1.0 REGIONAL ECONOMIC ANALYSIS

Introduction

Regional economic analysis is concerned with changes in the local economy that would be created by the Alternatives. Inflows or outflows of money to or from the local economy cause local business activity to change by a multiple of the original change. This process, known as the multiplier effect, occurs because an influx of funds is spent and re-spent in the local economy as expanding sectors hire labor and buy other inputs from local suppliers to create added output.

For example, consider an aluminum plant whose products are sold mainly to customers outside the region. The receipt of increased aluminum export sales dollars allows expansion of production and provides increased income to employees who respend some of their income in the region. The plant operation also requires many inputs and equipment which can often be purchased locally. These local purchases created by the plant=s increased exports cause local industry to expand to meet the new demand for inputs thus creating new jobs and sales in many other sectors. Conversely, if aluminum export sales decline, this multiplier process works in reverse and the total negative impact on the local economy is much greater than the initial loss of export sales.

The regional economic analysis examines how local and State economies would be affected by the proposed Alternatives. The baseline Alternative, A-1, depicts existing conditions. The other alternatives evaluated as part of this feasibility study are alternatives A-2a B maximum transport of juvenile salmon, A-2c B major system improvements, and A-3 B dam breaching. In many cases, only alternative A-3 (dam breaching) creates economic changes sufficiently large to warrant impact measurement. DREW study teams measure the direct economic effects associated with the proposed Alternatives for each industry and by affected resource type. The regional economic analysis is based on these DREW study team estimates.

1.1 Input-Output Methodology

The secondary economic effects are measured using an input-output model. Input-output is an accounting system that includes all the industries in a study region. The input-output accounts measure the interdependence among industries and workers in an economy. The greater the interdependence among industry sectors the larger the multiplier effect on the economy (and jobs) if a local industry makes sales to persons or firms outside the region or to government. The input-output technique is a model of sales flows among industries and government agencies that is based on historical purchase patterns for each industry and for consumers. The input-output model simultaneously considers the interdependent spending changes among industries in the region who provide goods as inputs (the indirect effects), and households in the region who provide labor and management services to directly and indirectly affected industries (the induced effects).

Sales to final demand is the portion of an industries= sales that is for export (from the defined study region), sales to government, or to create new physical investment. Sales to final demand are an important measure

because they are the driving force that supports the economy. Exports, sales to government, or sales for investment (i.e. new physical capital or addition to inventory) are the only sources of new spending for a regional economy. In this analysis, the primary changes in final demand sales are sales to Federal government and exports. Sales to final demand have a multiplier effect on the economic activity of a region because the expanding sector buys local labor and other inputs from local suppliers to create added output. Local suppliers must increase their purchases, spreading the expansion throughout the economy.

1.2 The Alternatives Create Secondary Economic Effects

Each Alternative has positive or negative changes in sales to final demand (including changes in government spending, changes in output of affected industries, and physical investments by private enterprise) which create indirect and induced changes in business sales, employment, and personal income in the study regions. These economic changes are shown by input-output multipliers that are applied to the change in sales to final demand to calculate the cumulative economic effects throughout the economy of a region. The secondary impacts for some industries are mainly local while other industries= impacts would occur at locations throughout the Pacific Northwest.

Economic changes created by the Alternatives can be Ashort run@ or Along run.@ Short run is used in this report to describe the effects of construction or other temporary spending that lasts for less than 10 years. In contrast, long run effects are permanent and continue for the 100 year period analyzed in this study.

1.2.1 Limitations of the Analysis

Regional economic effects are measured in this analysis using input-output models with industry spending coefficients estimated from national data (synthesized) rather than from local survey. Some valid criticisms have been directed at synthesized input-output as opposed to survey based input-output. First, the synthesized industry spending coefficients are based on a national industry spending calibration which may not apply to the specific region under study. However, an input-output model, unlike many other economic models, is constrained and consistent. The model is a double entry book keeping system of accounts so that total sales must equal total purchases in each sector and for the economy (including imports and exports from the study region). A 90-industry input-output model (as used in this study) is equivalent to a sales maximizing linear program with 90 constraint equations that limit the outcomes. These built-in constraints limit most input-output models= business sales multipliers (direct, indirect, and induced effects) to lie between 1.5 and 3.00 regardless of the underlying data source. Recent IMPLAN models, which use much more refined data than earlier models, are within plus or minus ten percent of the multipliers that would be found using survey data in place of national averages. This conclusion is based on experience with constructing about 30 direct survey input-output models. Furthermore, IMPLAN contains known sources of error which have been adjusted (DREW Regional Impact Study Team (1999)).

A limitation of input-output is that it is a picture of the economy at a point in time (based on historical ratios) rather than a dynamic structure of changing relationships. When prices or costs change in response to public policy changes, consumers and producers respond by substituting among final goods, substituting among inputs to production, migrating among regions, and shutting down businesses that are no longer

profitable. To evaluate these sorts of changes, economists must first use supply and demand models to estimate the direct effects that are then used to drive the input-output model. When supply and demand models are unavailable, accurate projections may be impossible.

1.2.2 Measures of Economic Change

Three economic measures are important for each input-output model, i.e., each State, region or subregion. Total business sales by sector is the estimated gross receipts (except for the trade sectors where it is the margin or value added by the trade sector). Business sales are the driving force for an economy. The second measure is estimated employment by sector. Jobs are usually viewed as the single most important outcome of increased business sales and the greatest concern when economic growth falters. The third measure is personal income. Personal income (household sales in the input-output tables) is wages, salaries, social insurance, and profit
received by individuals.

1.3 Geographic Definitions of the Study Regions

Eight input-output models were constructed to analyze possible changes in sales to final demand created by the Alternatives. The models include: State of Washington, State of Oregon, State of Idaho, State of Montana, the Upriver Subregion, the Reservoir Subregion, the Downriver Subregion, and the Lower Snake River Region which is the Upriver, Reservoir, and Downriver Subregions combined. The counties that comprise the three Lower Snake River Subregions are identified in Table 1.

Table 1
REGIONAL ECONOMIC ANALYSIS STUDY AREA BY STATE AND COUNTY

- - - - - - - - - Lower Snake River Region - - - - - - - - - -

Downriver Subregion	Reservoir Subregion	Upriver Subregion
Oregon	**Washington**	**Idaho**
Gilliam	Adams	Clearwater
Hood River	Asotin	Custer
Morrow	Columbia	Idaho
Sherman	Garfield	Latah
Umatilla	Walla Walla	Lemhi
Wasco	Whitman	Lewis
		Nez Perce
Washington		Valley
Benton		
Franklin		**Oregon**
Klickitat		Wallowa
Skamania		

The subregion models are applied to cases where impacts are localized. For example, Alternative A-3 (breaching) would reduce irrigated agriculture only in the Reservoir Subregion and that would create negative economic effects on the Reservoir and Downriver Subregions. Conversely, electric rate increases caused by Alternative A-3 would impact several States. The multiplier effects tend to be smaller for the Subregions than for States because the subregions have a greater dependence on imported goods. Thus, using a State model to analyze local impacts would obscure the location of the impact and overstate the impact.

The geographic definition of the subregion models separated the lower Snake River into three components. The Downriver Subregion defines a region that would be the terminus of barge transport under Alternative A-3 (breaching). The Reservoir Subregion defines a region in eastern Washington that would lose barge transport and gain free-flowing river recreation under Alternative A-3 (breaching). The Upriver Subregion defines a region in central Idaho and NE Oregon that would lose barge transport and gain free-flowing river recreation and increased fishing opportunities under Alternative A-3 (breaching).

