Coast Basin										
Lewis & Clark R.	21.42	8.35	3.70	0.84	0.43	62.40	39.49	23.21	6.90	3.80
Youngs R.	25.85	10.08	4.45	1.01	0.52	75.26	47.62	27.91	8.33	4.57
Big Cr.	18.82	7.34	3.23	0.74	0.38	54.78	34.66	20.27	6.07	3.33
Gnat Cr.	1.58	0.62	0.27	0.06	0.03	4.60	2.91	1.70	0.51	0.28
Clatskanie R.	19.63	7.65	3.41	0.77	0.40	57.20	36.21	21.36	6.32	3.49
Beaver Cr.	9.39	3.66	1.61	0.37	0.19	27.32	17.28	10.08	3.03	1.66
Necanicum R.	11.08	4.32	1.94	0.43	0.23	32.31	20.46	12.12	3.57	1.98
Elk Cr.	2.72	1.06	0.47	0.11	0.05	7.91	5.00	2.92	0.88	0.48
Nehalem R.	409.83	159.47	74.14	15.95	8.51	1200.51	761.88	462.88	131.56	74.56
Miami R.	6.53	2.54	1.12	0.26	0.13	18.99	12.01	7.01	2.11	1.15
Kilchis R.	27.86	10.86	4.83	1.09	0.57	81.20	51.40	30.29	8.98	4.95
Wilson R.	149.15	58.07	26.52	5.82	3.07	435.96	276.38	165.82	47.95	26.87
Trask R.	124.92	48.64	22.10	4.88	2.56	364.89	231.26	138.25	40.17	22.44
Tillamook R.	5.06	1.97	0.87	0.20	0.10	14.74	9.33	5.47	1.63	0.90
Nestucca R.	116.11	45.21	20.51	4.53	2.38	339.10	214.89	128.33	37.35	20.84
Little Nestucca R.	18.19	7.09	3.15	0.71	0.37	53.00	33.55	19.77	5.86	3.23
Neskowin R.	2.10	0.82	0.36	0.08	0.04	6.11	3.86	2.24	0.68	0.37
Basin Total	970.24	377.74	172.67	37.84	19.97	2836.27	1798.20	1079.64	311.89	174.90

TABLE II

MAXIMUM DEVELOPABLE POWER POTENTIAL

OREGON

AREA OF INTEREST	POWER (MW)					ENERGY (GWh)				
	P_{10}	P_{30}	P_{50}	P_{80}	P_{95}	E_{10}	E_{30}	E_{50}	E_{80}	E_{95}
2A. Upper Willamette Basin										
Willamette R. Main Stem	356.48	178.09	106.65	43.32	27.49	1285.63	973.09	722.75	362.18	240.83
Long Tom R.	24.12	10.44	4.86	1.43	0.82	74.91	50.96	31.38	11.90	7.22
McKenzie R.	1177.11	679.53	454.82	215.69	159.32	4848.49	3976.70	3189.32	1827.73	1395.67
Coast Fork Willamette R.	155.54	67.56	31.74	9.92	5.67	486.13	331.98	206.46	82.22	49.67
Middle Fork Willamette R.	876.26	386.62	187.10	64.06	36.39	2788.44	1930.57	1231.49	630.91	318.69
Sub-Basin Total	2589.52	1322.24	785.16	344.42	229.69	9483.60	7263.30	5381.40	2814.94	2012.07
2B. Mid-Willamette Basin										
Willamette R. Main Stem	664.29	311.99	193.77	82.67	54.46	2357.37	1740.14	1325.88	693.27	477.03
Molalla R.	438.89	203.72	109.98	25.90	12.43	1431.37	1019.34	690.90	212.17	108.86
Yamhill R.	133.81	48.63	18.61	2.89	1.29	367.50	218.26	113.06	23.59	11.27
Rickreall Cr.	16.26	6.11	2.25	0.34	0.15	44.94	27.16	13.66	2.74	1.28
Luckiamute R.	39.33	14.60	5.46	0.83	0.36	108.45	65.13	33.10	6.73	3.16
Santiam R. Main Stem	70.38	35.80	20.91	5.98	3.06	246.95	186.37	134.22	49.18	26.80

TABLE II

MAXIMUM DEVELOPABLE POWER POTENTIAL

OREGON

AREA OF INTEREST	POWER (MW)					ENERGY (GWh)				
	P_{10}	P_{30}	P_{50}	P_{80}	P_{95}	E_{10}	E_{30}	E_{50}	E_{80}	E_{95}
North Santiam R.	909.62	435.48	241.44	60.85	29.87	3035.91	2207.38	1527.41	499.23	271.80
South Santiam R.	750.77	352.83	192.43	46.60	22.57	2371.49	1774.31	1212.30	381.80	197.67
Calapooia R.	120.37	56.21	30.47	7.24	3.48	394.17	281.77	191.57	59.29	30.49
Mary's R.	42.46	15.51	5.90	0.91	0.40	116.74	69.52	35.84	7.42	3.53
Rest of Basin	29.48	13.47	7.16	1.62	0.77	94.98	66.92	44.82	13.28	6.73
Sub-Basin Total	3215.66	1494.35	828.38	235.83	128.86	10569.87	7656.30	5322.76	1948.70	1138.62
2C. Lower Willamette Basin										
Scappoose Cr.	2.55	0.99	0.37	0.07	0.03	7.18	4.46	2.27	0.58	0.25
Willamette R. Main Stem	284.66	128.75	81.76	35.94	24.21	1000.70	727.53	562.91	301.96	212.10
Johnson Cr.	0.89	0.41	0.19	0.05	0.03	2.84	2.01	1.23	0.44	0.28
Clackamas R.	872.44	511.25	335.82	173.31	134.24	3648.26	3015.47	2400.74	1475.43	1175.94
Tualatin R.	70.45	26.59	8.98	1.70	0.53	193.61	116.76	55.08	13.64	4.64
Sub-Basin Total	1230.99	667.99	427.12	211.07	159.04	4852.59	3866.23	3022.23	1792.05	1393.21
Basin Total (Upper, Middle & Lower Basins)	7036.17	3484.58	2040.66	781.32	517.59	24906.06	18785.83	13726.39	6555.69	4543.90

TABLE II

MAXIMUM DEVELOPABLE POWER POTENTIAL

OREGON

AREA OF INTEREST	POWER (MW)					ENERGY (GWh)				
	P_{10}	P_{30}	P_{50}	P_{80}	P_{95}	E_{10}	E_{30}	E_{50}	E_{80}	E_{95}
3. Sandy Basin										
Sandy R. Main Stem	369.13	201.76	114.59	29.73	17.15	1328.52	1035.28	729.85	246.67	150.24
Tributaries	421.46	243.70	151.09	55.18	34.15	1642.39	1330.95	1006.44	460.34	299.18
Basin Total	790.59	445.45	265.67	84.91	51.30	2970.91	2366.23	1736.28	707.01	449.42
4. Hood Basin										
Eagle Cr.	14.93	7.00	3.68	1.81	1.24	51.41	37.52	25.90	15.25	10.83
Hood R.	243.20	127.84	73.30	35.22	23.74	906.01	703.90	512.81	295.99	207.96
Fifteenmile Cr.	7.04	3.51	1.93	0.94	0.63	25.24	19.04	13.51	7.87	5.56
Basin Total	265.17	138.34	78.91	37.97	25.61	982.67	760.46	552.22	319.11	224.35
5. Deschutes Basin										
Deschutes R. Main Stem	1080.58	812.88	658.44	487.29	403.88	6162.02	5693.01	5151.86	4177.32	3538.02
White R.	82.91	45.75	28.10	17.36	13.58	336.04	270.93	209.08	147.90	118.93
Wapinitia Cr.	7.81	3.92	2.39	1.49	1.16	30.00	23.19	17.82	12.66	10.20
Warm Springs R.	131.51	73.88	45.44	28.04	21.92	538.62	437.64	337.99	238.90	192.04
Trout Cr.	36.98	19.73	12.09	7.48	5.86	147.00	116.78	89.99	63.75	51.30
Shitike Cr.	32.79	16.76	10.23	6.35	4.97	127.19	99.11	76.24	54.10	43.57

TABLE II

MAXIMUM DEVELOPABLE POWER POTENTIAL

OREGON

AREA OF INTEREST	POWER (MW)					ENERGY (GWh)				
	P_{10}	P_{30}	P_{50}	P_{80}	P_{95}	E_{10}	E_{30}	E_{50}	E_{80}	E_{95}
Metolius R.	137.51	111.00	98.98	82.74	73.64	895.87	849.43	807.33	714.83	645.05
Crooked R.	147.35	41.87	19.91	3.74	0.58	383.13	198.32	121.39	29.29	5.08
Squaw Cr.	185.47	102.42	67.97	51.22	39.79	797.76	652.27	531.55	436.12	348.57
Tumalo Cr.	75.37	41.62	27.62	20.81	16.17	324.18	265.05	216.00	177.22	141.64
Little Deshutes R.	15.56	11.38	8.69	5.03	3.05	79.50	72.19	62.77	41.90	26.70
Fall R.& Cultus R.	2.92	2.14	1.63	0.93	0.56	14.85	13.48	11.70	7.71	4.88
Basin Total	1936.76	1283.35	981.49	713.48	585.16	9836.16	8691.40	7633.72	6101.70	5125.98
6. John Day Basin										
John Day R. Main Stem	883.64	370.29	154.72	66.13	27.50	2696.18	1796.79	1041.40	537.00	240.91
Rock Cr.	25.40	7.72	2.70	0.68	0.19	65.49	34.51	16.94	5.45	1.69
N. Fk.John Day R. (except Middle Fk.)	201.76	71.23	27.15	8.92	3.08	558.67	329.98	175.54	71.74	26.95
Middle Fk. John Day R.	62.45	20.01	7.21	1.99	0.60	164.84	90.47	45.65	15.91	5.24
South Fk. John Day R.	20.50	6.20	2.17	0.55	0.15	52.78	27.73	13.59	4.35	1.34
Basin Total	1193.75	475.44	193.95	78.27	31.52	3537.97	2279.49	1293.12	634.46	276.13
7. Umatilla Basin										
Umatilla R.	274.29	132.64	54.46	16.18	1.67	865.92	617.75	343.80	125.85	14.60

TABLE II

MAXIMUM DEVELOPABLE POWER POTENTIAL

OREGON

AREA OF INTEREST	POWER (MW)					ENERGY (GWh)				
	P_{10}	P_{30}	P_{50}	P_{80}	P_{95}	E_{10}	E_{30}	E_{50}	E_{80}	E_{95}
8. Grande Ronde Basin										
Grande Ronde R. Main Stem	549.80	240.50	102.57	47.44	33.24	1739.14	1197.26	713.94	400.06	291.22
Joseph Creek	104.18	30.56	14.06	7.74	5.25	287.86	158.88	101.06	65.04	45.95
Wenaha R.	125.10	37.38	17.12	9.51	6.89	348.45	194.76	123.77	80.40	60.32
Wallowa R. (except Minam R.)	215.95	65.68	29.95	16.78	12.96	606.27	343.00	217.79	142.79	113.51
Minam R.	191.41	56.99	26.12	14.48	10.34	532.26	296.75	188.61	122.29	90.59
Other Tribs. of Grande Ronde R.	21.37	6.25	2.88	1.58	1.06	58.97	32.48	20.66	13.28	9.28
Imnaha R.	455.38	136.62	62.51	34.78	25.59	1270.65	712.18	452.49	294.59	224.20
Basin Total	1663.19	573.98	255.21	132.31	95.33	4843.6	2935.31	1818.32	1118.45	835.07
9. Powder Basin										
Pine Creek	18.12	6.78	3.09	1.12	0.51	53.15	33.28	20.35	9.15	4.46
Powder R. (except Eagle Cr.)	76.37	26.06	11.09	4.25	2.03	214.34	126.20	73.77	34.82	17.81
Eagle Cr.	28.83	10.85	4.96	1.80	0.81	84.82	53.33	32.70	14.66	7.12
Burnt R.	58.33	20.55	8.95	3.37	1.58	166.17	99.98	59.33	27.56	13.86
Basin Total	181.65	64.24	28.09	10.54	4.94	518.49	312.79	186.15	86.19	43.25

TABLE II

MAXIMUM DEVELOPABLE POWER POTENTIAL

OREGON

AREA OF INTEREST	POWER (MW)					ENERGY (GWh)				
	P_{10}	P_{30}	P_{50}	P_{80}	P_{95}	E_{10}	E_{30}	E_{50}	E_{80}	E_{95}
10. Malheur Basin										
Malheur R. Main Stem below Warm Springs Dam	30.56	17.47	8.47	3.80	1.94	112.31	89.37	57.87	31.29	17.02
N. Fk. Malheur R.	14.38	5.35	2.87	2.02	1.62	46.62	30.78	22.12	17.27	14.17
Malheur R. above Warm Springs Reservoir	18.05	5.02	2.38	0.55	0.09	46.83	24.00	14.76	4.34	0.82
Basin Total	62.99	27.84	13.72	6.37	3.65	205.76	144.15	94.75	52.90	32.01
11. Owyhee Basin										
Owyhee R. below Owyhee Dam	62.63	14.63	6.03	3.39	2.35	157.81	73.72	43.60	28.55	20.56
Owyhee R. Main Stem above Owyhee Reservoir	359.70	84.23	34.58	19.47	13.48	906.63	424.00	250.01	164.00	118.08
Crooked Cr.	20.25	4.84	1.24	0.41	0.30	47.82	20.82	8.23	3.51	2.66
Jordon Cr.	85.44	21.35	5.26	1.14	0.72	201.65	89.36	32.99	9.50	6.29
Basin Total	528.02	125.05	47.11	24.41	16.85	1313.91	607.90	334.83	205.56	147.59

TABLE II

MAXIMUM DEVELOPABLE POWER POTENTIAL

OREGON

AREA OF INTEREST	POWER (MW)					ENERGY (GWh)				
	P_{10}	P_{30}	P_{50}	P_{80}	P_{95}	E_{10}	E_{30}	E_{50}	E_{80}	E_{95}
12. Malheur Lake Basin										
Silvies R.	6.47	1.54	0.67	0.24	0.10	16.09	7.46	4.41	1.97	0.84
Donner & Blitzen R.	3.12	0.94	0.49	0.24	0.11	8.78	4.97	3.38	1.94	1.00
Basin Total	9.59	2.49	1.16	0.48	0.21	24.87	12.43	7.78	3.91	1.83
13. Goose & Summer Lakes Basin										
Chewaucan R.	9.68	2.83	1.34	0.73	0.47	26.82	14.83	9.62	6.13	4.14
14. Klamath Basin										
Jenny Cr.	21.79	18.67	14.01	4.09	0.12	109.75	104.30	87.94	31.50	1.02
Klamath R.	194.67	108.15	69.22	49.75	34.61	818.09	666.51	530.08	419.23	303.17
Williamson R. Main Stem	2210.35	1176.20	590.20	10.23	0.35	7250.69	5438.86	3392.58	78.81	3.14
Sprague R.	15.00	8.33	5.33	3.83	2.67	63.03	51.35	40.84	32.30	23.36
Basin Total	2441.81	1311.35	678.76	67.90	37.75	8241.56	6261.02	4051.44	561.84	330.69
15. Rogue Basin										
Illinois R.	642.44	320.65	167.90	59.00	32.56	2206.98	1643.21	1107.95	487.92	285.19
Applegate R.	158.16	78.93	41.28	14.49	7.94	543.05	404.24	272.32	119.77	69.55

TABLE II

MAXIMUM DEVELOPABLE POWER POTENTIAL

OREGON

AREA OF INTEREST	POWER (MW)					ENERGY (GWh)				
	P_{10}	P_{30}	P_{50}	P_{80}	P_{95}	E_{10}	E_{30}	E_{50}	E_{80}	E_{95}
Bear Cr.	28.86	13.96	6.97	2.38	1.18	96.29	70.17	45.70	19.56	10.37
S. Fk. Rogue R.	176.51	85.11	42.36	14.44	7.13	587.41	427.27	277.46	118.50	62.46
Rogue R. Main Stem & all tribs. not listed above	1869.28	963.54	528.62	190.96	116.24	6624.42	5037.56	3513.60	1590.99	1018.29
Basin Total	2875.26	1462.19	787.13	281.28	165.05	10058.14	7582.45	5217.03	2336.73	1445.85
16. Umpqua Basin										
Smith R.	47.35	19.49	7.76	1.45	0.73	137.75	88.94	47.85	11.91	6.35
North Umpqua R.	884.02	390.16	177.63	45.19	26.16	2739.08	1873.84	1129.12	374.99	229.13
South Umpqua R.	472.14	207.51	93.85	23.66	13.68	1457.89	994.25	596.01	196.36	119.80
Umpqua R. Main Stem & local tribs.	596.76	294.89	165.11	64.87	45.24	2101.17	1572.28	1117.54	546.75	396.27
Basin Total	2000.27	912.05	444.36	135.17	85.79	6435.89	4529.31	2890.53	1130.01	751.55
17. South Coast Basin										
Coos R.	182.37	63.58	22.29	3.31	1.46	487.83	279.72	135.03	26.97	12.80
Coquille R.	371.85	129.22	45.48	6.87	3.09	994.42	569.34	275.91	56.07	27.11
Floras Cr.	24.55	8.7	2.99	0.40	0.16	65.76	38.00	17.98	3.25	1.38
Sixes R.	29.46	10.30	3.60	0.52	0.22	78.81	45.25	21.76	4.24	1.95

TABLE II

MAXIMUM DEVELOPABLE POWER POTENTIAL

OREGON

AREA OF INTEREST	POWER (MW)					ENERGY (GWh)				
	P_{10}	P_{30}	P_{50}	P_{80}	P_{95}	E_{10}	E_{30}	E_{50}	E_{80}	E_{95}
Elk Cr.	50.11	17.63	6.11	0.86	0.35	134.13	77.24	36.86	6.94	3.08
Euchre Cr.	2.95	1.07	0.36	0.04	0.02	7.92	4.62	2.14	0.35	0.13
Hunter Cr.	3.94	1.30	0.46	0.08	0.04	10.38	5.77	2.82	0.64	0.36
Pistol R.	62.36	20.61	7.31	1.23	0.65	164.53	91.38	44.75	10.17	5.71
Chetco R.	311.47	102.95	36.49	6.16	3.26	821.69	456.37	223.48	50.79	28.54
Winchuck R.	21.09	6.97	2.47	0.42	0.22	55.63	30.90	15.13	3.44	1.93
N. Fk. Smith R.	32.25	10.66	3.78	0.64	0.34	85.08	47.25	23.14	5.26	2.96
Basin Total	1092.38	373.01	131.01	20.53	9.81	2906.18	1645.83	799.01	168.12	85.96
18. Mid-Coast Basin										
Salmon R.	27.84	10.43	4.57	1.03	0.54	79.68	49.18	28.63	8.51	4.74
Schooner Cr.	3.09	1.17	0.52	0.12	0.06	8.93	5.57	3.29	1.00	0.55
Drift Cr.	19.86	7.44	3.26	0.74	0.39	56.84	35.07	20.41	6.06	3.38
Siletz R.	219.53	80.55	34.27	7.52	4.02	620.03	376.55	214.39	62.05	35.25
Yaquina R.	29.99	11.16	4.84	1.08	0.57	85.46	52.48	30.34	8.94	5.01
Beaver Cr.	2.22	0.84	0.37	0.09	0.04	6.41	3.99	2.34	0.71	0.39
Alsea R.	174.42	64.48	27.72	6.15	3.26	494.94	302.32	173.52	50.71	28.60
Yachats R.	8.16	3.07	1.35	0.31	0.16	23.43	14.51	8.49	2.54	1.41
Tenmile Cr.	8.41	3.18	1.41	0.32	0.17	24.24	15.08	8.87	2.67	1.47

TABLE II

MAXIMUM DEVELOPABLE POWER POTENTIAL

OREGON

AREA OF INTEREST	POWER (MW)					ENERGY (GWh)				
	P_{10}	P_{30}	P_{50}	P_{80}	P_{95}	E_{10}	E_{30}	E_{50}	E_{80}	E_{95}
Big Cr.	2.53	0.96	0.43	0.10	0.05	7.30	4.56	2.70	0.82	0.45
Siuslaw R.	236.07	86.72	36.96	8.13	4.34	667.25	405.59	231.24	67.04	38.04
Siltcoos R.	3.96	1.50	0.66	0.15	0.08	11.39	7.08	4.16	1.25	0.69
Tahkenitch Cr.	2.30	0.86	0.38	0.09	0.05	6.59	4.08	2.38	0.71	0.39
Basin Total	738.37	272.38	116.76	25.82	13.74	2092.48	1276.06	730.78	212.99	120.37
Snake River in Oregon and 1/2 Ore-Ida Border Reaches	953.62	640.15	494.09	356.88	287.76	4879.22	4330.01	3818.24	3037.02	2507.14

TABLE II

MAXIMUM DEVELOPABLE POWER POTENTIAL

IDAHO

AREA OF INTEREST	POWER (MW)					ENERGY (GWh)				
	P_{10}	P_{30}	P_{50}	P_{80}	P_{95}	E_{10}	E_{30}	E_{50}	E_{80}	E_{95}
Bear R. Basin	75.66	48.57	33.22	15.38	8.42	328.75	281.28	227.52	125.92	72.50
Bear River	74.94	48.18	32.99	15.26	8.34	325.98	279.10	225.87	124.92	71.83
Malad River	0.72	0.39	0.23	0.12	0.08	2.77	2.18	1.65	1.00	0.67
Kootenai River Basin	454.78	141.07	66.40	31.52	20.94	1273.84	724.20	462.56	264.00	182.84
Kootenai River	131.37	59.38	29.43	14.72	11.03	439.50	313.37	208.41	124.64	96.43
Moyie River	186.24	49.13	23.00	11.09	7.08	492.15	251.93	160.35	92.58	61.82
Pend Oreille R. Basin	262.49	78.63	41.67	20.71	10.94	740.59	418.45	288.97	169.63	94.67
Priest River	178.73	58.37	32.84	16.99	9.01	529.63	318.76	229.31	139.06	77.85
Pack River	34.44	8.38	3.67	1.56	0.82	87.00	41.33	24.84	12.84	7.17
Spokane R. Basin	1034.93	376.34	150.66	62.74	38.41	2966.77	1812.91	1022.13	521.51	335.01
Spokane River	68.64	29.66	14.83	5.51	2.97	218.54	150.24	98.27	45.19	25.70
Coeur d'Alene R.	341.75	122.04	47.97	20.09	12.24	970.20	585.26	325.74	166.98	106.82
St. Joe River	624.54	224.64	87.86	37.14	23.20	1778.03	1077.41	598.12	309.34	202.49
Snake River Basin	4119.50	2389.95	1466.46	1013.90	812.69	17464.23	14434.05	11198.13	8621.33	7079.05
Snake River in Idaho	2079.29	1173.50	689.76	477.80	389.18	8557.69	6970.75	5275.72	4068.83	3389.61
Snake River in Wyoming	792.89	405.54	159.35	94.87	67.64	2707.74	2029.10	1166.43	799.31	590.59
Palouse River	8.61	2.73	0.85	0.15	0.06	22.10	11.78	5.22	1.22	0.53

TABLE II

MAXIMUM DEVELOPABLE POWER POTENTIAL

IDAHO

AREA OF INTEREST	POWER (MW)					ENERGY (GWh)				
	P_{10}	P_{30}	P_{50}	P_{80}	P_{95}	E_{10}	E_{30}	E_{50}	E_{80}	E_{95}
Clearwater River Basin	7527.60	2079.81	1059.35	554.40	352.34	20620.70	11076.22	5271.78	4631.06	3074.63
Clearwater River	1147.04	481.58	278.48	142.37	95.15	3843.99	2678.46	1966.81	1191.89	829.88
NF Clearwater River	1752.79	438.22	213.99	113.16	70.45	4605.19	2302.08	1516.38	942.23	614.92
SF Clearwater River	490.16	120.35	58.47	30.84	19.18	1278.85	630.95	414.12	256.79	167.40
Lochsa River	1587.66	397.57	194.22	102.72	63.96	4173.89	2088.86	1376.30	855.31	558.24
Selway River	1846.41	461.71	225.48	119.23	74.24	4851.53	2425.54	1597.79	992.85	647.97
Salmon R. Basin	8530.03	2620.97	1705.90	1261.99	973.90	26717.26	16274.47	13248.24	10720.57	8512.31
Salmon River	5217.48	1587.05	1046.27	785.25	608.14	16415.67	10055.09	8160.18	6673.93	5316.35
SF Salmon River	1110.46	321.57	214.61	156.06	121.39	3417.27	2035.13	1660.34	1326.95	1061.20
MF Salmon River	1459.80	425.19	283.78	207.42	160.40	4505.53	2692.92	2197.39	1762.59	1402.18
Lemhi River	58.57	40.75	33.93	22.69	13.91	306.94	275.72	251.83	187.81	120.53
Pahsimeroi	26.19	19.32	16.21	10.91	7.78	144.62	132.60	121.71	91.51	67.53
Wildhorse River	57.16	18.37	7.08	2.86	1.77	155.35	87.39	47.81	23.79	15.44
Weiser River	208.24	92.09	31.88	9.74	5.58	620.75	417.26	206.29	80.20	48.35
Payette R. Basin	1499.24	729.32	435.83	233.35	156.41	5481.51	4132.59	3104.23	1951.32	971.42
Payette River	364.20	141.02	71.63	44.75	35.61	1168.46	776.46	534.27	381.27	311.18
NF Payette River	466.84	302.42	190.10	81.65	45.23	1972.09	1684.01	1290.45	672.90	393.77
MF Payette River	76.57	19.14	11.98	9.15	7.25	219.77	119.15	94.07	77.94	63.35
SF Payette River	534.84	219.02	101.41	56.95	44.65	1702.93	1149.62	737.51	484.40	390.10

