ENVIRONMENTAL BENEFITS OF BEST MANAGEMENT PRACTICES IN URBAN WATER CONSERVATION: ESTABLISHING A BASELINE

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Statement of Work, Section One: Relevance and Importance

This project is aimed at developing and applying a much-needed tool for placing an economic value on the environmental benefits derived from implementing Best Management Practices (BMP) in urban water conservation. Adding quantified environmental benefits to the other benefits of BMP should increase the implementation of BMP, thereby increasing water conservation efforts and results. This research project, which will establish a baseline for valuing the environmental benefits gained from BMP in water conservation, is vital to the goals of ecosystem restoration established by the CALFED Bay-Delta Program.

Multiple Benefits across CALFED Program Elements

The CALFED Bay-Delta Program (CBDP) was established to develop a long-term, comprehensive plan for restoring ecological health and improving water management for beneficial uses of the Bay-Delta system (CALFED, 2000, p.2). The CALFED plan has four components: (1) restoring the ecological health of the Bay-Delta estuary, (2) increasing the reliability of water supplies, (3) protecting drinking water quality, and (4) protecting levees in the Delta. The CBDP's diverse components include ecosystem restoration, watersheds, and water use efficiency. All aspects of the CALFED program are interrelated and interdependent. Ecosystem restoration is dependent upon water supply, conservation, and management. Water supply depends on efficiency of water use and consistency in regulation. Water quality depends on water supply and improved conveyance, levee stability, and healthy watersheds. And the success of all elements depends on strategically managed storage and infrastructure (CALFED, 2000, p. 4). Environmental/economic linkages interconnect all four components of CALFED's Bay-Delta Program, from the ecological health of the Bay-Delta estuary through reliability of drinking water supplies and quality to protecting Delta levees.

One issue addressed in this research project is how to practically and effectively integrate efficient use of water with the goals of environmental and ecosystem restoration set by the CALFED Program. By explicitly applying economic valuation of environmental benefits of water conservation, the evaluation and design of water conservation activities provides environmental/economic linkages that can be explicitly addressed as a component of CALFED's water use efficiency programs. This valuation also will contribute to the understanding of California's water system with respect to ecosystem restoration and watersheds.

Under contract to the California Urban Water Conservation Council (the Council), the University of California at Berkeley (UCB) and Lawrence Berkeley National Laboratory (LBNL) are developing an analytical tool[2] for estimating the economic value of environmental benefits that may accrue from implementing Best Management Practices (BMP) in urban water conservation in California. Integrating considerations of environmental impact is a fundamental goal of the CALFED Bay-Delta Program and an important element of the Council's technical support to urban water agencies for implementing BMP. The UCB-LBNL tool for quantifying

[2] The tool will be ready for use by the end of 2005.

environmental benefits (the EB tool or the EB model) is a significant innovation for water resource planning.

The purpose of the EB model is to provide a practical tool with which utilities can place a monetary value on the environmental benefits, or costs, associated with a particular BMP. It is assumed here that the water savings associated with implementing one or several BMP can be quantified in terms of a reduction in demand for water from a water supply source or set of sources. This reduction in demand from a water supply source (such as a reservoir, stream, or groundwater resource) may increase the environmental benefit provided by that source.

Project Goals

The goals of this project are to:

1. develop and calibrate a tool to estimate environmental benefits of urban water conservation;
2. establish an environmental benefits baseline by examining the effects of including environmental benefits into the cost-benefit analyses that water suppliers perform when deciding whether to implement a BMP; and
3. evaluate the effectiveness of an environmental benefits valuation tool in distinguishing environmental benefits among various types of water sources and water-type years.

California's water resources are vital to its economy and to the health of its fish and wildlife habitats. Urban water suppliers recognize the need to both provide water to customers and preserve the state's ecosystems for future water supplies. Although water suppliers have access to various tools for calculating the cost-effectiveness and avoided costs of various water conservation programs, none of these tools to date calculated the environmental costs and benefits resulting from water conservation. This project estimates the environmental costs and benefits from various water conservation programs specific to individual utilities and agencies, enabling their inclusion in cost-effectiveness calculations.

Consistency with Water Management Plans

Established to assist with implementing water use efficiency programs in the urban sector, the California Urban Water Conservation Council (Council) predates establishment of the CALFED Bay-Delta Program (CBDP) by several years. The Council was created by the Memorandum of Understanding Regarding Urban Water Conservation in California (MOU),[2] first signed in 1991 by a group of urban water suppliers, environmental interest groups, and other interested parties. Water suppliers who signed the MOU agreed to develop and implement comprehensive conservation BMP using sound economic criteria. Since 1991, more than 200 urban water suppliers across California have signed the MOU.

The CBDP's current Water Use Efficiency Program Multi-Year Program Plan (California Bay-Delta Program (CBDP), 2004) recognizes the Council as the primary agency for providing technical assistance for implementing BMP in urban water conservation. As described in the CBDP's program plan, the Council provides technical assistance to urban water suppliers by refining the reporting database for urban BMP, determining revenue impacts of water conservation, supporting water agencies in preparing Urban Water Management Plans, and providing other support activities (CBDP, 2004). By supporting development of the EB tool, the

[2] Signatory water suppliers to the Council's MOU agree to implement any of the 14 Best Management Practices for urban water conservation that are locally cost-effective. The Council's water suppliers account for more than 80% of urban water supplied in the state.

Council recognizes Recital E in the MOU, which states that conserved water can be used for protection of the environment.

Not all MOU signatories are expected to implement all BMP, but they are mandated to implement all BMP that are determined to be cost-effective. For purposes of the MOU, cost-effective means that the net present value of expected benefits of implementation (including avoided water and wastewater costs and environmental benefits) equal or exceed the net present value of the expected costs of implementation.

The BMP and the criteria for their implementation are contained in the MOU, a copy of which is available on the Council's website (www.cuwcc.org). There currently are 14 BMP that address residential, commercial, industrial, and landscape uses, system loss and leak detection, education, public information, and pricing practices. As reported in the BMP database, gross water savings from the quantifiable BMP exceeded 100,000 acre-feet per year (AFY) in 2002, and the annual savings rate has grown at more than 8,000 AFY throughout the past decade. From 2001 to 2002, the annual gross savings rate increased by more than 10,000 AFY.

Consistency with Integrated Resource Management Plans

Integrated Resource Management Plans encourage a comprehensive approach to the management of water and other resources in any given watershed. Central to the MOU, as expressed in the Recitals section, is protecting the environment while providing reliable urban water supplies (MOU, 2004). The American Water Works Association (AWWA, the primary national association of water utilities) has a similar goal of including environmental aspects in integrated resource planning (AWWA, 1994).

The method to be developed for quantifying environmental benefits estimates the environmental impacts of avoided water use associated with implementing a given water conservation BMP, as specified in the MOU. This procedure follows the California Bay-Delta Program's recommendations for considering environmental impacts when examining resource strategies (CBDP, 2001).

Further Implementation of Existing Water Management Activities

To date, when urban water suppliers calculate avoided costs to evaluate the cost-effectiveness of BMP, they have no tools capable of calculating environmental benefits from the potential water savings. The key barrier to doing so has been the lack of a practical method for assigning a monetary value to the economic benefits of conserved water. The EB tool will remove this barrier to efficient valuation of environmental benefits for conservation programs. The environmental benefits valuation tool integrates the results of a meta-analysis of environmental valuation studies to produce an environmental benefits adder to the costs avoided by conserving water.

We propose to (1) calculate water savings associated with historical BMP filings using the EB tool; (2) compare the results to historical savings absent consideration of environmental benefits to determine the additional water savings potential; and (3) based on the additional water savings potential had historical programs included environmental benefits, estimate water savings potential of future BMP implementation. The comparison will establish a baseline for future BMP reporting and exemption filings. Examining the effect of including environmental benefits in specific historical BMP filings will determine whether the EB tool adequately distinguishes

between the environmental benefits arising from different characteristics of various water sources and water-type years.

The scope and budget for the previous tool development project limits the comprehensive quality assurance testing of the EB tool that will now be feasible in this project. Rerunning historical reports will provide a basis for predicting the EB tool's contribution to decisions regarding BMP implementation. Using temporal weather and water data will identify necessary refinements to the EB tool.

