COVER SHEET

FEDERAL ENERGY REGULATORY COMMISSION

DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR OROVILLE FACILITIES
Docket No. P-2100

Appendix A
Review of Socioeconomic Model and Related Documents
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APPENDIX A

REVIEW OF SOCIOECONOMIC MODEL AND RELATED DOCUMENTS

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REVIEW OF SOCIOECONOMIC MODEL AND RELATED DOCUMENTS

This appendix presents a review of several documents submitted by Butte County (or County) and the California Department of Water Resources (DWR) regarding the Oroville Facilities relicensing process. The focus is on the model and assumptions used by DWR to estimate costs incurred by Butte County to provide project-related services, as well as project-related revenues accruing to the County. This independent review was undertaken to address questions raised by Butte County about the appropriateness of both the model itself and the inputs and assumptions used by DWR in running the model. In our analysis, we used a copy of the model provided by DWR. We did not, however, have access to the original data set used by DWR as input to the model. While we found areas in which the model or assumptions could be improved upon, we found nothing to suggest that the model or assumptions would produce biased results, and therefore conclude that the material submitted by DWR is adequate for the staff's use in preparing the draft environmental impact statement.

DWR's MODEL AND ASSUMPTIONS

As part of the relicensing process, DWR submitted several reports to the Federal Energy Regulatory Commission (FERC, or Commission) detailing the economic impact of the project on Butte County. The reports address fiscal and socio-economic effects that the Commission will consider in its evaluation of the application for license. Of the reports submitted by DWR, our focus is on reports R-18, *Recreation Activity, Spending and Associated Economic Impacts*, and R-19, *Fiscal Impacts*, Final Report. R-19 summarizes the fiscal impacts of the project on Butte County. Each report appears to be thorough and comprehensive in its content, using up-to-date methods of analysis, including the IMPLAN model and econometric techniques.

The IMPLAN Model

DWR used the IMPLAN (Impact Analysis for Planning) model to derive its fiscal impact results. The IMPLAN model is an input-output model developed in 1979 by the Forest Service and is one of the most widely used input-output models used to evaluate changes in policy and to produce socioeconomic forecasts. Its primary attribute is that it captures multiplier effects as changes in policy create ripples throughout the economy. The effects can be classified as direct, referring to changes in production associated with a change in demand; indirect, referring to a secondary impact caused by the changing input requirements of producers; and induced, referring to changes in household spending due to additional employment generated by the direct and indirect effects. Its assumptions restrict production functions to be homogenous across all firms within an industry, and linear, with constant returns to scale. Output is also assumed to be homogenous or undifferentiated by quality, branding, etc. The IMPLAN model places no constraints on supply, and it assumes that in- and out-migration maintain the region in question at full employment at all times.

IMPLAN Model Inputs

Inputs used to estimate the fiscal impact of the project's recreation visitors, the primary focus of our review, are the annual number of visitors to the project and their daily expenditures in the County. DWR estimated visitation via traffic counting, supplemented with other data, and estimated expenditures from survey data. Other model input, not related to visitor spending, includes DWR's estimated annual spending in the County for salaries, goods, and services needed to operate and maintain the project.

IMPLAN Model Output

The direct cost impact of the project on Butte County derives from the County's providing public services (primarily fire and rescue services and law enforcement and criminal justice services) to the project and the project's recreational visitors, as well as to maintaining access roads to sites within the

project. The indirect cost impact stems from providing services to the growth-related population associated with project and visitor spending. Direct revenues to the County come from collecting tax revenue associated with project and visitor expenditures in the unincorporated portion of the County; indirect revenues come from taxes paid by the growth-related population

Model Estimation of Indirect Impacts

Indirect effects flow from changes in input requirements of producers directly affected by economic changes. For example, an increased number of visitors to the project may raise demand for local restaurants. This is the direct effect. But the restaurants will then purchase more food from local suppliers. This is the indirect effect. Both the restaurant and its suppliers are then likely to raise their demand for inputs and labor. As stated above, the IMPLAN model instantaneously "clears" the labor market by assuming that in- and out-migration occur immediately. Thus, in the IMPLAN model, if the demand for labor rises, then it will be met by in-migration. This would result in an increase in the County's population and a subsequent increase in the cost of providing services, but would also raise its revenue through the additional taxes paid by newcomers. Similarly, if the demand for labor falls, workers are assumed to out-migrate such that the economy remains at full employment. This would have the effect of reducing the fiscal burden on the County and also reducing the tax revenue associated with the out-migrants.