TABLE II

MAXIMUM DEVELOPABLE POWER POTENTIAL
IDAHO

AREA OF INTEREST	POWER (MW)					ENERGY (GWh)				
	P_{10}	P_{30}	P_{50}	P_{80}	P_{95}	E_{10}	E_{30}	E_{50}	E_{80}	E_{95}
Boise River Basin	1053.30	315.23	181.93	99.44	56.14	3049.53	1756.43	1289.38	819.86	487.76
Boise River	245.68	70.50	42.99	19.36	10.14	696.92	390.00	293.59	159.02	90.39
NF Boise River	158.80	41.07	22.11	12.79	7.93	432.25	226.00	159.57	106.50	69.23
MF Boise River	225.47	59.41	32.22	18.92	11.91	619.64	328.70	233.45	157.71	103.94
SF Boise River	369.87	130.89	77.52	44.38	23.49	1157.69	738.99	551.98	363.26	203.20
Owyhee River Basin	137.92	34.84	16.87	6.39	3.23	355.46	178.87	111.87	52.25	27.92
Owyhee River in Idaho	102.07	25.64	11.67	4.70	2.58	261.37	127.46	78.83	38.63	22.35
Owyhee River in Nevada	35.85	9.20	5.11	1.69	0.65	94.09	47.41	33.04	13.62	5.57
Bruneau River Basin	195.12	49.08	22.31	12.21	8.10	508.79	252.92	159.11	101.62	70.15
Bruneau River in Idaho	189.17	47.40	21.50	11.86	7.92	492.78	244.39	153.65	98.77	68.56
Bruneau River in Nevada	5.95	1.68	0.81	0.35	0.18	16.01	8.53	5.46	2.85	1.59
Wood River Basin	272.98	109.61	64.42	43.83	32.68	932.00	645.77	487.44	370.16	284.73
Malad River	24.36	15.47	14.04	13.14	12.64	140.25	124.66	119.67	114.54	110.72
Big Wood River	185.97	53.51	28.96	17.29	12.07	529.67	297.61	211.58	145.11	105.08
Little Wood River	62.65	40.63	21.42	13.40	7.97	262.08	223.50	156.19	110.51	68.93

TABLE II

MAXIMUM DEVELOPABLE POWER POTENTIAL

IDAHO

AREA OF INTEREST	POWER (MW)					ENERGY (GWh)				
	P_{10}	P_{30}	P_{50}	P_{80}	P_{95}	E_{10}	E_{30}	E_{50}	E_{80}	E_{95}
Salmon Falls Creek Basin	34.90	15.59	11.24	8.96	5.14	135.82	101.97	86.72	73.74	44.47
Salmon Falls Creek in Idaho	20.48	11.96	9.19	7.67	4.36	96.39	81.45	71.75	63.12	37.69
Salmon Falls Creek in Nevada	14.42	3.63	2.05	1.29	0.78	39.43	20.52	14.97	10.62	6.78
Lost R. Basin	123.96	41.82	27.83	19.69	13.89	405.05	261.13	212.11	165.77	121.35
Big Lost River	103.76	28.15	16.34	10.92	7.31	296.18	163.71	122.32	91.47	63.85
Little Lost R.	13.34	6.88	4.77	2.75	1.54	52.93	41.60	34.22	22.71	13.43
Box Canyon Springs	21.11	19.35	17.59	14.95	13.63	153.73	150.65	144.48	129.46	119.34
Deep Creek	10.95	8.21	5.75	2.52	0.88	52.01	47.21	38.58	20.19	7.60
Mud Creek	11.32	7.99	6.66	3.86	2.53	58.70	52.87	48.20	32.27	22.06
Niagara Springs	3.34	2.94	2.88	2.59	2.31	24.82	24.12	23.92	22.27	20.07
Cedar Draw	4.39	3.13	1.98	0.63	0.31	21.73	19.54	15.51	7.79	2.73
Rock Creek	11.62	10.78	9.45	6.02	4.97	77.11	75.64	70.98	51.45	43.40
Portneuf River Basin	22.10	14.71	11.25	6.13	4.22	105.52	92.58	80.45	51.26	36.62

TABLE II

MAXIMUM DEVELOPABLE POWER POTENTIAL

IDAHO

AREA OF INTEREST	POWER (MW)					ENERGY (GWh)				
	P_{10}	P_{30}	P_{50}	P_{80}	P_{95}	E_{10}	E_{30}	E_{50}	E_{80}	E_{95}
Mud Lake Basin	2.59	2.02	1.69	1.15	0.70	14.80	13.79	12.64	9.59	6.12
Blackfoot River Basin	124.26	74.30	22.92	6.87	6.30	421.66	334.13	154.09	74.08	54.41
Willow Creek	21.03	5.87	2.91	1.43	0.86	57.21	30.64	20.27	11.86	7.46
Henrys Fork Basin	523.18	290.52	217.06	143.67	99.77	2287.16	1879.55	1622.16	1204.20	867.83
Henrys Fork	217.02	149.86	109.39	66.30	41.57	1055.78	938.12	796.31	550.96	361.38
Teton River	121.10	69.18	49.45	34.68	27.16	538.16	447.18	378.05	293.95	236.35
Falls River	167.27	60.38	48.29	33.94	23.39	595.39	408.13	365.80	284.01	203.25
Henrys Fork Basin in Idaho	479.37	273.61	203.47	133.88	92.23	2123.94	1763.48	1517.69	1121.36	802.25
Henrys Fork Basin in Wyoming	43.81	16.91	13.59	9.79	7.54	163.22	116.07	104.47	82.84	65.58
Salt River Basin	48.12	26.67	21.04	16.27	12.96	223.15	185.58	165.83	138.69	113.29
Salt R. Basin in Idaho	0.60	0.29	0.22	0.16	0.14	2.52	1.98	1.70	1.40	1.21
Salt R. Basin in Wyoming	47.52	26.38	20.82	16.11	12.82	220.63	183.60	164.13	137.29	112.08
Grays River	183.79	59.29	36.46	25.86	20.09	578.33	360.20	280.22	219.83	175.66
Hoback River	145.11	28.39	16.22	11.31	8.63	371.06	166.56	123.92	95.96	75.42
Gros Ventre R.	179.49	35.69	20.46	14.19	10.48	461.05	209.10	155.75	120.03	91.58

TABLE II

MAXIMUM DEVELOPABLE POWER POTENTIAL

IDAHO

AREA OF INTEREST	POWER (MW)					ENERGY (GWh)				
	P_{10}	P_{30}	P_{50}	P_{80}	P_{95}	E_{10}	E_{30}	E_{50}	E_{80}	E_{95}
Spread Creek	20.70	4.55	2.67	1.79	1.09	54.77	26.47	19.90	14.86	9.55
Buffalo Fork	104.95	21.29	12.27	8.44	6.01	271.13	124.56	92.95	71.17	52.54
Pacific Creek	39.88	8.40	4.89	3.32	2.20	104.17	49.03	36.71	27.78	19.18
Lewis River	57.08	11.76	6.80	4.66	3.22	148.10	68.69	51.32	39.12	28.08
Coulter Creek	5.31	1.16	0.68	0.46	0.28	14.02	6.74	5.07	3.79	2.47
Heart River	3.91	0.87	0.51	0.34	0.20	10.39	5.06	3.81	2.83	1.78
TOTALS										
Wyoming	1624.44	620.23	294.72	191.14	140.20	5104.61	3345.18	2204.68	1614.81	1224.51
Nevada	56.22	14.51	7.97	3.33	1.61	149.53	76.46	53.47	27.09	13.94
Idaho	25459.98	9147.16	5443.34	3479.25	2560.46	82034.97	53364.76	38338.12	29400.52	21941.87

TABLE II

MAXIMUM DEVELOPABLE POWER POTENTIAL

MONTANA

AREA OF INTEREST	POWER (MW)					ENERGY (GWh)				
	P_{10}	P_{30}	P_{50}	P_{80}	P_{95}	E_{10}	E_{30}	E_{50}	E_{80}	E_{95}
Bitterroot	566.62	152.84	80.37	44.84	37.75	1372.57	820.01	578.99	381.93	330.56
Blackfoot	366.44	98.37	55.50	37.97	30.95	911.93	559.83	427.93	322.47	271.20
Clark Fork	3566.77	1378.80	927.06	587.71	421.35	11399.72	8420.34	6901.22	4970.52	3691.50
Flathead	3511.61	1131.87	577.60	270.41	201.99	9298.82	5831.25	3948.04	2282.71	1769.74
Kootenai	1969.96	813.95	403.79	204.33	154.82	6042.97	4216.93	2832.43	1719.73	1356.40
Montana Total	9981.40	3575.83	2044.32	1145.26	846.86	29026.01	19848.36	14688.61	9677.36	7419.40

TABLE II

MAXIMUM DEVELOPABLE POWER POTENTIAL
PACIFIC NORTHWEST REGION

AREA OF INTEREST	POWER (MW)					ENERGY (GWh)				
	P_{10}	P_{30}	P_{50}	P_{80}	P_{95}	E_{10}	E_{30}	E_{50}	E_{80}	E_{95}
State of Washington	28307	13928	8862	4443	2906	102025	80124	61314	37500	26629
State of Oregon	25024	12105	6787	2812	1954	87483	64951	46324	23676	17115
State of Idaho	25460	9147	5443	3479	2560	82035	53365	38338	29401	21942
State of Montana Columbia Basin	9981	3576	2044	1145	847	29026	19848	14689	9677	7419
State of Wyoming Columbia Basin	1624	620	295	191	140	5105	3345	2205	1615	1225
State of Nevada Columbia Basin	56	15	8	3	2	150	76	53	27	14
Pacific Northwest Region total	90452	39391	23439	12073	8409	305824	221709	162923	101896	74344

IV. REACH RANKING

The reach ranking procedures presented in this study were developed around the data presented in the Feasibility Transmission and Load Restraints tables and the total power potential data for the reaches. The ranking parameters and criteria used are those that the investigators felt would be significant to low head hydroelectric development in the Pacific Northwest Region. The parameters used are in no way all inclusive or far superior to other schemes which could be devised. The techniques used should be viewed more as an example use of the data presented in the study, rather than an exact solution to the problem of choosing the best reaches.

The first step in the ranking process was to screen out the less desirable reaches. This was done using the data available in Table II feasibility transmission and load restraints. The basic criteria used to screen out reaches are as follows:

1. A check in the column titled land use restriction
2. More than one check in the columns titled Utility Displacement, Building Displacement, and Special Fish Problems
3. The distance to the nearest transmission line was greater than 10 miles
4. No local market exists (no 1, 2, or 3 in Local market column)

If any of the four criteria was met the reach was eliminated from further consideration. After this screening was accomplished the remaining reaches were ranked according to the value of Q_{30} in the reach. The results of these rankings are shown in Table III.

Table III

WASHINGTON REACH RANKING

STREAM DESCRIPTION	REACH NUMBER	Q_{30} (CFS)	PAGE
Nisqually River	01-029-000-000-000-R0003	2370	W11- 429
Sauk River	01-061-000-000-000-R0069	2100	W 4- 125
Kettle River	01-500-460-000-000-R0001	2043	W60-1412
Cle Elum River	01-500-260-000-000-R0049	1160	W37-1257
South Fork Stillaguamish River	01-022-000-000-000-R0022	1110	W 5- 262
Cle Elum River	01-500-260-000-000-R0050	1110	W37-1258
White Salmon River	01-500-120-000-000-R0003	993	W29-1132
South Fork Nooksack River	01-023-000-000-000-R0005	807	W 1- 5
East Fork Lewis River	01-500-040-000-000-R0011	685	W27-1069
South Fork Nooksack River	01-023-000-000-000-R0006	624	W 1- 6
Dickey River	01-038-000-000-000-R0002	550	W20- 568
Miller River	01-034-000-000-000-R0041	452	W 7- 314
Pilchuck Creek	01-022-000-000-000-R0003	352	W 5- 243
North Fork Skykomish River	01-034-000-000-000-R0027	345	W 7- 300
Olequa Creek	01-500-020-000-000-R0059	271	W26- 962
Little Naches River	01-500-260-000-000-R0024	234	W37-1232
Clear Creek	01-061-000-000-000-R0101	203	W 4- 157
Copalis River	01-047-000-000-000-R0002	191	W21- 715
Cedar Creek	01-021-000-000-000-R0005	188	W 8- 373
Big Sheep Creek	01-500-470-000-000-R0001	184	W61-1418
North Fork Skykomish River	01-034-000-000-000-R0028	173	W 7- 301
South Fork Tieton River	01-500-260-000-000-R0029	168	W37-1237
Copalis River	01-047-000-000-000-R0003	164	W21- 716
Little Naches River	01-500-260-000-000-R0025	163	W37-1233
Panther Creek	01-500-100-000-000-R0008	163	W29-1121
West Cady Creek	01-034-000-000-000-R0032	154	W 7- 305
Abernathy Creek	01-500-010-000-000-R0001	149	W25- 900
Squire Creek	01-022-000-000-000-R0019	146	W 5- 259
Chambers Creek	01-005-000-000-000-R0001	138	W12- 459
Salmon Creek	01-500-020-000-000-R0065	124	W26- 968

Table III

WASHINGTON REACH RANKING

STREAM DESCRIPTION	REACH NUMBER	Q_{30} (CFS)	PAGE
Mill Creek	01-500-008-000-000-R0001	123	W25- 899
Silver Creek	01-034-000-000-000-R0031	122	W 7- 304
Little Naches River	01-500-260-000-000-R0026	116	W37-1234
Skookum Creek	01-023-000-000-000-R0010	114	W 1- 10
Clear Creek	01-061-000-000-000-R0102	113	W 4- 158
Trout Creek	01-034-000-000-000-R0029	105	W 7- 302
Trout Creek	01-500-100-000-000-R0010	105	W29-1123
Green River	01-028-000-000-000-R0009	104	W 9- 385
Germany Creek	01-500-012-000-000-R0001	103	W25- 902
West Fork Miller River	01-034-000-000-000-R0044	102	W 7- 317
Silver Creek	01-034-000-000-000-R0030	98.3	W 7- 303
Money Creek	01-034-000-000-000-R0040	97.8	W 7- 313
Big Creek	01-500-040-000-000-R0014	95.5	W27-1072
Mashel River	01-029-000-000-000-R0018	93.	W11- 444
Little Nisqually River	01-029-000-000-000-R0020	88.5	W11- 446
Kendall Creek	01-023-000-000-000-R0030	78.1	W 1- 30
South Fork Willapa River	01-056-000-000-000-R0007	75.9	W24- 860
Roundtop Creek	01-029-000-000-000-R0025	73.0	W11- 451
Eightmile Creek	01-500-300-000-000-R0017	68.6	W45-1286
Quartz Creek	01-034-000-000-000-R0033	68.4	W 7- 306

TABLE III

OREGON REACH RANKING

STREAM DESCRIPTION	REACH NUMBER	Q_{30} (CFS)	PAGE
1. North Coast Basin			
Miami River	02-520-000-000-000-R0002	111	0 1-72
Lewis and Clark River	-500-003-000-000-R0003	106	0 1-3
2. Willamette Basin			
2A. Upper Willamette Basin			
Willamette River Main Stem	02-500-060-000-000-R0021	13,158	0 2A-1
Willamette River Main Stem	-R0022	12,106	0 2A-10
Willamette River Main Stem	-R0024	11,982	0 2A-12
Middle Fk. Willamette River	-192-000-R0013	1,131	0 2A-118
N. Fk. of Middle Fk. Willamette River	-192-010-R0001	718	0 2A-103
Salmon Creek	-020-R0001	347	0 2A-111
Salt Creek	-030-R0001	291	0 2A-115
2B. Mid Willamette Basin			
Willamette River Main Stem	02-500-060-000-000-R0005	30,521	0 2B-1
Willamette River Main Stem	-R0017	14,738	0 2B-194
South Santiam River	-110-020-R0001	4,427	0 2B-139
South Santiam River	-R0017	3,278	0 2B-155
Molalla River	-036-000-R0001	3,254	0 2B-2
Calapooia River	-120-000-R0002	1,067	0 2B-186
Mary's River	-131-000-R0001	867	0 2B-196
Mary's River	-R0002	497	0 2B-200
Muddy Creek	-134-000-R0002	335	0 2B-210

TABLE III

OREGON REACH RANKING

STREAM DESCRIPTION	REACH NUMBER	Q_{30} (CFS)	PAGE
Muddy Creek (West)	02-500-060-131-010-R0001	304	0 2B-197
Rickreall Creek	-089-000-R0001	205	0 2B-88
Muddy Creek	-134-000-R0003	142	0 2B-213
Little Pudding River	-036-005-R0016	84	0 2B-18
Muddy Creek	-134-000-R0005	74	0 2B-215
2C. Lower Willamette Basin			
Tualatin River	02-500-060-029-000-R0003	1,638	0 2C-44
Clackamas River	-024-000-R0008	1,431	0 2C-28
Tualatin River	-029-000-R0005	1,295	0 2C-48
Tualatin River	-000-R0006	675	0 2C-57
Dairy Creek	-005-R0001	516	0 2C-49
Oak Grove Fork Clackamas River	-024-009-R0001	429	0 2C-25
Dairy Creek	-029-005-R0004	336	0 2C-52
Eagle Creek	-024-004-R0001	286	0 2C-11
Gales Creek	-029-007-R0001	195	0 2C-58
Eagle Creek	-024-004-R0003	134	0 2C-13
Fish Creek	-006-R0001	130	0 2C-19
McKay Creek	-029-005-R0002	124	0 2C-50
Rock Creek	-003-R0001	122	0 2C-46
Clear Creek	-024-003-R0002	120	0 2C-8
West Fork Dairy Creek	-029-005-R0005	118	0 2C-53
Roaring River	-024-007-R0001	117	0 2C-22

TABLE III
OREGON REACH RANKING

STREAM DESCRIPTION	REACH NUMBER	Q_{30} (CFS)	PAGE
Clear Creek	02-500-060-024-003-R0003	93	0 2C-9
North Fork Eagle Creek	-004-R0002	87	0 2C-12
3. Sandy Basin	None		
4. Hood Basin			
Fifteenmile Creek	02-500-165-000-000-R0002	136	0 4-17
5. Deschutes Basin			
Squaw Creek	02-500-180-040-000-R0003	527	0 5-85
Tumalo Creek	-050-000-R0001	384	0 5-95
Crooked River	-030-000-R0001	338	0 5-70
Crooked River	-R0006	329	0 5-72
Crooked River	-R0007	292	0 5-73
6. John Day Basin	None		
7. Umatilla Basin	None		
8. Grande Ronde Basin	None		
9. Powder Basin			
Powder River	02-500-240-120-000-R0012	111	0 9-14
Powder River	-R0013	100	0 9-15
Eagle Creek	-010-R0002	96	0 9-19

TABLE III

OREGON REACH RANKING

STREAM DESCRIPTION	REACH NUMBER	Q_{30} (CFS)	PAGE
10. Malheur Basin			
Malheur River	02-500-240-180-000-R0001	245	0 10-1
11. Owyhee Basin			
Owyhee River	02-500-240-200-000-R0001	867	0 11-1
12. Malheur Lake Basin	None		
13. Goose and Summer Lakes Basin	None		
14. Klamath Basin			
Klamath River	02-000-014-002-000-R0003	904	0 14-7
15. Rogue Basin	None		
16. Umpqua Basin			
Calapooya Creek	02-700-030-000-000-R0002	328	0 16-35
Elk Creek	-020-000-000-R0006	110	0 16-27
17. South Coast Basin			
Hunter Creek	02-950-000-000-000-R0001	233	0 17-64
18. Mid Coast Basin	None		

Table III
IDAHO REACH RANKING

STREAM DESCRIPTION	REACH NUMBER	Q_{30} (CFS)	PAGE
Kootenai River	03-500-500-000-000-R0002	17517	I 11
Snake River	03-500-240-000-000-R0026	9983	I 109
Snake River	03-500-240-000-000-R0056	9954	I 125
Snake River	03-500-240-000-000-R0058	9398	I 126
Snake River	03-500-240-000-000-R0027	8274	I 110
Snake River	03-500-240-000-000-R0048	7212	I 121
Snake River	03-500-240-000-000-R0046	7048	I 120
Snake River	03-500-240-000-000-R0028	6185	I 111
Snake River	03-500-240-000-000-R0045	6029	I 119
Snake River	03-500-240-000-000-R0054	6005	I 124
Snake River (Wyoming)	06-500-240-000-000-R0002	5400	I 127
Snake River (Wyoming)	06-500-240-000-000-R0006	4418	I 129
Snake River (Wyoming)	06-500-240-000-000-R0008	4148	I 130
Payette River	03-500-240-160-000-R0011	3750	I 349
Payette River	03-500-240-160-000-R0013	3750	I 350
Payette River	03-500-240-160-000-R0015	3750	I 351
Snake River	03-500-240-000-000-R0030	3317	I 112
Payette River	03-500-240-160-000-R0005	2400	I 348
Snake River	03-500-240-000-000-R0032	2369	I 113
Henry's Fork	03-500-240-300-000-R0008	1842	I 497
Payette River	03-500-240-160-000-R0017	1800	I 352
Henry's Fork	03-500-240-300-000-R0012	1699	I 498
Henry's Fork	03-500-240-300-000-R0006	1677	I 496
South Fork Payette River	03-500-240-160-180-R0003	1650	I 366
North Fork Payette River	03-500-240-160-100-R0005	1600	I 358
South Fork Payette River	03-500-240-160-180-R0005	1575	I 367
Coeur d'Alene River	03-500-420-504-000-R0014	1534	I 46
Weiser River	03-500-240-140-000-R0003	1403	I 334
Weiser River	03-500-240-140-000-R0005	1366	I 335
Coeur d'Alene River	03-500-420-504-000-R0018	1338	I 47

Table III
IDAHO REACH RANKING

STREAM DESCRIPTION	REACH NUMBER	Q_{30} (CFS)	PAGE
Weiser River	03-500-240-140-000-R0007	1310	I 336
Bear River	03-250-000-000-000-R0013	1040	I 6
Coeur d'Alene River	03-500-420-504-000-R0024	902	I 48
Bear River	03-250-000-000-000-R0004	899	I 2
Bear River	03-250-000-000-000-R0009	860	I 3
Teton River	03-500-240-300-010-R0002	852	I 502
Bear River	03-250-000-000-000-R0011	843	I 5
Bear River	03-250-000-000-000-R0014	842	I 7
Bear River	03-250-000-000-000-R0002	816	I 1
Salt River	06-500-240-307-000-R0002	730	I 524
Bear River	03-250-000-000-000-R0010	699	I 4
Salt River	06-500-240-307-000-R0004	603	I 525
Weiser River	03-500-240-140-000-R0011	600	I 338
South Fork Boise River	03-500-240-220-150-R0007	576	I 394
Hoback River	06-500-240-311-000-R0002	516	I 538
St. Maries River	03-500-420-502-010-R0004	495	I 80
Greys River	06-500-240-309-000-R0002	483	I 532
Teton River	03-500-240-300-010-R0006	471	I 504
Weiser River	03-500-240-140-000-R0013	440	I 339
Pack River	03-500-480-275-000-R0002	412	I 33

Table III
MONTANA REACH RANKING

STREAM DESCRIPTION	REACH NUMBER	Q_{30} (CFS)	PAGE
Clark Fork River	04 - 500 - 480 - 350 - 000 - R0030	21890	M 30
Clark Fork River	04 - 500 - 480 - 350 - 000 - R0029	21260	M 29
Clark Fork River	04 - 500 - 480 - 350 - 000 - R0028	20897	M 28
Clark Fork River	04 - 500 - 480 - 350 - 000 - R0027	20818	M 27
Clark Fork River	04 - 500 - 480 - 350 - 000 - R0026	20284	M 26
Clark Fork River	04 - 500 - 480 - 350 - 000 - R0025	17000	M 25
Clark Fork River	04 - 500 - 480 - 350 - 000 - R0024	16932	M 24
Clark Fork River	04 - 500 - 480 - 350 - 000 - R0023	16858	M 23
Kootenai River	04 - 500 - 500 - 000 - 000 - R0002	14454	M 160
Clark Fork River	04 - 500 - 480 - 350 - 000 - R0022	11522	M 22
Clark Fork River	04 - 500 - 480 - 350 - 000 - R0021	6202	M 21
Clark Fork River	04 - 500 - 480 - 350 - 000 - R0020	6163	M 20
Clark Fork River	04 - 500 - 480 - 350 - 000 - R0019	5964	M 19