1.4 Potential Business Failures with Breaching

Increases in costs for electric power and transportation, decreases in the availability of irrigated farm output, and removal of the reservoirs and locks could cause significant cost increases for energy and transport intensive industries or in industries requiring reservoirs or inputs from agriculture. In some cases, cost increases could be large enough to cause affected plants or firms to shut down or to relocate to another region. Substantial proprietary information about each firm or plant, such as the cost and profit structure, would be required to allow prediction of those businesses that would close or relocate. It would also be necessary to forecast market prices for the potentially affected products into the future. These types of information are not publicly available and, therefore, it was not possible to analyze potential plant closings.

Industries that might have business failures under the breaching alternative include: water transport services (barge marine cargo, cruise ships, and marinas, requiring reservoirs and locks), primary aluminum manufacturing (electricity-intensive), paper manufacturing (transport-intensive), grain production (transport-intensive), and food processing (dependent on fruit and vegetable inputs from irrigated agriculture).

Table 2 shows the amount of direct employment in industries with potential business failures with breaching by Subregion or State. Primary aluminum production is located in the Downriver Subregion and throughout the Pacific Northwest. Breaching would cause power costs to rise for aluminum plants in Washington, Oregon, and Idaho. Food processing impacted by breaching is in the Downriver and Reservoir Subregions. Paper manufacturing that would be most affected by breaching is in the Upriver Subregion. Grain farms located in the Upriver Subregion and the eastern part of the Reservoir Subregion would be most affected by breaching. Water transport impacted by breaching, consisting of marinas, jet boats, cruise ships, and marine cargo, is mainly in the Upriver Subregion.

The estimated direct employment shown in Table 2 excludes the multiplier effect that would occur with business closures. For example, if one primary aluminum plant with 580 employees closed, aluminum

exports from the Downriver Subregion would fall by an estimated -$145.00 million (IMPLAN). However, the estimated direct, indirect, and induced effects on jobs in the Downriver Subregion would total -1,400 jobs. The direct employment loss of -580 jobs would be in the aluminum plant while the secondary effect on employment would create employment losses of -820 jobs distributed across many sectors of the economy.

Table 2
ESTIMATED DIRECT EMPLOYMENT IN INDUSTRIES THAT HAVE POTENTIAL BUSINESS FAILURES WITH DAM BREACHING, 1994

Geographic Area	Primary Aluminum Mfg.	Food Processing (can/freeze)	Paper Mfg.	Grain Farms	Water Transport
Upriver Subregion	0	0	1,778	1,646	134
Reservoir Subregion	0	1,917	545	3,488	24
Downriver Subregion	1,159	5,388	100	6,180	27
TOTAL, LOWER SNAKE RIVER REGION	1,159	7,305	2,423	11,314	185
State of Washington	5,300	21,705	11,579	10,893	9,495
State of Oregon	930	13,265	5,234	7,828	2,195
State of Idaho	30	9,275	1,780	8,668	300

SOURCE: IMPLAN, 1994.

1.5 Economic Impacts by Resource Category

This section shows the direct, indirect, and induced regional economic effects of the proposed Alternatives by resource category. Employment changes projected by the 1994 IMPLAN model were divided by 1.07 to adjust for inflation when using final demand changes of the Alternatives that were in 1998 dollars. The IMPLAN model projects employment on the basis of jobs per dollar of sales in 1994. Thus, without this adjustment, inflation would cause projected changes in jobs to be overstated. All impacts are shown in 1998 dollars.

1.5.1 Electric Power Effects

1.5.1.1 Economic Effects of Potential Rate Increases

Alternative A-3 (breaching) would terminate hydroelectric generation at the four Corps dams on the lower Snake River leading to a need for replacement power generation. The capital costs for constructing the new power plants and the increased operating costs for these plants would lead to increased electricity bills to ratepayers.

The geographic regions and distribution of increases in electric bills might be determined by Federal legislation and cannot be known in advance. The method of collecting the increased electric bill is also unknown. If the increased electric bill was paid by electric rate increases, that would cause customer substitution out of electricity and increase the demand for natural gas, propane, fuel oil, and insulation. Over time, more efficient household, commercial, and industrial electric appliances, machines, and processes would be substituted for electricity use. The long run demand for electricity has been shown to be sensitive to price increases. As a result, increasing the price per kWh consumed would reduce the amount of electricity that needed to be produced and increase the demand for substitute products. However, if the increased electric bill was paid by an increased fixed monthly charge, the substitution effects would be minimal because few customers would be willing to give up their electricity connection (except for those firms and farms that shut down or leave the region).

Electric bill increases would reduce net income for industries and reduce disposable income for households in the region.[1] The extent to which business firms would leave the region or reduce output and employment in reaction to reduced net income is unknown. Some industries may be able to pass part of the increased electric bill on to their customers while others, such as agriculture, cannot do this because of intense national or global competition. Increased electric bills paid by residential consumers, farmers, and business owners would reduce their disposable income, leading to reduced consumer spending for other goods and services.

The economic impact of increased electricity bills on the aluminum sector is unknown because information is not available to predict the effects of increased operating costs on production and employment. However, the aluminum processing sector could be severely impacted. Based on their share of current electricity use, aluminum plants in Washington would have an increase in their annual electricity bill of $26.00 million, while plants in Oregon would have an increase of $12.88 million, and plants in Montana would have an increase of $4.58 million (see Table 3).

1.5.1.2 Impacts on Residential and Farm Incomes Under Alternative A-3 (Breaching)

Increased electric bills to residential and farm irrigation customers are assumed to be paid by households and create a reduction in disposable income to households. The cost to individual households would rise by one to six dollars depending on how many ratepayers were subject to the rate increase. The direct, indirect, and induced economic effects of reduced household income in the States of Washington, Oregon, Idaho, and Montana are estimated using input-output models for these four States. Alternative A-3 (breaching) is the only alternative that would create a significant change in household electricity bills. Table 3 shows the projected increase of electricity bills for residential and farm irrigation customers based on

[1] It is assumed that increased rates paid on electricity consumed by the Federal government would be borne by taxpayers throughout the U.S. so that impacts in the Pacific Northwest would be minimal (DREW Hydropower Impact Study Team (1999)).

current consumption patterns (DREW Hydropower Impact Study Team (1999)).

Increased electric power bills paid by residential and farm households would cause household personal income to fall by -$57.32 million in Washington. Using the Washington input-output multipliers; business sales in the State would fall by -$134.56 million, Washington employment would fall by -743 jobs, and personal income would fall by an added -$21.06 million (personal income down -$78.39 million throughout the State).

Increased electric power bills paid by households would cause household personal income to fall by -$32.00 million in Oregon. Using the Oregon input-output multipliers; business sales in the State would fall by -$80.52 million, Oregon employment would fall by -507 jobs, and personal income would fall by an added -$13.81 million (personal income down -$45.81 million throughout the State).

Increased electric power bills paid by households would cause household personal income to fall by -$16.32 million in Idaho. Using the Idaho input-output multipliers; business sales in the State would fall by -$37.10 million, Idaho employment would fall by -248 jobs, and personal income would fall by an added -$5.90 million (personal income down -$22.22 million throughout the State).

Increased electric power bills paid by households would cause household personal income to fall by -$2.50 million in Montana. Using the Montana input-output multipliers; business sales in the State would fall by -$5.26 million, Montana employment would fall by -36 jobs, and personal income would fall by an added -$0.61 million (personal income down -$3.11 million throughout the State.