Thus, this research project is vital for implementing urban water use efficiency programs that meshes efficiently with the ecosystem restoration goals of the CALFED Bay-Delta Program.

Statement of Work, Section Two: Technical/Scientific Merit, Feasibility

Hypothesis upon Which the Research is Based

This research proposal is submitted under section B of the request for proposals. This work is not a "project" as defined by CEQA, California Code of Regulations, Title 14, Division 6, Chapter 3, Section 15378.

The hypothesis that underlies the proposed work is that including a quantification of environmental benefits will increase the cost-effectiveness of implementing BMP and, thereby, increase the numbers of BMP implemented and decrease the numbers of exemptions filed. This project will contribute to a more complete picture of California's water resources by establishing a baseline for evaluating environmental benefits resulting from urban water conservation programs. This baseline will enable initial forecasts of future environmental benefits.

Of the 14 BMP listed in the MOU, 8 have quantifiable benefits.[3] The Council has created spreadsheets to assist water utilities in calculating the cost-effectiveness of these 8 BMP (Appendix 1 presents a list of all BMP). This project will examine those 8 BMP: (1) water survey programs for single- and multi-family residential customers; (2) residential plumbing retrofit; (4) metering with commodity rates for all new connections and retrofits of existing connections; (5) large landscape conservation programs and incentives; (6) high-efficiency washing machine rebate programs; (9) conservation programs for all commercial, industrial, and institutional (CII) accounts; (9a) CII Ultra Low Flush Toilets (ULFT) replacement programs; and (14) residential Ultra Low Flush Toilets (ULFT) replacement programs.

Estimates of Water Savings

Assuming that water suppliers implement BMP because they are cost-effective, using the EB tool can provide an estimate of potential water savings attributable to BMP. The EB tool is designed to be used by water suppliers in determining the cost-effectiveness of established or potential BMP.

According to the Council's website, water savings resulting from the eight quantifiable BMP have been recorded since 1991 (BMP9 counts as two BMP). In 1991, 183 acre-feet (AF) were saved from implementing BMP9a [Commercial, Industrial, and Institutional (CII) Ultra Low

[3] Retail water suppliers have 8 quantifiable BMP with which to comply; wholesale water suppliers have 6. The nature of those 6 BMP makes it difficult to quantify the results of compliance by wholesale water suppliers.

Flush Toilet (ULTF) Replacement], the lowest BMP water saving achieved that year. The highest water savings, at 18,813 AF, stemmed from BMP5 (Large Landscape Conservation Programs and Incentives). The median value for 1991 was slightly greater than 1,200 AF per BMP. By 2004, the median water savings from all BMP had more than quadrupled to 5,285 AF. BMP9a (CII ULFT water savings) and BMP14 (gross water savings for residential ULFT replacement) produced the low and high water savings values of 793 and 77,189 AF, respectively. The median value for the past 14 years of reporting is 3,500 AF (see Table 1).

Table 1 Range of Water Savings from BMP

	Smallest Water Savings (BMP) (AF)	Largest Water Savings (BMP) (AF)	Median Water Savings for All BMP (AF)
1991	183 (BMP9a)	18,813 (BMP5)	1,200
2004	793 (BMP9a)	77,189 (BMP14)	5,285
1991-2004			3,500

In 2001, 70 (of over 200) of the Council's water utility members reported not implementing any BMP, based on never having reported or having ceased to report. A similar number (69) was reported in 2002. Including environmental values and thereby increasing the cost-effectiveness of BMP might inspire another 7 utilities, or 10% of those not currently reporting, to conduct water conservation programs. Based on the median savings of 3,500 AF per BMP, we could assume an additional annual water savings of 24,500 AF. By 2004, the number of non-reporting water utilities had grown to 150. If 10% of that number were to implement BMP because the inclusion of environmental benefits increased their cost-effectiveness, the additional annual savings could amount to 50,000 AF.

To put 50,000 AF in context: A family of four uses about 1/2 to 2/3 of an acre-foot of water per year (Douglas County Water Resource Authority website, accessed when in January 2005). More to the point, in 2003 the U.S. Bureau of Reclamation (USBR) paid $4 million, or $80 per AF, for 50,000 AF of water to protect threatened coho salmon in the Klamath River. For 2004, the USBR expected to pay close to $100 per AF for water needed for salmon (Barnard, 2004). Of course, the degree to which conserved water is useful to the environment depends on when and where the water is conserved.

Pertinent Research in the Area

The environmental benefits (EB) valuation model being developed by UCB and LBNL is a practical tool that combines economic theory with field research documented in academic reports. The model has been refined based on the field experience of water utilities participating as stakeholders in the model development process.

Assumptions

This project makes the following assumptions.

- The hypothesis that environmental benefits from urban water conservation have no economic value is false.
- The value of urban water conservation depends upon the characteristics of the water source, the magnitude of the water savings and the season
- Sufficient data exist to provide initial estimates of the economic value of urban water conservation, even though these data are incomplete and ranges of values may be needed in some cases to account for uncertainty.

- The impact on urban water conservation of including environmental benefits in a cost-effectiveness calculation can be estimated.

Research Methods

This project has five phases: data collection, applying the EB tool, developing the database, evaluating findings, and producing reports.

Data Collection: Most of the necessary data is readily accessible. Calls will be made to member water utilities to estimate marginal water savings from BMP. The number of utilities that reported implementing all BMP from 1991 to 2004 is 120. We assume each call to a water supplier to learn the marginal water savings from the eight BMP requires no more than one hour. We assume that the information will be collected from the utilities within a 90-day period Allowing some time for call backs, we have allotted three months for this task.

*Applying the EB Tool**:*** The environmental valuation benefit model complements the current menu of tools and reports offered on the California Urban Water Conservation Council's (Council's) website. The Council created the tools to assist water agencies in complying with the BMP.

> ***Cost-Effectiveness Spreadsheets (CE tool)*:** the Council created a set of spreadsheets for estimating water savings from quantifiable BMP to help calculate the costs and benefits of implementing BMP. These spreadsheets are used in conjunction with the Council's BMP Coverage Calculator.
>
> ***Environmental Benefits Valuation Tool*:** the Council currently is supporting creation of the EB tool, which will enable an environmentally and economically more efficient evaluation of the benefits of water conservation programs by facilitating the inclusion of quantified environmental benefits.

For the years 1999 through 2004, there are approximately 4,500 BMP reports covering BMP 1, 2, 4, 5, 6, 9, 9a, and 14 for retail water suppliers, with approximately 400 BMP exemption filings covering the same quantifiable BMP. The data inputs from historical reports will be rerun to capture the values for avoided costs and environmental benefits. Each report run is estimated to take between 1 and 2 hours, with two people working on approximately 5,000 reports. We expect this task to require about 15 months.

Developing the Database: Data will be stored in a Microsoft Excel spreadsheet and will be available to the California Department of Water Resources (DWR) and others on the Council's website.

Evaluating Findings: Sufficient data exist to provide initial estimates of environmental benefits. Consideration will be given to the limitations of the estimates, in terms of coverage, variability and uncertainty. To deal with variability, estimates will be made specific to water conservation practices, to utilities and to water sources. Sensitivity analysis over a range of values will be used where appropriate to estimate the effect of these uncertainties. Where data permit, probability distributions will be used to systematically address all the uncertainties and variabilities, rank order their importance, and calculate the probability that the environmental benefit baseline will be reduced with the advent of new research and studies.

Deliverables: The research deliverables include:

- one technical report on the baseline established from the comparison between historical savings and their recalculation with the EB tool,
- a summary report on recommendations for improving the EB tool, and
- a database that includes inputs into the Council's cost-effectiveness calculator along with the recalculated savings.
- a guide to the database

Task List and Schedule

Phase I: Data Collection (3 months)

Program Components

The data collection effort includes

- locating water suppliers
- identifying water suppliers' water sources
- obtaining water supplier data from BMP implementation reports
- obtaining water supplier data from BMP exemption filings
- estimating marginal water savings per BMP for all available years
- determining water-year types from 1991 to 2004

Program Goal

- All data will be put in a format that can be input into the CE and EB tools.