Table III
MONTANA REACH RANKING

STREAM DESCRIPTION	REACH NUMBER	Q_{30} (CFS)	PAGE
Clark Fork River	04 - 500 - 480 - 350 - 000 - R0014	5776	M 14
Clark Fork River	04 - 500 - 480 - 350 - 000 - R0018	5749	M 18
Clark Fork River	04 - 500 - 480 - 350 - 000 - R0013	5607	M 13
Clark Fork River	04 - 500 - 480 - 350 - 000 - R0016	5533	M 16
Clark Fork River	04 - 500 - 480 - 350 - 000 - R0015	5495	M 15
Clark Fork River	04 - 500 - 480 - 350 - 000 - R0012	5483	M 12
Bitterroot River	04 - 500 - 480 - 350 - 260 - R0024	1928	M 97
Clark Fork River	04 - 500 - 480 - 350 - 000 - R0008	1534	M 8
Bitterroot River	04 - 500 - 480 - 350 - 260 - R0019	1466	M 92
Bitterroot River	04 - 500 - 480 - 350 - 260 - R0018	1349	M 91
Clark Fork River	04 - 500 - 480 - 350 - 000 - R0007	1178	M 7
Blackfoot River	04 - 500 - 480 - 350 - 220 - R0012	970	M 71
Swan River	04 - 500 - 480 - 350 - 440 - R0048	956	M 146

Table III
MONTANA REACH RANKING

STREAM DESCRIPTION	REACH NUMBER	Q_{30} (CFS)	PAGE
Clark Fork River	04 - 500 - 480 - 350 - 000 - R0005	840	M 5
Blackfoot River	04 - 500 - 480 - 350 - 220 - R0009	666	M 68
Yaak River	04 - 500 - 500 - 500 - 000 - R0004	577	M 182
Thompson River	04 - 500 - 480 - 350 - 520 - R0004	426	M 55
Rock Creek	04 - 500 - 480 - 350 - 200 - R0006	425	M 43
Blackfoot River	04 - 500 - 480 - 350 - 220 - R0004	391	M 63
Clark Fork River	04 - 500 - 480 - 350 - 000 - R0002	383	M 2
Flint Creek	04 - 500 - 480 - 350 - 180 - R0002	308	M 36
Stillwater River	04 - 500 - 480 - 350 - 440 - R0040	294	M 138
Clark Fork River	04 - 500 - 480 - 350 - 000 - R0001	256	M 1
St. Regis River	04 - 500 - 480 - 350 - 420 - R0002	244	M 51
Fish Creek	04 - 500 - 480 - 350 - 320 - R0003	191	M 47
North Fork Blackfoot River	04 - 500 - 480 - 350 - 220 - R0007	174	M 66

Table III
MONTANA REACH RANKING

STREAM DESCRIPTION	REACH NUMBER	Q_{30} (CFS)	PAGE
Logan Creek	04 - 500 - 480 - 350 - 440 - R0039	154	M 137
Prospect Creek	04 - 500 - 480 - 350 - 560 - R0001	145	M 56
Silver Bow Creek	04 - 500 - 480 - 350 - 110 - R0002	138	M 32
St. Regis River	04 - 500 - 480 - 350 - 420 - R0001	123	M 50
North Fork Fish Creek	04 - 500 - 480 - 350 - 320 - R0002	118	M 46
Lake Creek	04 - 500 - 500 - 460 - 000 - R0001	114	M 177
Logan Creek	04 - 500 - 480 - 350 - 440 - R0038	103	M 136
Beaver Creek	04 - 500 - 480 - 350 - 600 - R0001	98	M 57
Nevada Creek	04 - 500 - 480 - 350 - 220 - R0003	98	M 62
Monture Creek	04 - 500 - 480 - 350 - 220 - R0008	73	M 67
Ashley Creek	04 - 500 - 480 - 350 - 440 - R0042	73	M 140

Table III
Pacific Northwest Region
Reach Ranking

STREAM DESCRIPTION	REACH NUMBER	Q_{30} (CFS)	PAGE
Willamette River	02-500-060-000-000-R0005	30521	02B-1
Clark Fork River	04-500-480-350-000-R0030	21890	M30
Clark Fork River	04-500-480-350-000-R0029	21260	M29
Clark Fork River	04-500-480-350-000-R0028	20897	M28
Clark Fork River	04-500-480-350-000-R0027	20818	M27
Clark Fork River	04-500-480-350-000-R0026	20284	M26
Kootenai River	03-500-500-000-000-R0002	17517	I11
Clark Fork River	04-500-480-350-000-R0025	17000	M25
Clark Fork River	04-500-480-350-000-R0024	16932	M24
Clark Fork River	04-500-480-350-000-R0023	16858	M23
Willamette River	02-500-060-000-000-R0017	14738	02B-194
Kootenai River	04-500-500-000-000-R0002	14454	M160
Willamette River	02-500-060-000-000-R0021	13158	02A-1
Willamette River	02-500-060-000-000-R0022	12106	02A-10
Willamette River	02-500-060-000-000-R0024	11982	02A-12
Clark Fork River	04-500-480-350-000-R0022	11522	M22
Snake River	03-500-240-000-000-R0026	9983	I109
Snake River	03-500-240-000-000-R0056	9954	I125
Snake River	03-500-240-000-000-R0058	9398	I126
Snake River	03-500-240-000-000-R0027	8274	I110
Snake River	03-500-240-000-000-R0048	7212	I121
Snake River	03-500-240-000-000-R0046	7048	I120
Clark Fork River	04-500-480-350-000-R0021	6202	M21
Snake River	03-500-240-000-000-R0028	6185	I111
Clark Fork River	04-500-480-350-000-R0020	6163	M20
Snake River	03-500-240-000-000-R0045	6029	I119
Snake River	03-500-240-000-000-R0054	6005	I124

Table III
Pacific Northwest Region
Reach Ranking

STREAM DESCRIPTION	REACH NUMBER	Q_{30} (CFS)	PAGE
Clark Fork River	04-500-480-350-000-R0019	5964	M19
Clark Fork River	04-500-480-350-000-R0014	5776	M14
Clark Fork River	04-500-480-350-000-R0018	5749	M18
Clark Fork River	04-500-480-350-000-R0013	5607	M13
Clark Fork River	04-500-480-350-000-R0016	5533	M16
Clark Fork River	04-500-480-350-000-R0015	5495	M15
Clark Fork River	04-500-480-350-000-R0012	5483	M12
Snake River	06-500-240-000-000-R0002	5400	I127
South Santiam River	02-500-060-110-020-R0001	4427	02B-139
Snake River	06-500-240-000-000-R0006	4418	I129
Snake River	06-500-240-000-000-R0008	4148	I130
Payette River	03-500-240-160-000-R0011	3750	I349
Payette River	03-500-240-160-000-R0013	3750	I350
Payette River	03-500-240-160-000-R0015	3750	I351
Snake River	03-500-240-000-000-R0030	3317	I112
South Santiam River	02-500-060-110-020-R0017	3278	02B-155
Molalla River	02-500-060-036-000-R0001	3254	02B-2
Payette River	03-500-240-160-000-R0005	2400	I348
Nisqually River	01-029-000-000-000-R0003	2370	W11-429
Snake River	03-500-240-000-000-R0032	2369	I113
Sayk River	01-061-000-000-000-R0069	2100	W4-125
Kettle River	01-500-460-000-000-R0001	2043	W60-1412
Bitterroot River	04-500-480-350-260-R0024	1928	M-97

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APPENDIX I

WASHINGTON

SAMPLE
REACH DATA TABLES

REPORT VOLUME CONTENTS

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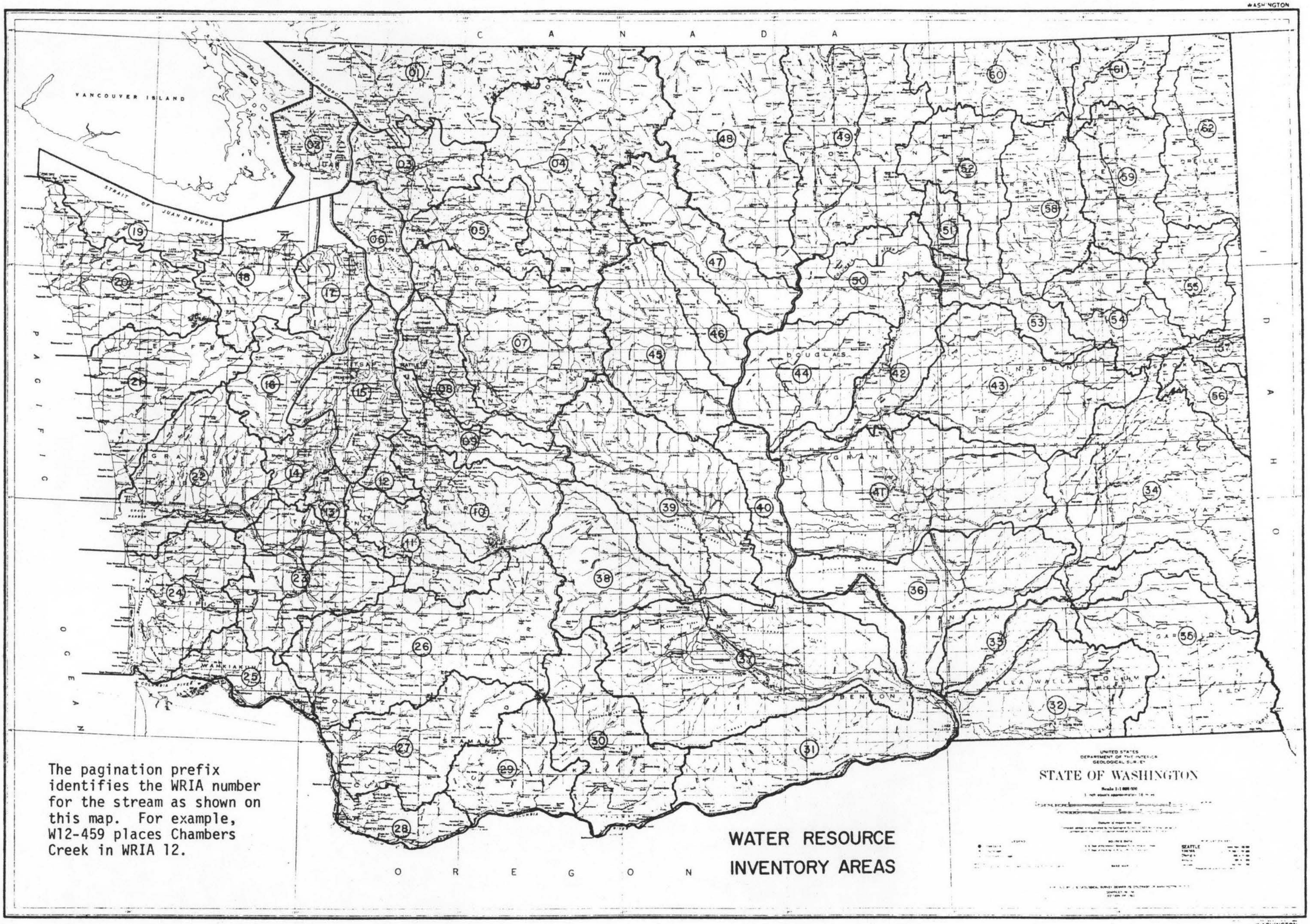
APPENDIX I
WASHINGTON



The pagination prefix identifies the WRIA number for the stream as shown on this map. For example, W12-459 places Chambers Creek in WRIA 12.

WATER RESOURCE INVENTORY AREAS

Washington Reach Index

STREAM NAME	REACH NUMBER	PAGE THRU PAGE
Sooes River	01-035-000-000-000-R0001 - R0002	W20-563 - W20-564
Ozette Creek	01-036-000-000-000-R0001 - R0002	W20-565 - W20-566
Dickey River	01-038-000-000-000-R0001 - R0006	W20-567 - W20-572
Quillayute River	01-037-000-000-000-R0001 - R0039	W20-573 - W20-611
Goodman Creek	01-039-000-000-000-R0001 - R0004	W20-612 - W20-615
Mosquito Creek	01-040-000-000-000-R0001 - R0002	W20-616 - W20-617
Hoh River	01-041-000-000-000-R0001 - R0020	W20-618 - W20-637
Cedar Creek	01-042-000-000-000-R0001	W20-638
Queets River	01-043-000-000-000-R0001 - R0027	W21-639 - W21-665a
Raft River	01-044-000-000-000-R0001 - R0007	W21-666 - W21-672
Quinault River	01-045-000-000-000-R0001 - R0039	W21-673 - W21-711
Moclips River	01-046-000-000-000-R0001 - R0002	W21-712 - W21-713
Copalis River	01-047-000-000-000-R0001 - R0003	W21-714 - W21-716
Humptulips River	01-048-000-000-000-R0001 - R0014	W22-717 - W22-730
Hoquim River	01-049-000-000-000-R0001 - R0006	W22-731 - W22-736
Wishkah River	01-050-000-000-000-R0001 - R0009	W22-737 - W22-745
Johns River	01-052-000-000-000-R0001	W22-746
Elk River	01-053-000-000-000-R0001	W22-747
Chehalis River	01-051-000-000-000-R0001 - R0093	W23-748 - W23-840
North River	01-054-000-000-000-R0001 - R0009	W24-841 - W24-849
Smith River	01-055-000-000-000-R0001 - R0004	W24-850 - W24-853
Willapa River	01-056-000-000-000-R0001 - R0012	W24-854 - W24-865
Bear River	01-059-000-000-000-R0001	W24-866
Palix River	01-062-000-000-000-R0001 - R0003	W24-867 - W24-869
North Nemah River	01-057-000-000-000-R0001 - R0003	W24-870 - W24-872
Naselle River	01-058-000-000-000-R0001 - R0009	W24-873 - R24-881
Grays River	01-500-002-000-000-R0001 - R0009	W25-882 - R25-890
Skamokawa River	01-500-004-000-000-R0001 - R0005	W25-891 - W25-895
Elochoman River	01-500-006-000-000-R0001 - R0003	W25-896 - W25-898
Mill Creek	01-500-008-000-000-R0001	W25-899
Abernathy Creek	01-500-010-000-000-R0001 - R0002	W25-900 - R25-901
German Creek	01-500-012-000-000-R0001	W25-902
Coal Creek	01-500-014-000-000-R0001	W25-903
Cowlitz River	01-500-020-000-000-R0001 - R0144	W26-904 - W26-1047
Kalama River	01-500-038-000-000-R0001 - R0011	W27-1048 - W27-1058
Lewis River	01-500-040-000-000-R0001 - R0036	W27-1059 - W27-1094
Salmon Creek	01-500-042-000-000-R0001 - R0002	W28-1095 - W28-1096

STREAM NAME	REACH NUMBER	PAGE THRU PAGE
LaCamas Creek	01-500-044-000-000-R0001 - R0003	W28-1097 - W28-1099
Washougal River	01-500-046-000-000-R0001 - R0011	W28-1100 - W28-1110
Hamilton Creek	01-500-048-000-000-R0001	W28-1111
Rock Creek	01-500-096-000-000-R0001 - R0002	W29-1112 - W29-1113
Wind River	01-500-100-000-000-R0001 - R0013	W29-1114 - W29-1126
Little White Salmon River	01-500-106-000-000-R0001 - R0003	W29-1127 - W29-1129
White Salmon River	01-500-120-000-000-R0001 - R0016	W29-1130 - W29-1145
Klickitat River	01-500-160-000-000-R0001 - R0029	W30-1146 - W30-1174
Walla Walla River	01-500-238-000-000-R0001 - R0030	W32-1175 - W32-1194
Palouse River	01-500-240-020-000-R0001 - R0003	W34-1195 - W34-1197
Asotin Creek	01-500-240-050-000-R0001 - R0002	W35-1198 - W35-1199
Tucannon River	01-500-240-010-000-R0001 - R0003	W35-1200 - W35-1202
Grande Ronde River	01-500-240-060-000-R0001 - R0006	W35-1203 - R35-1208
Yakima River	01-500-260-000-000-R0001 - R0058	W37-1209 - W37-1266
Columbia River	01-500-000-000-000-R0001	W40-1267
Crab Creek	01-500-280-000-000-R0001 - R0002	W41-1268 - W41-1269
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Entiat River	01-500-320-000-000-R0001 - R0010	W46-1314 - W47-1323
Chelan River	01-500-340-000-000-R0001 - R0026	W47-1324 - W47-1349
Pasayten River	01-064-000-000-000-R0001 - R0002	W48-1350 - W48-1351
Methow River	01-500-360-000-000-R0001 - R0022	W48-1352 - W48-1373
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Nespelem River	01-500-390-000-000-R0001 - R0002	W51-1387 - W41-1388
Sanpoil River	01-500-400-000-000-R0001 - R0005	W52-1389 - W52-1393
Spokane River	01-500-420-000-000-R0001 - R0012	W54-1394 - W54-1405
Colville River	01-500-440-000-000-R0001 - R0006	W59-1406 - W59-1411
Kettle River	01-500-460-000-000-R0001 - R0006	W60-1412 - W60-1417
Big Sheep Creek	01-500-470-000-000-R0001 - R0002	W61-1418 - W61-1419
Pend Oreille River	01-500-480-000-000-R0001 - R0002	W62-1420 - W62-1421

TABLE II

FEASIBILITY, TRANSMISSION AND LOAD RESTRAINTS

Washington

REACH IDENTIFICATION NUMBER	FEASIBILITY RESTRAINT				TRANSMISSION AND LOAD CONSIDERATIONS			
	LAND USE RESTRICTIONS	UTILITY DISPLACEMENT	BUILDING DISPLACEMENT	SPECIAL FISH PROBLEMS	DISTANCE TO NEAREST LINE Miles	LINE CAPACITY KVA	LOCAL MARKET	DISTANCE* TO CITY > 1000 Miles
Nooksack River								
01-023-000-000-								
000-R0001		X		X	1	55(PS)		1
R0002		X		X	1	55(PS)		14
R0003		X	X	X	4	55(PS)	1	13
R0004		X		X	4	500(B)	1	12
R0005				X	3	500(B)	1	4
R0006				X	7	500(B)	1	10
R0007				X	6	115(PS)		16
R0008					9	115(PS)		18
R0009		X		X	5	500(B)	1	15
R0010				X	6	500(B)	1	14
R0011					6	500(B)	1	11
R0012					7	115(PS)		13
R0013					7	115(PS)		19
R0014				X	4	55(PS)		15
R0015				X	7	500(B)		20
R0016					13	55(PS)		22
R0017		X		X	3	55(PS)		10
R0018					8	55(PS)		12
R0019					8	55(PS)		14
R0020				X	8	55(PS)		20
R0021				X	12	55(PS)		23

* Distance in air miles to nearest city with population greater than 100

TABLE II

FEASIBILITY, TRANSMISSION AND LOAD RESTRAINTS

Washington

REACH IDENTIFICATION NUMBER	FEASIBILITY RESTRAINT				TRANSMISSION AND LOAD CONSIDERATIONS			
	LAND USE RESTRICTIONS	UTILITY DISPLACEMENT	BUILDING DISPLACEMENT	SPECIAL FISH PROBLEMS	DISTANCE TO NEAREST LINE Miles	LINE CAPACITY KVA	LOCAL MARKET	DISTANCE TO CITY > 1000 Miles
R0022		X		X	1	55(PS)		15
R0023		X		X	1	55(PS)		21
R0024		X		X	1	55(PS)		24
R0025		X			3	55(PS)		30
R0026					6	55(PS)		35
R0027					8	55(PS)		36
R0028	X				10	55(PS)		38
R0029					2	55(PS)		15
R0030		X			2	55(PS)	1	15
R0031					6	55(PS)		25
R0032		X	X		7	55(PS)		25
R0033					3	55(PS)		33
R0034					6	55(PS)		35
R0035		X			9	55(PS)		40
Silesia Creek								
01-024-000-000								
000-R0001				X	12	55(PS)		40
R0002				X	12	55(PS)		40
R0003				X	12	55(PS)		40
R0004				X	12	55(PS)		40

REACH HYDRO POTENTIAL CHARACTERISTICS

REACH # 01-023-000-000-000-R0001

I. LOCATION

A.	State	Washington
B.	County	Whatcom
C.	Township, Range	T40N R3E
D.	Latitude, Longitude	48°37' 122°26'
E.	Stream Name	Nooksack
F.	Major Basin Name	Nooksack
G.	River Mile	0.0/36.0

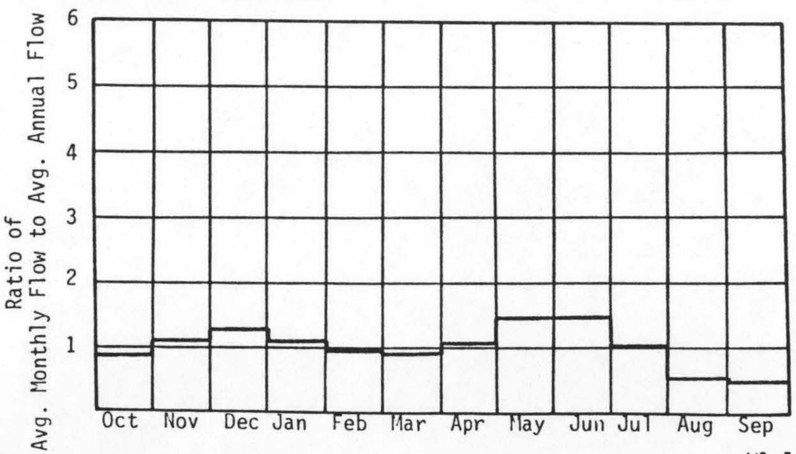
II. HYDROLOGIC AND HYDRAULIC CHARACTERISTICS

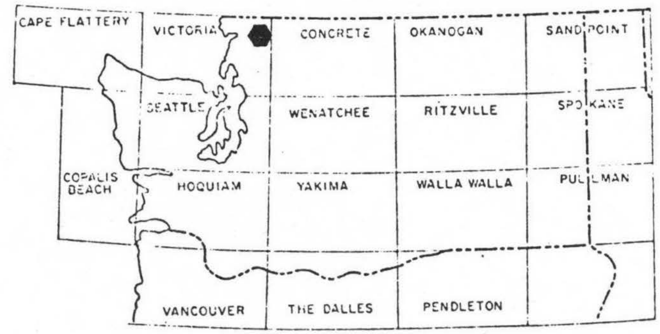
A.	Upstream Elevation of Reach	215	Ft. MSL
B.	Downstream Elevation of Reach	0	Ft. MSL
C.	Total Available Head in Reach	215	Ft.
D.	Average Slope in Reach	6	Ft./Mi.
E.	Drainage Area above Reach Mouth	807.1	Sq.Mi.
F.	Inflow Classification	Natural	

III. REACH FLOW DURATION AND THEORETICAL POTENTIAL ENERGY CHARACTERISTICS

Exceedance Percentage	Discharge CFS	Theoretical Plant Size MW	Annual Energy Available GWH	Plant Factor
95	1130	20.6	181	1.00
80	1790	32.6	274	0.96
50	3030	55.2	401	0.83
30	4170	75.8	471	0.71
10	6580	120	545	0.52

IV. TYPICAL ANNUAL HYDROGRAPH QMR = 3657 cfs





LOCATIONS FOR USGS 1:250,000 MAP SERIES

REACH HYDRO POTENTIAL CHARACTERISTICS

REACH # 01-060-000-000-000-R0001

I. LOCATION

A.	State	Washington
B.	County	Skagit
C.	Township, Range	T35N R3E
D.	Latitude, Longitude	48°31' 122°23'
E.	Stream Name	Samish River
F.	Major Basin Name	Samish
G.	River Mile	0.0/7.8

II. HYDROLOGIC AND HYDRAULIC CHARACTERISTICS

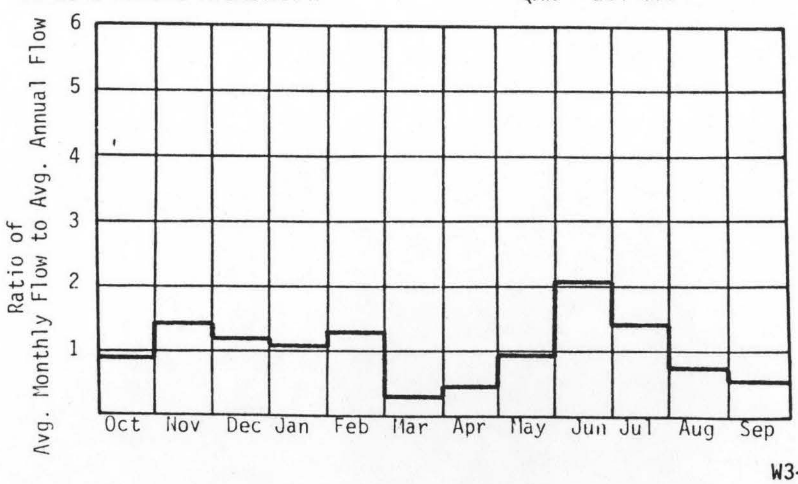
A.	Upstream Elevation of Reach	20	Ft. MSL
B.	Downstream Elevation of Reach	0.0	Ft. MSL
C.	Total Available Head in Reach	20	Ft.
D.	Average Slope in Reach	2.6	Ft./Mi.
E.	Drainage Area above Reach Mouth	106	Sq.Mi.
F.	Inflow Classification	Natural	