Structural Parameters

The structural parameters of the IMPLAN model are in widespread use and are considered sound. There is little benefit to reviewing them further, except to say that over time, the parameters of the model are subject to change. The degree of change derives primarily from changes in technology that increase the efficiency of production. For example, as manufacturing establishments are modernized, it takes fewer employees to produce the same amount of output. While it is possible to estimate the process of technological change by a time series analysis of the IMPLAN parameters, it is also reasonable to state that growth in productivity is a slow process. With respect to providing government services, such as police and fire protection, or recreational services, such as food service and hotels, productivity would not likely be appreciably different in the future than it is today. Thus, we find the structural parameters of the model to be entirely suitable to this application.

Sensitivity Analysis

The model reacts to changes in inputs, including the number of visitors and their spending habits during their visit. In this section, we describe the sensitivity of the model to recreational visitation and spending.

Recreation Days/Visits

DWR provided estimates of annual visits to the project area by recreational site. The number of visits to the project was estimated using traffic count data supplemented by periodic visual inspections of passengers in each vehicle, California Department of Parks and Recreation (DPR) campground information, observational data, other DPR data, and trail counters.[118] Table A-1 shows the total fiscal impact (direct plus indirect effects) of visitors to the project on Butte County, as estimated by DWR's IMPLAN model. In this case, a 5.0 percent change in visitors (holding visitor spending constant) in either direction results in a 5.0 percent change in Butte County's fiscal deficit. This indicates a precise

[118] Trail counters are infrared sensors placed strategically along side hiking trails. The sensors are placed high enough to avoid counting animals but low enough to count people while remaining.

1:1 relationship between the percent change in visitors and percent change in costs to the County and percent change in County tax revenues.

Table A-1. Fiscal impact on Butte County of recreational visitors to the Oroville Facilities. (Source: DWR IMPLAN model and Staff)

Costs	**Baseline**	**+ 5% Visitor Days**	**-5% Visitor Days**
Fire protection	$283,584	$297,764	$269,405
Law enforcement	$481,497	$505,572	$457,423
Road maintenance	$129,061	$135,514	$122,608
Other Services & Costs	$131,724	$138,310	$125,138
Total Costs	$1,025,867	$1,077,160	$974,573
Percent Change		+5.0%	–5.0%
Revenues			
Sales Tax	$217,074	$227,927	$206,220
Property Tax	$97,356	$102,224	$92,488
Lodging Tax	$3,348	$3,516	$3,181
Other Revenue	$318,440	$334,362	$302,518
Total Revenues	$636,218	$668,029	$604,407
Percent Change		+5.0%	–5.0%
Net Fiscal Effect	–$389,649	–$409,132	–$370,167
Percent Change		+5.0%	–5.0%

Table A-2 provides a range of values for employment and earnings around the baseline visits, as estimated by the model. Again, the relationship is strictly 1:1.

Table A-2. Employment and earnings impact on Butte County of recreational visitors to Oroville Facilities. (Source: DWR IMPLAN model and Staff)

	Baseline Visits	**+5% Visits**	**–5% Visits**
Jobs	664	698	631
Percent Change		+5.0%	–5.0%
Earnings	$12,833,000	$13,475,000	$12,191,000
Percent Change		+5.0%	–5.0%

This exercise sheds light on how the model estimates the change in the fiscal burden imposed by the project on Butte County in response to variations in the model inputs. The sensitivity analysis shows that the model used by DWR is strictly linear, which is what one expects of the IMPLAN model, and demonstrates that the model produces the expected results.

There is a large difference in the visitation numbers used by DWR to run the model and those used by Butte County in its estimates of project-related costs. First, instead of using the year-round average daily visits, the County used average daily visits during the peak season as inputs to its

calculations. The County's estimate of the nonresident visitor population (5,270) is 176 percent higher than the 1,910 figure used in DWR's license application studies. Holding average spending constant, the use of average peak visits as opposed to year-round averages would naturally raise the estimated fiscal burden placed on the County. Thus, following the logic shown in tables A-1 and A-2, increasing the number of non-resident visitors by 176 percent would also increase project-related costs ($2,830,534), revenues ($1,755,429), the net fiscal deficit ($1,075,105), and the number of jobs (1,832) by the same percentage.

The County states that its rationale for using peak numbers is that the County's supply of its services is fixed in the short-run, not unlike the supply of electric power or other highly capital intensive enterprises. And like the suppliers of electric power, the use of peak numbers suggests that the County needs to keep spare government services capacity available in order cover peak periods. The implication of this argument is that the County cannot fluidly procure labor service for fire, police, and so on to cover peak visitation periods and then dismiss these resources during the off-peak periods. In other words, the County must retain the necessary infrastructure to cover peak periods even if it becomes spare capacity during the off-peak period. The larger the difference between peak and off-peak numbers, the starker will be the difference in costs. This inability to hire and fire resources at will would end up raising the fixed costs to the County and hence its fiscal burden. Resources would include at least fire and police equipment and the necessary infrastructure to store and maintain it, additional trained staff, and a communications network.