Phase II: Apply the EB Tool (15 months)

Program Components

The tools used are:

- avoided-cost tool to obtain marginal water savings per BMP
- environmental-benefit tools to obtain net present values of environmental benefits derived from marginal water savings
- cost-effectiveness spreadsheet to show the benefits and costs of the quantifiable BMP

Program Goals

- Obtain quantity and source of savings by BMP for each utility.
- Identify water savings by water-year type.

Phase III: Organize Data (6 months)

Program Component

- Develop database from output of EB tool

Program Goal

- Produce database of water savings showing quantity, source, and water-year type organized by utility and BMP.

Phase IV: Evaluate Findings (6 months)

Program Components

- Water savings and cost-effectiveness values from historical BMP cost-effectiveness spreadsheet runs that show results absent consideration of environmental benefits

- Water savings and cost-effectiveness results of recalculating BMP cost-effectiveness spreadsheet runs that include environmental benefits

Program Goals

- Establish baseline of environmental benefits from water conservation BMP.
- Assess variability and uncertainty of EB tool sensitivity to water source and water-year type.

Phase V: Prepare and Produce Reports (5 months)

Program Components

- Baseline estimates of environmental benefits
- Variability and uncertainty of the EB tool.
- Sensitivity to water source and water-year type

Program Goals

Reports will include:

- results of comparison that establishes environmental baseline
- degree to which EB tool is sensitive to water source and water-year type
- guide to database of recalculated cost-effectiveness values for BMP by utility

Table 2: Project Schedule with Tasks, Deliverables, Time Frames, and Projected Costs

ID	Task Name	Duration	Start	Finish	Projected Cost[4]
1	Project Initiation	0.5 months	12/1/2005	12/14/2005	
2	**Data Collection**	**3 months**	**12/15/2005**	**3/15/2006**	**$30,000**
3	Locate Water Suppliers	1 day	12/15/2005	12/15/2005	
4	Identify Water Supplier Water Source	1 day	12/15/2005	12/15/2005	
5	Obtain Data Inputs from BMP Reports	1 week	12/15/2005	12/22/2005	
6	Obtain Data Inputs from BMP Exemptions	1 week	12/15/2005	12/15/2005	
7	Estimate Marginal Water Savings	10 weeks	12/15/2005	12/15/2005	
8	Water-Type Years 1991-2004	1 day	12/15/2005	12/15/2005	
9	**Applying the EB Tool**	**15 months**	**3/15/2006**	**6/15/2007**	**$100,000**
10	AC[1] Tool for Marginal Water Savings	5 months	3/15/2006	8/15/2006	
11	EB Tool for NPV[2] of Environmental Bens.	5 months	8/15/2006	1/15/2007	
12	CE[3] Spreadsheet for B&C for BMP	5 months	1/15/2007	6/15/2007	
13	**Developing the Database**	**6 months**	**6/16/2007**	**12/15/2007**	**$35,000**
14	**Evaluating Findings**	**6 months**	**12/16/2007**	**6/15/2008**	**$65,000**
15	Baseline Environmental Benefits	3 months	12/16/2007	3/15/2008	
16	Variability and Uncertainty of EB Tool	3 months	3/16/2008	6/15/2008	
17	**Preparing and Producing Reports**	**5 months**	**6/16/2008**	**11/15/2008**	**$70,000**
18	Environmental Benefit Baseline	2 months	6/16/2008	8/15/2008	
19	Variability and Uncertainty of EB Tool	2 months	8/15/2008	10/15/2008	
20	Database Guide	1 month	10/16/2008	11/15/2008	

[1] AC = Avoided Cost
[2] NPV = net present value
[3] CE = cost-effectiveness
[4] Projected Cost = LBNL costs only. Council inkind contribution of $20,000 would be split evenly between Data Collection and Evaluating Findings.

Statement of Work, Section Three: Monitoring and Assessment

The monitoring plan will follow all five phases of this project: Data Collection, Applying the EB Tool, Developing the Database, Evaluating Findings, and Producing Reports.

The team will have a kick-off meeting to review the goals and methods of the study and discuss the workplan. This first meeting will take place at LBNL in Berkeley. The LBNL team will hold weekly meetings to discuss progress made during the project. Every month throughout the project, the team will produce a memorandum noting the progress of the study and goals accomplished. The team will benefit greatly from the integral participation of the California Urban Water Conservation Council, which maintains an ongoing role in monitoring and evaluation of the urban water conservation programs and activities undertaken by the membership.

***Data Collection*:** Given that much of the necessary data is readily available, we anticipate that most of the time allotted to this task will be devoted to data organization. The project leadership will maintain a master record to assure that information from water utilities is recorded as it becomes available. The data will be stored at LBNL until its transfer to the Council. As data is collected it will be summarized in the monthly memoranda.

***Applying the EB Tool*:** LBNL and UCB will make themselves available to resolve any questions about applying the EB tool to the Council's spreadsheets.

***Developing the Database*:** Data will be stored in a Microsoft Excel spreadsheet and will be available to DWR and others via the Council's website.

***Evaluating Findings*:** Analyses of the findings will be presented in the reports. Updates throughout the analysis period will be recorded in the monthly memoranda.

Preparing and Producing Reports: The research deliverables include one technical report (on the baseline established from the comparison between historical savings and their recalculation with the EB tool); a summary report (on recommendations to improve the EB tool); and a database and guide that includes inputs into the Council's cost-effectiveness calculator and the recalculated savings.

***Estimated Costs of Monitoring and Assessment Plan*:** The cost of the monitoring and assessment plan is included in the overall budget for this proposal. The cost, all of which reflects labor, is estimated to be approximately 10% of the total cost of the project.

***Evaluating Success in Relation to Project Goals and Objectives*:** This project has two primary objectives: (1) to establish a baseline regarding the effects of including environmental benefits in the cost-benefit analyses that water suppliers perform to decide whether to implement urban water conservation BMP; and (2) to determine the effectiveness of the environmental benefits valuation tool in distinguishing among various water sources and water-year types.

This project will be evaluated based on its development of a baseline of environmental benefits derived from urban water conservation BMP and the EB tool's sensitivity to differences in water sources and water-year types. This project will not be evaluated based on the quantity of environmental savings from BMP or the degree of the EB tool's sensitivity.

Qualifications of Applicants and Cooperators

The team, comprising staff members of Lawrence Berkeley National Laboratory, UC Berkeley , and the California Urban Water Conservation Council, is uniquely qualified to carry out this project in an effective and efficient way.

Role and Qualifications of LBNL

LBNL will serve as lead agency. LBNL has been a leader in science and engineering research for more than 70 years. Located on a 200-acre site in the hills above the University of California's Berkeley campus, LBNL holds the distinction of being the oldest of the U.S. Department of Energy's National Laboratories. LBNL, managed by the University of California, operates with an annual budget of more than $500 million (FY2004) and a staff of about 3,800 employees, including more than 500 students.

LBNL conducts unclassified research in a range of scientific disciplines, with key efforts in fundamental studies of the universe, quantitative biology, nanoscience, new energy systems and environmental solutions, and the use of integrated computing as a tool for discovery. It is organized into 17 scientific divisions and hosts four national Department of Energy user facilities.

The Environmental Energy Technologies Division (EETD) was founded in 1973 in response to concerns about the cost, availability, and environmental effects of energy use. The EETD has performed cost/benefit analyses used to evaluate federal energy-efficiency standards that have saved the United States more than $40 billion in the past two decades.

EETD has researched connections between water and energy systems starting in 1979 and is currently expanding its activities regarding the analysis of water conservation measures and policies. EETD regards the Department of Water Resources as a natural partner in furthering research in water conservation, efficiency, and economics. During the past three years, the EETD has invested in building specialized water-related research capabilities, forming the Water Energy Technology Team (http://water-energy.lbl.gov/) in collaboration with the Earth Sciences Division.

WETT comprises resource engineers, scientists, and economists who have the capability to address both domestic and international water and wastewater challenges. LBNL-WETT is a leader in developing tools, technology, and computer-based decision support systems to improve energy and water efficiency and to enhance environmental monitoring, modeling, and management. It provides clients throughout the world with treatment alternatives that reduce energy and water demand and increase water supply. Researchers have been studying the feasibility and cost of engineering changes designed to increase the efficiency of water use. LBNL-WETT is conducting a study of California's water-energy systems and ways to avoid future crises. In addition, the group has calculated water and energy benchmarks for various industries; performed studies of real-time water management issues; and developed many energy-efficient technologies, including UV Waterworks, a device that efficiently uses UV light energy to remove microorganisms from drinking water.