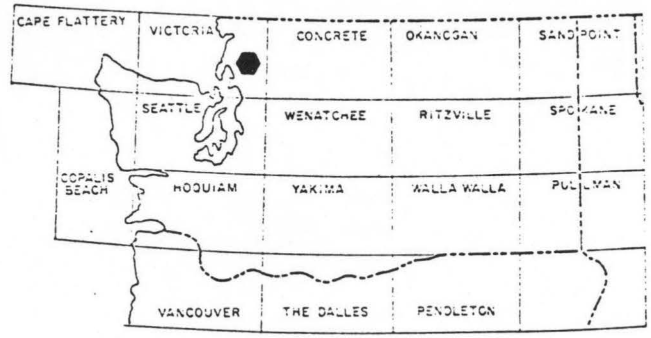
III. REACH FLOW DURATION AND THEORETICAL POTENTIAL ENERGY CHARACTERISTICS

Exceedance Percentage	Discharge CFS	Theoretical Plant Size MW	Annual Energy Available GWH	Plant Factor
95	29.0	0.05	0.43	1.00
80	50.2	0.08	0.70	0.94
50	185	0.31	1.97	0.72
30	309	0.52	2.70	0.59
10	576	0.97	3.41	0.40

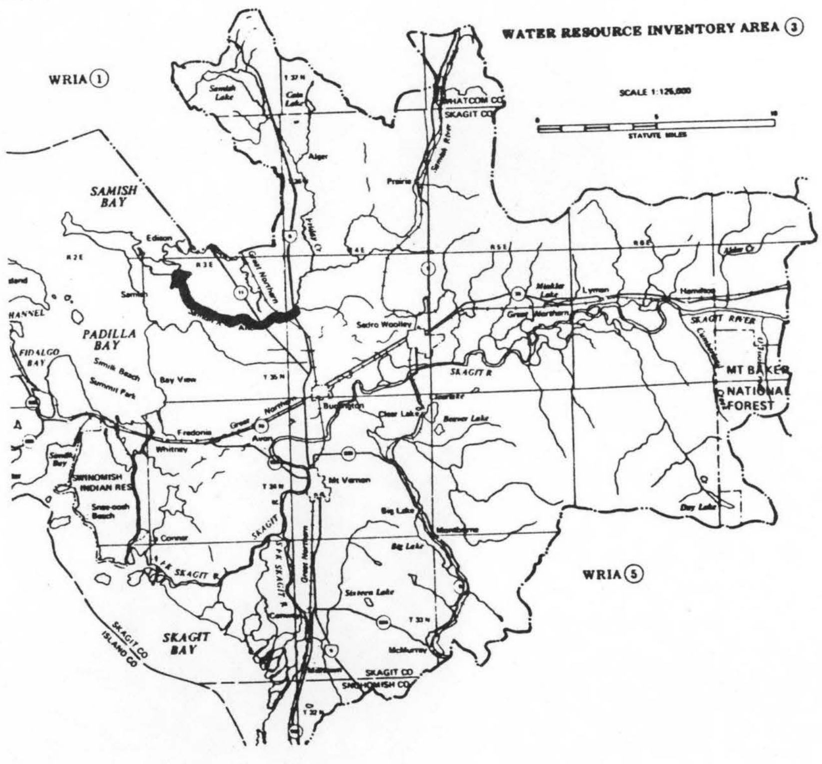
IV. TYPICAL ANNUAL HYDROGRAPH

QMR = 264 cfs





LOCATIONS FOR USGS 1:250,000 MAP SERIES



REACH HYDRO POTENTIAL CHARACTERISTICS

REACH # 01-022-000-000-000-R0001

I. LOCATION

A. State	Washington
B. County	Snohomish
C. Township, Range	T32N R4E
D. Latitude, Longitude	48°12' 122°17'
E. Stream Name	Stillaguamish River
F. Major Basin Name	Stillaguamish
G. River Mile	0.0/9.3

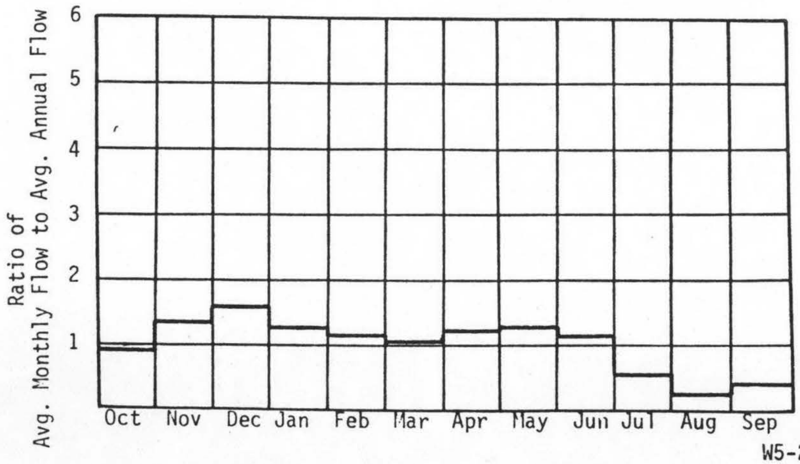
II. HYDROLOGIC AND HYDRAULIC CHARACTERISTICS

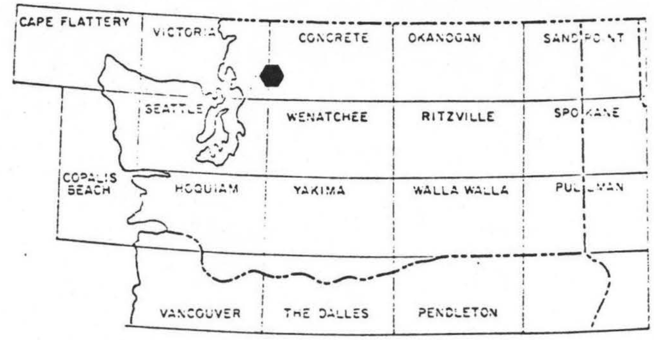
A. Upstream Elevation of Reach	20	Ft. MSL
B. Downstream Elevation of Reach	0	Ft. MSL
C. Total Available Head in Reach	20	Ft.
D. Average Slope in Reach	2.15	Ft./Mi.
E. Drainage Area above Reach Mouth	669.2	Sq.Mi.
F. Inflow Classification	Natural	

III. REACH FLOW DURATION AND THEORETICAL POTENTIAL ENERGY CHARACTERISTICS

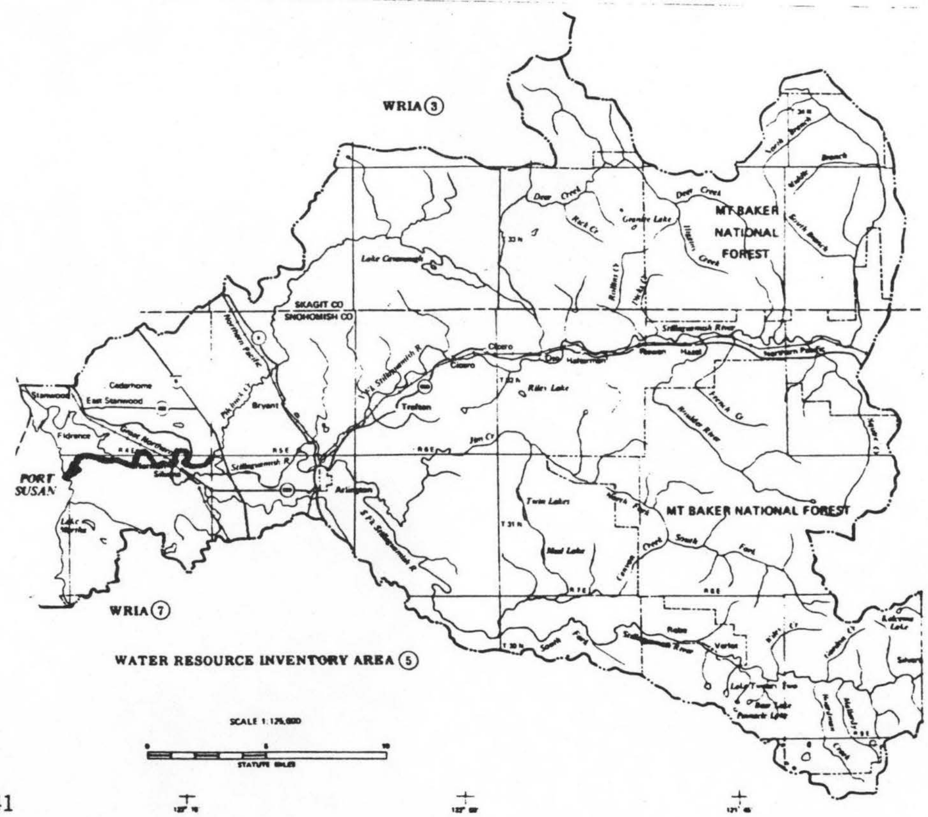
Exceedance Percentage	Discharge CFS	Theoretical Plant Size MW	Annual Energy Available GWH	Plant Factor
95	635	1.11	9.68	1.00
80	1130	1.92	15.9	0.95
50	3570	6.04	40.2	0.76
30	4830	8.18	47.3	0.66
10	8180	13.9	57.0	0.47

IV. TYPICAL ANNUAL HYDROGRAPH QMR = 4352 cfs





LOCATIONS FOR USGS 1:250,000 MAP SERIES



REACH HYDRO POTENTIAL CHARACTERISTICS

REACH # 01-007-000-000-000-R0002

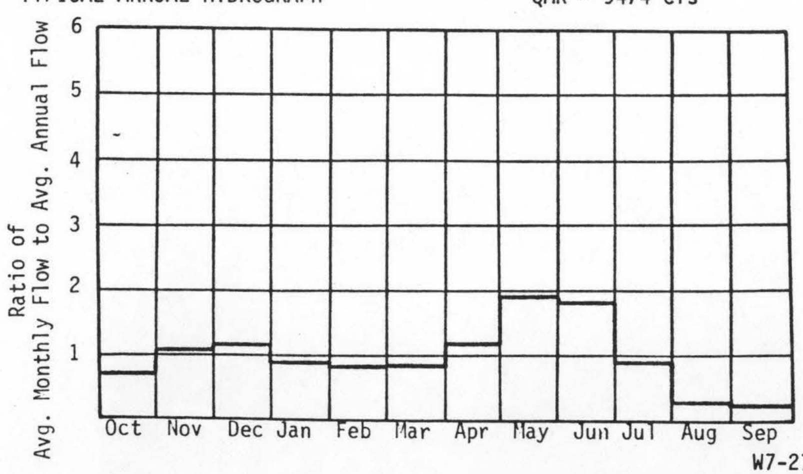
I. LOCATION
- A. State — Washington
- B. County — Snohomish
- C. Township, Range — T28N R6E
- D. Latitude, Longitude — 47°52' 122°05'
- E. Stream Name — Snohomish
- F. Major Basin Name — Snohomish
- G. River Mile — 12.2/18.7

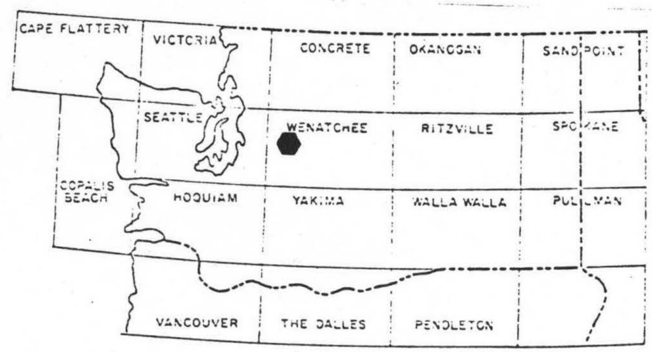
II. HYDROLOGIC AND HYDRAULIC CHARACTERISTICS
- A. Upstream Elevation of Reach — 14 Ft. MSL
- B. Downstream Elevation of Reach — 4 Ft. MSL
- C. Total Available Head in Reach — 10 Ft.
- D. Average Slope in Reach — 1.54 Ft./Mi.
- E. Drainage Area above Reach Mouth — 1587.2 Sq.Mi.
- F. Inflow Classification — Regulated

III. REACH FLOW DURATION AND THEORETICAL POTENTIAL ENERGY CHARACTERISTICS

Exceedance Percentage	Discharge CFS	Theoretical Plant Size MW	Annual Energy Available GWH	Plant Factor
95	1800	1.52	13.3	1.00
80	3880	3.29	26.8	0.93
50	7480	6.33	44.4	0.80
30	11100	9.38	55.0	0.67
10	18190	15.4	64.7	0.48

IV. TYPICAL ANNUAL HYDROGRAPH   QMR = 9474 cfs





LOCATIONS FOR USGS 1:250,000 MAP SERIES

REACH HYDRO POTENTIAL CHARACTERISTICS

REACH # 01-020-000-000-000-R0001

I. LOCATION

A.	State	Washington
B.	County	King
C.	Township, Range	T26N R4E
D.	Latitude, Longitude	47°45' 122°15'
E.	Stream Name	Sammamish
F.	Major Basin Name	Sammamish
G.	River Mile	0.0/4.7

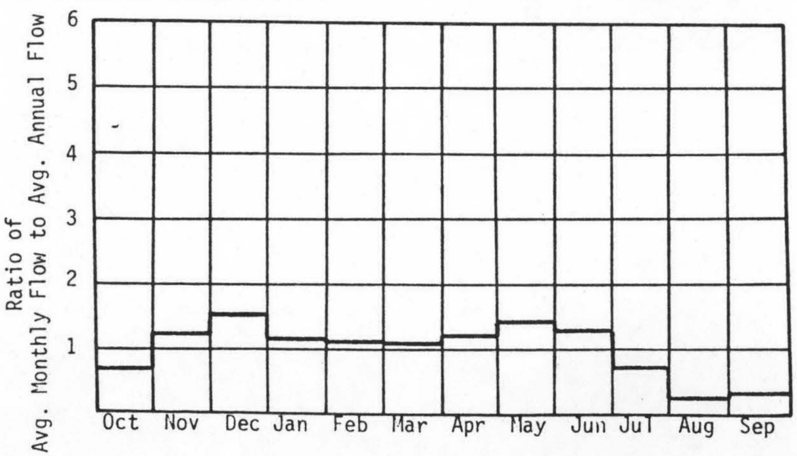
II. HYDROLOGIC AND HYDRAULIC CHARACTERISTICS

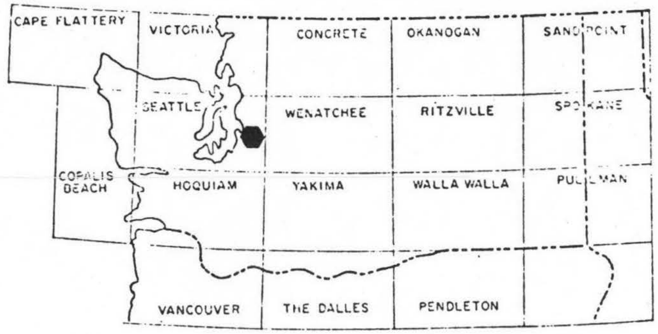
A.	Upstream Elevation of Reach	18	Ft. MSL
B.	Downstream Elevation of Reach	0	Ft. MSL
C.	Total Available Head in Reach	18	Ft.
D.	Average Slope in Reach	5	Ft./Mi.
E.	Drainage Area above Reach Mouth	241.5	Sq.Mi.
F.	Inflow Classification	Regulated	

III. REACH FLOW DURATION AND THEORETICAL POTENTIAL ENERGY CHARACTERISTICS

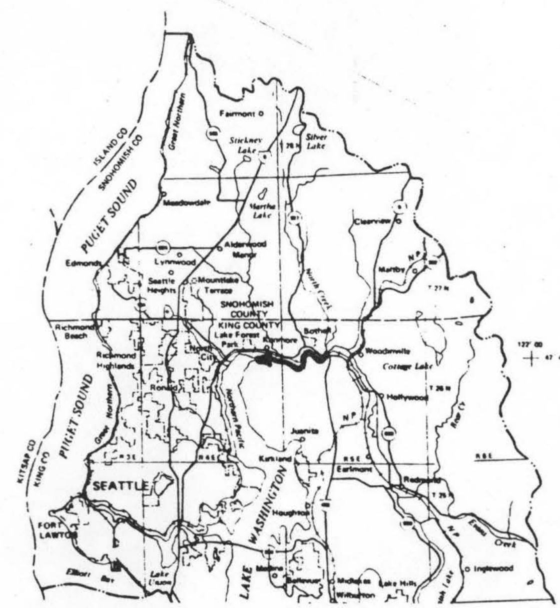
Exceedance Percentage	Discharge CFS	Theoretical Plant Size MW	Annual Energy Available GWH	Plant Factor
95	83.0	0.13	1.11	1.00
80	118	0.18	1.51	0.96
50	256	0.39	2.70	0.79
30	443	0.67	3.66	0.62
10	720	1.10	4.42	0.46

IV. TYPICAL ANNUAL HYDROGRAPH QMR = 346 cfs





LOCATIONS FOR USGS 1:250,000 MAP SERIES



WRIA ⑦

APPENDIX II

OREGON

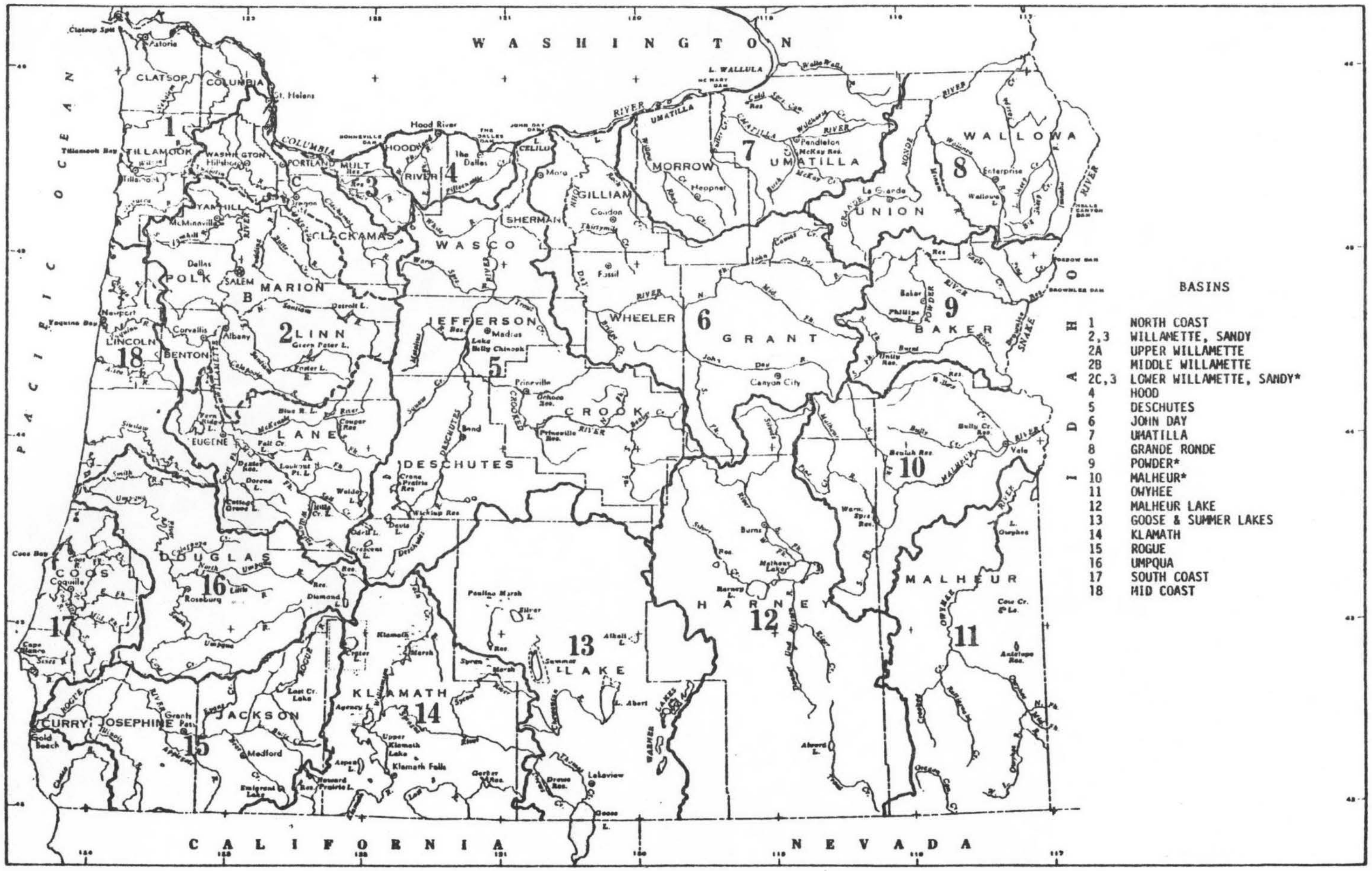
SAMPLE
REACH DATA TABLES

REPORT VOLUME CONTENTS

TABLE OF CONTENTS FOR

APPENDIX II

TABLE OF CONTENTS (cont.)


WASHINGTON
PACIFIC OCEAN
IDAHO
CALIFORNIA
NEVADA
CLATSOP
COLUMBIA
TILLAMOOK
WASHINGTON
MULT
HOOD RIVER
YAMHILL
CLACKAMAS
WASCO
SHERMAN
GILLIAM
MORROW
UMATILLA
UNION
WALLOWA
POLK
MARION
LINN
BENTON
LINCOLN
JEFFERSON
WHEELER
GRANT
BAKER
CROOK
LANE
DESCHUTES
DOUGLAS
COOS
HARNEY
MALHEUR
LAKE
KLAMATH
JACKSON
JOSEPHINE
CURRY
BASINS
1 NORTH COAST
2,3 WILLAMETTE, SANDY
2A UPPER WILLAMETTE
2B MIDDLE WILLAMETTE
2C,3 LOWER WILLAMETTE, SANDY*
4 HOOD
5 DESCHUTES
6 JOHN DAY
7 UMATILLA
8 GRANDE RONDE
9 POWDER*
10 MALHEUR*
11 OWYHEE
12 MALHEUR LAKE
13 GOOSE & SUMMER LAKES
14 KLAMATH
15 ROGUE
16 UMPQUA
17 SOUTH COAST
18 MID COAST

OREGON REACH INDEX

OREGON REACH INDEX

OREGON REACH INDEX

STREAM DESCRIPTION	REACH NUMBER	PAGES
Johnson Creek	02-500-060-018-000-R0001	2C-4
Clackamas River & Tribs.	02-500-060-024-000-R0001 thru R0013	2C-6 to 2C-40
Tualatin River & Tribs.	02-500-060-029-000-R0001 thru R0009	2C-42 to 2C-65
3. Sandy Basin		
Sandy River Main Stem	02-500-080-000-R0001 thru R0002, R0003, R0004 R0005 thru R0007, R0008, R0009 R0010, R0011 thru R0013	3- 1-2, 5, 22 25-26, 37, 43 45, 48-50
Gordon Creek	02-500-080-010-000-R0001 thru R0002	3-3 to 3-4
Bull Run River & Tribs.	02-500-080-015-000-R0001 thru R0009	3-6 to 3-21
Cedar Creek	02-500-080-020-000-R0001 thru R0002	3-23 to 3-24
Salmon River & Tribs.	02-500-080-025-000-R0001 thru R0008	3-27 to 3-36
Zig Zag River & Tribs.	02-500-080-030-000-R0001 thru R0003	3-38 to 3-42
Clear Creek	02-500-080-035-000-R0001	3-44
Lost Creek	02-500-080-040-000-R0001 thru R0002	3-46 to 3-47
4. Hood Basin		
Eagle Creek	02-500-125-000-000-R0001 thru R0002	4-1 to 4-2
Hood River & Tribs.	02-500-140-000-000-R0001 thru -030-000-R0003	4-3 to 4-15
Fifteenmile Creek	02-500-165-000-000-R0001 thru R0002	4-16 to 4-17
5. Deschutes Basin		
Deschutes River Main Stem	02-500-180-000-000-R0001 thru R0005, R0007, R0009 thru R0011 R0013, R0015, R0017, R0018 R0019 thru R0021, R0022 thru R0024 R0025, R0026, R0027	5- 1-3, 17, 20-21 36, 45, 50, 82 92-94, 98-100 114, 117, 120

OREGON REACH INDEX

OREGON REACH INDEX

STREAM DESCRIPTION	REACH NUMBER	PAGES
Wildhorse Creek	02-500-220-010-000-R0001	7-7
Meacham Creek	02-500-220-015-000-R0001 thru R0002	7-11 to 7-12
8. Grande Ronde Basin		
Grande Ronde River Main Stem	02-500-240-060-000-R0005, R0006 thru R0009, R0011 R0012 thru R0015, R0018 thru R0022 R0023 thru R0025	8- 8, 14-17, 30 33-36, 40-44 47-49
Joseph Creek & Tribs.	02-500-240-060-004-R0004 thru R0011	8-1 to 8-7
Wenaha River & Tribs.	02-500-240-060-047-R0001 thru R0011	8-9 to 8-13
Wallowa River & Tribs	02-500-240-060-082-R0001 thru R0020	8-18 to 8-29
Looking Glass Creek	02-500-240-060-085-R0001 thru R0002	8-31 to 8-32
Catherine Creek	02-500-240-060-140-R0001 thru R0004	8-37 to 8-39
Meadow Creek	02-500-240-060-181-R0001 thru R0002	8-45 to 8-46
Imnaha River Main Stem	02-500-240-100-000-R0001 thru R0004, R0005 thru R0009	8- 50-53, 59-63
Big Sheep & Little Sheep Creeks	02-500-240-100-023-R0001 thru R0006	8-54 to 8-58
9. Powder Basin		
Pine Creek	02-500-240-117-000-R0001 thru R0003	9-1 to 9-3
Powder River Main Stem	02-500-240-120-000-R0002 thru R0015	9-4 to 9-17
Eagle Creek	02-500-240-120-010-R0001 thru R0004	9-18 to 9-21
Burnt River	02-500-240-123-000-R0001 thru R0010	9-22 to 9-31
10. Malheur Basin		
Malheur River Main Stem Below Warm Springs Dam	02-500-240-180-000-R0001 thru R0009, R0010 thru R0012	10- 1-9, 12-14