However, the information on the record also shows that other agencies that provide law enforcement, fire, rescue, and other services in the project area, such as California Department of Parks and Recreation, increase their staff during the peak recreation season and decrease their staff during the off-season. This increase in the availability of other service providers during the peak season argues against the need for Butte County to staff up during the peak season or provide infrastructure designed to meet peak season needs. Additionally, DWR's proposed funding of DFG under Measure B111 would likely lead to a reduction in the demand for Butte County law enforcement services at the OWA.

The County has not provided any substantiating, empirical evidence to support its use of peak period visits. This might include information concerning the ratio of fixed to variable costs in providing fire, rescue and law enforcement services, and information on the number of calls responded to by week or month over some period of years. To support the County's position, that data would have to demonstrate that the County must respond to 2 or 3 times as many calls during the peak season than it does during off-peak periods. Without such supporting evidence, we conclude that DWR's use of average daily visits is the appropriate measure.

Visitor Spending

Visitor spending affects Butte County's fiscal condition indirectly through its effects on earnings, employment, and population. DWR's visitor spending estimates were based on data taken from surveys conducted throughout one year. The surveys are subject to error and, as we discuss in more detail below, are considered deeply flawed by Butte County's consultant, Dr. Jon S. Ebeling. Nevertheless, they provide the only available information on visitor spending in the area. DWR presents spending data with accompanying measures of spread around the mean, by which some assumptions about the distribution can be made. Table A-3 provides a summary of DWR's visitor spending estimates.

Table A-3. Visitor spending by site at Oroville Facilities. (Source: DWR, 2004)

	Residents of Butte County				Non Residents of Butte County				
Site	**Mean**	**Std Dev**	**Min**	**Max**	**Mean**	**Std Dev**	**Min**	**Max**	**Number of Residents/Non-Residents Surveyed**
Oroville	$39.3	$46.6	$0.0	$283.0	$20.2	$31.3	$0.0	$268.2	268/312
Feather River	$23.8	$38.2	$0.0	$200.8	$22.8	$32.0	$0.0	$139.2	49/27
Forebay	$32.3	$49.8	$0.0	$335.0	$14.8	$22.9	$0.0	$100.5	71/19
Afterbay	$35.6	$35.0	$0.0	$206.5	$11.9	$21.7	$0.0	$82.7	61/43
OWA	$40.8	$51.0	$0.0	$174.5	$42.1	$59.8	$0.0	$340.0	31/83

The statistics indicate a wide dispersion of spending among visitors in both the resident and non-resident populations. For each site, the coefficient of variation (standard deviation/mean) is close to one or significantly above one for both residents and non-residents, indicating a high degree of variance in the data set.[119] Since we are not in possession of the raw data used to generate these tables, we have made assumptions about the shape of the distribution in order to apply a Monte Carlo simulation[120]. First, the fields are each truncated at $0.0 since it is not possible to observe negative spending. Second, at each recreation site, the data in table A-3 indicate that the maximum spending is high relative to the mean. Without the advantage of visual inspection of the distribution, it is reasonable to assume that these statistics indicate a log-normal distribution. Figure A-1 gives a graphical example, showing the theoretical distribution for the log-normal distribution for Butte County resident spending at Lake Oroville.

[119] Standard deviation is the most common measure of statistical dispersion, measuring how spread out the values in a data set are. If the data points are all close to the mean, then the standard deviation is close to zero. If many data points are far from the mean, then the standard deviation is far from zero. If all the data values are equal, then the standard deviation is zero. The coefficient of variation is a dimensionless statistic that is useful for comparing the degree of variation from one data series to another, even if the means are drastically different from each other. A coefficient of variation greater than one indicates a high degree of variance in the data points.

[120] In Monte Carlo simulation values for uncertain variables are randomly generated over and over to simulate a model.