LBNL also has committed more than $500K of Laboratory Director Research Development (LDRD) funds in support of better understanding the effects of climate change on the California water system. The LDRD project includes running and making technical improvements to

CALSIM, the California Department of Water Resources (DWR) water resources simulation model.

For the California Urban Water Conservation Council, the EETD's WETT team has investigated the environmental benefits from applying Best Management Practices (BMP) to water conservation in California. This research will enable an environmentally and economically more efficient evaluation of the benefits of water conservation programs by including quantified environmental benefits in the determination of program costs/benefits.

James E. ("Jim") McMahon will be project lead. He is Co-chair of the Water Energy Technology Team and Head of the Energy Analysis Department at LBNL. He conducts technical and economic analysis of technologies and policies for mitigating environmental problems, particularly related to energy and water systems. He has authored over 100 publications, mostly about U.S. energy efficiency programs, including a book: (coauthor Stephen Wiel) "Energy Efficiency Labels and Standards: A Guidebook for Appliances, Equipment and Lighting." Washington, DC. Collaborative Labeling and Appliance Standards Program, 2001 (available in English, Chinese and Spanish). He has provided consultation to the national governments of over 40 countries and to international agencies.

Dr. McMahon's recent research includes: 1) the feasibility and cost of engineering design changes that could increase energy or water efficiency for products accounting for most of the energy consumption in buildings (including water-using products such as clothes washers and dishwashers); and 2) past and projected impacts of increasing energy efficiency on consumers, manufacturers, utility companies, the nation, and the environment. His special interests include uncertainty analysis, how costs and savings from efficiency improvements are distributed among different consumers, and long-term forecasts of energy and water demand by end use, and marginal energy prices. Dr. McMahon received a B.S. degree in Chemistry from Providence College and a Ph.D. degree in Molecular Biophysics from Florida State University. He first worked as a consultant to LBNL in 1977 studying the impacts of a California drought on electricity supply and air quality, and was hired as a staff scientist in January 1978.

Camilla Dunham Whitehead serves as the Project Manager for the Water and Energy Technology Team at LBNL. In that role, she integrates the interests of a diverse set of researchers into a coherent group and interacts with groups such as: US DOE, US EPA, Alliance to Save Energy, ACEEE, Woodrow Wilson Center for Scholars, California Urban Water Conservation Council, and American Water Work Association on behalf of the team. Ms. Whitehead's Master's thesis explored the extent to which a wetland designed for domestic wastewater could also process hazardous chemical wastes. This research was done at the behest of the Romberg Tiburon Center for Environmental Studies of San Francisco State University.

Role and Qualifications of UC Berkeley

Professor Michael Hanemann, Chancellor's Professor of Environmental Economics and Policy in the Department of Agricultural & Resource Economics and the Goldman School of Public Policy, will serve as the Lead Investigator at UC Berkeley. At Berkeley, Dr. Hanemann's fields of teaching and research include water resource economics, environmental economics, and non-market valuation. For this project, Dr Hanemann will provide expert guidance on the application of the EB tool and the analysis of the findings.

Dr. Hanemann has worked extensively on non-market valuation of the environmental value of

water. From 1986 to 1991, he was a member of the National Academy of Sciences/National Research Council Committee that reviewed the Glen Canyon Environmental Studies Program. He contributed to two books produced by the committee dealing with the political, legal, and economic aspects of the Colorado River. Since 1988 he has served as a consultant to NOAA; the Attorneys General of California, Alaska, Montana, and New York; the Spanish government; and the Energy Regulatory Agency of Peru regarding litigation for natural resources damages from the release of hazardous substances. In 1993-94, he was a consultant to the U.S. Environmental Protection Agency in preparing the regulatory impact analysis of the proposed water quality standards for the San Francisco Bay/Delta. He had responsibility for estimating the impacts on urban water use in Southern California, commercial fishing, and water-based recreation in Northern California. He subsequently served as a consultant for the economic analysis of water-based recreation in the Bureau of Reclamation's Programmatic Environmental Impact Statement for the Central Valley Project Improvement Act.

Several of Dr. Hanemann's current research projects on water will contribute materially to the implementation of this study including the following.

- The California Energy Commission has created a California Climate Change Center at UC Berkeley to analyze the potential effects of climate change on California. Dr. Hanemann is Director of the new center, and two of its current research projects focus directly on California water issues. One of these projects, being conducted jointly with Professor John Dracup of the Civil & Environmental Engineering Department, is compiling a database of information on water supply, costs, and prices for all urban and agricultural water agencies in California.
- Another project, being conducted jointly with Professor John Landis of the City and Regional Planning Department, studies the effect of new urban growth on future residential water use in California. This project involves collecting household-level water use data from various vintages and styles of housing development. The intention is to conduct an econometric analysis of the effects of housing vintage, density, and style, as well as climate, on residential water use. Professor Landis will combine these results with forecasts of the locations of urban growth in California to project future baseline urban demand for water in various regions of California.

UC Berkeley has extensive experience in the theory and practice of environmental valuation and agricultural and resource economics. The UC Berkeley and LBNL teams are intricately linked at an institutional level. The University of California manages LBNL under contract with the Department of Energy, and LBNL staff and WETT member Larry Dale is Assistant Director of the UC Berkeley California Climate Change Center headed by Dr. Michael Hanemann.

Role and Qualifications of California Urban Water Conservation Council

The mission of the California Urban Water Conservation Council is to improve water use efficiency statewide. The California Urban Water Conservation Council and the Memorandum of Understanding that created it represent a unique approach to urban water conservation through collaboration between water agencies, regulators, public interest groups, and other interested organizations. The approach relies on a consensus partnership to simultaneously improve the state of the art in urban water conservation while moving forward on recognized Best Management Practices (BMPs) in a timely and cost-effective manner. The Council supports the water conservation efforts of its member organizations through assistance in implementing the BMPs, collaborative research and development among the membership, and through monitoring

and evaluation of the urban water conservation programs and activities undertaken by the membership. A special interest of the Council is the overall integration of urban water conservation BMPs into the planning and management of California's water resources.

The Council's 319 member organizations include 181 water supply agencies that deliver nearly 80 percent of California's urban water; 29 environmental groups; and 109 other organizations interested in water efficiency issues.

The Council was created to oversee the 1991 Memorandum of Understanding Regarding Urban Water Conservation in California (MOU), which sets forth Best Management Practices (BMP's) for the efficient use of water in urban areas of the state. In becoming signatories to the MOU, Council members agree to implement the 14 BMP's and comply with all requirements of the MOU. Members submit bi-annual progress reports to the Council, which reports annually to the State Water resources Control Board.

In this project for the Council, Katie Shulte Joung will be the liaison between LBNL, the Council, and its member agencies. Katie will be responsible for coordinating data collection. The Council's role will be an in-kind contribution.

Katie Shulte Joung (please refer to full resume in Appendix) is a Project Manager with the California Urban Water Conservation Council. Katie's work at the Council includes managing sixteen research and local assistance projects as part of a $1.9 million three-way cooperative agreement (see item 3 below) with the California Department of Water Resources, CALFED, and the Bureau of Reclamation. For the first two years of this 3-year cooperative agreement, all projects funded by DWR were completed on time and within budget; we are currently on track to complete the remainder of work in year three before the April 30, 2005 deadline in the contract. Katie has extensive experience in coordinating public outreach, facilitating and organizing workshops, and providing training and technical assistance on water supply and land use planning linkages as well as numerous conservation activities.

Prior to joining the Council, Katie was with the Governor's Office of Planning and Research (OPR) where she was an Associate Planner specializing in land-use planning and water policy issues and providing local agencies with technical assistance regarding the California Environmental Quality Act and state planning law, and water supply planning legislation (SB 221 and SB 610). She has a B.A. from U.C. Berkeley with an emphasis on environmental policy and planning.