OREGON REACH INDEX

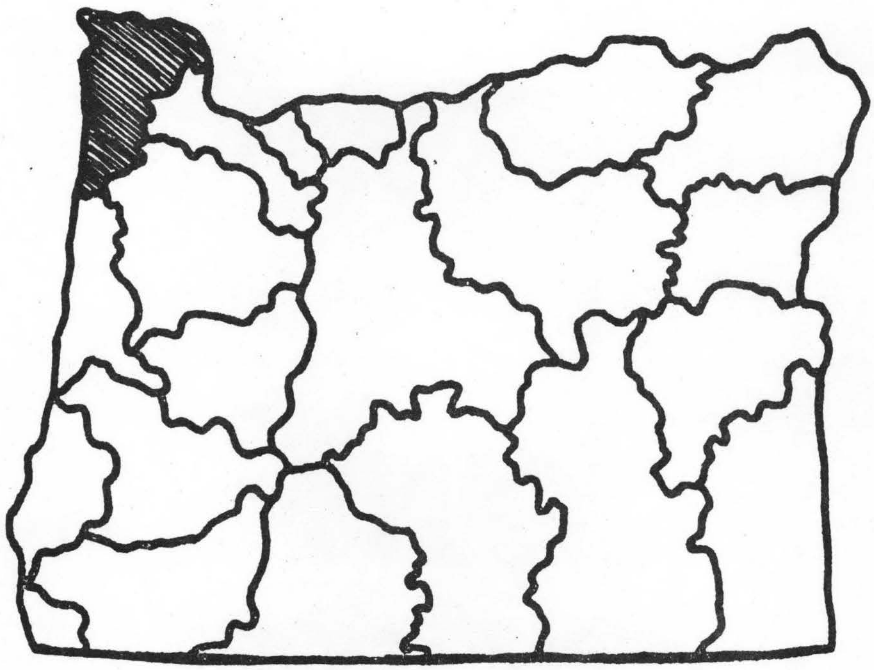
STREAM DESCRIPTION	REACH NUMBER	PAGES
North Fork Malheur River	02-500-240-180-015-R0001 thru R0002	10-10 to 10-11
Malheur River Above Warm Springs Reservoir	02-500-240-180-000-R0013 thru R0018	10-15 to 10-20
11. Owyhee Basin		
Owyhee River Below Owyhee Dam	02-500-240-200-000-R0001 thru R0020	11-1 to 11-3
Owyhee River Main Stem Above Owyhee Reservoir	02-500-240-200-000-R0070 thru R0110, R0118 R0122 thru R0171	11- 4-8, 12 18-23
Crooked Creek	02-500-240-200-003-R0001 thru R0004	11-9 to 11-11
Jordan Creek	02-500-240-200-005-R0001 thru R0007	11-13 to 11-17
12. Malheur Lake Basin		
Silvies River	02-000-012-001-000-R0001 thru R0004	12-1 to 12-4
Donner und Blitzen River	02-000-012-002-000-R0001 thru R0004	12-5 to 12-8
13. Goose and Summer Lakes Basin		
Chewaucan River	02-000-013-000-000-R0001 thru R0005	13-1 to 13-5
14. Klamath Basin		
Jenny Creek	02-000-014-001-000-R0001 thru R0004	14-1 to 14-4
Klamath River	02-000-014-002-000-R0001 thru R0003	14-5 to 14-7
Williamson River Main Stem	02-000-014-003-000-R0001, R0002 thru R0006	14- 8, 26-30
Sprague River & Tribs.	02-000-014-003-001-R0001 thru R0017	14-9 to 14-25

OREGON REACH INDEX

OREGON REACH INDEX

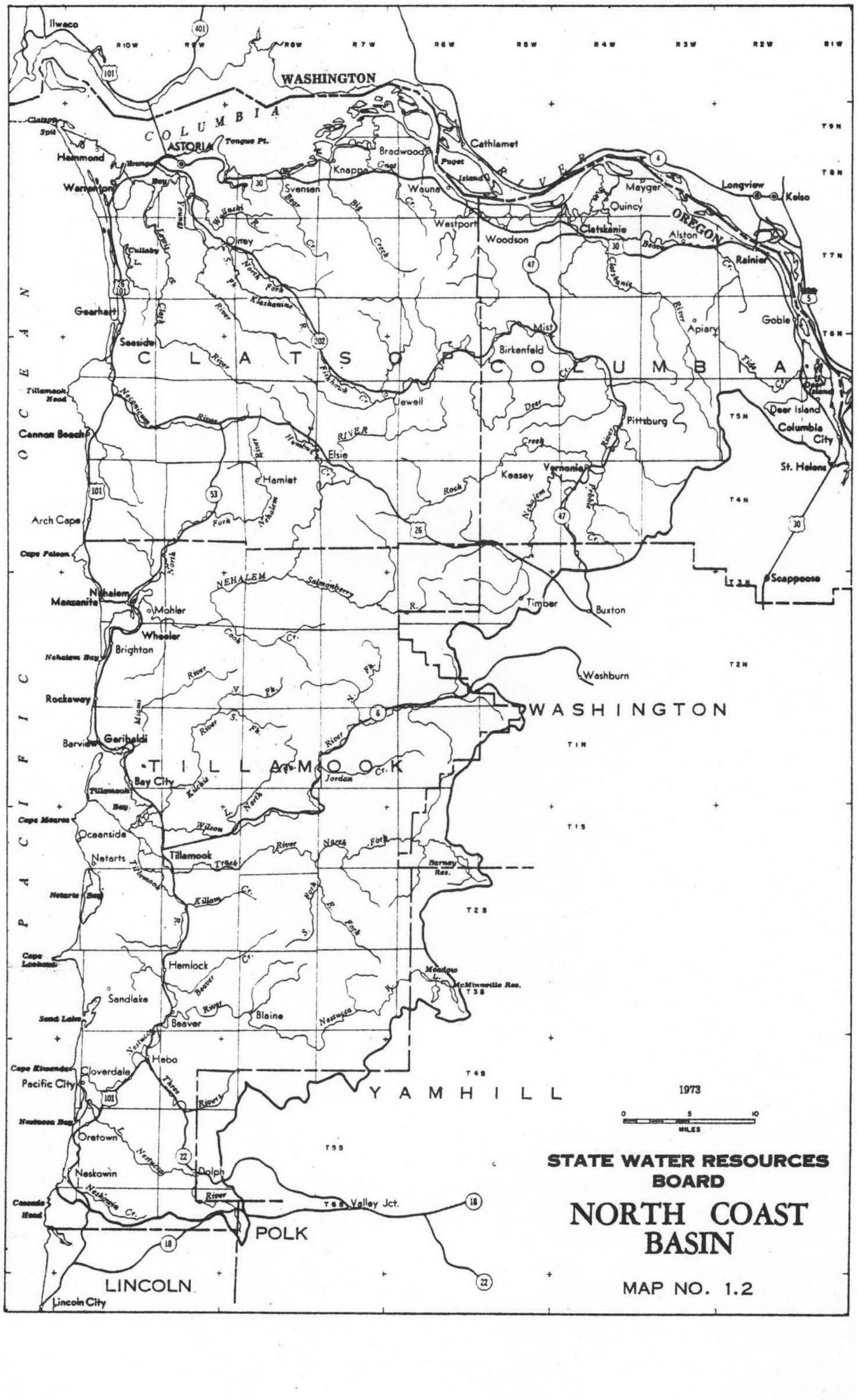
STREAM DESCRIPTION	REACH NUMBER	PAGES
South Fork Rogue River & Tribs.	02-900-105-000-000-R0001 thru R0005	15-112 to 15-124
Mill Creek	02-900-115-000-000-R0001 thru R0002	15-126 to 15-127
Union Creek	02-900-120-000-000-R0001 thru R0002	15-130 to 15-131
16. Umpqua Basin		
Umpqua River Main Stem	02-700-000-000-000-R0001, R0002 thru R0003, R0004 thru R0006 R0007 thru R0012, R0013	16- 1, 12-13, 19-21 28-33, 39
Smith River & Tribs.	02-700-002-000-000-R0001 thru R0008	16-2 to 16-11
Mill Creek & Tribs.	02-700-011-000-000-R0001 thru -005-000-R0002	16-14 to 16-18
Elk Creek	02-700-020-000-000-R0001 thru R0006	16-22 to 16-27
Calapooya Creek	02-700-030-000-000-R0001 thru R0005	16-34 to 16-38
North Umpqua River & Tribs.	02-700-100-000-000-R0001 thru R0015	16-40 to 16-74
South Umpqua River & Tribs.	02-700-200-000-000-R0001 thru R0017	16-75 to 16-114
17. South Coast Basin		
Coos River & Tribs.	02-810-000-000-000-R0001 thru -009-011-000-R0002	17-1 to 17-18
Coquille River & Tribs.	02-825-000-000-000-R0001 thru -008-000-000-R0007	17-19 to 17-49
Floras Creek & Tribs.	02-835-000-000-000-R0001 thru -002-000-000-R0002	17-50 to 17-53
Sixes River	02-840-000-000-000-R0001 thru R0004	17-54 to 17-57
Elk River	02-845-000-000-000-R0001 thru R0004	17-58 to 17-61
Euchre Creek	02-850-000-000-000-R0001 thru R0002	17-62 to 17-63
Hunter Creek	02-950-000-000-000-R0001	17-64
Pistol River & Tribs.	02-955-000-000-000-R0001 thru R0003	17-65 to 17-68
Chetco River & Tribs	02-960-000-000-000-R0001 thru R0008	17-69 to 17-80

OREGON REACH INDEX



APPENDIX 1

NORTH COAST BASIN

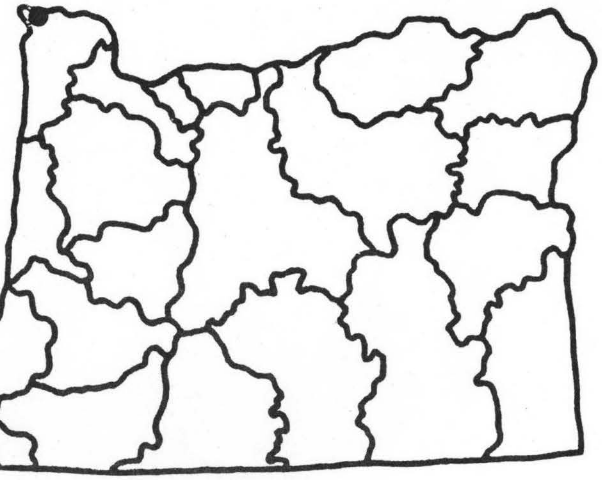

STATE WATER RESOURCES BOARD
NORTH COAST BASIN
MAP NO. 1.2
1973
WASHINGTON
COLUMBIA RIVER
OREGON
PACIFIC OCEAN
CLATSOP
COLUMBIA
TILLAMOOK
WASHINGTON
YAMHILL
POLK
LINCOLN
ASTORIA
Ilwaco
Hammond
Warrenton
Gearhart
Seaside
Cannon Beach
Arch Cape
Nehalem
Manzanita
Mohler
Wheeler
Brighton
Rockaway
Barview
Garibaldi
Bay City
Oceanside
Netarts
Tillamook
Hemlock
Sandlake
Beaver
Blaine
Hebo
Cloverdale
Pacific City
Oretown
Neskowin
Dolph
Valley Jct.
Lincoln City
Cathlamet
Bradwood
Knappa
Svensen
Wauna
Westport
Woodson
Mayger
Quincy
Clatskanie
Alston
Longview
Kelso
Rainier
Goble
Apiary
Mist
Birkenfeld
Jewell
Elsie
Hamlet
Pittsburg
Keasey
Vernonia
Deer Island
Columbia City
St. Helens
Scappoose
Timber
Buxton
Washburn

REACH HYDRO POTENTIAL CHARACTERISTICS

REACH # 02-500-003-000-000-R0001

I. LOCATION

A.	State	Oregon
B.	County	Clatsop
C.	Township, Range	T7N, R9W, Sec.7
D.	Latitude, Longitude	46° 05'N,123° 52'W
E.	Stream Name	Lewis & Clark River
F.	Major Basin Name	North Coast
G.	River Mile	0.0 to 10.0



II. HYDROLOGIC AND HYDRAULIC CHARACTERISTICS

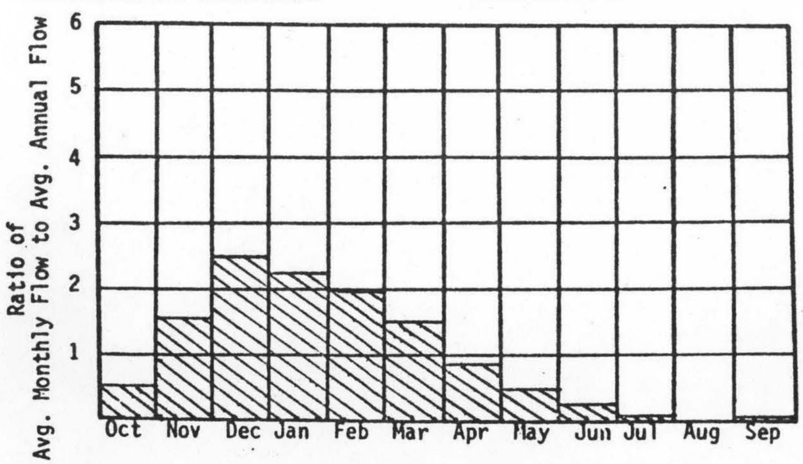
A.	Upstream Elevation of Reach	38	Ft. MSL
B.	Downstream Elevation of Reach	0	Ft. MSL
C.	Total Available Head in Reach	38	Ft.
D.	Average Slope in Reach	3.8	Ft./Mi.
E.	Drainage Area above Reach Mouth	60.7	Sq.Mi.
F.	Inflow Classification	Natural	

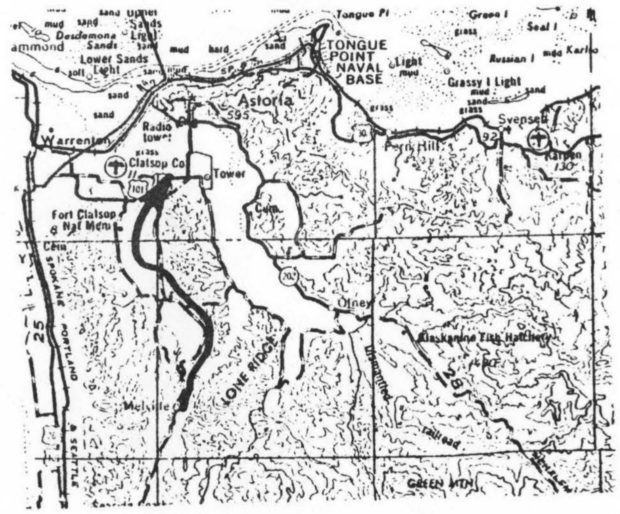
III. REACH FLOW DURATION AND THEORETICAL POTENTIAL ENERGY CHARACTERISTICS

EXCEEDANCE PERCENTAGE	DISCHARGE CFS	THEORETICAL PLANT SIZE MW	ANNUAL ENERGY AVAILABLE GWH	PLANT FACTOR
95	13.3	.04	.38	1.000
80	25.5	.08	.68	.940
50	114.3	.37	2.30	.715
30	254.5	.82	3.89	.541
10	653.3	2.10	6.14	.333

U.S.G.S. TOPO SERIES
1:240,000 SCALE
MAP NAME: HOQUIAM

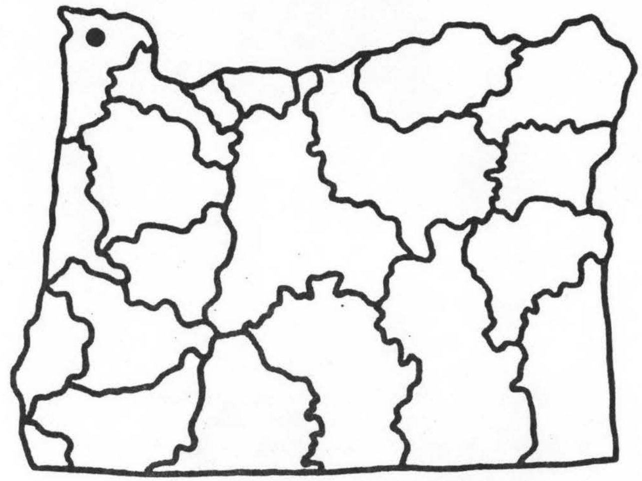
IV. TYPICAL ANNUAL HYDROGRAPH   AVG. ANNUAL FLOW = 252 CFS





REACH HYDRO POTENTIAL CHARACTERISTICS

REACH # 02-500-003-000-000-R0002



I. LOCATION

A.	State	Oregon
B.	County	Clatsop
C.	Township, Range	T6N, R9W, Sec.18
D.	Latitude, Longitude	45° 58'N,123° 52'W
E.	Stream Name	Lewis & Clark River
F.	Major Basin Name	North Coast
G.	River Mile	10.0 to 19.0

II. HYDROLOGIC AND HYDRAULIC CHARACTERISTICS

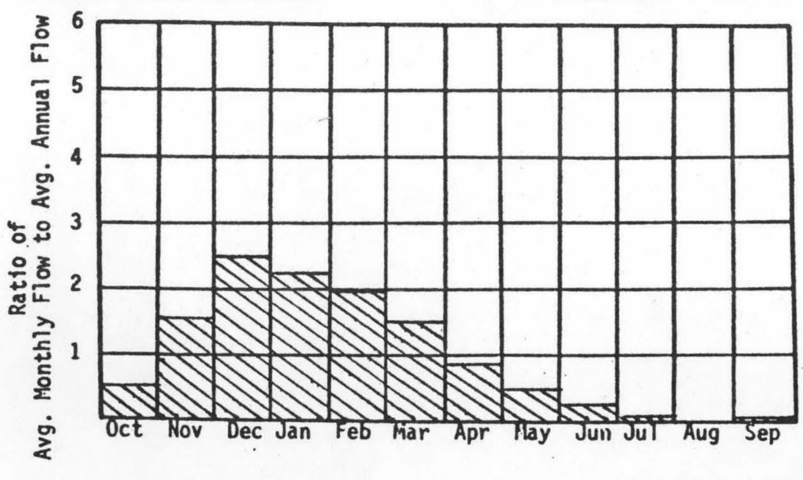
A.	Upstream Elevation of Reach	538	Ft. MSL
B.	Downstream Elevation of Reach	38	Ft. MSL
C.	Total Available Head in Reach	500	Ft.
D.	Average Slope in Reach	55.6	Ft./Mi.
E.	Drainage Area above Reach Mouth	40.3	Sq.Mi.
F.	Inflow Classification	Natural	

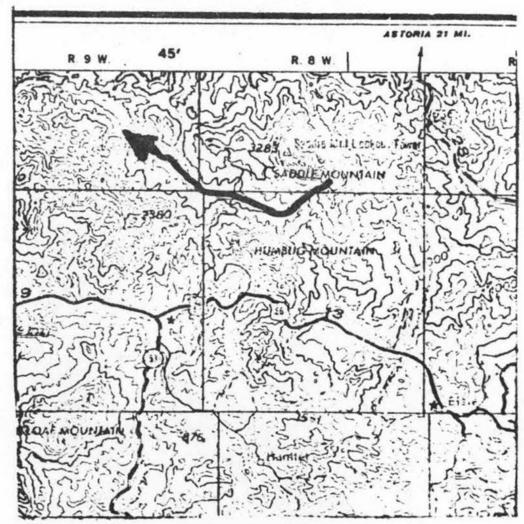
III. REACH FLOW DURATION AND THEORETICAL POTENTIAL ENERGY CHARACTERISTICS

EXCEEDANCE PERCENTAGE	DISCHARGE CFS	THEORETICAL PLANT SIZE MW	ANNUAL ENERGY AVAILABLE GWH	PLANT FACTOR
95	8.5	.36	3.16	1.000
80	16.4	.70	5.74	.940
50	72.6	3.08	19.28	.716
30	163.7	6.94	32.81	.540
10	420.1	17.80	51.84	.332

U.S.G.S. TOPO. SERIES
1:250,000 SCALE
MAP NAME: HOQUIAM - VANCOUVER

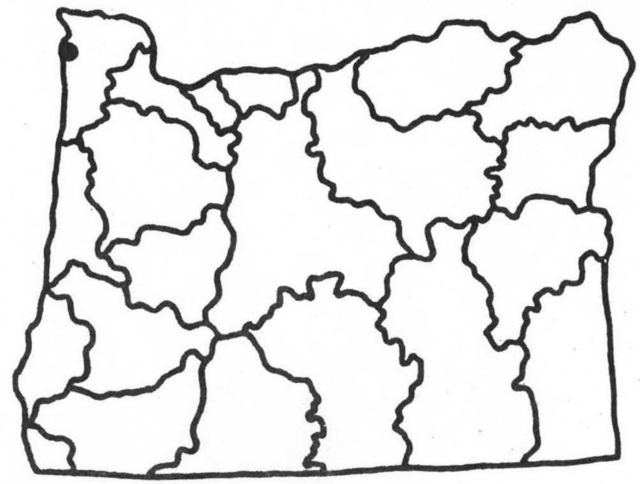
IV. TYPICAL ANNUAL HYDROGRAPH AVG. ANNUAL FLOW = 162 CFS





REACH HYDRO POTENTIAL CHARACTERISTICS

REACH # 02-500-003-000-000-R0003



I. LOCATION
- A. State: Oregon
- B. County: Clatsop
- C. Township, Range: T6N, R9W, Sec.22
- D. Latitude, Longitude: 45° 59'N,123° 47'W
- E. Stream Name: Lewis & Clark River
- F. Major Basin Name: North Coast
- G. River Mile: 19.0 to H.W.