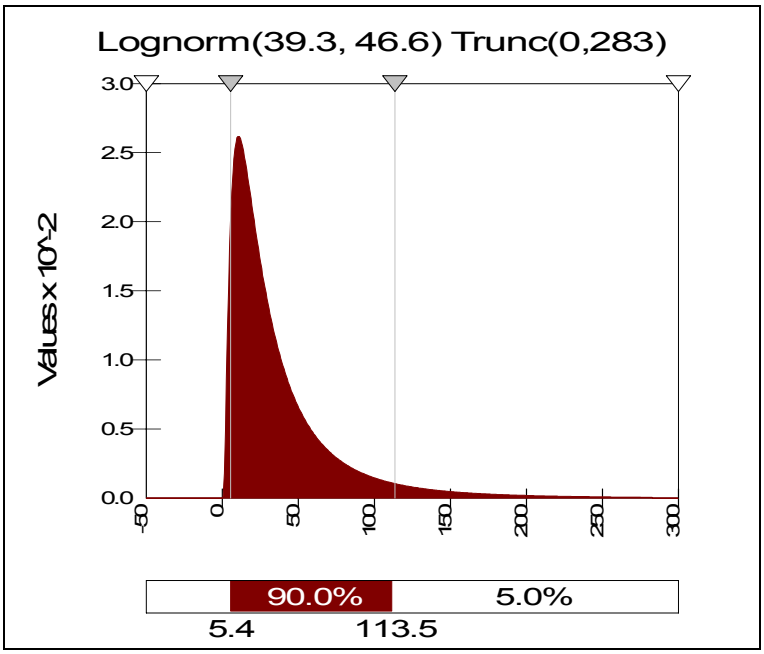

Figure A-1. Log-normal distribution of Butte County resident spending at Lake Oroville. (Source: Staff)

Monte Carlo simulations of the above distributions generate the mean values given in table A-4. In each case the simulated values are lower than the survey sample values.

Table A-4. Survey-based and simulated average spending by site for resident and non-resident visitors at the Oroville Facilities. (Source: DWR, 2004 and Staff)

Site	Residents Survey/Simulated	Non-Residents Survey/Simulated
Oroville	$39.30 / $37.50	$20.20 / $19.49
Feather River	$23.80 / $21.75	$22.80 / $20.44
Thermalito Forebay	$32.30 / $30.53	$14.80 / $13.19
Thermalito afterbay	$35.60 / $34.29	$11.90 /$10.17
OWA	$40.80 / $35.31	$42.10 / $39.30

In relative terms, the differences between the simulated and survey values range between 3.5 percent and 14.5 percent. If one holds visitor days constant, this means that the model input used by DWR (the mean of the surveyed spending values) would project a greater effect on employment, population, County expenses, and tax revenue than the simulated values would. Visitor spending falls into the indirect fiscal impact category, estimated via the IMPLAN model, where indirect effects are assumed to be a function of visitor spending across a range of industrial categories. In table A-4, visitor spending averages estimated from survey data and then simulated based on a theoretical log-normal distribution are given. To test the sensitivity of indirect effects on Butte County operations to visitor spending by site, the simulated values are applied under the assumption that the difference between survey and simulated values is even across all spending items. In addition, the survey averages are subjected to changes of +/–5.0 percent. In each case, visitor days are held constant. Table A-5 contains the results of this exercise.

Table A-5. Fiscal impact on Butte County of recreational visitors to Oroville Facilities, based on surveyed and simulated average visitor spending. (Source: DWR, 2005 and Staff)

Costs	Baseline (from survey)	Simulated Average Visitor Spending	–5% Survey Expenditure	+ 5% Survey Expenditure
Fire protection	$73,873	$69,678	$70,179	$77,566
Law enforcement	$304,806	$287,499	$289,565	$320,046
Road maintenance	$98,399	$92,812	$93,479	$103,319
Other Services & Costs	$119,892	$113,085	$113,897	$125,887
Total Costs	$596,969	$563,074	$567,121	$626,818
Percent Change		–5.7%	–5.0%	+5.0%
Revenues				
Sales Tax	$193,551	$182,706	$183,874	$203,229
Property Tax	$88,141	$83,197	$83,734	$92,549
Lodging Tax	$3,298	$3,084	$3,133	$3,463
Other Revenue	$288,957	$272,585	$274,509	$303,404
Total Revenues	$573,948	$541,572	$545,250	$602,645
Percent Change		–5.6%	–5.0 %	+5.0%
Net Fiscal Effect	**–$23,021**	**–$21,502**	**–$21,871**	**–$24,173**
Percent Change		**–6.6%**	**–5.0%**	**+5.0%**

The results in table A-5 indicate a precise 1:1 proportionality of visitor spending to revenues and costs, such that if inputs are changed by *X* percent across all sites and visitor categories (resident and non-resident), all outputs change by the same proportion. Application of the simulated mean expenditure is by site and by residency. In this case, because not all inputs are changed by the same proportion, the model results show that aggregate Butte County service costs would decline by slightly more than revenues and the result is a deficit that would be 6.6 percent lower than the baseline estimate.