Previous Water Use Efficiency Grant Experience

In 2002, a landmark cooperative agreement was signed awarding $1.7 million over three years to the California Urban Water Conservation Council (Council). The funding comes from three entities: the Department of Water Resources (DWR), the U.S. Bureau of Reclamation, and the CALFED Bay-Delta Authority (CBDA). This agreement represents a significant commitment to assist urban water agencies across California to reach water use efficiency goals. This grant agreement included $600,000 for tasks funded by DWR, all of which are on track for timely completion.

- Avoided Cost and Environmental Benefit: In September 2004, the Council began a research project of significant proportions: How to best quantify the avoided costs and capital costs associated with new water supply - costs which are avoided when water

conservation programs produce "saved water" - and how to estimate the environmental benefits and costs connected to those water conservation programs. Until now, there has not been an easy or standardized way to estimate these number that are important to assessing the true value of water conservation in California. A methodology and model will be available by the end of 2005.

- CALFED Year 4 Report: The Council assisted CBDA in the preparation of the Year 4 Comprehensive Report for CALFED's Water Use Efficiency program. This included compiling information, by hydrologic region, on conservation implementation by device or program, extracting data from Urban Water Management Plans, and developing a model to calculate statewide water savings and costs.
- Certification Support: provide support for CBDA in defining protocols for implementation of a BMP program certification process.
- Water Savings Calculation Model: a software program to estimate statewide water savings from BMP activities has been developed. This database relies on the data provided by water agencies on the implementation of quantifiable BMPs. The water savings calculations will likely be used in the State Water Plan (Bulletin 160) and in various CBDA planning documents. The model also provides enables water suppliers to calculate their agency's water savings potential for use in program planning.
- Cost-Effectiveness Workshops: In the fall of 2002 and 2004, the Council hosted a series of workshops to provide guidance on how to conduct cost-effectiveness analysis. Signatory water suppliers are expected to implement an applicable BMP only when it is cost-effective to do so. The workshops provided a general analytic framework from which to assess BMP benefits and costs, guidance on analysis time horizons, use of discounting and selection of discount rates, perspectives of analysis, use of sensitivity analysis, and an overview utility avoided costs.
- Revenue Impacts: In the Fall of 2004, the Council hosted workshops for water agency general managers, finance directors, rate managers, and other interested parties. The Workshops provided information on: managing revenue stability through rate design; the effect of pricing on water consumption and conservation; incorporating future capital investment in rate structure design; adaptive pricing benefits for drought management; equity versus efficiency; and the benefits to wastewater utilities in adopting a conservation oriented rate structure.
- BMP Costs and Savings Study: The Council updated its BMP Costs and Savings Study, a reference document summarizing the best available estimates of BMP-related program costs and water savings and added a new chapter on Program Cost Accounting. This publication is an integral resource to water agencies in analyzing and developing conservation programs. Additional updates on technologies, data and case studies will be incorporated in the publication in Year 3 of the project.
- Large Landscape Technical Assistance: the Council will provide technical assistance and training on BMP 5 - Large Landscape Conservation implementation, including providing expert assistance in the field for water agencies developing landscape programs. This will include: review of water district landscape customer data; on-site landscape technical assistance; guidance on the linkages between water pricing, billing, and landscape water use; and demonstration of landscape efficiency technologies to reduce drainage and erosion as well as water waste.

These projects will facilitate even greater urban water conservation efforts by California's water suppliers and help meet the needs of our growing population while preserving important natural resources. This partnership among state and federal agencies has worked very well to promote

coordinated water conservation efforts and we would like to see this collaboration continue in future projects. The Cooperative Agreement has given the Council the ability to provide needed work products to DWR, the Bureau, and CBDA while also supporting the Council's mission and objectives.

Outreach, Community Involvement, and Acceptance

The project will use the Council's proven ability to reach out and assist urban water supply agencies in addressing their water conservation and efficiency programs and needs, leveraging the Council's unique approach to urban water conservation, based on collaborations between water agencies, regulators, public interest groups, and other interested organizations. As indicated above, the approach relies on a consensus partnership to simultaneously improve the state of the art in urban water conservation while moving forward on recognized Best Management Practices (BMPs) in a timely and cost-effective manner

Specific outreach activities will include

- presentations at industry conferences (e.g., Association of California Water Agencies, American Water Works Association, Association of Environmental Professionals)
- short articles in select water utility and environmental/scientific journals.
- presentation of research findings at Council membership meetings.
- use of the upgraded model by the Council in training its members.
- posting of report(s) on the Council's website.

Council information on the BMP reporting and exemption filing is publicly available.

Innovation

The environmental benefits (EB) tool is an innovative and practical product of years of study and experience. The EB tool distills quantities of information into a model that enables the information to be used more efficiently to determine the benefits—and value of those benefits—to the environment from water conserved by urban water suppliers.

This project is a natural next step in the exploration of the BMP structure that guides water suppliers in enacting the most cost-effective water conservation programs.

For many years, information has been available about the characteristics of water sources (the environmental services of a given water source; the source type and location; how the environmental services are valued; the dependencies of flora, fauna, and habitats on a given unit of water) and about water conserved (amount in a particular time period, from which source, the marginal unit saved). The EB tool is new in making the information more accessible for calculating the net present value of environmental benefits of urban water utility conservation programs. The innovative aspect of this project derives from using that tool to establish an historical baseline of environmental benefits using past BMP reports and exemption filings. No baseline currently exists. The information will be made available to water supply planners at the state, regional, or local levels for use in forecasting impacts of planned conservation programs, comparing cost-effectiveness of various BMP, and evaluating past conservation efforts.

Incorporating environmental benefits into the cost-effectiveness calculation of BMP is an innovation that enhances BMP implementation by assigning a quantifiable environmental aspect to conserved water.

Benefits and Costs

Benefits:

Our research will provide the first comprehensive estimate of environmental benefits associated with urban water conservation programs, throughout California. Benefits of this research will emerge at the local, regional, and state levels. Local agencies will benefit from more cost-effective implementation of BMP. Armed with this information, local agencies can better design and implement conservation programs to maximize local benefits, both environmental and economic.

It may be possible to quantify a subset of potential local benefits. We believe that the general technical assistance and information provided by our research will accelerate implementation of BMP. Even a fairly mild acceleration of BMP implementation, equal to 10% of current BMP savings, would result in conserving some 50,000 acre-feet of water annually. On a present-value basis under our proposed budget, we estimate this conservation could be achieved for less than $200 per acre-foot, in addition to any existing BMP program costs.

Urban water use and conservation advocacy groups also may benefit from this research. These regional groups, including the California Urban Water Agencies and California Urban Water Conservation Council, support programs to improve member agencies' efficiency of urban water use. Our research will provide these groups with a broad overview of environmental costs and benefits of urban water use. They can use this information to construct an initial, baseline estimate of environmental benefits associated with existing water efficiency and conservation programs. They can also track the environmental benefits resulting from implementing BMP.

Finally, this research will provide state water managers with information they can use to improve operation of the Bay Delta system. State water managers, including the Department of Water Resources and the U.S. Bureau of Reclamation, are responsible for managing flows in the Bay Delta system to promote a mix of agricultural, urban, and environmental uses. Although these managers currently have tools to quantify urban and agricultural benefits of water operations, they lack tools to quantify environmental benefits. State water managers can use this baseline information to evaluate potential benefits of changes to baseline flows and to improve the operating efficiency of the Bay Delta system.

Costs:

The total proposed budget for this project is $320,000, which includes $20,000 of inkind support from the California Urban Water Conservation Council. The following explanation is based on the costs outlined in Table C-1 on the following page. Additional budget information can be found on the LBNL Proposal Estimate worksheet following Table C-1.

LBNL's Salaries and Fringe Benefits, totaling $148,050, are allocated across all phases of the project as follows:

- Data Collection 10%
- EB Tool Application 35%
- Database Development 12%
- Findings Evaluation 20%
- Reports Preparation 23%

Materials and Supplies: includes $2,000 for copy costs, publication costs, and fax costs.

Equipment: No equipment is budgeted for this project

Subcontract: includes $20,000 for a subcontract with UC Berkeley for Prof. Michael Hanemann's effort to be applied to the following phases of the project:

- EB Tool Application $ 5K
- Findings Evaluation $10K
- Reports Preparation $ 5K

Travel: $2,000 total for 4 trips to Sacramento at $500.00 each.