II. HYDROLOGIC AND HYDRAULIC CHARACTERISTICS
- A. Upstream Elevation of Reach: -- Ft. MSL
- B. Downstream Elevation of Reach: -- Ft. MSL
- C. Total Available Head in Reach: 66 Ft.
- D. Average Slope in Reach: -- Ft./Mi.
- E. Drainage Area above Reach Mouth: 17.5 Sq.Mi.
- F. Inflow Classification: Natural

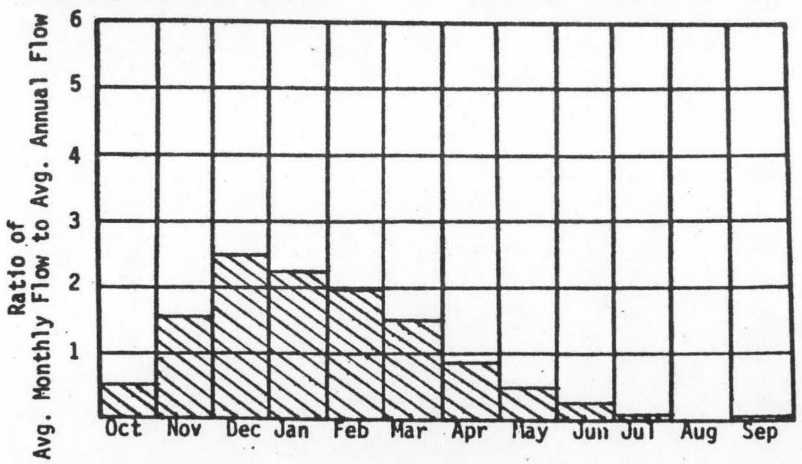
III. REACH FLOW DURATION AND THEORETICAL POTENTIAL ENERGY CHARACTERISTICS

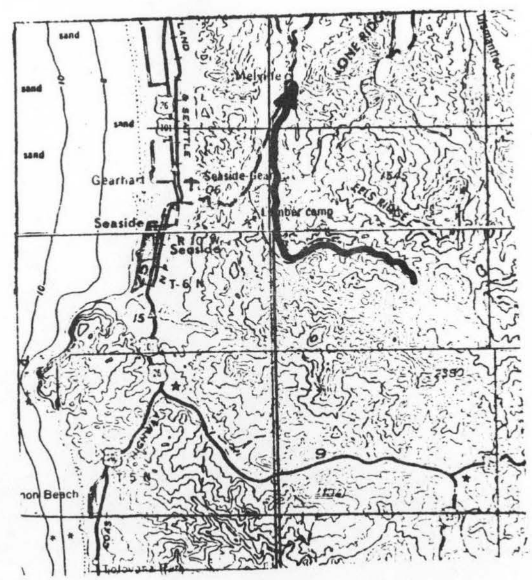
EXCEEDANCE PERCENTAGE	DISCHARGE CFS	THEORETICAL PLANT SIZE MW	ANNUAL ENERGY AVAILABLE GWH	PLANT FACTOR
95	5.5	.03	.27	1.000
80	10.7	.06	.49	.939
50	46.4	.26	1.63	.716
30	105.9	.59	2.79	.539
10	271.7	1.52	4.42	.332

U.S.G.S. TOPO. SERIES
1:250,000 SCALE
MAP NAME: VANCOUVER

IV. TYPICAL ANNUAL HYDROGRAPH

AVG. ANNUAL FLOW = 105 CFS



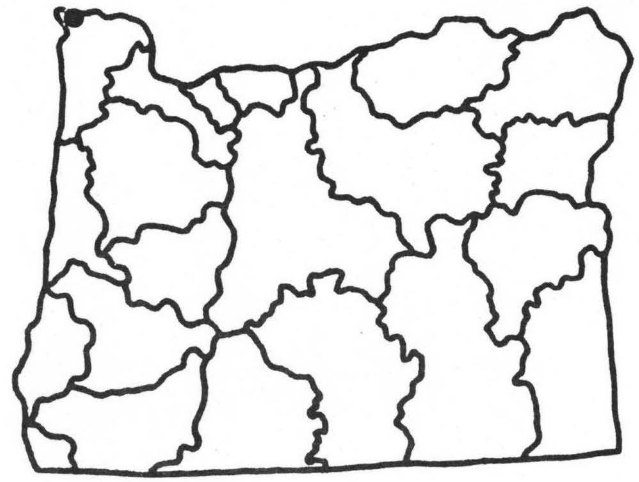


REACH HYDRO POTENTIAL CHARACTERISTICS

REACH # 02-500-005-000-000-R0001

I. LOCATION

A.	State	Oregon
B.	County	Clatsop
C.	Township, Range	T8N, R9W, Sec.8
D.	Latitude, Longitude	46° 9'N,123° 50'W
E.	Stream Name	Youngs River
F.	Major Basin Name	North Coast
G.	River Mile	0.0 to 1.8



II. HYDROLOGIC AND HYDRAULIC CHARACTERISTICS

A.	Upstream Elevation of Reach	1.0	Ft. MSL
B.	Downstream Elevation of Reach	0	Ft. MSL
C.	Total Available Head in Reach	1.0	Ft.
D.	Average Slope in Reach	0.6	Ft./Mi.
E.	Drainage Area above Reach Mouth	119.3	Sq.Mi.
F.	Inflow Classification	Natural	

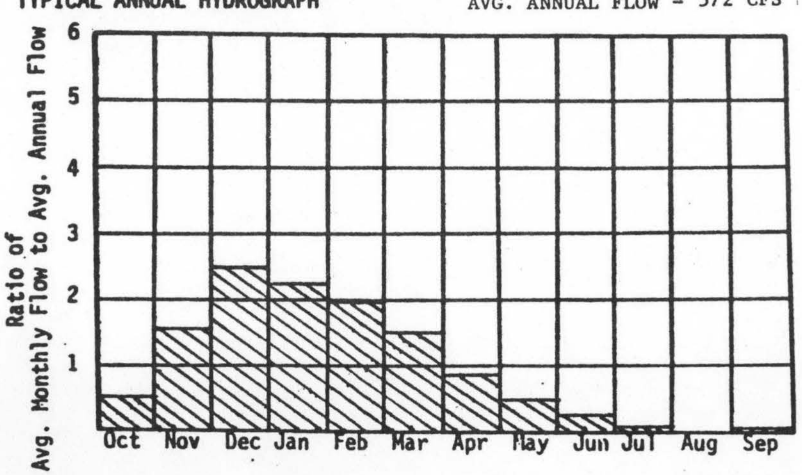
III. REACH FLOW DURATION AND THEORETICAL POTENTIAL ENERGY CHARACTERISTICS

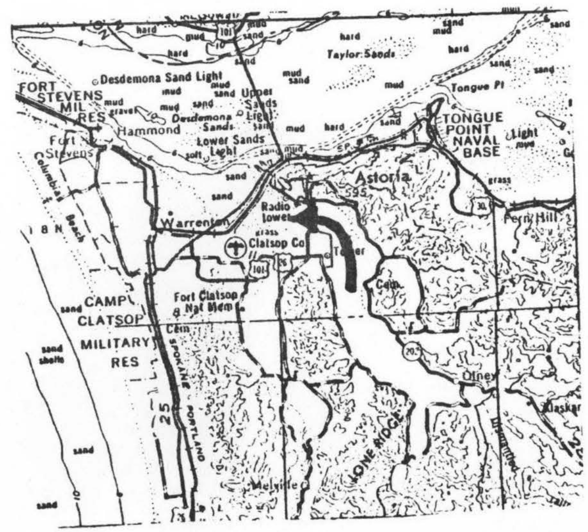
EXCEEDANCE PERCENTAGE	DISCHARGE CFS	THEORETICAL PLANT SIZE MW	ANNUAL ENERGY AVAILABLE GWH	PLANT FACTOR
95	30.6	.00	.02	1.000
80	57.7	.00	.04	.941
50	265.2	.02	.14	.713
30	576.3	.05	.23	.544
10	1480.5	.13	.37	.334

U.S.G.S. TOPO. SERIES
1:250,000 SCALE
MAP NAME: HOQUIAM

IV. TYPICAL ANNUAL HYDROGRAPH

AVG. ANNUAL FLOW = 572 CFS





REACH HYDRO POTENTIAL CHARACTERISTICS

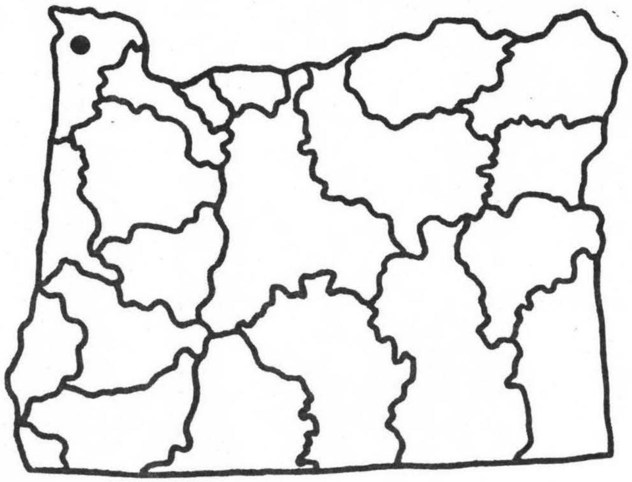
REACH # 02-500-005-000-000-R0002

I. LOCATION

A.	State	Oregon
B.	County	Clatsop
C.	Township, Range	T7N, R9W, Sec.4
D.	Latitude, Longitude	46° 06'N, 123° 49'W
E.	Stream Name	Youngs River
F.	Major Basin Name	North Coast
G.	River Mile	1.8 to 6.4

II. HYDROLOGIC AND HYDRAULIC CHARACTERISTICS

A.	Upstream Elevation of Reach	20	Ft. MSL
B.	Downstream Elevation of Reach	1.0	Ft. MSL
C.	Total Available Head in Reach	19.0	Ft.
D.	Average Slope in Reach	4.1	Ft./Mi.
E.	Drainage Area above Reach Mouth	97.1	Sq.Mi.
F.	Inflow Classification	Natural	



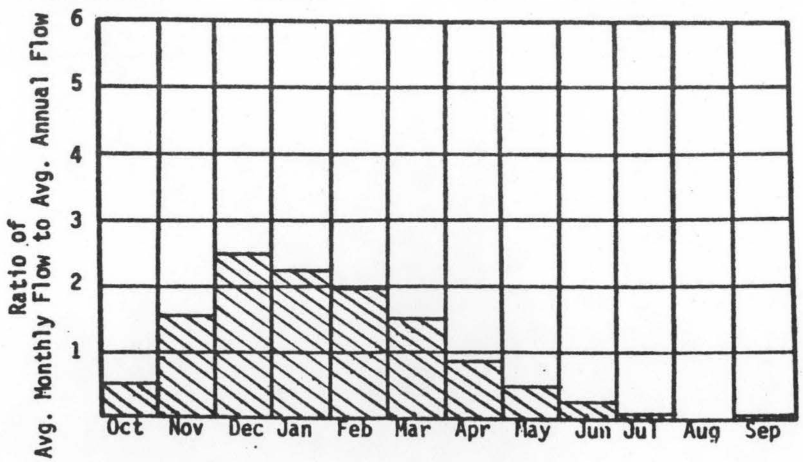
U.S.G.S. TOPO. SERIES
1:250,000 SCALE
MAP NAME: HOQUIAM

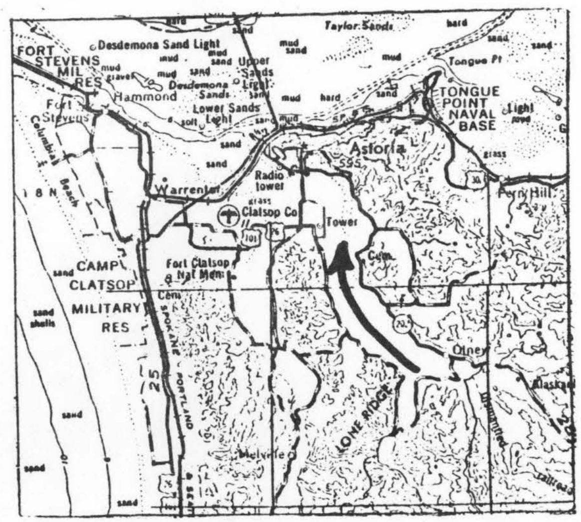
III. REACH FLOW DURATION AND THEORETICAL POTENTIAL ENERGY CHARACTERISTICS

EXCEEDANCE PERCENTAGE	DISCHARGE CFS	THEORETICAL PLANT SIZE MW	ANNUAL ENERGY AVAILABLE GWH	PLANT FACTOR
95	24.9	.04	.35	1.000
80	47.2	.08	.63	.941
50	215.7	.35	2.17	.714
30	471.5	.76	3.61	.543
10	1211.2	1.95	5.70	.334

IV. TYPICAL ANNUAL HYDROGRAPH

AVG. ANNUAL FLOW = 468 CFS





FEASIBILITY, TRANSMISSION AND LOAD RESTRAINTS

REACH IDENTIFICATION NUMBER	FEASIBILITY RESTRAINT				TRANSMISSION AND LOAD CONSIDERATIONS			
	LAND USE RESTRICTIONS	UTILITY DISPLACEMENT	BUILDING DISPLACEMENT	SPECIAL FISH PROBLEMS	DISTANCE TO NEAREST LINE Miles	LINE CAPACITY KVA	LOCAL MARKET	DISTANCE TO CITY >1000 Miles
02-500-								
003-000-000-R0001	X	X	X	X	1.2	115-PPL	1,2	6.0
003-000-000-R0002	-	X	-	X	1.9	115-PPL	1,2	2.5
003-000-000-R0003	-	-	-	X	5.4	115-PPL	1,2	6.0
005-000-000-R0001	X	X	X	X	0.2	115-PPL	1,2	1.0
005-000-000-R0002	-	X	X	X	1.0	230-B	1,2	4.8
005-006-000-R0001	-	X	X	X	4.8	115-PPL	-	9.0
005-006-002-R0001	-	X	X	X	5.2	230-B	-	8.8
005-006-002-R0002	-	X	X	X	5.2	230-B	-	9.0
005-006-003-R0001	-	X	-	X	6.2	115-PPL	-	9.0
005-006-003-R0002	-	X	-	-	7.6	115-PPL	-	10.0
005-000-000-R0003	X	-	-	X	3.8	115-PPL	-	6.8
005-000-000-R0004	-	-	-	-	7.0	115-PPL	-	8.8
011-000-000-R0001	-	X	X	X	1.8	230-B	1,2	13.8

FEASIBILITY, TRANSMISSION AND LOAD RESTRAINTS

REACH IDENTIFICATION NUMBER	FEASIBILITY RESTRAINT				TRANSMISSION AND LOAD CONSIDERATIONS			
	LAND USE RESTRICTIONS	UTILITY DISPLACEMENT	BUILDING DISPLACEMENT	SPECIAL FISH PROBLEMS	DISTANCE TO NEAREST LINE Miles	LINE CAPACITY KVA	LOCAL MARKET	DISTANCE TO CITY >1000 Miles
02-500-								
011-000-000-R0002	-	-	-	X	5.4	230-B	-	17.0
013-000-000-R0001	-	-	-	X	4.0	115-B	-	15.0
013-000-000-R0002	-	-	-	X	1.3	115-B	-	15.8
015-000-000-R0001	-	X	X	X	1.5	115-B	1	1.2
015-000-000-R0002	-	-	X	X	1.8	2-230-B	-	5.8
015-000-000-R0003	-	-	X	X	2.8	2-230-B	-	7.0
017-000-000-R0001	-	X	X	X	1.8	115-B	1	5.0
017-000-000-R0002	-	X	X	-	1.7	115-B	-	2.8
02-505-								
000-000-000-R0001	-	X	X	X	0.3	115-PPL	1,2	1.8
000-000-000-R0002	-	X	X	X	0.8	115-PPL	1,2	5.0
000-000-000-R0003	-	X	X	X	2.2	115-PPL	-	8.2
000-000-000-R0004	-	X	X	X	4.0	115-PPL	-	9.0

APPENDIX III

IDAHO

SAMPLE
REACH DATA TABLES

REPORT VOLUME CONTENTS

TABLE OF CONTENTS
APPENDIX III
IDAHO

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IDAHO REACH INDEX

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B. Malad River	-010-000-000-R0001	I 10
II. Kootenai River	03-500-500-	
A. Main Stem	-000-000-R0002	I 11
B. Minor Trib. to Kootenai	-010-000-R0001 thru 090-000-R0006	I 12-I 16
C. Moyie River	-100-000-R0001 thru R0009	I 17-I 20
D. Boulder Creek	-110-000-R0001 thru R0003	I 21-I 22
III. Pend Oreille River	03-500-480-	
A. Priest River & Trib.	-251-000-R0002 thru R0012	I 23-I 32
B. Pack River & Trib.	-275-000-R0002 thru R0010	I 33-I 37
C. Lightning Creek	-350-010-R0001 thru R0003	I 38-I 39
IV. Spokane River	03-500-420-	
A. Main Stem	-000-000-R0001	I 40
B. Coeur d'Alene River	-504-000-R0002 thru R0005	I 41-I 51
1. So. Fk. Coeur d'Alene & Trib.	-504-010-R0002 thru R0010	I 52-I 56
2. No. Fk. Coeur d'Alene & Trib.	-504-020-R0002 thru R0004	I 57-I 58
3. Minor Trib. to Coeur d'Alene	-504-000-R0019 thru R0034	I 59-I 64
C. St. Joe River	03-500-420-502	
1. Main Stem	-502-000-R0002 thru R0044	I 65-I 78
2. St. Maries River & Trib.	-502-010-R0002 thru R0010	I 79-I 84
3, Minor Trib. to St. Joe	-502-000-R0011 thru R0041	I 85-I 91
V. Snake River (Idaho)	03-500-240-	
A. Main Stem	-000-000-R0002 thru R0058	I 92-I 126
B. Palouse River	-020-000-R0002 thru R0008	I 140-I 143
C. Clearwater River	03-500-240-040-	
1. Main Stem	-000-R0002 thru R0028	I 144-I 150
2. Potlatch River	-005-R0002 thru R0006	I 151-I 153

TABLE I

IDAHO REACH INDEX

STREAM DESCRIPTION	REACH NUMBER	PAGE
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C. Clearwater River (Con't.)	03-500-240-040-	
3. No. Fk. Clearwater & Trib.	-010-R0004 thru R0062	I 154-I 177
4. Minor Trib. to Clearwater	-012-R0002 thru 014-R0004	I 178-I 180
5. Middle Fork Clearwater	-020-R0240	I 181
a. Lochsa River & Trib.	-020-R0005 thru R0070	I 182-I 196
b. Selway River & Trib.	-020-R0100 thru R0235	I 197-I 220
6. So. Fk. Clearwater & Trib.	-025-R0002 thru R0032	I 221-I 230
D. Salmon River	03-500-240-080-	
1. Main Stem	-000-R0002 thru R0084	I 231-I 258
2. Slate Creek	-002-R0006	I 259
3. Little Salmon River & Trib.	-010-R0002 thru R0008	I 260-I 263
4. Minor Trib. to Salmon	-012-R0012 thru 018-R0022	I 264-I 266
5. So. Fk. Salmon & Trib.	-020-R0002 thru R0022	I 267-I 277
6. Minor Trib. to Salmon	-022-R0028 thru -025-R0040	I 278-I 281
7. Middle Fork Salmon & Trib	-030-R0002 thru R0052	I 282-I 307
8. Panther Creek	-040-R0002 thru R0004	I 308-I 309
9. North Fork Salmon	-045-R0002	I 310
10. Lemhi River & Trib.	-050-R0002 thru R0014	I 311-I 317
11. Pahsimeroi River & Trib.	-060-R0002 thru R0008	I 318-I 321
12. Warm Springs Creek	-070-R0058	I 322
13. East Fork Salmon & Trib.	-080-R0002 thru R0008	I 323-I 326
14. Minor Trib. to Salmon	-082-R0064 thru 088-R0080	I 327-I 331
E. Wildhorse River	03-500-240-105-000-R0002	I 332
F. Weiser River	03-500-240-140-	
1. Main Stem	-000-R0001 thru R0019	I 333-I 342
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G. Payette River	03-500-240-160-	
1. Main Stem	-000-R0001 thru R0017	I 346-I 352
2. Squaw Creek	-060-R0001 thru R0005	I 353-I 355
3. No. Fk. Payette & Trib.	-100-R0001 thru R0033	I 356-I 365

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IDAHO REACH INDEX

STREAM DESCRIPTION	REACH NUMBER	PAGE
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5. Middle Fork Payette & Trib.	-200-R0021 thru R0025	I 378-I 380
H. Boise River	03-500-240-220-	
1. Main Stem	-000-R0001 thru R0013	I 381-I 388
2. Mores Creek & Trib.	-030-R0001 thru R0007	I 389-I 391
3. South Fork Boise & Trib.	-150-R0001 thru R0023	I 392-I 399
4. North Fork Boise & Trib.	-170-R0001 thru R0005	I 400-I 402
5. Middle Fork Boise & Trib.	-190-R0001 thru R0007	I 403-I 406
I. Owyhee River (Idaho)	03-500-240-200-	
1. Main Stem	-000-R0002 thru R0012	I 407-I 412
2. Jordan Creek	-010-R0002 thru R0004	I 415-I 416
3. South Fork Owyhee	-020-R0002 thru R0004	I 417-I 418
J. Owyhee River (Nevada)	05-500-240-200-	
1. Main Stem	-000-R0013 thru R0014	I 413-I 414
2. South Fork Owyhee	-020-R0006 thru R0010	I 419-I 421
K. Bruneau River (Idaho)	03-500-240-240-	
1. Main Stem	-000-R0002 thru R0004	I 422-I 423
2. West Fork Bruneau	-030-R0002 thru R0008	I 424-I 427
3. Jarbridge River	-030-R0016 thru R0018	I 429-I 430
L. Bruneau River (Nevada)	05-500-240-240-	
1. West Fork Bruneau	-030-R0009	I 428
M. Wood River Basin	03-500-240-242	
1. Malad River	-000-R0004 thru R0008	I 431-I 433
2. Big Wood River & Trib.	-010-R0002 thru R0026	I 434-I 446
3. Little Wood River & Trib.	-020-R0004 thru R0016	I 447-I 453
N. Salmon Falls Creek (Idaho)	03-500-240-244-	
1. Main Stem	-000-R0002 thru R0010	I 454-I 456
O. Salmon Falls Creek (Nevada)	05-500-240-244-	
1. Main Stem	-000-R0012 thru R0014	I 457-I 458

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IDAHO REACH INDEX

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P. Lost River Basin	03-500-240-250-	
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2. Little Lost River & Trib.	-020-R0004 thru R0006	I 464-I 465
3. Birch Creek	-040-R0002 thru R0004	I 466-I 467
Q. Minor Tributaries to Snake River	03-500-240-	
1. Box Canyon Springs	-246-000-R0001	I 468
2. Deep Creek	-248-000-R0001	I 469
3. Mud Creek	-252-000-R0001	I 470
4. Niagara Springs	-254-000-R0001	I 471
5. Cedar Draw	-256-000-R0001	I 472
6. Rock Creek	-258-000-R0001	I 473
R. Portneuf River	03-500-240-260-	
1. Main Stem	-000-R0002 thru R0012	I 474-I-478
2. Marsh Creek	-010-R0002 thru R0006	I 479-I 480
S. Mudlake Basin	03-500-240-262-	
1. Medicine Lodge Creek	-000-R0002 thru R0004	I 481-I 482
T. Blackfoot River	03-500-240-280-	
1. Main Stem	-000-R0002 thru R0016	I 483-I 491
U. Willow Creek	03-500-240-288-	
1. Main Stem	-000-R0002 thru R0004	I 492-I 493
V. Henry's Fork (Idaho)	03-500-240-300-	
1. Main Stem	-000-R0002 thru R0018	I 494-I 501
2. Teton River	-010-R0002 thru R0018	I 502-I 508
3. Falls River	-020-R0002 thru R0006	I 510-I 512
a. Minor Trib. to Falls River	-020-R0012 thru R0016	I 515-I 517
4. Warm River	-030-R0002 thru R0004	I 522-I 523
W. Henry's Fork (Wyoming)	06-500-240-300-	
1. Teton River & Trib.	-010-R0014	I 509
2. Falls River	-020-R0008 thru R0020	I 513-I 514
a. Minor Tributaries	-020-R0010 thru R0024	I 518-I 521

TABLE I

IDAHO REACH INDEX

STREAM DESCRIPTION	REACH NUMBER	PAGE
VI. Snake River (Wyoming)	06-500-240-000-	
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B. Salt River (Wyoming)	06-500-240-307-	
1. Main Stem	-000-R0002 thru R0006	I 524-I 526
2. Strawberry Creek	-020-R0002	I 527
3. Swift Creek	-040-R0002	I 529
4. Crow Creek	-010-R0002 thru R0004	I 530-I 531
C. Salt River (Idaho)	03-500-240-307-	
1. Stump Creek	-030-R0002	I 528
D. Greys River	06-500-240-309-	
1. Main Stem	-000-R0002 thru R0010	I 532-I 536
2. Little Greys River	-010-R0002	I 537
E. Hoback River	06-500-240-311-	
1. Main Stem	-000-R0002 thru R0010	I 538-I 542
2. Minor Tributaries	-010-R0002 thru 020-R0002	I 543- I 544
F. Gros Ventre River	06-500-240-315-	
1. Main Stem	-000-R0002 thru R0012	I 545-I 550
2. Minor Tributaries	-010-R0002 thru 020-R0006	I 552-I 553
G. Spread Creek	06-500-240-317-000-R0004	I 554
H. Buffalo Fork	06-500-240-319-	
1. Main Stem	-000-R0002 thru R0006	I 555-I 557
2. Minor Tributaries	-020-R0002 thru 030-R0002	I 558-I 559
I. Minor Tributaries	06-500-240-	
1. Pacific Creek	-321-000-R0002	I 560
2. Lewis River	-323-000-R0002	I 561
3. Coulter Creek	-325-000-R0002	I 562
4. Heart River	-327-000-R0002	I 563

TABLE II

FEASIBILITY, TRANSMISSION AND LOAD RESTRAINTS

IDAHO

REACH IDENTIFICATION NUMBER	FEASIBILITY RESTRAINT				TRANSMISSION AND LOAD CONSIDERATIONS			
	LAND USE RESTRICTIONS	UTILITY DISPLACEMENT	BUILDING DISPLACEMENT	SPECIAL FISH PROBLEMS	DISTANCE TO NEAREST LINE Miles	LINE CAPACITY KVA	LOCAL MARKET	DISTANCE TO CITY >1000 Miles *
03-250-000-000	BEAR	RIVER	BASIN					
Bear R Main Stem								
000R0002					<1	46 (IP)	1,2,3	2
000R0004					<1	230 (U)	1,2	9
000R0009					3	138 (U)	1,3	17
000R0010					1	46 (U)	1,3	7
000R0011					<1	138 (U)	1,3	6
000R0013					2	46 (U)	1,3	3
000R0014		X			<1	46 (U)	1,3	12
000R0020		X			<1	69 (U)	1,2,3	8
000R0022		X			3	345 (PPL)	1,2,3	15
03-250-010-000	BEAR	RIVER	TRIBUTARIES					
Malad River								
000R0001		X			<1	138 (U)	1,3	12

IP = Idaho Power Company U = Utah Power Company PPL = Pacific Power & Light Co.