In table A-6, below, we again raise and reduce visitor spending across all sites and visitor types evenly by 5.0 percent and then by the simulated percent differentials by individual site and visitor type to estimate the impact on employment and earnings. The results for the 5.0 percent deviations are identical to the impact of visitor days, such that jobs and earnings both rise and decline in proportion. The simulated differentials result in an average (unweighted) decrease in spending per visit of 7.2 percent for residents and 9.2 percent for non-residents, for a total unweighted average of 8.2 percent. The application of these simulated percentage changes to the model reduces both jobs and earnings by a weighted average 5.6 percent from the baseline estimate.

A more thorough accounting of the possible range of County costs, revenue, employment, and earnings would require simulation over the appropriate distribution of visitor days and visitor spending by site, by type of visitor, and expenditure type simultaneously.

Table A-6. Impact on Butte County employment and earnings of recreational visitors to Oroville Facilities, based on surveyed and simulated average visitor spending. (Source: DWR, 2005 and Staff)

	Baseline Average Expenditure	Simulated Average Expenditures	(-5% Survey) Expenditure	(+5% Survey) Expenditure
Jobs	664	627	631	698
Percent Change		–5.6%	–5.0%	+5.0%
Earnings	$12,833,000	$12,113,000	$12,191,000	$13,475,000
Percent Change		–5.6%	–5.0%	+5.0%

Visitor Projections

Visitor projections are important in determining the economic impact of the project because a new license could be granted for a period of 30 to 50 years. DWR projects recreational visits to the project on a weighted per capita basis by recreational site (Lake Oroville and Thermalito forebay) using an econometric model that incorporates the joint influences of water levels, population trends, and gasoline prices after 1979.[121] DWR reports the following results:

- Water levels are positively associated with visits to Lake Oroville but negatively associated with attendance at Thermalito forebay, which DWR surmises to be an indication that Thermalito forebay is a substitute recreational good for Lake Oroville. That is, at lower water levels some people who prefer to recreate at Lake Oroville will move instead to Thermalito forebay, but when water levels are higher, they move back to the lake.
- Population growth was considered as a potential factor in explaining demand for recreation at the project, but an analysis of population growth and demand for project recreational facilities over a 30-year period failed to reveal a relationship.[122]
- Because higher gas prices raise the cost of a visit, gas prices have a negative impact on visits to both sites, as expected. With respect to gasoline prices, these are volatile. In addition to economic conditions of supply and demand, they are subject to uncertain geopolitical influences. Hence gasoline prices are notoriously difficult to forecast beyond the short-term and are often forecasted as returning to some long-run trend rate of growth.
- DWR subsequently used the models to project attendance levels annually through 2050.

DWR submitted two annual models and one monthly model to account for seasonal differences in attendance. The models appear to be robust and the coefficients retain the expected signs. The models detect a declining trend in attendance at both Lake Oroville and at the forebay. We do not have access to the statistical properties of the models other than the standard measures of fit, the statistical significance

[121] See Projected Recreation Use Final R-12.

[122] See Projected Recreation Use Final R-12, page 5-8.

of the estimated coefficients, and assurance that the models have been corrected for autocorrelation.[123] Nor are we in possession of the raw data used to generate the results. However, DWR's results show that their models adequately represent visitation at project facilities.

Butte County does not appear to object to the models' specification but is concerned that DWR does not sufficiently address future variation in the independent variables and does not account for population growth. It is not clear from DWR what their assumptions about gasoline prices and water levels are. With respect to gasoline prices, these are volatile. In addition to economic conditions of supply and demand, they are subject to uncertain geopolitical influences. Hence gasoline prices are notoriously difficult to forecast beyond the short-term and are often forecasted as returning to some long-run trend rate of growth. Recent experience has shown that even a large increase in gas prices does not necessarily result in a reduction in driving. Thus, it would be impossible to predict not only gas prices but the effect of gas prices on recreational use of the Oroville Facilities' recreational amenities.

With respect to water levels, they are a function of weather and various operational requirements of the project. The econometric method employed by DWR should be able to produce models that generate visits for a "worst case", a "base case" and a "best case" scenario. In practice, variations around the baseline forecast are usually generated with 5.0 percent differentials of the independent variables in either direction. DWR provides various scenarios on page 4-9 of R-12, *Projected Recreation Use (Final)*. Using recreation days as units, DWR's base case projections call for a compounded annual average increase in demand at the project of 1.5 percent from 2002 to 2050.