Miscellaneous: The budget of $12,936 for miscellaneous costs includes laboratory and office space, electricity charges and miscellaneous costs such as telephone, and computer use.

Other: Totalling $115,014, these represent burdens, overheads and other required Department of Energy charges explained on the LBNL budget sheet and accompanying description following Table C-1.

Finally, the Council's in-kind contribution of $20K will be spent in the areas of

- Data Collection as liaison with the water suppliers $10K
- Findings Evaluation with UCB and LBNL, and $10K
- overall project management with UCB and LBNL.

Table C-1: Project Costs (Budget)

PLACEHOLDER FOR REQUIRED EXCEL SPREADSHEET

INSERT LBNL BUDGET SHEET

Brief Explanation of Costs included in LBNL Budgets

Salaries and wages are presented in accordance with costing practice for all Department of Energy (DOE) programs. The direct labor rates are based on actual payroll salaries. The salaries are escalated each year to allow for merit increase and career advancement. The escalation factor used for FY06 through FY07 is 3%.

Fringe benefits are a direct cost at LBNL. The fringe benefit rates for staff at LBNL differ according to employment status. The LBNL career rate is estimated at 23.0% in FY06 and 23.5% in FY07. These rates are approved by DOE and they are consistent with rates charged for all work at LBNL.

Indirect Costs:

Organization Burden is charged at the rate of 17% on total salaries and fringe benefits. The purpose of this burden is to distribute the cost of management and supervision of division activities.

A procurement burden of 5.1% is charged on purchased supplies and services (including permanent equipment) and electricity.

A travel burden of 14% is charged on all travel costs.

A General rate of 46% is charged on total direct costs except for equipment, purchased supplies, travel and electricity. The purpose of this rate is to distribute the costs incurred for the general management and administration of the laboratory including the costs of maintaining the Laboratory site.

A rate of 6% is charged for the Laboratory Director's Research and Development Program.

A Safeguards & Security Charge of 0.82% is applied to all direct costs. This charge is used to recover a pro rata share of DOE direct funded costs from projects funded by other sponsors.

The Lab's Federal Administrative Charge of 3% is waived for state agencies.

LIST OF SOURCES

Note: All URL's are up-to-date as of December 2004.

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A & N Technical Services Inc., 2004B. Urban water conservation potential: 2003 Technical Update. Prepared for California Urban Water Agencies, July 2004, 72 pp., **http://www.cuwa.org/library/CUWA_03UrbanWaterConservationPotential.pdf**

A & N Technical Services, 1997. Performance standards for demonstrating urban water conservation. Briefing book prepared for California Urban Water Agencies, June 1997, 15 pp., **http://www.cuwa.org/library/PerformanceStandardsforDemonstratingUrbanWaterConv.pdf**

American Water Works Association (AWWA), Government Affairs, 1994. Integrated Resource Planning in the Water Industry, **http://www.awwa.org/Advocacy/govtaff/intrepap.cfm**

Barnard, J., 2004. "Feds Buying More Water for Klamath Salmon," Register Guard, January 17, **http://www.registerguard.com/news/2004/01/17/b5.cr.klamath.0117.html**

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CALFED Bay-Delta Program, 2000. Programmatic Record of Decision, August 28, **http://calwater.ca.gov/Archives/GeneralArchive/rod/ROD.pdf**

California Bay-Delta Program (CBDP), 2004. Water Use Efficiency Program Multi-Year Program Plan (Years 5-8), **http://calwater.ca.gov/ProgramPlans_2004/Water_Use_Efficiency_Program_Plan_7-04.pdf**

CBDP, 2001. Water Use Efficiency Common Program, **http://calwater.ca.gov/Archives/GeneralArchive/WaterUseEfficiencyAlternative.shtml**

California Urban Water Conservation Council, 2003. Annual Report for 2003, **http://www.cuwcc.org/Uploads/annual_reports/FY2003/Annual_Report_2003.pdf**

Memorandum of Understanding (MOU), August 2004. **http://www.cuwcc.org/memorandum.lasso**

Douglas County Water Resource Authority (DCWRA) website, **http://www.douglas.co.us/DC/WaterInfo.htm**

Planning and Management Consultants, Ltd, 1992. Evaluation of urban water conservation programs: A procedures manual. Prepared for California Urban Water Agencies, February, 287 pp., **http://www.cuwa.org/library/EvaluationOfUrbanWaterConservationPrograms.pdf**

Maddaus, W., and Maddaus, L., "Water Demand Management within the Integrated Resource Planning Process," **http://www.cuwcc.org/Uploads/Tech_Docs/Demand_Mgmt_IRP.pdf**

Mitchell, D., 2003. BMP reporting database water saving calculations. Memorandum to the Research and Evaluation Committee of the California Urban Water Conservation Council, April 28, **http://bmp.cuwcc.org/bmp/summaries/public/BMPWaterSavingsCalcs.pdf**

RCD-Watershed Information Sharing Project, **http://www.carcd.org/wisp/glenn/**

Appendix 1: Best Management Practices

Best Management Practice		Cost-Effectiveness Spreadsheet
1.	Water survey programs for single-family and multi-family residential customers	Yes
2.	Residential plumbing retrofit	Yes
3.	System water audits; leak detection and repair	No
4.	Metering with commodity rates for all new connections and retrofits of existing connections	Yes
5.	Large landscape conservation programs and incentives	Yes
6.	High-efficiency washing machine rebate programs	Yes
7.	Public information programs	No
8.	School education programs	No
9.	Conservation programs for all commercial, industrial, and institutional accounts	Yes
9a	Commercial, industrial, and institutional ULFT replacement programs	Yes
10.	Wholesale agency assistance program	No
11.	Conservation pricing	No
12.	Conservation coordinator	No
13.	Water waste prohibition	No
14.	Residential ULFT replacement programs	Yes

Appendix 2: Resumes

The following resumes describe the skills and experience of the key players who will undertake this project. After the project lead (James E. McMahon), they are arranged in alphabetical order.

James E. McMahon
Chris Bolduc
Larry Dale
Camilla Dunham Whitehead
Michael Hanemann
Katie Shulte Joung
Robert Van Buskirk

JAMES E. MCMAHON, Ph.D.

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RECENT RELEVANT EXPERIENCE

Analyzed Environmental Benefits For Valuation Model. Analyzed and managed diverse team of researchers to develop environmental benefit valuation model for the California Urban Water Conservation Council. Investigates environmental benefits from water conservation best management practices (BMP's) in California by facilitating the inclusion of quantified environmental benefit externalities in BMP program cost/benefit determination. Manage policy analysts in the WETT group and the faculty of the Agriculture Resource Economics department to bring a uniquely powerful set of interdisciplinary skills to create databases of environmental values, water supply characteristics, and municipal utility characteristics to construct marginal valuation matrices.

Head, Energy Analysis Department. Manages department of nearly 100 staff, comprised of six groups: End-Use Forecasting and Market Assessment, Government & Industries Programs, Electricity Markets and Policy, International Energy Studies, Heat Island Group, and Energy Efficiency Standards Group (group leader). (http://eetd.lbl.gov/ea/EA_Org.html)

Co-Chair, Water and Energy Technology Team (WETT). Interdisciplinary team intended to research sustainability through efficient technologies and integrated management of water and energy resources. (http://water-energy.lbl.gov)

Manage technical and economic analysis of US efficiency standards for appliances, lighting and equipment. Modify, debug, and maintain detailed databases and computer models of U.S. energy consumption in residential and commercial buildings for U.S. Department of Energy studies related to appliance, lighting and equipment standards. Provide technical support documents containing full documentation of analyses.

Review load forecasts and DSM program plans for utilities and their consultants. Include impacts of efficiency programs and utility incentive programs.