* Distance in air miles to nearest city with population greater than 1000

TABLE II

FEASIBILITY, TRANSMISSION AND LOAD RESTRAINTS

IDAHO

REACH IDENTIFICATION NUMBER	FEASIBILITY RESTRAINT				TRANSMISSION AND LOAD CONSIDERATIONS			
	LAND USE RESTRICTIONS	UTILITY DISPLACEMENT	BUILDING DISPLACEMENT	SPECIAL FISH PROBLEMS	DISTANCE TO NEAREST LINE Miles	LINE CAPACITY KVA	LOCAL MARKET	DISTANCE TO CITY > 1000 Miles
03-500-500-000	KOOTENAI	RIVER	BASIN					
Kootenai River								
000R0002		X			<1	115 (B)	1,2,3	10
03-500-500-010	KOOTENAI	RIVER	TRIBUTARIES					
Boundary Creek								
000R0001	X				22	25 (BF)	1,3	24
03-500-500-020								
Smith Creek								
000R0001					21	25 (BF)	1,3	20
03-500-500-090								
Deep Creek								
000R0002	X	X			4	115 (B)	1,3	4
000R0004		X			2	115 (B)	1,3	4
000R0006		X			1	115 (B)	1	5
03-500-500-100								
Moyie River								
000R0001	X				1	25 (BF)	1,2	7
000R0005	X				5	25 (BF)	1,2	10
000R0007	X	X			10	25 (BF)	None	14
000R0009	X	X			16	25 (BF)	1,2	19

B = Bonneville Power Administration

BF = City of Bonners Ferry

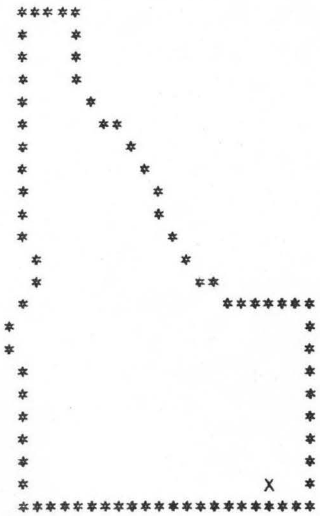
REACH HYDRO-POTENTIAL CHARACTERISTICS

REACH NUMBER 03250000000000R0002

LOCATION MAPS

U.S. TOPO SERIES
1:250000
SCALE

MAP NAME
PRESTON



I LOCATION

A.	STATE	IDAHO
B.	COUNTY	FRANKLIN
C.	TOWNSHIP, RANGE	T15S R38E
D.	LATITUDE, LONGITUDE	42 6 111 57
E.	STREAM NAME	BEAR RIVER
F.	MAJOR BASIN NAME	BEAR RIVER
G.	RIVER MILE	100.5 TO 119.3

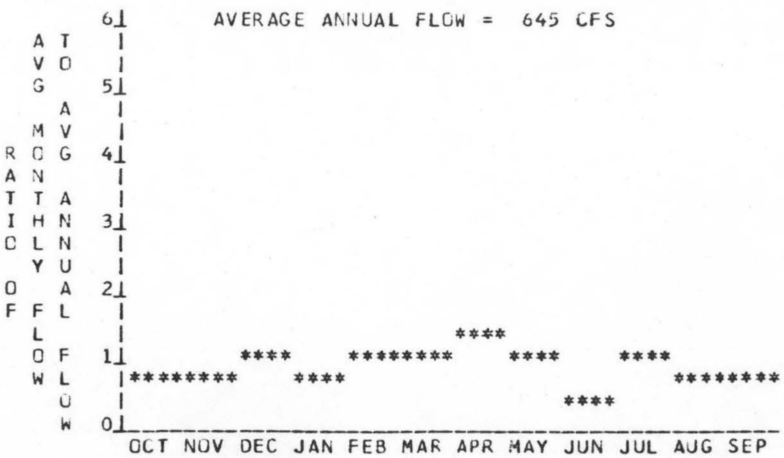
II HYDROLOGIC AND HYDRAULIC CHARACTERISTICS

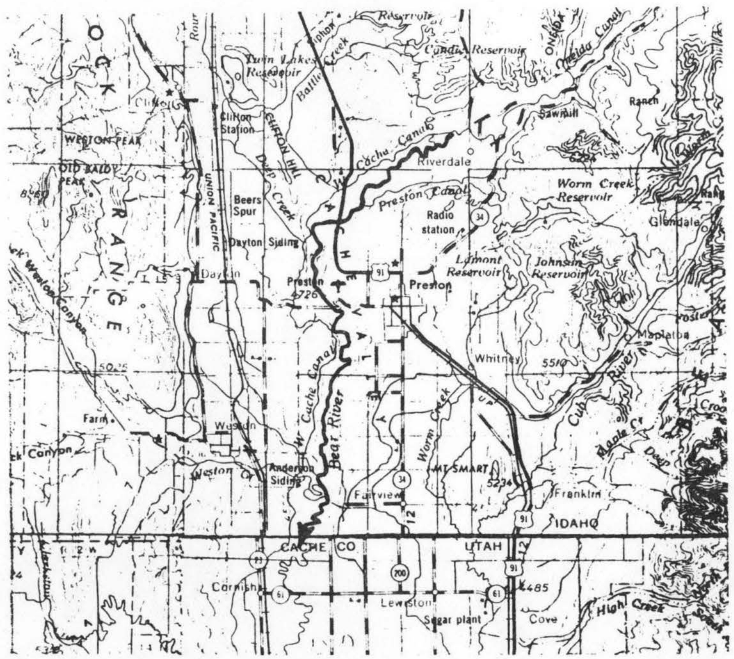
A.	UPSTREAM ELEVATION OF REACH	4523 FT. MSL
B.	DOWNSTREAM ELEVATION OF REACH	4432 FT. MSL
C.	TOTAL AVAILABLE HEAD IN REACH	91 FT.
D.	AVERAGE SLOPE IN REACH	4.8 FT./MI.
E.	DRAINAGE AREA ABOVE REACH MOUTH	4881 SQ.MI.
F.	INFLOW CLASSIFICATION	REGULATED

III REACH FLOW DURATION AND THEORETICAL POTENTIAL ENERGY CHARACTERISTICS

EXCEEDANCE PERCENTAGE	DISCHARGE CFS	THEORETICAL PLANT SIZE MW	ANNUAL ENERGY AVAILABLE GWH	PLANT FACTOR
95	153	1.18	10.13	0.98
80	332	2.56	20.71	0.92
50	572	4.41	31.25	0.81
30	816	6.29	37.84	0.69
10	1295	9.99	44.31	0.51

IV TYPICAL ANNUAL HYDROGRAPH





REACH HYDRO-POTENTIAL CHARACTERISTICS

REACH NUMBER 03250000C0000R0004

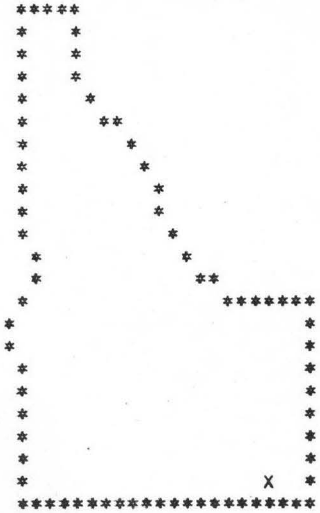
I LOCATION

A.	STATE	IDAHO
B.	COUNTY	FRANKLIN
C.	TOWNSHIP, RANGE	T14S R40E
D.	LATITUDE, LONGITUDE	42 12 111 45
E.	STREAM NAME	BEAR RIVER
F.	MAJOR BASIN NAME	BEAR RIVER
G.	RIVER MILE	119.3 TO 131.0

LOCATION MAPS

U.S. TOPO SERIES
1:250000
SCALE

MAP NAME
PRESTON



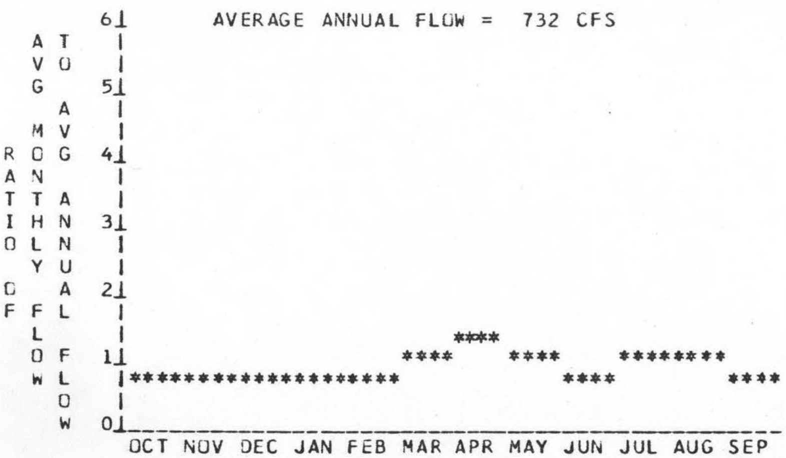
II HYDROLOGIC AND HYDRAULIC CHARACTERISTICS

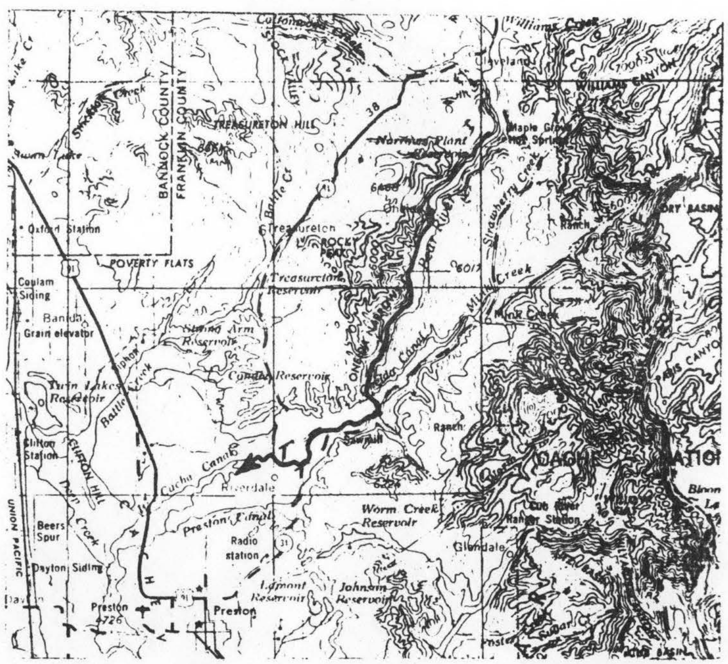
A.	UPSTREAM ELEVATION OF REACH	4728 FT. MSL
B.	DOWNSTREAM ELEVATION OF REACH	4523 FT. MSL
C.	TOTAL AVAILABLE HEAD IN REACH	205 FT.
D.	AVERAGE SLOPE IN REACH	17.5 FT./MI.
E.	DRAINAGE AREA ABOVE REACH MOUTH	4590 SQ.MI.
F.	INFLOW CLASSIFICATION	REGULATED

III REACH FLOW DURATION AND THEORETICAL POTENTIAL ENERGY CHARACTERISTICS

EXCEEDANCE PERCENTAGE	DISCHARGE CFS	THEORETICAL PLANT SIZE MW	ANNUAL ENERGY AVAILABLE GWH	PLANT FACTOR
95	230	4.00	34.51	C.99
80	360	6.25	51.82	C.95
50	680	11.81	83.47	C.81
30	899	15.62	96.81	C.71
10	1248	21.68	107.43	C.57

IV TYPICAL ANNUAL HYDROGRAPH





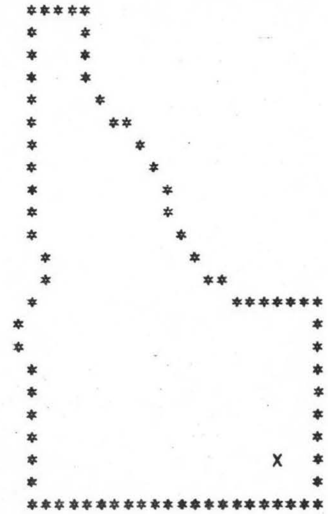
REACH HYDRO-POTENTIAL CHARACTERISTICS

REACH NUMBER 032500000C000R0009

LOCATION MAPS

U.S. TOPO SERIES
1:250000
SCALE

MAP NAME
PRESTON



I LOCATION

A.	STATE	IDAHO
B.	COUNTY	FRANKLIN, CARIBOU
C.	TOWNSHIP, RANGE	T11S R40E
D.	LATITUDE, LONGITUDE	42 26 111 45
E.	STREAM NAME	BEAR RIVER
F.	MAJOR BASIN NAME	BEAR RIVER
G.	RIVER MILE	135.4 TO 154.5

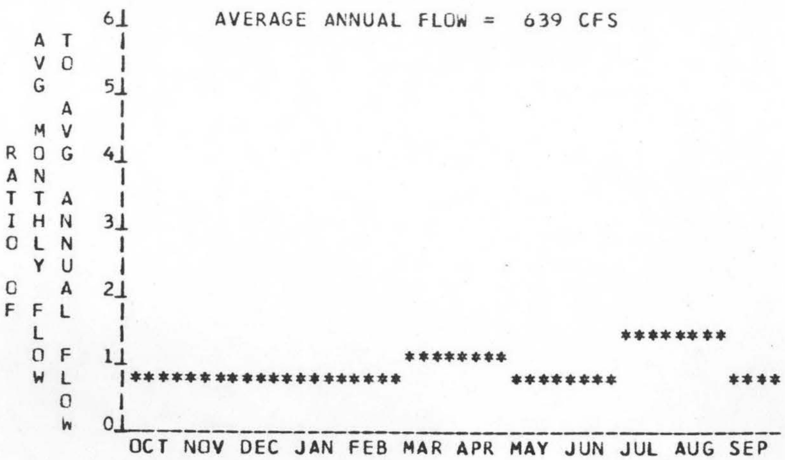
II HYDROLOGIC AND HYDRAULIC CHARACTERISTICS

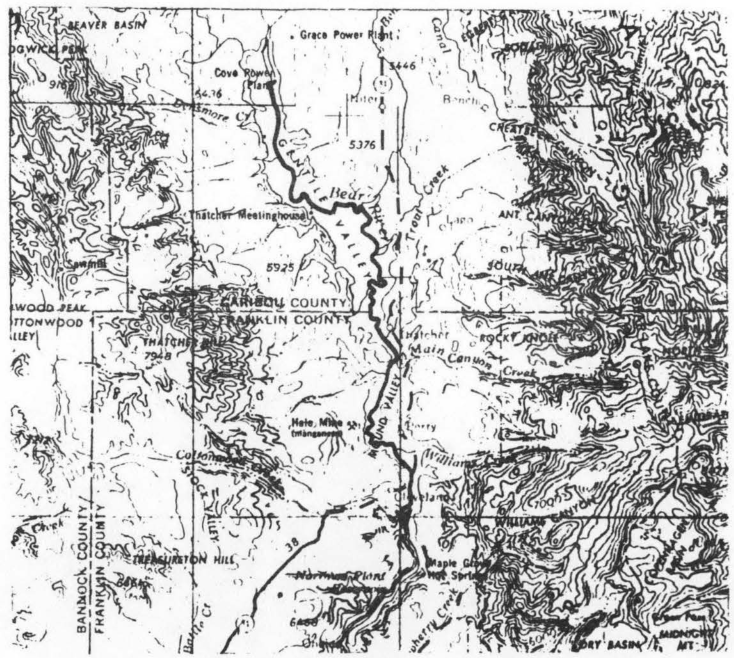
A.	UPSTREAM ELEVATION OF REACH	4940 FT. MSL
B.	DOWNSTREAM ELEVATION OF REACH	4887 FT. MSL
C.	TOTAL AVAILABLE HEAD IN REACH	53 FT.
D.	AVERAGE SLOPE IN REACH	2.8 FT./MI.
E.	DRAINAGE AREA ABOVE REACH MOUTH	4481 SQ.MI.
F.	INFLOW CLASSIFICATION	REGULATED

III REACH FLOW DURATION AND THEORETICAL POTENTIAL ENERGY CHARACTERISTICS

EXCEEDANCE PERCENTAGE	DISCHARGE CFS	THEORETICAL PLANT SIZE MW	ANNUAL ENERGY AVAILABLE GWH	PLANT FACTOR
95	85	0.38	3.26	0.98
80	218	0.98	7.84	0.91
50	548	2.46	16.28	0.76
30	860	3.86	21.19	C.63
10	1236	5.55	24.15	0.50

IV TYPICAL ANNUAL HYDROGRAPH





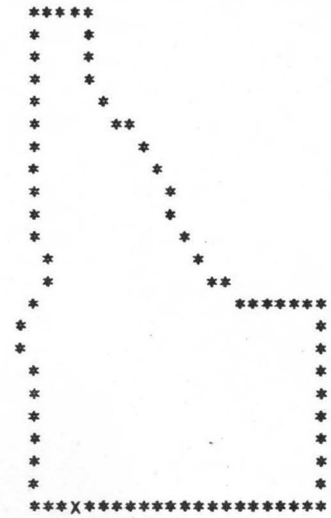
REACH HYDRO-POTENTIAL CHARACTERISTICS

REACH NUMBER 05500240200000R0013

LOCATION MAPS

U.S. TOPO SERIES
1:250000
SCALE

MAP NAME
MC DERMITT



I LOCATION

A.	STATE	NEVADA
B.	COUNTY	ELKO
C.	TOWNSHIP, RANGE	T47N R52E
D.	LATITUDE, LONGITUDE	41 57 116 7
E.	STREAM NAME	OWYHEE RIVER
F.	MAJOR BASIN NAME	OWYHEE RIVER
G.	RIVER MILE	256.0 TO 263.4

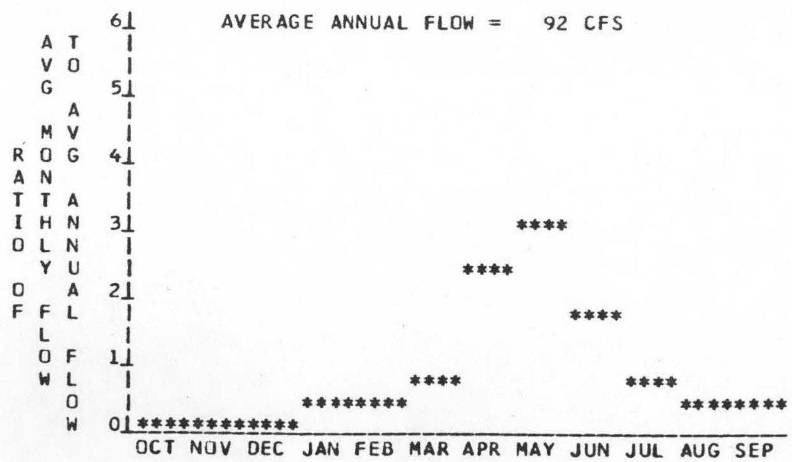
II HYDROLOGIC AND HYDRAULIC CHARACTERISTICS

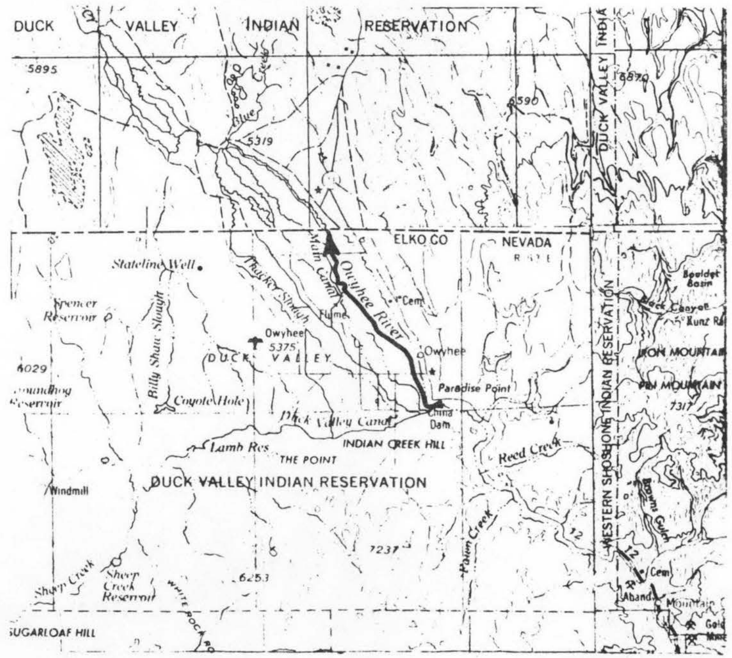
A.	UPSTREAM ELEVATION OF REACH	5428 FT. MSL
B.	DOWNSTREAM ELEVATION OF REACH	5326 FT. MSL
C.	TOTAL AVAILABLE HEAD IN REACH	102 FT.
D.	AVERAGE SLOPE IN REACH	13.8 FT./MI.
E.	DRAINAGE AREA ABOVE REACH MOUTH	483 SQ.MI.
F.	INFLOW CLASSIFICATION	REGULATED

III REACH FLOW DURATION AND THEORETICAL POTENTIAL ENERGY CHARACTERISTICS

EXCEEDANCE PERCENTAGE	DISCHARGE CFS	THEORETICAL PLANT SIZE MW	ANNUAL ENERGY AVAILABLE GWH	PLANT FACTOR
95	11	0.10	0.83	1.00
80	22	0.19	1.56	0.94
50	78	0.67	4.31	0.73
30	120	1.04	5.59	0.61
10	420	3.63	10.13	0.32

IV TYPICAL ANNUAL HYDROGRAPH





REACH HYDRO-POTENTIAL CHARACTERISTICS

REACH NUMBER 0650024000000OR0018

LOCATION MAPS

U.S. TOPO SERIES
1:250000
SCALE

MAP NAME
DRIGGS

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I LOCATION

A.	STATE	WYOMING
B.	COUNTY	TETON
C.	TOWNSHIP, RANGE	T45N R114W
D.	LATITUDE, LONGITUDE	43 51 110 33
E.	STREAM NAME	SNAKE RIVER
F.	MAJOR BASIN NAME	SNAKE RIVER
G.	RIVER MILE	996.2 TO 1001.3

II HYDROLOGIC AND HYDRAULIC CHARACTERISTICS

A.	UPSTREAM ELEVATION OF REACH	6738 FT. MSL
B.	DOWNSTREAM ELEVATION OF REACH	6717 FT. MSL
C.	TOTAL AVAILABLE HEAD IN REACH	21 FT.
D.	AVERAGE SLOPE IN REACH	4.1 FT./MI.
E.	DRAINAGE AREA ABOVE REACH MOUTH	814 SQ.MI.
F.	INFLOW CLASSIFICATION	REGULATED

III REACH FLOW DURATION AND THEORETICAL POTENTIAL ENERGY CHARACTERISTICS

EXCEEDANCE PERCENTAGE	DISCHARGE CFS	THEORETICAL PLANT SIZE MW	ANNUAL ENERGY AVAILABLE GWH	PLANT FACTOR
95	12	0.02	0.18	0.98
80	182	0.32	2.50	0.88
50	503	0.90	5.76	0.73
30	2405	4.28	17.62	0.47
10	3710	6.60	21.69	0.37