MODEL CRITIQUE BY DR. JON EBELING

In its Answer to DWR's rejection of a motion for relief from alleged negative fiscal impacts imposed by the Project, Butte County submitted a critique of the DWR results by Dr. Jon S. Ebeling of Regional and Economic Sciences. Dr. Ebeling reviewed all submissions by DWR but the bulk of his work was in reviewing R-18, *Recreation Activity, Spending and Associated Economic Impacts*, which is a study of fiscal impacts using IMPLAN. Dr. Ebeling raises seven issues that in his view are critical flaws of the study. We address each of those issues as follows:

1. Input data are point estimates rather than a range of values around a distribution. Given sufficient information, this point can be corrected using Monte Carlo simulations of the data. In the simulations, the distribution of the survey data is inspected and a particular distributional assumption is chosen based on how closely the theoretical shape matched the actual survey data. In most cases, distributions will appear normal or log-normal. The appropriate statistics are entered to simulate values as if they were picked out of the chosen distribution. The simulations are done typically up to 500 times or more. The simulations will result in a new mean based on the theoretical distribution, as well as extreme values. Each of these outputs can subsequently replace the survey data in the fiscal impacts model. Our application of this method to survey expenditure data (see table A-6) found that under an assumed log-normal distribution, mean spending by Butte County resident and non-resident visitors to project recreational facilities is lower by 8.2 percent on an unweighted average basis, and that the resulting impact would be reduce the County's net fiscal deficit by 6.6 percent and to reduce the indirect employment and earnings estimate by 5.6 percent.

[123] Autocorrelation occurs when the estimated errors of past realizations of the dependent variable are correlated with the current errors. It indicates that the model is partially driven by past "shocks," the effect of which die out only slowly through time. The effect is to render the estimated coefficients inefficient and inferences drawn from them will be prone to error.

2. The model is static and does not account for the dynamics of visitation owing to exogenous factors such as varying lake water levels, gasoline prices, population, and population demographics. We agree with Dr. Ebeling that it is not clear from DWR documents what their assumptions about water levels and gasoline prices are. As we note above in our discussion of Visitor Projections, DWR did not find a correlation between population and visits at the project. Given that water levels depend both on the weather and operational considerations, such as the trade-off between the demand for power and society preferences for recreational facilities, fish flows, etc., and that gasoline prices and consumer responses to those prices are similarly difficult to predict, assumptions based on the long-term average growth rate of each would be reasonable.

3. The process of "cleaning" the survey data is not properly explained and thus not justifiable. Dr. Ebeling's objection to "data cleaning" is not unreasonable, but we do not have sufficient information to determine whether DWR's data cleaning introduced any bias. It is not unusual for survey research data to undergo such a process. It is crucial, in fact, to conduct such a task to ensure the quality of the data. While some respondents might just have made errors, others may have more malicious intent, designed to bias or simply disrupt the study results. It is important to root these responses out to eliminate the bias they may cause. If DWR eliminated responses based on plausibility, good practice would require that the deleted values be documented.

4. Indirect effects of the project are not explained. Above under *the heading Model Estimation of Indirect Impacts,* we describe how indirect effects flow from changes in input requirements of producers directly affected by economic changes. This is a standard feature of IMPLAN and other input-output models. First, the model considers the level of visitor spending and uses input/output coefficients to translate this into earnings and employment by industry generated by the additional demand. The level of new employment must be supplied by either the local labor market or from in-migrants. The model uses a constant ratio of population to employment to generate the new level of population. The new (indirect) population places demands on County services and pays taxes to the County in the same proportion as current residents.

5. The survey data collection was inadequate and the response rate of 37.3 percent is poor. In our experience, a response rate of 37.5 percent is actually quite high for a mail survey. Dr. Ebeling offers no evidence for his assertion that the response rate is inadequate. Moreover, even small sample sizes are adequate as long as they are representative of the population.

6. Results could be biased because persons who did respond to the survey may retain unobservable characteristics (and therefore impossible to adjust for) that make them different from those who did not respond. This is a reasonable point, in that neither Dr. Ebeling nor we can assess the possibility of bias in a study without examining the distribution of data collected. For example, if all respondents belong to just one income, race, or other demographic and the universe is known to contain two or more classes, then the data could be biased. We have no evidence that this is the case.

7. Forecasts of fiscal impacts were generated using only one year of actual budget data. It would be easy to address this concern by simply examining the budget allocations over time. If there is significant variation in expenditures over time, then an average allocation may be sufficient. Our examination of the data does not indicate that the data used by DWR was significantly different than the 2002-2003 data used by Butte County in its studies. In all cases, the level of project-related fiscal deficit is in the range of 2 to 3 percent of the County's total budget.