Table 3
ANNUAL ELECTRICITY EXPENDITURE INCREASES CAUSED BY ALTERNATIVE A-3 (BREACHING) BY STATE AND SECTOR, 1998 (Million Dollars) [1/]

Sector	State							
	Wash.	Ore.	Idaho	Mont.	Cal.	Nev.	Wyom.	Total
Commercial	39.45	24.88	8.49	1.78	0.45	0.07	0.14	72.56
Industrial[2/]	35.24	22.35	12.44	5.10	0.22	1.08	0.27	76.70
Irrigation	3.39	1.74	4.06	0.12	0.18	0.01	0.01	9.51
Residential	53.94	30.26	12.26	2.38	0.71	0.82	0.41	100.78
Aluminum	26.00	12.88	0.00	4.58	0.00	0.00	0.00	43.46
Federal	2.67	0.00	0.00	0.00	0.00	0.00	0.00	2.67
Total	160.69	92.11	37.25	13.96	1.56	1.98	0.83	308.38

1/ Electricity spending increases are distributed to sectors based on the existing spending shares.
2/ Excluding aluminum which is shown in a separate row below.
SOURCE: DREW Hydropower Impact Study Team (1999).

1.5.1.3 Impacts on Local Owners of Commercial and Industrial Firms Under Alternative A-3 (Breaching)

Although the effects on the viability and operating levels of electricity-intensive firms and plants are unknown, the effect on the personal income of in-State owners of many small commercial and industrial firms can be estimated (primary aluminum is excluded because it is not a locally owned small business). Data in Table 3 show the projected increase of electricity bills for commercial and industrial firms. Based on unpublished payroll data, a rough estimate of in-State ownership for commercial and industrial firms is 50 percent and 30 percent respectively (precise estimates would require knowledge of electricity consumption by many individual firms and industries). Thus, the commercial row of Table 3 was multiplied times 0.5 and the industrial row times 0.3 to find the increased electricity bills paid by in-State owners if Alternative A-3 (breaching) was selected. These estimates of increased electricity bills to local owners of commercial and industrial establishments are treated as reductions of their spendable personal income.

Increased electric power bills paid for commercial and industrial use would cause household personal income to fall by -$30.30 million in Washington. Using the Washington input-output multipliers; business sales in the State would fall by -$71.13 million, Washington employment would fall by -393 jobs, and personal income would fall by an added -$11.13 million (personal income down -$41.43 million throughout the State).

Increased electric power bills paid for commercial and industrial use would cause household personal income to fall by -$19.15 million in Oregon. Using the Oregon input-output multipliers; business sales in

the State would fall by -$48.18 million, Oregon employment would fall by -303 jobs, and personal income would fall by an added -$8.26 million (personal income down -$27.41 million throughout the State).

Increased electric power bills paid for commercial and industrial use would cause household personal income to fall by -$7.79 million in Idaho. Using the Idaho input-output multipliers; business sales in the State would fall by -$17.71 million, Idaho employment would fall by -118 jobs, and personal income would fall by an added -$2.82 million (personal income down -$10.61 million throughout the State).

Increased electric power bills paid for commercial and industrial use would cause household personal income to fall by -$2.43 million in Montana. Using the Montana input-output multipliers; business sales in the State would fall by -$5.11 million, Montana employment would fall by -34 jobs, and personal income would fall by an added -$0.60 million (personal income down -$3.09 million throughout the State).

The impacts shown above are for the Amiddle@ estimate of the change in electric bills. The effects of the Alow@ estimate can be found by dividing the results shown above by 1.284. The effects of the Ahigh@ estimate can be found by multiplying the results shown above by 1.241 (DREW Hydropower Impact Study Team (1999)).

1.5.1.4 Reduced Sales, Employment and Personal Income for Hydroelectric Operation and Maintenance

Alternative A-3 results in shut down of hydroelectric generation at the four lower Snake River dams. Reduction or termination of operation and maintenance costs (the plants require security and preservation services after shut down) would create negative direct, indirect, and induced economic impacts on the region. These impacts are included in the Avoided Cost section of the report.

1.5.1.5 Direct, Indirect, and Induced Economic Effects of Power Plant Construction

It is assumed that six new power plants would be constructed to replace the lower Snake River dam power output. Two of the six plants are needed to support system reliability.

A total of three new combined-cycle plants would be constructed in the Downriver Subregion. The first two plants would be constructed in 2007 and go on line in 2008. The first two plants are expected to be constructed in Hermiston and Tri-Cities. It is estimated that a third plant would be built in 2008 in Tri-Cities. Three more plants would be constructed in the Puget Sound region. A fourth plant would be built in 2009, a fifth plant in 2010, and a sixth plant in 2016 (DREW Hydropower Impact Study Team (1999)).

Each 250 mw gas-fired combined-cycle steam electric plant was assumed to take one year to construct. The plant construction costs of ($601,000/MW)(250 MW) = $150.00 million are proposed to occur during the years 2007 (2 plants), 2008, 2009, 2010, and 2016 (DREW Hydropower Impact Study Team (1999)).

The Downriver Subregion utility construction multipliers are 2.2159, 0.00001987, and 0.6989 for sales,

employment, and personal income respectively. Thus, the business sales created by the one-year construction projects for each plant would be $332.40 million. The total one-year employment effect for each plant would be 2,786 jobs. The household sector would have an increase of $104.80 million in personal income.

It is assumed that these sales, employment, and personal income impacts would be doubled in the year 2007, in the Downriver Subregion, because two plants would be built simultaneously. A single plant would be built in the Downriver Subregion in 2008. The remaining three combined-cycle plants would be built somewhere in the Puget Sound area outside the Lower Snake River Subregion. Similar construction impacts can be expected in the Puget Sound area.

1.5.1.6 Direct, Indirect, and Induced Economic Effects of Power Plant Operation

According to BPA power system modeling, once new combined-cycle plants are constructed, they will operate at 90 percent of their design capacity. The operating costs of the new plants were estimated at $13.61/MWh. The annual operating cost of each combined-cycle plant is (250MW)(0.90)(8760 hours per year)($13.61/MWh) = $26.80 million per year. Thus, the six new plants will create operation spending of (6)($26.80 million) = $160.80 million per year. The increase in annual final demand purchases of the $160.80 million required to operate the six new power plants was split 21% to labor (households) and labor-intensive services, and 79% to the natural gas production, transmission, and distribution sector based on information on combined-cycle plants (DREW Hydropower Impact Study Team (1999)).

Annual spending increases in the Lower Snake River Subregion to operate the plants would be ($26.8 million)(2) = $53.60 million per year in 2008 and $80.40 million per year in 2009 and thereafter. Annual spending increases in the Puget Sound region would be $26.8 million per year in 2010, $53.60 million per year in 2011, and $80.40 million per year in 2017 and thereafter. Prior to the construction of the new gas-fired steam electric plants, the shortfall of power generated in the region would require electricity imports to the region. It is assumed that these temporary electricity imports do not create any measurable changes in spending or employment within the study region.

The Downriver Subregion is likely to be most impacted by the operation of the new combined-cycle power plants, however the Reservoir Subregion could also be impacted. Thus, the Lower Snake River Model was used to estimate impacts. The sales multiplier for labor is 2.3695, the employment multiplier is .00001597, and the personal income multiplier is 0.3692.