EMPLOYMENT HISTORY

1978-present: Lawrence Berkeley National Laboratory, Berkeley, California
Head, Energy Analysis Department (ca 100 persons, ca $20 million/year)
Co-Chair Water and Energy Technology Team (WETT), Leader, Energy Efficiency Standards Group (Group size: 30 persons, ca $4 million/year)
Staff Scientist, Energy Analysis Program, Environmental Energy Technologies Division
1975-1978: Postdoctoral fellow, Department of Chemistry, University of California, Berkeley

SELECTED CONSULTING EXPERIENCE

ADEME, Paris (France)
Centre universitaire d'etude des problemes de l'energie, Geneve, (Switzerland)
Danish Energy Agency, Copenhagen (Denmark)
ENEA, Rome (Italy)

IEA, Paris (France)
Barakat & Chamberlin, Inc, Oakland, California
Morse, Richard, & Weisenmiller & Associates, Oakland, California,
Regional Economic Research, Inc., San Diego, California
United Nations, New York
Xenergy, Oakland, California

RELEVANT RESEARCH EXPERIENCE

Analyzed interactions between water and energy systems. Contributed to "Effects of the Drought on California Electricity Supply and Demand" (LBL-6356). Analyzed combined water and energy savings from technology improvements in buildings (clothes washers, dishwashers, toilets, showerheads, faucets, urinals).

Analyzed U.S. Department of Energy Efficiency Standards for Appliances, Lighting and Equipment. Managed economic and technical analysis of proposed and adopted national standards, including engineering analysis and impacts on consumers, manufacturers, utilities, and environment (analyst since 1979, manager since 1986). Designed, maintained, and executed residential and commercial sector energy demand forecasting models. Performed studies of technological feasibility and economic justification for U.S. Department of Energy efficiency standards for 12 residential appliance types (including furnaces, boilers, water heaters, air conditioners, and all major appliances); lighting equipment including fluorescent lamp ballasts; commercial heating, cooling and water heating equipment; distribution transformers and small electric motors. Provided estimates of energy savings, changes in purchase and usage patterns, and net economic benefit to residential and commercial consumers due to proposed policy (for all analyses since 1979). Invited participant to DOE conference "Estimating the Benefits of Government-Sponsored Energy R&D," March, 2002.

Analyzed Other National Energy Policies. Managed analyses of policy options (including labels, information and rating programs, and/or performance) regarding office equipment, lamps, luminaires, small electric motors, and plumbing products. Coauthor of major studies, including Evaluation of Advanced Technologies, Early Replacement of Appliances, Potential for Electricity Efficiency Improvements in the US Residential Sector, Federal Policy Options for Lighting Efficiency.

Behavior of the Market for Efficient Appliances. Analyzed the effects of federal, state and utility programs on efficiency of new appliances sold nationally and regionally. Contributed to analyses of market behavior regarding appliance efficiency choice, for all major residential appliances.

Analysis of Commercial Building Energy Consumption. Analyzed full set of policy options for improving indoor lighting energy consumption, including education/information programs (for consumers and designers, and component labeling), national incentive programs (rebates and tax credits), voluntary component standards, mandatory system performance standards (i.e., building codes), and mandatory component performance standards. Reviewed published works on energy consumption in commercial buildings; analyzed energy consumption methodologies; coauthored report with national energy policy implications.

Energy Demand Models. Reviewer for USDOE/EIA National Energy Modeling System (NEMS). Collaborated closely with EPRI on design of, and data required for, residential and commercial end-use energy forecasting models, REEPS and COMMEND. Improved LBNL's

national residential model, including: applied vintage structure and historical shipments data to turnover of appliances; incorporated recent improvements in appliance efficiencies and housing construction techniques; expanded coverage of end uses; replaced decision algorithm for appliance efficiency choice; improved representation of equipment cost/price data; converted from average value to distribution of appliance efficiencies in policy cases; and updated national data base.

PROFESSIONAL SOCIETIES

American Association for the Advancement of Science

CHRISTOPHER BOLDUC

www: http://eappc48.lbl.gov/cbolduc/
Email: cabolduc@lbl.gov
Phone: 510.486.7260

SUMMARY OF QUALIFICATIONS

- Client and server side web development
- Web interface design and coding for database applications
- Database design - specialized performance-enhanced designs for www
- HTML coding - hand coded HTML 4.0, CSS levels 1 and 2
- Graphic design - Top-notch skills from over six years of experience
- Project documentation and training - thorough recordkeeper and patient teacher
- Organizational skills - able to manage and consistently meet deadlines
- Interpersonal and communication skills - well-honed after two years of working overseas

PROFESSIONAL EXPERIENCE

Research Associate
Lawrence Berkeley National Laboratory
December, 2001 - Present

- Design and build web based user interfaces through a collaborative, iterative process – completed electricity tariff data entry application
- WordPerfect template design, technical support and training - produced a template to standardize Group documents and reduce overhead costs
- Identified the need for and installed a search engine to index data files on subgroup servers

Founder / Desktop Publisher / Web Designer
HUB Works , San Francisco, Toronto, Taipei
August, 1995 - Present

- Browser aware Dynamic HTML and programming using CGI, PHP, MySQL, Javascript, HTML,XHTML, DHTML and CSS
- Corporate identity design (print and www)
- Publication design for books, catalogs, magazines, and stationery
- Creation of original artwork using Photoshop, Illustrator, ImageReady, Fireworks
- Set production and billing schedules and met deadlines

Web Developer / Project Manager
Pristine Communications , Taipei, Taiwan
March, 1999 - June 2000

- Web application design and development using CGI, PHP, MySQL and HTML for Linux and Solaris platforms in European and Asian languages
- Information system and web page design for multiple languages
- Concept Development - transformed clients' ideas into web applications
- Managed a small team consisting of a designer, programmer, copy writer and at times freelance translators and designers
- Acted as the intermediary between programmers, designers, translators, copy writers and clients

Web Programmer / Technical Writer
Advantech Co. Ltd. , Hsindien, Taiwan
March, 1998 - 1999

- Technical writing, page layout and graphic design for industrial and consumer computer products
- Web page design and web site maintenance: forms, roll-overs, templates
- Personnel training: software, typographical techniques, image processing and HTML
- Maintained close dialogue with project managers

Web Master

Coach House Books , Toronto, Canada

January, 1997 - April, 1998

- Web site design, management, upkeep and functionality
- Mirrored site to Canadian and Ontario government and university archives
- Client management

Junior Print Designer

Coach House Printing , Toronto, Canada

September, 1994 - December, 1997

- Layout, typography and graphics creation using QuarkXPress and PageMaker
- Publication design from conception to finished product: books, stationery and ephemera
- Image scanning, color correction and preparation for print
- All aspects of print production including pre-press, printing and binding

LARRY L. DALE, Ph.D

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RECENT RELEVENT EXPERIENCE

2003 – present: Assistant Director – California Climate Change Center
Research program development and supervision with a focus on climate change impacts on California water resources and energy supply.

2001-Present: Staff scientist –Lawrence Berkeley National Laboratory
Economic and cost/benefit analysis of energy efficiency programs including: policy impacts on employment, estimation of sector-specific costs of capital, analysis of distribution chain mark-ups, and analysis of cost innovation trends for efficient equipment.

1995-2001: University of Santa Clara
Research and Classes included:

- X Economic theory, international trade, environmental and resource economics.
- X Energy and Resource Sustainability Studies
- X Performed a price and sustainability analysis of natural gas supplies in New Zealand. Analysis was used to evaluate degree of competition in New Zealand natural gas markets.
- X Allocated the cost of electricity transmission services among users in New Zealand. Study recommended changes to government pricing of transmission services.
- X Evaluated the competitive impact of petroleum product exchange contracts in a price fixing case.
- X Evaluated methods for monitoring energy and mineral resource sustainability using scarcity rent and price data.
- X Evaluated benefits of fuel standards adopted to improve air quality in Los Angeles. Included evaluation of health and property benefits associated with clean air standards. Study used in a analysis associated with a patent on a clean gasoline fuel.

Water Resources Studies

- X Calculated the value of water markets to the agriculture and urban sectors of the California economy.
- X Recommended policies to increase water market participation.
- X Estimated urban and agricultural demand for water in Tunisia. The analysis was used to evaluate available water supply options.
- X Evaluated options to limit groundwater pumping by farmers in the Salinas Valley. Estimated agriculture water demand and impacts of changes in irrigation practices.
- X Analyzed the efficiency of water use by urban, agricultural and hydroelectricity sectors in El Salvador.
- X Recommended changes to El Salvador's water code to boost water use efficiency.
- X Evaluated the economic impact of flow, temperature, and fish standards in the Sacramento-San Joaquin Delta. Estimated benefits to the salmon fishery and costs to farmers and urban users. Study performed for the U. S Environmental Protection Agency.