Our conclusion is that changing the data collection methods or analytical techniques recommended by Dr. Ebeling would likely improve the robustness of DWR's results, but would not be likely to have a significant effect on the results themselves.

QUESTIONS POSED BY BUTTE COUNTY

In its November 15, 2005 filing with the Commission, Butte County requested that the Commission require DWR to provide responses to the following nine questions posed by Butte County. The Commission declined to make that requirement at that time. In the course of our independent review of DWR's model and analytical approaches, we have reached the following conclusions regarding Butte County's questions.

1. ***(a) Please provide the standard deviations that were used after calculating the daily average in table 5.1-1 at page 5-2 of the R-9 Report.***

   (b) Please provide the formulae used to calculate the daily averages presented in the columns and in the totals in table 5.1-1 at page 5-2 of the R-9 Report.

The formula used to calculate the daily average is total use for the period/days in the period. The average daily value presented in the table is a typical measure presented by license applicants for this type of study, and we find it adequate for our use. We do not see any evidence that the standard deviations, if calculated by DWR, were used.

2. ***(a) Did DWR calculate the daily average visitor figure in parentheses at the bottom of the Season Total column in table 5.1-1 at page 5-2 of the R-9 Report by calculating a weighted average of the Weekday Total and the Weekend Total?***

   (b) If the answer to question 2(a) above is "yes," please provide an explanation concerning the weights used to calculate the daily average totals for both the column on Recreation Season and the column on Off-Season in table 5.1-1 at page 5-2 of the R-9 Report.

   (c) If the answer to question 2(a) above is "no," please state the methodology used and explain the rationale for the use of the methodology. Please provide the formulae that illustrate the calculations for totals for study areas on weekdays, weekends, and seasonal totals for recreation, and the same formulas for weekdays, weekends, and seasonal totals for off-season totals.

   (d) Please provide the formulae used to calculate the combined season total.

From our review, it appears clear that the daily averages are a simple calculation based on the following: (1) 124 days in the 4-month season, (2) 241 days in the 8-month off season, (3) 84 weekdays and 40 weekend days during the 4-month season,[124] and (4) 173 weekdays and 68 weekend days during the 8-month off season.

Season total average = visitation for season/days in the season

Combined season total = recreation season total + off-season total

3. ***The following statement appears on Page 5-1 of the R-9 report:***

   It is important to note that visitation at several Lake Oroville sites was probably affected by low water conditions on the reservoir during much of the 2002 recreation season.

[124] In 2002, there were actually 88 weekdays and 36 weekend days in the 4-month recreation season (May 15–September 15) defined by DWR. Although not explicitly stated by DWR, it appears that they followed the common practice of counting Memorial Day, July 4, and Labor Day as weekend days rather than weekdays. Because the Fourth of July holiday was on a Thursday in 2002 when the survey was made, DWR appears to have also counted July 5 as a weekend day.

Compared to pool levels during the previous 12 years (1990 to 2001), the reservoir elevation was approximately 20 to 50 feet below average through most of that summer. By mid-summer, use of several boating and swimming facilities was impaired and some facilities were unusable. The pool level returned to full-pool by May, 2003 as the data collection period for this study ended.

(a) Were the data for "recreational days" in table 5.1-1 at page 5-2 of the R-9 Report adjusted to compensate for the low water levels at the lake during the one-year study period between May 15, 2002 and May 14, 2003?

(b) If the answer to 3(a) above is "yes", please provide the compensation formula.

(c) If the answer to question 3(a) above is "no", why not?

It appears to us from our review of the R-9 report and data that DWR did not adjust the figures in table 5.1-1 to compensate for low water levels. DWR presented the actual data counts. We note that there is no requirement in the R-9 study plan for DWR to adjust the data counts to reflect average conditions.

4. How was the number of people per vehicle cited at Page 4-12 of the R-9 Report calculated?

We find that DWR adequately explains in section 4.2.1.2 of report R-9 how the people-per-vehicle estimates were made

5. The R-9 Report contains frequent references to "professional judgments". Regarding estimates of the number of persons visiting the project area, please answer the following:

(a) Are the individuals who made the professional judgments employees of a State agency? If so, please name each State agency.

(b) How was it determined that the individuals who made the professional judgments are professional? Are these individuals members of a professional organization or organizations? If so, what are the name(s) of said organizations?