Labor and labor-intensive services, which make up 21 percent of total operating costs, for the first two plants receives ($26.80 million)(2)(.21) = $11.26 million. Thus, operation labor and labor-intensive services for the first two plants would create some $26.70 million of direct, indirect and induced spending per year in the region. Operation labor and labor-intensive maintenance services for the first two plants would create some 168 jobs in the region, starting in 2008. Operation labor and labor-intensive maintenance services for the first two plants would create some $4.16 million of personal income (direct, indirect, and induced) in the Downriver Subregion, starting in 2008. Adding the third plant would increase

the total impacts by 1.5 times to $40.05 million in sales, 252 jobs, and $6.24 million in personal income starting in 2009 and thereafter. The remaining three combined-cycle power plants would add to the impacts in a similar manner in the Puget Sound area in 2010, 2011 and 2017.

The major input to the combined-cycle generating plant is natural gas and that accounts for ($26.80 million)(2)(.79) = $42.34 million per year of purchases from the gas distribution sector for the first two combined-cycle generating plants. The multipliers for business sales, employment, and personal income are 1.584, 0.0000105194, and 0.2730 respectively. Thus, the total (direct, indirect, and induced) added business sales in the region created by the first two plant=s gas purchases would be $67.10 million per year. The added employment from gas purchases to operate the first two plants would be 416 jobs. The added personal income from gas purchases to operate the first two plants (direct, indirect, and induced) would be $11.56 million per year. Adding the third, equal sized, plant would increase the impacts by 1.5 times to $100.65 million in business sales, 624 jobs, and $17.34 million in personal income starting in the year 2009 and thereafter. The remaining three combined-cycle power plants would add to business sales, income, and employment in a similar manner in the Puget Sound area in 2010, 2011 and 2017.

1.5.1.7 Direct, Indirect, and Induced Economic Effects of Transmission Line Construction Under Alternative A-3 (Breaching)

A total construction expenditure to modify electricity transmission lines of $177.00 to $271.00 million would occur over a two year period during the breaching process. A new transmission line from Spokane to Tri-Cities accounts for $100.00 to $150.00 million of the expense. The remainder of the spending is for projects in the Downriver Subregion. It is assumed that the impacts all occur in the Downriver Subregion. The Downriver Subregion utility construction multipliers are 2.2159, 0.00001987, and 0.6989 for business sales, employment, and personal income respectively. The annual spending of $88.50 to $135.50 million to modify power lines results in $196.10 to $300.30 million in business sales, 1,643 to 2,516 jobs and $61.90 to $94.70 million of personal income.

1.5.1.8 Direct, Indirect, and Induced Economic Effects of New Transmission Line Operation and Maintenance

Spending to operate and maintain new electricity transmission lines of approximately $0.85 million is assumed to occur annually. It is assumed that the spending would occur somewhere in the Lower Snake River Region. The Lower Snake River Region electric utility multipliers are 1.9634, 0.00001052, and 0.4095 for business sales, employment, and personal income respectively. The $0.85 million spent to operate and maintain power lines would result in $1.67 million of business sales, 8 jobs and $0.35 million of personal income.

1.5.2 Changes in Sportfishing, Recreation, and Tourism Expenditures

Fishing trips and recreation and tourism trips by non-residents create new spending flows in the regions where the visit occurs. Thus, sportfishing, recreation, and tourism by non-residents are exports which stimulate the local economy. Alternative A-3 (breaching) has two effects which increase exports; (1) the total number of trips per year to the fishing and recreation sites increases, and (2) the share of trips made

by non-residents increases. Both effects tend to increase the level of fishing and recreation exports (DREW Recreation Impact Study Team (1999)).

Alternative A-3 (breaching) is expected to increase steelhead and salmon runs in all three subregions, and along the coastal areas of the Pacific Northwest (DREW Anadromous Fish Study Team (1999)). However, breaching reduces or eliminates some species of fish currently available on the four lower Snake River reservoirs and the allocation of salmon for sportfishing harvest after breaching is very small. The number of fishing trips made to these areas is expected to increase in response to the increased fishing opportunities. However, the increase in fishing trips is severely limited by the projected increases in non-protected fish.

Alternative A-3 (breaching) reinstates some 130 miles of free-flowing Snake River that is suitable for rafting, kayaking and other river-based activities. The Corps would construct campgrounds and other facilities as needed. Thus, the only potential constraint on water-based recreation would be congestion on the river. Expansion of recreation trips is expected to occur along the free-flowing Snake River in the Reservoir Subregion based on contingent behavior survey (DREW Recreation Impact Study Team (1999)). The contingent behavior surveys measured consumer intentions to visit the sportfishing and river recreation sites with and without Alternative A-3 (breaching).

Changes in spending on sportfishing and recreation trips with Alternative A-3 (breaching) are based on surveys of current sportfishing and recreation visitation for the Reservoir and Upriver Subregions, Corps visitation data, and the contingent behavior surveys of recreationist intentions (DREW Recreation Impact Study Team (1999)).

1.5.2.1 Sportfishing Impacts in the Upriver Subregion

The following table (Table 4) shows the sportfishing effects of breaching on business sales, employment, and personal income in central Idaho and northeast Oregon. The two A-2 alternatives would not create significant upstream fishing effects. The impacts shown are based on the increased fish availability with Alternative A-3 (breaching) projected by PATH and the DREW Anadromous Fish Study Team (1999).

Table 4
ANNUAL ECONOMIC EFFECTS OF FISHING IN THE UPRIVER SUBREGION FOR ALTERNATIVE A-3 (BREACHING)[1/2/]

Year	Increase in Business Sales, 1998 ($ Million per Year)	Increase in Jobs	Increase in Personal Income, 1998 ($ Million per Year)
0	6.15	92	1.73
5	4.40	66	1.24
10	28.74	432	8.10
15	20.98	312	5.85
20	24.57	369	6.92
25	25.70	386	7.24
30 to 100	26.74 to 28.43	402 to 427	7.56 to 8.01

1/ The increase in fishing trips is constrained by the supply of fish projected by PATH and the DREW Anadromous Fish Study Team (1999).
2/ A single point estimate of increased fish availability was provided by the DREW Anadromous Fish Study Team (1999).
SOURCE: DREW Recreation Impact Study Team (1999).

1.5.2.2 Sportfishing Impacts in the Reservoir Subregion

The following table (Table 5) shows the sportfishing effects of breaching on business sales, employment, and personal income in the Reservoir Subregion. The two A-2 alternatives did not create significant fishing effects. The impacts shown are based on PATH and the DREW Anadromous Fish Study Team (1999) projected fish availability. Fishing trips are constrained below both the DREW Recreation Workgroup contingent behavior "low" and "medium" forecasts of fishing demand by the limited availability of fish projected by PATH and the DREW Anadromous Fish Study Team (1999).

1.5.2.3 Recreation and Tourism Impacts in the Reservoir Subregion - Middle Forecast

The following table (Table 6) shows the recreation effects of breaching on business sales, employment, and personal income in the Reservoir Subregion. The two A-2 alternatives did not create significant recreation effects. The impacts shown are based on the DREW Recreation Workgroup contingent behavior Amiddle level@ forecast. Limitation of recreation facilities and river congestion do not affect the Amiddle@ forecast impact estimates.

Table 5
ANNUAL ECONOMIC EFFECTS OF FISHING IN THE RESERVOIR SUBREGION FOR ALTERNATIVE A-3 (BREACHING)[1/]

Year	Increase in Business Sales, 1998 ($ Million per Year)	Increase in Jobs	Increase in Personal Income, 1998 ($ Million per Year)
0	3.4	36	0.86
5	2.79	29	0.71
10	4.72	50	1.2
15	5.44	57	1.39
20	7.1	75	1.81
25	8.77	92	2.23
30 to 100	8.99 to 9.47	93 to 99	2.29 to 2.41

1/ Fishing trips are constrained below both the Amiddle@ and Alow@ DREW Recreation Impact Study Team (1999) contingent behavior forecasts of fishing demand due to the limited availability of fish projected by PATH and the DREW Anadromous Fish Study Team (1999).
SOURCE: DREW Recreation Impact Study Team (1999).