IV TYPICAL ANNUAL HYDROGRAPH

```
          6I       AVERAGE ANNUAL FLOW = 1445 CFS
   A T     I
   V O     I
   G      5I
     A     I
   M V     I
R  O G    4I
A  N       I
T  T A     I
I  H N    3I                                       ****
O  L N     I                                          ****
   Y U     I
O    A    2I                                    ****
F  F L     I
   L       I                                             ****
   O F    1I
   W L     I                               ****
     O     I                            ****
     W    0I************************
            OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
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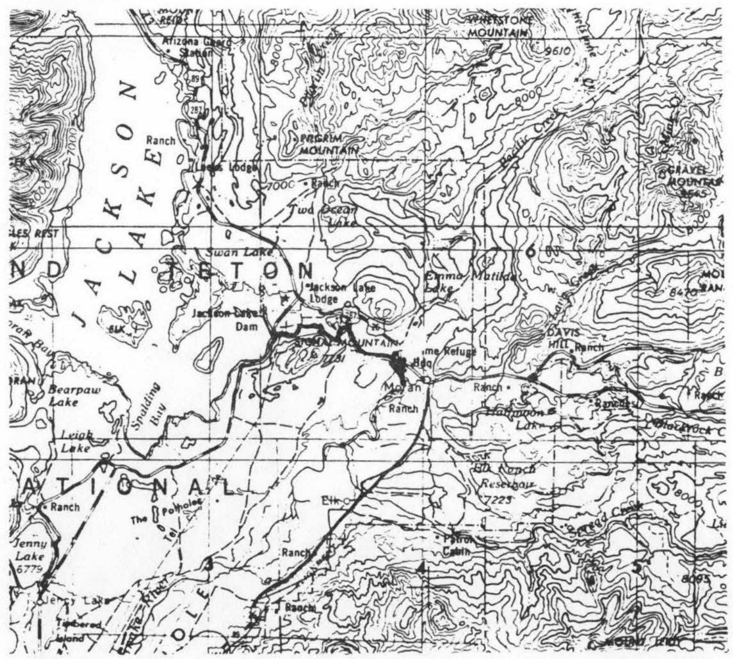


APPENDIX IV

MONTANA

SAMPLE
REACH DATA TABLES

REPORT VOLUME CONTENTS

TABLE OF CONTENTS
APPENDIX I
MONTANA

TABLE I

MONTANA REACH INDEX

	STREAM DESCRIPTION	REACH NUMBER	PAGE
I	Clark Fork River (Main Stem)	04 - 500 - 480 - 350 - 000 - R0001 thru R0030	M1 - M30
	A. Silver Bow Creek	04 - 500 - 480 - 350 - 110 - R0001 thru R0002	M31 - M32
	B. Little Blackfoot River	04 - 500 - 480 - 350 - 140 - R0001 thru R0002	M33 - M34
	C. Flint Creek	04 - 500 - 480 - 350 - 180 - R0001 thru R0003	M35 - M37
	D. Rock Creek	04 - 500 - 480 - 350 - 200 - R0001 thru R0006	M38 - M43
	E. Ninemile Creek	04 - 500 - 480 - 350 - 280 - R0001	M44
	F. Fish Creek	04 - 500 - 480 - 350 - 320 - R0001 thru R0003	M45 - M47
	G. Trout Creek	04 - 500 - 480 - 350 - 360 - R0001	M48
	H. Cedar Creek	04 - 500 - 480 - 350 - 380 - R0001	M49
	I. St. Regis River	04 - 500 - 480 - 350 - 420 - R0001 thru R0002	M50 - M51
	J. Thompson River	04 - 500 - 480 - 350 - 520 - R0001 thru R0004	M52 - M55
	K. Prospect Creek	04 - 500 - 480 - 350 - 560 - R0001	M56
	L. Beaver Creek	04 - 500 - 480 - 350 - 600 - R0001	M57

TABLE I
MONTANA REACH INDEX

	STREAM DESCRIPTION	REACH NUMBER	PAGE
	M. Vermilion River	04 - 500 - 480 - 350 - 620 - R0001	M58
	N. Bull River	04 - 500 - 480 - 350 - 740 - R0001	M59
	O. Blackfoot River and tributaries	04 - 500 - 480 - 350 - 220 - R0001 thru R0014	M60 - M73
	P. Bitterroot River and tributaries	04 - 500 - 480 - 350 - 260 - R0001 thru R0025	M74 - M98
	Q. Flathead River and tributaries	04 - 500 - 480 - 350 - 440 - R0001 thru R0060	M99 - M158
II	Kootenai River (Main Stem)	04 - 500 - 500 - 000 - 000 - R0001 thru R0008	M159 - M166
	A. Tobacco River	04 - 500 - 500 - 280 - 000 - R0001 thru R0002	M167 - M168
	B. Big Creek	04 - 500 - 500 - 320 - 000 - R0001	M169
	C. Fisher River	04 - 500 - 500 - 340 - 000 - R0001 thru R0005	M170 - M174
	D. Libby Creek	04 - 500 - 500 - 360 - 000 - R0001	M175
	E. Pipe Creek	04 - 500 - 500 - 400 - 000 - R0001	M176

TABLE I

MONTANA REACH INDEX

TABLE II

FEASIBILITY, TRANSMISSION AND LOAD RESTRAINTS

MONTANA

REACH IDENTIFICATION NUMBER	FEASIBILITY RESTRAINT				TRANSMISSION AND LOAD CONSIDERATIONS			
	LAND USE RESTRICTIONS	UTILITY DISPLACEMENT	BUILDING DISPLACEMENT	SPECIAL FISH PROBLEMS	DISTANCE TO NEAREST LINE Miles	LINE CAPACITY KVA	LOCAL MARKET	DISTANCE* TO CITY >1000 Miles
04500480350-			CLARK	FORK	RIVER -	MAIN	STEM	
000R0001		X			1	100(MPC)	1,2,3	10
000R0002		X			2	100(MPC)	1,2	7
000R0003		X	X		<1	100(MPC)	1	3
000R0004		X	X		2	100(MPC)	1,2	11
000R0005		X			<1	100(MPC)	1	17
000R0006		X	X		<1	161(MPC)	1	27
000R0007		X			<1	161(MPC)	1,3	22
000R0008		X			<1	230(BPA)	1	9
000R0009		X	X		<1	230(BPA)	1	5
000R0010		X	X		<1	100(MPC)	1,2,3	1
000R0011		X	X		<1	100(MPC)	1	10
000R0012		X			<1	100(MPC)	1	18
000R0013		X			<1	100(MPC)	1	25
000R0014		X			<1	100(MPC)	1,2	16
000R0015		X			<1	100(MPC)	1	13
000R0016		X			<1	100(MPC)	1	9
000R0017		X	X		<1	100(MPC)	1,2	4
000R0018		X			<1	100(MPC)	1	2
000R0019		X			<1	100(MPC)	1,2	7
000R0020		X			7	100(MPC)	1	10
000R0021		X			8	100(MPC)	1	9
000R0022		X			5	500(BPA)	1,2	5

MPC = Montana Power Company BPA = Bonneville Power Administration

* Distance in air miles to nearest city with population greater than 1000

TABLE II

FEASIBILITY, TRANSMISSION AND LOAD RESTRAINTS

MONTANA

REACH IDENTIFICATION NUMBER	FEASIBILITY RESTRAINT				TRANSMISSION AND LOAD CONSIDERATIONS			
	LAND USE RESTRICTIONS	UTILITY DISPLACEMENT	BUILDING DISPLACEMENT	SPECIAL FISH PROBLEMS	DISTANCE TO NEAREST LINE Miles	LINE CAPACITY KVA	LOCAL MARKET	DISTANCE TO CITY >1000 Miles
04500480350-			CLARK	FORK	RIVER -	MAIN	STEM	(cont)
000R0023		x			3	500(BPA)	1	2
000R0024		x			<1	500(BPA)	1	7
000R0025		x			<1	230(BPA)	1	12
000R0026		x			<1	230(BPA)	1,2,3	4
000R0027		x			<1	230(BPA)	1	5
000R0028		x			2	230(BPA)	1	13
000R0029					<1	230(WWP)	1	24
000R0030					2	230(BPA)	1	28
04500480350-			SILVER	BOW	CREEK			
110R0001		x	x		<1	161(MPC)	1,2,3	9
110R0002		x			<1	100(MPC)	1	8
04500480350-			LITTLE	BLACKFOOT	RIVER			
140R0001		x	x		<1	100(MPC)	1	18
140R0002		x	x		6	100(MPC)	1	13
04500480350-				FLINT	CREEK			
180R0001		x	x		<1	100(MPC)	1	4

BPA = Bonneville Power Administration WWP = Washington Water Power Co.

MPC = Montana Power Company

REACH HYDRO POTENTIAL CHARACTERISTICS

REACH # 04-500-480-350-000-R0001

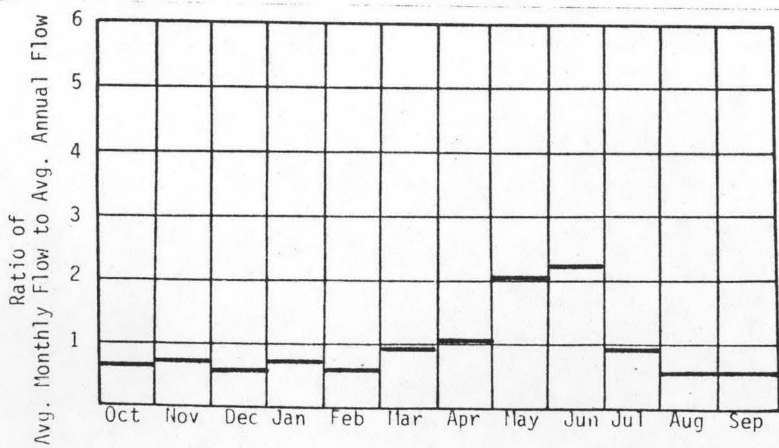
I. LOCATION
- A. State — Montana
- B. County — Deer Lodge
- C. Township, Range — T5N, R9W
- D. Latitude, Longitude — 46°11', 112°46'
- E. Stream Name — Clark Fork River
- F. Major Basin Name — Clark Fork
- G. River Mile — 293.5 to 299.0

II. HYDROLOGIC AND HYDRAULIC CHARACTERISTICS
- A. Upstream Elevation of Reach — 4850 Ft. MSL
- B. Downstream Elevation of Reach — 4730 Ft. MSL
- C. Total Available Head in Reach — 120 Ft.
- D. Average Slope in Reach — 21.8 Ft./Mi.
- E. Drainage Area above Reach Mouth — 734 Sq.Mi.
- F. Inflow Classification — Partially Regulated

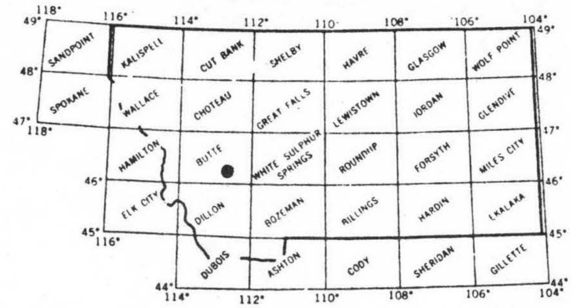
III. REACH FLOW DURATION AND THEORETICAL POTENTIAL ENERGY CHARACTERISTICS

Exceedance Percentage	Discharge CFS	Theoretical Plant Size MW	Annual Energy Available GWH	Plant Factor
95	68	.69	6.06	1.00
80	90	.92	7.82	.97
50	163	1.66	11.92	.82
30	256	2.60	15.26	.67
10	680	6.92	21.20	.35

IV. TYPICAL ANNUAL HYDROGRAPH AVERAGE ANNUAL FLOW = 259 CFS



LOCATIONS FOR USGS
1:250,000 MAP SERIES



REACH HYDRO POTENTIAL CHARACTERISTICS

REACH # 04-500-480-350-000-R0002

I. LOCATION

A.	State	Montana
B.	County	Powell
C.	Township, Range	T6N, R9W
D.	Latitude, Longitude	46°18', 112°44'
E.	Stream Name	Clark Fork River
F.	Major Basin Name	Clark Fork
G.	River Mile	279.8 to 293.5

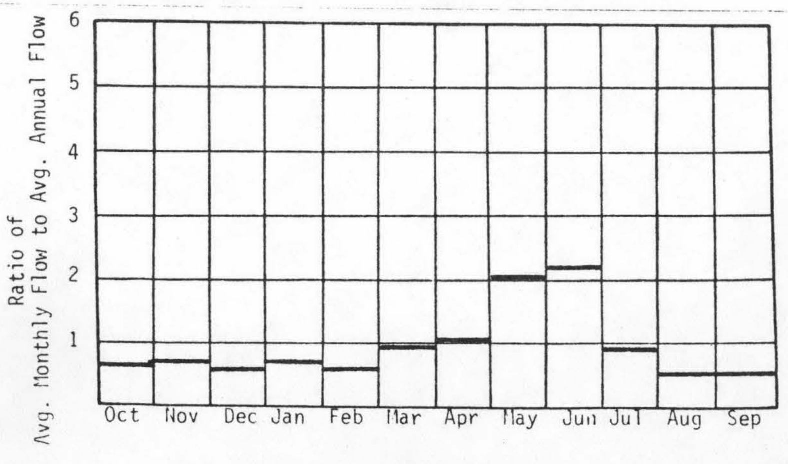
II. HYDROLOGIC AND HYDRAULIC CHARACTERISTICS

A.	Upstream Elevation of Reach	4730	Ft. MSL
B.	Downstream Elevation of Reach	4520	Ft. MSL
C.	Total Available Head in Reach	210	Ft.
D.	Average Slope in Reach	15.3	Ft./Mi.
E.	Drainage Area above Reach Mouth	945	Sq.Mi.
F.	Inflow Classification	Partially Regulated	

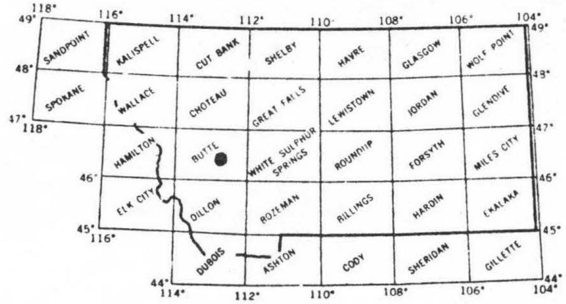
III. REACH FLOW DURATION AND THEORETICAL POTENTIAL ENERGY CHARACTERISTICS

Exceedance Percentage	Discharge CFS	Theoretical Plant Size MW	Annual Energy Available GWH	Plant Factor
95	102	1.81	15.87	1.00
80	135	2.41	20.47	.97
50	244	4.35	31.23	.82
30	383	6.81	39.98	.67
10	1018	18.12	55.55	.35

IV. TYPICAL ANNUAL HYDROGRAPH AVERAGE ANNUAL FLOW = 384 CFS



LOCATIONS FOR USGS 1:250,000 MAP SERIES



REACH HYDRO POTENTIAL CHARACTERISTICS

REACH # 04-500-480-350-000-R0003

I. LOCATION

A.	State	Montana
B.	County	Powell
C.	Township, Range	T8N, R9W
D.	Latitude, Longitude	46°27', 112°44'
E.	Stream Name	Clark Fork River
F.	Major Basin Name	Clark Fork
G.	River Mile	267.2 to 279.8

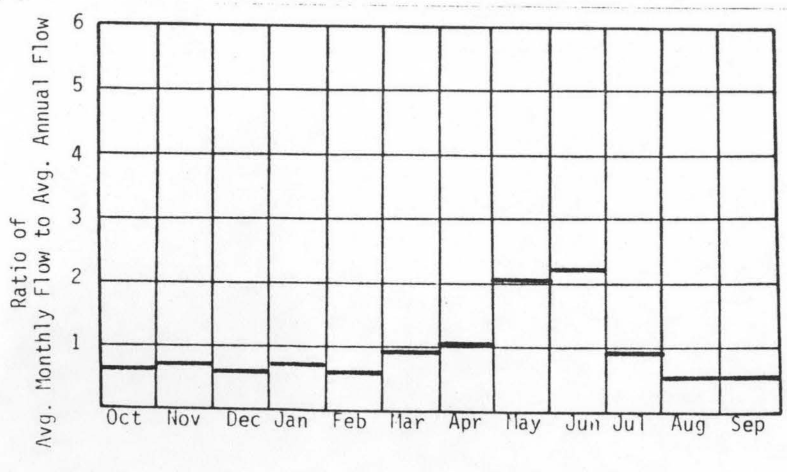
II. HYDROLOGIC AND HYDRAULIC CHARACTERISTICS

A.	Upstream Elevation of Reach	4520	Ft. MSL
B.	Downstream Elevation of Reach	4335	Ft. MSL
C.	Total Available Head in Reach	185	Ft.
D.	Average Slope in Reach	14.7	Ft./Mi.
E.	Drainage Area above Reach Mouth	1147	Sq.Mi.
F.	Inflow Classification	Partially Regulated	

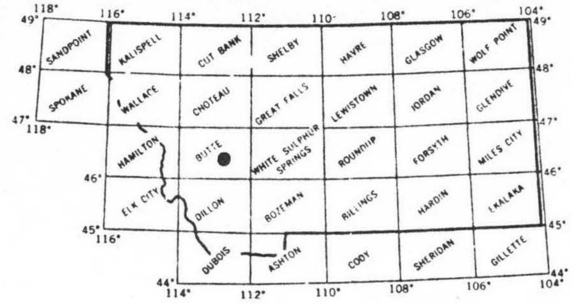
III. REACH FLOW DURATION AND THEORETICAL POTENTIAL ENERGY CHARACTERISTICS

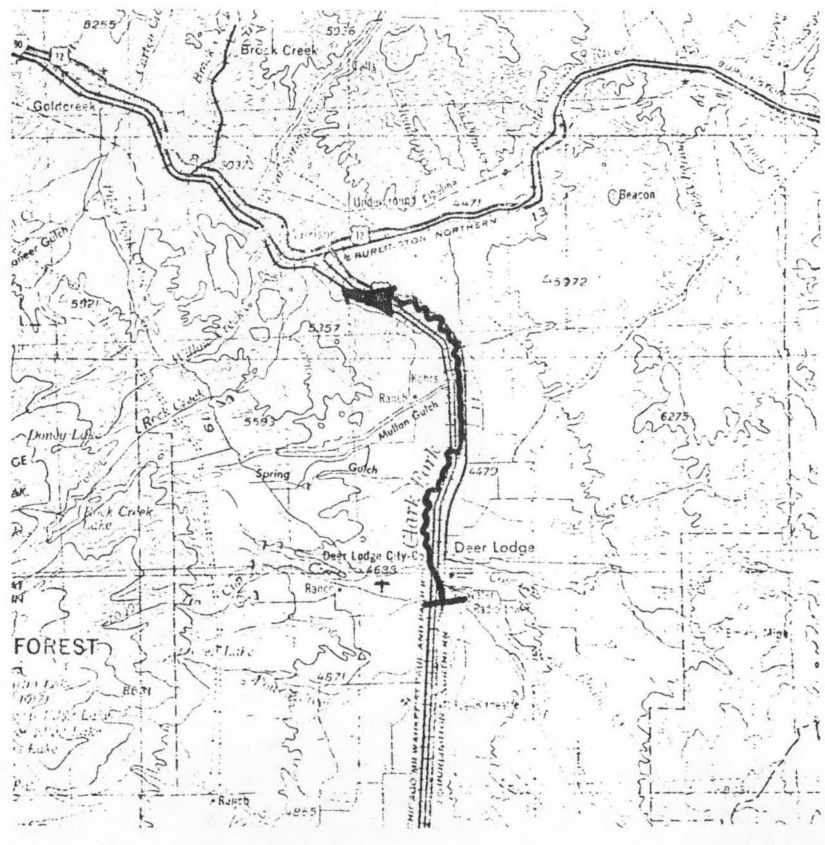
Exceedance Percentage	Discharge CFS	Theoretical Plant Size MW	Annual Energy Available GWH	Plant Factor
95	127	2.00	17.50	1.00
80	169	2.66	22.57	.97
50	306	4.79	34.43	.82
30	479	7.51	44.08	.67
10	1274	19.97	61.24	.35

IV. TYPICAL ANNUAL HYDROGRAPH AVERAGE ANNUAL FLOW = 478 CFS



LOCATIONS FOR USGS
1:250,000 MAP SERIES





REACH HYDRO POTENTIAL CHARACTERISTICS

REACH # 04-500-480-350-000-R0004

I. LOCATION

A. State	Montana
B. County	Powell
C. Township, Range	T9N, R10W
D. Latitude, Longitude	46°32', 112°50'
E. Stream Name	Clark Fork River
F. Major Basin Name	Clark Fork
G. River Mile	261.0 to 267.2

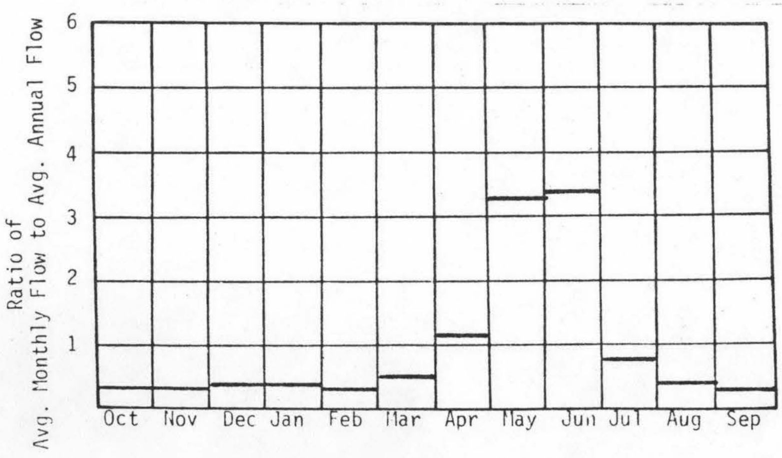
II. HYDROLOGIC AND HYDRAULIC CHARACTERISTICS

A. Upstream Elevation of Reach	4335	Ft. MSL
B. Downstream Elevation of Reach	4280	Ft. MSL
C. Total Available Head in Reach	55	Ft.
D. Average Slope in Reach	8.9	Ft./Mi.
E. Drainage Area above Reach Mouth	1689	Sq.Mi.
F. Inflow Classification	Partially Regulated	

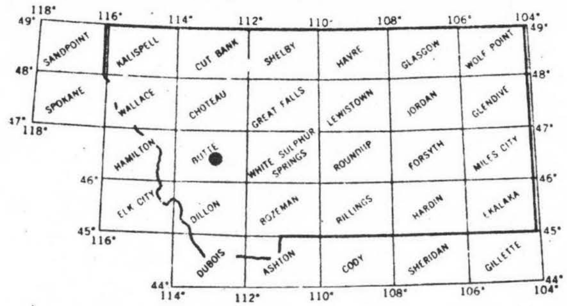
III. REACH FLOW DURATION AND THEORETICAL POTENTIAL ENERGY CHARACTERISTICS

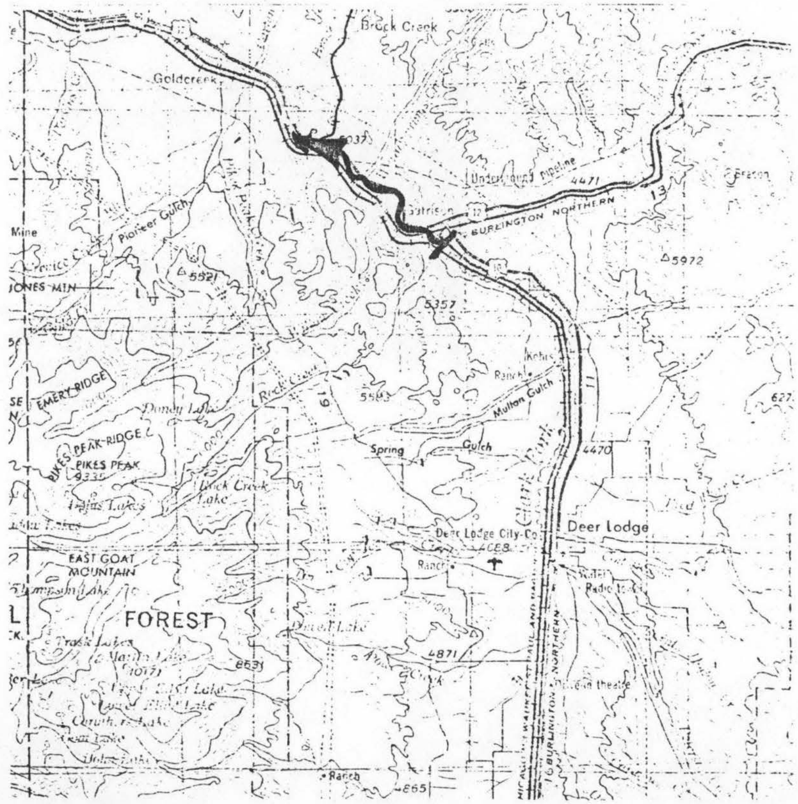
Exceedance Percentage	Discharge CFS	Theoretical Plant Size MW	Annual Energy Available GWH	Plant Factor
95	209	.97	8.53	1.00
80	256	1.19	10.23	.98
50	423	1.97	14.67	.85
30	668	3.11	18.28	.67
10	1740	8.11	25.58	.36

IV. TYPICAL ANNUAL HYDROGRAPH   AVERAGE ANNUAL FLOW = 650 CFS



LOCATIONS FOR USGS
1:250,000 MAP SERIES





REACH HYDRO POTENTIAL CHARACTERISTICS

REACH # 04-500-480-350-000-R0005

I. LOCATION

A.	State	Montana
B.	County	Powell
C.	Township, Range	T10N, R11W
D.	Latitude, Longitude	46°36', 112°57'
E.	Stream Name	Clark Fork River
F.	Major Basin Name	Clark Fork
G.	River Mile	252.0 to 261.0

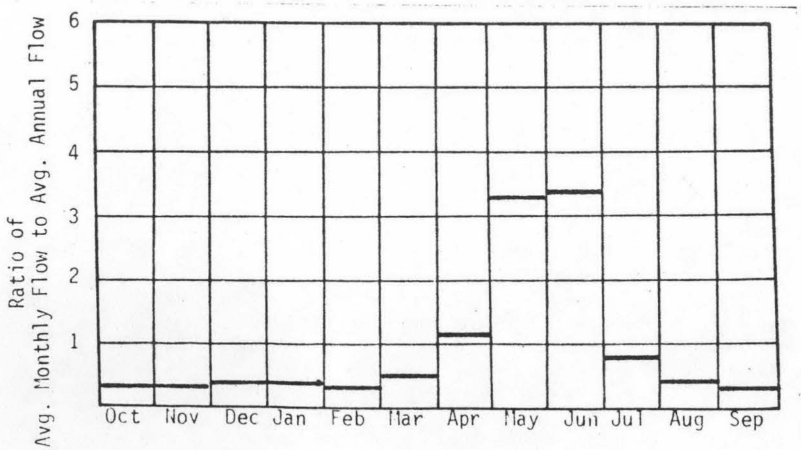
II. HYDROLOGIC AND HYDRAULIC CHARACTERISTICS

A.	Upstream Elevation of Reach	4280	Ft. MSL
B.	Downstream Elevation of Reach	4065	Ft. MSL
C.	Total Available Head in Reach	215	Ft.
D.	Average Slope in Reach	23.9	Ft./Mi.
E.	Drainage Area above Reach Mouth	1856	Sq.Mi.
F.	Inflow Classification	Partially Regulated	

III. REACH FLOW DURATION AND THEORETICAL POTENTIAL ENERGY CHARACTERISTICS

Exceedance Percentage	Discharge CFS	Theoretical Plant Size MW	Annual Energy Available GWH	Plant Factor
95	263	4.78	41.91	1.00
80	322	5.86	50.31	.98
50	532	9.69	72.13	.85
30	840	15.31	89.85	.67
10	2188	39.87	125.72	.36

IV. TYPICAL ANNUAL HYDROGRAPH AVERAGE ANNUAL FLOW = 814 CFS



LOCATIONS FOR USGS 1:250,000 MAP SERIES