DWR uses the term "professional judgment" in the same way that other applicants use the term: to indicate that those collecting and presenting the recreational use data had to use some judgment in putting together and presenting the raw data acquired in the field. The authors of the R-9 report are noted on the title page of the report. Given that the report was prepared by environmental planners with EDAW, Inc., a firm selected based on criteria spelled out in the study plan and well known for preparing similar studies, and working under the direction of a DWR staff environmental scientist, we see no reason to doubt their judgment, and see no evidence of poorly applied judgment in the report.

6. There are comments on page 4-17 of the R-9 Report indicates that, although data were collected at several different periods during the day, only peak time data was used to calculate both "people at one time" and the "vehicles at one time".

(a) What are the estimates for non-peak times at these locations?

(b) Please provide the data for both "people at one time" and the "vehicles at one time" for all non-peak times.

(c) Was the "people at one time" data for non-peak times included in the totals of table 5.1-1 at Page 5-2 of the R-9 Report?

(d) Was the "vehicles at one time" data for non-peak times included in the totals of table 5.1-1 at Page 5-2 of the R-9 Report?

We do not see a need for information about people-at-one-time or vehicles-at-one-time at non-peak periods. These data are generally used to determine the adequacy of facility capacity, such as whether there are enough parking spaces to accommodate the peak number of vehicles at a site. In this context, the peak number of people or vehicles during non-peak times is not relevant.

7. Page 4-1 of the R-9 Report contains references to several different sources of data, including campground occupancy data, vehicle traffic counter data and observational data.

(a) How were all of these sources of data merged and integrated to create table 5.1-1 at Page 5-2 of the R-9 Report? Please provide the formulae used to integrate the data from the various sources to create table 5.1-1 at Page 5-2 of the R-9 Report.

(b) Were adjustments made to account for the failure of some of the data collection instruments?

(c) If so, please explain how these adjustments were made.

This section of the report notes that some problems occurred during data collection, such as counters being stolen, batteries being taken, ant infestations, etc. DWR indicates that professional judgments were made to fill in the missing gaps. The data collection problems encountered by DWR are typical of this type of study and the use of professional judgment to fill data gaps is also common. The level of detail provided by DWR is adequate for our analysis.

8. Page 4-12 of the R-9 Report states that there were adjustments made to traffic counted, in order to account for the percentage of non-recreational traffic counted. Please provide each adjustment made, in terms of how many vehicles were counted at each station, percentage of adjustment which was made, and each revised total after each adjustment.

The non-recreational vehicles that DWR refers to here include DWR's or California Department of Parks and Recreation's vehicles, other state vehicles, and delivery or work vehicles. The report states that the counts were reduced by 1 percent, 5 percent, or 10 percent based on a combination of past DWR estimates, observation data, and professional judgment. Given the small amount of this traffic and the relative ease of estimating it, we do not see the need to know where each and every adjustment was made to account for it.

9. As to the R-18 and the R-19 Report, what is the annual total indirect population figure?

The model simulates population changes under the assumption that the total population/employment ratio remains constant. This implies an economy at full employment equilibrium. Equilibrium population/employment ratios are derived from census population estimates. In the model, the balance of labor supply and labor demand is disturbed when there is a change in total visits to the project, spending per visitor, or both. Excess labor demand created by increased visits or spending is satisfied by in-migration from outside Butte County. A commuter matrix of weights derived from census "*Journey to Work*" data forms the basis by which population is assigned across the towns and unincorporated areas. The population/employment ratio given in the model is 2.18. At spending levels consistent with those recorded in the survey data, and holding the number of visitor days constant, the model estimates 654 project-generated jobs for the County. At a ratio of 2.18 persons for every job, the project would generate 1,423 additional residents in Butte County.

In the model, population impacts are directly proportional to visitor spending, which probably overstates the impact of visitor spending on Butte County population. In reality, some of the increased jobs generated by the project would be filled by Butte County residents and not exclusively by in-migrants. The precise relationship between local labor supply and jobs generated by the project depends

on traditional factors of labor economics, including skills, demographics and especially wages. Because the model predicts that Butte County's costs of serving the additional population would be greater than the revenue associated with those people, any overestimate of population impacts would also overstate the County's project-related fiscal deficit.

LITERATURE CITED

DWR (California Department of Water Resources). 2005. Responses to Deficiencies, Clarifications, Additional Information Requests, and Revisions to January 2005 License Application, Binder #1 Public Information: California Department of Water Resources, Sacramento, CA. August 2005.

DWR. 2004. Recreation activity, spending, and associated economic impacts. Final Study Report, R-18. Oroville Facilities Relicensing FERC Project No. 2100. California Department of Water Resources, Sacramento, CA. May 2004.