Table 6
ANNUAL ECONOMIC EFFECTS OF RIVER RECREATION IN THE RESERVOIR SUBREGION MIDDLE FORECAST FOR ALTERNATIVE A-3 (BREACHING)[1/]

Year	Increase in Business Sales, 1998 ($ Million per Year)	Increase in Jobs	Increase in Personal Income, 1998 ($ Million per Year)
0	35.95	456	9.65
5	49.84	631	13.37
10	73.14	927	19.63
20 to 100	77.28	980	20.74

1/ The Amiddle@ forecast is based on the DREW Recreation Impact Study Team (1999) contingent behavior survey for recreation visits with breaching.
SOURCE: DREW Recreation Impact Study Team (1999).

1.5.3 Economic Impacts in the Transportation Sector with Alternative A-3 (Breaching)

1.5.3.1 Impacts of New Construction for Rail Transport

New railroad hopper cars costing $14.00 to $26.85 million would be required. The place of construction is unknown. It was assumed that the rail car construction would occur outside the Pacific Northwest study region.

Construction of tidewater railroad track for car storage is projected to cost between $1.99 and $4.05 million. This construction is located near ocean ports. It was assumed that the rail car storage is located in Oregon. The IMPLAN new road construction sector for Oregon was used to model impacts of railroad construction. The road construction sector is also other heavy construction which includes railroad construction. The Oregon multipliers were 2.3809, 0.00002085, and 0.6072, for business sales, employment, and personal income, respectively. The range of effects of rail car storage construction in Oregon would be $ 4.74 to $9.64 million in business sales. The effect on employment would be 41 to 84 jobs. The effect on personal income would be $1.21 to $2.46 million. It is assumed that the rail car storage construction is completed within one year.

New mainline railroad track upgrades of $14.00 to $24.00 million would be required somewhere in the Lower Snake River Region. Short-line railroad upgrades are estimated at $19.90 to $23.80 million. Thus, total rail construction would be $33.90 to $47.80 million. The new road construction sector was used to model impacts of railroad construction. The IMPLAN road construction sector is also other heavy construction which includes railroad construction. Lower Snake River Region multipliers are 2.5584, 0.00002283, and 0.68325 for business sales, employment, and personal income. The range of effects of railroad track construction on business sales would be $86.73 to $122.29 million. The range of employment effects would be 723 to 1,020 jobs. The range of personal income effects would be $23.16 to $32.66 million. It is assumed that railroad track improvements would have to be completed rapidly (within a year) to meet the increased hopper car traffic.

1.5.3.2 Impacts of New Construction for Road Transport

Road construction costs of $84.10 to $100.70 million are one-time costs for intersection and road improvements in the Lower Snake River Region. These estimates are for Washington only. The IMPLAN new road construction sector for the Lower Snake River model again is used to estimates the impacts of road construction. The range of effects on business sales would be $215.16 to $257.63 million. The range of employment effects would be 1,794 to 2,149 jobs. The range of personal income effects would be $57.46 to $68.80 million. Road and intersection improvements would have to be completed rapidly (within a year) to accommodate the increased heavy truck traffic. Note: Road construction impacts outside Washington in central Idaho and northeast Oregon are unknown.

1.5.3.3 Impacts of New Construction for Transport-Related Facilities

Country grain elevators are estimated to have $14.00 to $16.90 million in new construction and river elevators are estimated to have $58.70 to 335.40 million in new construction. Total elevator construction

would be between $72.70 million and $352.30 million. The Lower Snake River Region new industrial buildings sector is used to model impacts of grain elevator construction. The multipliers are 2.7916, 0.000029297, and 0.9366 for business sales, employment, and personal income respectively. The range of effects on business sales would be $202.95 to $983.48 million. The range of effects on employment would be 1,991 to 9,646 jobs. The range of effects on personal income would be $6.75 to $329.96 million. (Note: the most likely impacts were set at 1.2 times the average impacts for transport related facilities by the DREW Transportation Impact Study Team (1999).) Grain elevator improvements would have to be completed rapidly (within a year) to accommodate the increased use of rail and truck in place of barge transport.

1.5.3.4 Impacts of Breaching on Industries Using or Replacing Barge Transport

The effects of increased transport cost for Alternative A-3 (breaching) in the Upriver and Reservoir Subregions are complex. On the one hand, the trucking/warehousing sector could decline because grains and other products currently trucked to the ports in Lewiston/Clarkston from locations in Idaho, Montana, and North Dakota are terminated. However, trucking to rail terminals and ports located near Tri-Cities might increase.

The effect on rail transport also is not clear cut. Rail transport is more labor-intensive than barge so that a shift of transport mode from barge to rail implies slightly increased transport employment in the Upriver and Reservoir Subregions. However, that simplistic outcome has an implicit assumption that demand for transport in unaffected by price which is unlikely to be valid.

When transport prices increase, because barge transport is not available, several reactions can occur. First, a Asubstitution effect@ can cause a search for alternate carriers or alternate routes to minimize the impact of increased transport costs. Lacking alternate carriers, routes for some products, may shift away from the west coast and the Upriver Subregion. Second, the Aoutput effect@ of increased transport costs can cause producers to reduce their outputs because they become less competitive on national and world markets when their cost of production increases. A third effect is the Astages of production@ effect. Export of raw materials is promoted by low cost transportation. Bulk materials are less likely to be shipped if cost per ton is increased. The decision is either to, (a) stop producing the bulk materials, or (b) increase the stages of production so that the materials shipped out have a higher value per ton. The latter option implies that more processed goods would be shipped out of the region and fewer bulk materials. Local value added (and employment) within the Upriver Subregion could rise. Total quantity shipped might fall and yet the total value shipped might rise if more processing of raw materials was conducted in the Upriver Subregion.

Given these possible long run adjustments to increased transport costs, it is unclear how much transport volume might fall over time if barging was eliminated. No studies exist to project the possible changes in shipping volume. Thus, it is impossible to model the direct, indirect, and induced effects in the industries using the transport sector or in the transport sector itself created by dam breaching. The price sensitivity of transport demand depends upon the impacts on and the unknown reactions by the sectors that utilize the transport services. The demand for transport depends upon the changes induced in the sectors utilizing

transport, but these sectors have not been studied.

1.5.3.5 Cruise Ship Effects of Alternative A-3 (Breaching)

Existing cruise ships cannot operate in the swift and shallow waters of a free-flowing Snake River. However, it is likely that some of the cruise ship employment and retail sales to passengers would shift to the Downriver Subregion if the Snake River was unavailable with breaching.

Direct non-payroll purchases by the cruise ship sector in the Upriver Subregion are estimated at $2.64 million per year (DREW Transportation Impact Study Team (1999)). Cruise ship companies purchase engine fuel, jet boat services, laundry services, water supplies, and docking. The largest purchases are for prepaid jet boat tours and fuel which account for about 46 and 45 percent of direct purchases. The multipliers for the mix of direct purchases made by cruise ship companies are 2.181 for business sales, 0.0000228 for employment, and 0.5240 for personal income. Similar calculations were carried out for the cruise ship payroll using household sales multipliers. Thus, the direct, indirect, and induced effects of Alternative A-3 (breaching) on the cruise ship sector in the Upriver Subregion include -$7.96 million in annual business sales, -76 lost jobs, and -$2.11 million lost personal income per year from direct purchases and payroll by cruise ship companies in the Upriver Subregion.[2]

About 21,315 passengers are estimated to travel to the Upriver Subregion by cruise ship (DREW Transportation Impact Study Team (1999)). The annual loss of retail sales to cruise ship passengers in the Upper Subregion might be about -$1.21 million. (Assuming that the average spending per passenger in Lewiston is $57, DREW Regional Impact Study Team (1999)). The IMPLAN multipliers for retail trade apply on the sales margin which is about 15 percent of actual retail sales. Lost retail sales then would reduce total business sales by -$0.43 million, employment by -7 jobs and personal income by -$0.14 million in the Upriver Subregion.

Total impacts include the effects of lost sales to cruise ship companies, lost cruise ship payroll, and lost retail sales to passengers. Total direct, indirect, and induced losses in the Upriver Subregion are estimated at -$8.39 million per year in business sales, -83 jobs and -$2.25 million per year in personal income.

1.5.4 Water Supply Effects of Alternative A-3 (Breaching)

1.5.4.1 Shut Down of Irrigation

Irrigated agricultural output near Ice Harbor Dam would decline with breaching. The lost production is in the Reservoir Subregion but reduced farm spending would also occur in the Downriver Subregion. Therefore, the Lower Snake River Region multipliers were used. The maximum direct value of production lost is estimated at -$75.87 million per year. This assumes that all 37,000 irrigated acres are shut down.

[2] The total impact estimate also includes the effects of direct cruise ship employment and payroll in the Upriver Subregion based on confidential reports (DREW Regional Impact Study Team (1999)).

The maximum loss of annual business sales (direct, indirect, and induced) was estimated at -$232.26 million with breaching (DREW Regional Impact Study Team (1999)). The maximum direct, indirect, and induced employment loss from reduction in irrigated lands was estimated to be -2,256 jobs. The maximum loss of personal income was estimated at -$79.19 million per year.

About 21 percent of the irrigated land might support the development of alternative water supplies to replace the lost irrigation water. If fruit orchards and vineyards production continued on 7,735 of the 37,000 acres, the direct value of production lost would be -$38.37 million (DREW Regional Impact Study Team (1999)). In that case, (direct, indirect, and induced) annual business sales would fall by -$119.43 million, jobs would decline by -901, and personal income would fall by -$42.07 million per year with breaching.

1.5.4.2 Pump Station Modifications

There are eight existing municipal and industrial pump stations along the lower Snake River, all located on the Lower Granite reservoir. Water withdrawn from these stations is used for municipal water system backup, golf course irrigation, industrial process water for paper production, concrete aggregate washing, and park irrigation. Under Alternative A-3 (breaching), the river elevation would fall to its natural level and these pumping stations would require modification to maintain current water supplies (DREW Water Supply Study Team (1999).

Modification of municipal and industrial pump stations was estimated to cost between $11.51 million and $55.20 million (DREW Water Supply Study Team (1999)). The wide range of costs reflects uncertainty about required modifications to the Potlatch Corporation system (DREW Water Supply Study Team (1999)). The direct, indirect, and induced economic effects for industrial pump station modification were estimated using the Upriver Subregion utility construction multiplier. These were assumed to be one-year impacts. A range of $25.14 to $120.56 million increase in total business sales would be created in the Upriver Subregion by construction to modify industrial pump stations and related facilities on Lower Granite Reservoir. Employment effects would range from an increase of 292 to 1,397 jobs in the Upriver Subregion. Total personal income effects would range from an increase of $7.73 to $37.10 million in the Upriver Subregion.

1.5.4.3 Construction Expenditures to Modify Private Wells

Approximately 209 functioning wells are presently located within one mile of the lower Snake River. About 95 of these wells are expected to required modification if dam breaching were to occur (DREW Water Supply Study Team (1999).

Construction spending in the Reservoir Subregion to modify private wells was estimated at $56.45 million (DREW Water Supply Study Team (1999)). About 22 percent of the wells were in the Downriver Subregion (Franklin County) and the rest were in the Reservoir Subregion. The impact of construction expenditures to modify private wells was estimated using the maintenance-and-repair-not-elsewhere-

classified sales multiplier. Well modification in the Reservoir Subregion would result in a $107.76 million increase in business sales. Employment in the Reservoir Subregion would increase by 916 jobs. Personal income in the Reservoir Subregion would increase by $29.52 million. These are assumed to be one-year impacts. Well modification in the Downriver Subregion would result in a $30.40 million increase in business sales. Employment in the Downriver Subregion would increase by 259 jobs. Personal income in the Downriver Subregion would increase by $8.33 million. These are assumed to be one-year impacts.

1.5.5 Implementation Expenditure Effects

Implementation of the selected alternative would require modifications to the operation and physical structure of the four lower Snake River dams, hydroelectric plants, and reservoirs. Implementation activities proposed under each alternative include new construction or destruction spending, and spending on mitigation.

The following three tables (Tables 7-9) summarize the implementation effects of breaching the four dams based on spreadsheets provided by the DREW Implementation Study Team (1999). Direct, indirect, and induced effects are shown for business sales, employment, and personal income by Alternative and over time.

Table 7
SHORT TERM ECONOMIC EFFECTS OF IMPLEMENTATION ON BUSINESS SALES, 1998 ($ Million per Year)[1/]

Year	Alternative A-2a	Alternative a-2c	Alternative A-3 (Breaching)
2001	-1.89	-1.48	11.03
2002	-7.36	-4.39	-8.92
2003	-4.63 or -6.94	11.72 or 9.41	22.95 or 20.63
2004	1.64 or -5.15	33.05 or 26.26	111.28 or 104.48
2005	0	28.41	202.27
2006	0	14.96	198.54
2007	0	0	169.37
2008	0	0	47.02
2009	0	0	24.71

1/ Two sets of baseline data definitions were used for the years 2003 and 2004 by the DREW Implementation Study Team (1999).

Table 8
SHORT TERM ECONOMIC EFFECTS OF IMPLEMENTATION ON EMPLOYMENT (Jobs)[1/]

Year	Alternative A-2a	Alternative a-2c	Alternative A-3 (Breaching)
2001	-28	-22	164
2002	-110	-67	-132
2003	69 or –103	176 or 140	343 or 308
2004	24 or –77	495 or 392	1,664 or 1,564
2005	0	426	3,025
2006	0	223	2,970
2007	0	0	2,532
2008	0	0	704
2009	0	0	369

1/ Two sets of baseline data definitions were used for the years 2003 and 2004 by the DREW Implementation Study Team (1999).

Table 9
SHORT TERM ECONOMIC EFFECTS OF IMPLEMENTATION ON PERSONAL INCOME, 1998 ($ Million per Year)[1/]

Year	Alternative A-2a	Alternative a-2c	Alternative A-3 (Breaching)
2001	-0.76	-0.6	4.52
2002	-3.01	-1.8	-3.66
2003	-1.89 or -2.84	4.79 or 3.85	9.41 or 8.46
2004	0.67 or -2.11	13.51 or 10.74	45.62 or 42.84
2005	0	11.62	82.93
2006	0	6.12	81.4
2007	0	0	69.44
2008	0	0	19.28
2009	0	0	10.13

1/ Two sets of baseline data definitions were used for the years 2003 and 2004 by the DREW Implementation Study Team (1999).

1.5.6 Avoided Cost Expenditure Effects (Changes in Corps Operating Spending)

The two A-2 alternatives result in relatively small modifications to Corps spending. Alternative A-3 (dam breaching) results in much reduced spending because of the shut down of electric generation operations, dam operations, and lock operations.

The following three tables (Tables 10-12) summarize the effects of the changes in operating costs for the two A-2 alternatives. The effects are shown for business sales, employment, and personal income by Alternative and over time. These effects would occur primarily in the Reservoir Subregion.

Table 10
ANNUAL ECONOMIC EFFECT OF AVOIDED COSTS ON BUSINESS SALES, 1998 ($ Million per Year),

Year	Alternative A-2a	Alternative A-2c
2001 to 2026	-4.09	2.18
2027 to 2100	0	1.26

Table 11
ANNUAL ECONOMIC EFFECT OF AVOIDED COSTS ON EMPLOYMENT (Jobs)

Year	Alternative A-2a	Alternative A-2c
2001 to 2026	-83	44
2027 to 2100	0	25

Table 12
ANNUAL ECONOMIC EFFECT OF AVOIDED COSTS ON PERSONAL INCOME, 1998 ($ Million per Year)

Year	Alternative A-2a	Alternative A-2c
2001 to 2026	-2.36	1.26
2027 to 2100	0	0.73

Table 13 summarizes the effects of the reduced Corps operating costs for the A-3 (breaching) alternative. The effects are shown for business sales, employment, and personal income by Alternative and over time. These effects would primarily occur in the Lower Snake River Region.

Table 13
ANNUAL ECONOMIC EFFECTS OF AVOIDED COSTS ON BUSINESS SALES, JOBS AND PERSONAL INCOME FOR ALTERNATIVE A-3 (BREACHING)

Year	Change in Business Sales, 1998 ($ Million per Year)	Change in Employment (Jobs)	Change in Personal Income, 1998 ($ Million per Year)
2001	-6.67	-135	-3.85
2002	-6.67	-135	-3.85
2003	-6.67	-135	-3.85
2004	-7.08	-143	-4.09
2005	-6.05	-122	-3.5
2006	-27.97	-565	-16.16
2007 to 2100	-59.04 to -81.72	-1,193 to -1,651	-34.11 to -47.22

1.6 Summary of Effects of Alternative A-3 (Breaching) by State and by Subregion

1.6.1 Effects of Alternative A-3 (Breaching) in the Pacific Northwest Outside the Subregions

Several impact categories occur either throughout the Pacific Northwest, throughout a State, or in an area of a State outside the Subregions.

Increased electric power bills would cause business sales, employment, and personal income to fall in the States of Washington, Oregon, Idaho, and Montana, as shown below in Table 14.

Table 14
ANNUAL IMPACTS OF INCREASED ELECTRIC POWER BILLS, BY STATE, 1998 [1/]

	Washington	Oregon	Idaho	Montana
Business Sales ($ million per year)	-205.69	-128.70	-54.81	-10.37
Employment (jobs)	-1,136	-810	-366	-70
Personal Income ($ million per year)	-119.82	-73.22	-32.83	-6.20

1/ This table excludes the impacts of plant shut down or business failures caused by increased electric bills.

Three combined cycle electric power plants would be built in the Puget Sound region of Washington. Construction of each of these plants would occur in different years and would create about $332.40 million in business sales, 2,786 jobs, and $104.80 million in personal income in the State of Washington over three one year periods.

Operation and maintenance of the three combined cycle power plants would add $140.70 million in business sales, 876 jobs, and $23.58 million in personal income to Puget Sound region of the Washington State economy. (This is in addition to the three new power plants located in the Downriver Subregion of Oregon and Washington.)

Construction of tidewater rail car storage in Oregon is projected to cost about $3.02 million and create $7.19 million in sales, 63 jobs, and $1.84 million in personal income. These construction impacts would only last one year.

1.6.2 Effects by Subregion for Alternative A-3 (Breaching)

Summary data are shown in Tables 15-20 for business sales, employment, and personal income. The tables show midpoints when only lower and upper bounds were available from DREW study teams. Averages are shown when the effects vary by year over a number of years. The average for the implementation category was calculated over a nine year period (a short run impact). The averages for recreation/tourism nonangler and recreation/tourism angler, and avoided costs were calculated over a 100 year period (long run impacts).

Table 15
ALTERNATIVE A-3, SHORT TERM IMPACTS
ON BUSINESS SALES BY SUBREGION, 1998 ($ Million per Year)[2/]

Impact Category	Upriver Subregion	Reservoir Subregion	Downriver Subregion	Total, Lower Snake River Region
Electric Power – Power Plant Construction Spending	0.00	0.00	664.80 3/	664.80 3/
Electric Power – Transmission Line Construction Spending	0.00	0.00	248.20	248.20
Transport - Rail Construction Spending	1/	1/	1/	104.51
Transport - Road Construction Spending	1/	1/	1/	236.40
Transport – Facilities Construction Spending	1/	1/	1/	711.86
Transport – Tidewater Rail Car Storage Construction Spending	3/	3/	3/	3/
Water Supply – Well Modification Spending	0.00	107.76	30.40	138.16
Water Supply – Pump Modification Spending	72.85	0.00	0.00	72.85
Implementation - Dam Breaching Spending	17.29	34.59	34.59	86.47
Net Change				
Total Business Sales	7,964.66	6,744.85	19,717.96	34,427.47
Percent Net Change				

1/ These effects occur in the Lower Snake River Region but it is not known how they will be distributed among the subregions.

2/ Economic changes created by the Alternatives can be Ashort run@ or Along run.@ Short run is used in this report to describe the effects of construction or other temporary spending that lasts for less than 10 years. In contrast, long run effects are permanent and continue for the 100 year period analyzed in this study.

3/ See Section 1.6.1 for State impact projections.

Table 16
ALTERNATIVE A-3, LONG TERM IMPACTS
ON BUSINESS SALES BY SUBREGION, 1998 ($ Million per Year) [1/2/]

Impact Category	Upriver Subregion	Reservoir Subregion	Downriver Subregion	Total, Lower Snake River Region
Electric Power – Increased Electric Bills Cause Reduced Spending by Owners of Industrial and Commercial Business	3/	3/	3/	3/
Electric Power – Increased Electric Bills Cause Reduced Spending by Residential and Farm Households	3/	3/	3/	3/
Electric Power - Operation and Maintenance Spending on Replacement Power Plants	0.00	0.00	140.70	140.70
Electric Power - Operation and Maintenance Spending on New Transmission Lines	0.00	0.00	1.67	1.67
Recreation/Tourism - Increased Nonangler Spending	4/	4/	4/	73.64
Recreation/Tourism - Increased Angler Spending	24.90	8.07	?	?
Transport - Reduced Cruise Ship Operations	-8.39	0.00	0.00	-8.39
Water Supply - Water to Irrigated Farms is Shut Down	0.00	-123.09	-52.76	-175.85
Avoided Costs - Reduced Corps Spending	-6.54	-52.34	-6.54	-65.42
Net Change				
Total Business Sales	7,964.66	6,744.85	19,717.96	34,427.47
Percentage Change				

1/ This table excludes the impacts of plant shut down or business failures caused by increased electric bills.
2/ Economic changes created by the Alternatives can be Ashort run@ or Along run.@ Short run is used in this report to describe the effects of construction or other temporary spending that lasts for less than 10 years. In contrast, long run effects are permanent and continue for the 100 year period analyzed in this study.
3/ See Section 1.6.1 for State impact projections.
4/ These effects occur in the Lower Snake River Region but it is not known how they will be distributed among the subregions.

Table 17
ALTERNATIVE A-3, SHORT TERM IMPACTS
ON EMPLOYMENT BY SUBREGION (Jobs)[2/]

Impact Category	Upriver Subregion	Reservoir Subregion	Downriver Subregion	Total, Lower Snake River Region
Electric Power - Power Plant Construction Spending	0	0	5,572 3/	5,572 3/
Electric Power - Transmission Line Construction Spending	0	0	2,080	2,080
Transport - Rail Construction Spending	1/	1/	1/	872
Transport - Road Construction Spending	1/	1/	1/	1,972
Transport - Facilities Construction Spending	1/	1/	1/	6,982
Transport - Tidewater Rail Car Storage Construction	3/	3/	3/	3/
Water Supply - Well Modification Spending	0	916	259	1,175
Water Supply - Pump Modification Spending	844	0	0	844
Implementation - Dam Breaching Spending	259	517	517	1,293
Net Change				
Total Employment	74,935	66,203	178,544	319,682
Percent Net Change				

1/ These effects occur in the Lower Snake River Region but it is not known how they will be distributed among the subregions.

2/ Economic changes created by the Alternatives can be Ashort run@ or Along run.@ Short run is used in this report to describe the effects of construction or other temporary spending that lasts for less than 10 years. In contrast, long run effects are permanent and continue for the 100 year period analyzed in this study.

3/ See Section 1.6.1 for State impact projections.

Table 18
ALTERNATIVE A-3, LONG TERM IMPACTS
ON EMPLOYMENT BY SUBREGION (Jobs) [1/2/]

Impact Category	Upriver Subregion	Reservoir Subregion	Downriver Subregion	Total, Lower Snake River Region
Electric Power - Increased Electric Bills Cause Reduced Spending by Owners of Industrial and Commercial Business	3/	3/	3/	3/
Electric Power - Increased Electric Bills Cause Reduced Spending by Residential and Farm Households	3/	3/	3/	3/
Electric Power - Operation and Maintenance Spending on Replacement Power Plants	0	0	876	876
Electric Power - Operation and Maintenance Spending on New Transmission Lines	0	0	8	8
Recreation/Tourism - Increased Nonangler Spending	4/	4/	4/	934
Recreation/Tourism - Increased Angler Spending	374	85	?	?
Transport - Reduced Cruise Ship Operations	-83	0	0	-83
Water Supply - Water to Irrigated Farms is Shut Down	0	-1,105	-474	-1,579
Avoided Costs - Reduced Corps Spending	-133	-1,060	-133	-1,326
Net Change				
Total Employment	74,935	66,203	178,544	319,682
Percentage Change				

1/ This table excludes the impacts of plant shut down or business failures caused by increased electric bills.
2/ Economic changes created by the Alternatives can be Ashort run@ or Along run.@ Short run is used in this report to describe the effects of construction or other temporary spending that lasts for less than 10 years. In contrast, long run effects are permanent and continue for the 100 year period analyzed in this study.
3/ See Section 1.6.1 for State impact projections.
4/ These effects occur in the Lower Snake River Region but it is not known how they will be distributed among the subregions.

Table 19
ALTERNATIVE A-3, SHORT TERM IMPACTS
ON PERSONAL INCOME BY SUBREGION, 1998 ($ Million per Year)[2/]

Impact Category	Upriver Subregion	Reservoir Subregion	Downriver Subregion	Total, Lower Snake River Region
Electric Power - Power Plant Construction Spending	0.00	0.00	209.60 3/	209.60 3/
Electric Power - Transmission Line Construction Spending	0.00	0.00	78.30	78.30
Transport - Rail Construction Spending	1/	1/	1/	27.91
Transport - Road Construction Spending	1/	1/	1/	63.13
Transport - Facilities Construction Spending	1/	1/	1/	202.03
Transport - Tidewater Rail Car Storage Construction Spending	3/	3/	3/	3/
Water Supply - Well Modification Spending	0.00	29.52	8.33	37.85
Water Supply - Pump Modification Spending	22.40	0.00	0.00	22.40
Implementation - Dam Breaching Spending	7.09	14.18	14.18	35.45
Net Change				
Total Personal Income	2,108.38	2,218.18	5,992.24	10,318.80
Percent Net Change				

1/ These effects occur in the Lower Snake River Region but it is not known how they will be distributed among the subregions.

2/ Economic changes created by the Alternatives can be Ashort run@ or Along run.@ Short run is used in this report to describe the effects of construction or other temporary spending that lasts for less than 10 years. In contrast, long run effects are permanent and continue for the 100 year period analyzed in this study.

3/ See Section 1.6.1 for State impact projections.

Table 20
ALTERNATIVE A-3, LONG TERM IMPACTS
ON PERSONAL INCOME BY SUBREGION, 1998 ($ Million per Year) [1/2/]

Impact Category	Upriver Subregion	Reservoir Subregion	Downriver Subregion	Total, Lower Snake River Region
Electric Power - Increased Electric Bills Cause Reduced Spending by Owners of Industrial and Commercial Business	3/	3/	3/	3/
Electric Power - Increased Electric Bills Cause Reduced Spending by Residential and Farm Households	3/	3/	3/	3/
Electric Power - Operation and Maintenance Spending on Replacement Power Plants	0.00	0.00	23.58	23.58
Electric Power - Operation and Maintenance Spending on New Transmission Lines	0.00	0.00	0.35	0.35
Recreation/Tourism - Increased Nonangler Spending	4/	4/	4/	19.76
Recreation/Tourism - Increased Angler Spending	7.01	2.33	?	?
Transport - Reduced Cruise Ship Operations	-2.25	0.00	0.00	-2.25
Water Supply - Water to Irrigated Farms is Shut Down	0.00	-41.05	-17.59	-58.64
Avoided Costs - Reduced Corps Spending	-3.79	-30.33	-3.79	-37.91
Net Change				
Total Personal Income	2,108.38	2,218.18	5,992.24	10,318.80
Percentage Change				

1/ This table excludes the impacts of plant shut down or business failures caused by increased electric bills.
2/ Economic changes created by the Alternatives can be Ashort run@ or Along run.@ Short run is used in this report to describe the effects of construction or other temporary spending that lasts for less than 10 years. In contrast, long run effects are permanent and continue for the 100 year period analyzed in this study.
3/ See Section 1.6.1 for State impact projections.
4/ These effects occur in the Lower Snake River Region but it is not known how they will be distributed among the subregions.

1.7 Unresolved Issues in the Estimates of Economic Change Created by the Alternatives

The regional economic analysis depends upon information from the DREW study teams as the basis for estimating economic impacts. Thus, most of the unresolved issues listed by the other DREW study teams also limit the regional economic analysis. Space limitations prevent a review of those issues here.

Several types of missing data precluded doing an impact analysis or, at best, a hypothetical example was provided. For example, the effect of increased shipping costs because of breaching on industry output and employment for firms that use barges for shipping was not studied. Thus, changes in outputs and employment in the wood products, grain production, and other sectors are unknown. The extent to which irrigated agriculture will shut down under breaching is unknown. Also, the effect of reductions in irrigated agriculture under breaching on the food processing sector are unknown. Economic effects on Indian tribes under breaching are unknown. The required road investments outside Washington under breaching are unknown. The future increases in spending for road and railroad maintenance are unknown. The future distribution of electricity rate increases caused by breaching across regions, industries, or consumers is unknown. The possibility of business failures because of increased electric rates with breaching is unknown. The possibility of shut down of cruise ship operations on the Columbia River with breaching is unknown.