- X Evaluated environmental protections at Mono Lake, California. Indicated the impact of these protections on water treatment and water storage costs in Los Angeles, California.
- X Evaluated options for improving sewage treatment and monitoring water quality discharges in Vallejo, California. The work was used to evaluate fishery and other environmental damages associated with water quality violations at the Vallejo water quality treatment plant.
- X Monitored the adoption of water conservation "best management practices" by California urban areas. Served on steering committee set up to monitor the adoption of these BMP's.

Agriculture and Forestry Studies

- X Estimated the value of old growth forest properties in the Headwaters forest in California.
- X Estimated the price elasticity of demand for pesticides by corn and cotton farmers in the United States.
- X Evaluated the competitive impact of mergers and acquisitions in the biotechnology and pesticide industry.
- X Forecast demand for bio-engineered corn seed in the United States. Study was used to evaluate damages in a patent infringement case.
- X Evaluated the market for California dried fruit. Estimated dried fruit demand, supply and market price trends.
- X Evaluated the effectiveness of advertising by a dried fruit cooperative.

Environmental, Technology, Industry and Real Estate Studies

- X Evaluated policy options for solid waste disposal in Krakow, Poland.
- X Estimated the benefits and costs of Superfund site cleanup in San Francisco and Dallas, Texas. Results of the Dallas
- X Superfund work are published in the May 1999 issue of Land Economics.
- X Estimated the demand for boat marina properties in New York State. Analysis was used to estimate damages in a contract dispute.
- X Estimated damages from stigma associated with toxic waste sites and flooding, based on hedonic price analysis.
- X Evaluated the market for pharmaceutical brand drugs in the hospital, retail, and HMO markets. Estimated the effect of competition the ability of pharmaceutical companies to set brand drugs prices.
- X Studied price formation in the commercial paper products market. Evaluated price formation and potential price fixing in the industry.
- X Analyzed the impact of technological advances on price and market share of computer printers. Used to help evaluate damages in a computer patent infringement case.
- X Evaluated the benefits of parks, golf courses, and open space to surrounding housing developments.

1983-1987: Fellow-East West Center, Honolulu , HI
The East West Center is a U.S. supported research foundation dealing with economic and planning issues in the Pacific Rim.

1979-1982: Economist Forest and Range Experiment Station, Berkeley, CA
PSW Forest and Range Experiment Station is a research wing of the USDA Forest Service.

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RECENT RELEVENT EXPERIENCE

2004-present: Project Manager, Water and Energy Technology Team (WETT)

Co-founded and organized (WETT) as a new grassroots division initiative exploring water and energy synergies in industry, agriculture, water quality, wastewater, and residences. Contributed greatly to project and program direction.

Integrated the interests of a diverse set of researchers into a coherent, yet flexible group. Interacted with investigators and researchers from EET and ES Divisions and with groups such as: US DOE, US EPA, Alliance to Save Energy, ACEEE, Woodrow Wilson Center for Scholars, California Urban Water Conservation Council, American Water Work Association; Publicized the skills and abilities of WETT by coordinating and editing the capabilities submissions for two brochures and a website.

Facilitated communication between Environmental Energy Technologies and Earth Sciences Division by arranging and setting agendas for monthly meetings, helping to convene and prepare materials for joint projects such as the LERDWG meetings and the LDRD submission.

Masters Thesis: Explored the extent to which a wetland designed for domestic wastewater could also process hazardous chemical wastes. Research done at the behest of the Romberg Tiburon Center for Environmental Studies of San Francisco State University.

EMPLOYMENT HISTORY

1999-2004: Principal Research Associate, Lawrence Berkeley National Laboratory

Residential Furnace and Boiler Standards: Performed research assignments that led to the development of the procedure for determining the life-cycle cost of the baseline and trial standard levels. Documented work in Technical Support Document.

1993-1998: Research Associate, Lawrence Berkeley National Laboratory

Water Heater Efficiency Standards: Developed the procedure for determining the life-cycle cost of the baseline and trial standard levels for a Consumer Sub-Group Analysis.

Clothes Washer Efficiency Standards: Supervised and conducted collection of water and wastewater price data. Calculated an escalation rate for water and wastewater prices.

Plumbing Fixture Efficiency: Gathered and organized water conservation data on plumbing fixtures and fittings. Organized planning meetings for plumbing industry stakeholders with the U.S. Department of Energy.

Prof. W. Michael Hanemann

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www: http://are.Berkeley.EDU/~hanemann/
Full Curriculum Vitae: http://are.berkeley.edu/%7Ehanemann/hanemanncv.pdf

EDUCATION

Ph.D., 1978, Economics, Harvard University
M.A., 1973, Public Finance and Decision Theory, Harvard University
M.Sc., 1967, Development Economics, London School of Economics.
B.A., 1965, Philosophy, Politics, and Economics, Oxford University, England

EXPERIENCE

PROFESSOR – Department of Agricultural and Resource Economics, University of California, Berkeley, 1995 - Present

Chancellor's Professor of Environmental Economics and Policy in the Department of Agricultural & Resource Economic and the Goldman School of Public Policy. Research interests include non-market valuation, environmental economics and policy, water pricing and management, demand modeling for market research and policy design, the economics of irreversibility and adaptive management, and welfare economics. Actively taught courses include the Economics of Water Resources, and Non-market Valuation.
Consulting and advisory work water rate setting has received considerable attention in the California water industry, and has co-authored several reports on water pricing and conservation for the Council. Has consulted with the World Bank, the Mexican National Water Commission, the Spanish Ministry of Public Works, and water agencies in Florida and Washington on water pricing and water resource allocation. Co-editor with Duane Bauman and John Boland of *Urban Water Demand Management and Planning* McGraw Hill, 1998.

DIRECTOR – California Climate Change Center, 2003 - Present

Research program development and supervision with a focus on climate change impacts on California water resources.

ASSOCIATE PROFESSOR – Department of Agricultural and Resource Economics, University of California, Berkeley, 1984 - 1995

In addition to research and teaching duties, consulting and advisory activities important California water issues. In 1986 was retained by the California State Water Resources Control Board as its first economics consultant to analyze the economic and financial impacts of regulating agricultural drainage discharges to the San Joaquin River in the Grasslands area in response to severe selenium and salinity problems. From 1987 to the end of 1989 served as the Board's economics staff for the first three years of its decision-making on water diversions from the San Francisco Bay/Delta to central and southern California. Was responsible for the cross-examination of witnesses testifying on economics matters during six months of hearings, he conducted economic analyses for the Board staff relating to agricultural, urban and instream uses of water, and co-authored the staff report to the Board. Subsequently participated in the

negotiations which led to the signing of the Memorandum of Understanding on Urban water Conservation. From 1992 to 1994 was senior economic consultant to the Board for its EIR on Mono Lake, and conducted the analysis of the economic impacts of reduced diversions on Los Angeles' water supply, on outdoor recreation in the Mono Basin, and on statewide public-trust values associated with the protection of Mono Lake.

ADDITIONAL EMPLOYMENT

ASSISTANT PROFESSOR – Department of Agricultural and Resource Economics, University of California, Berkeley, 1978 - 1984

ACTING ASSISTANT PROFESSOR – Department of Agricultural and Resource Economics, University of California, Berkeley, 1976 - 1978

LECTURER – Department of Economics, Northeastern University, Boston, Massachusetts, 1976

STAFF ECONOMIST/CONSULTANT – Urban Systems Research & Engineering Inc., Cambridge, Massachusetts, 1970-1975

OTHER PROFESSIONAL ACTIVITIES

Member, UNEP Working Group on Benefits of Biodiversity Conservation (1992-93)

University Fellow, Resources for the Future (1989-92)

Consultant to California State Water Resources Control Board (1986-89); California Attorney General’s Office (1987-97); Alaska Attorney General’s Office (1989-93); Montana Attorney General’s Office (1995-98); NOAA (1991-96); Mayor of Los Angeles Blue Ribbon Committee on Water Rates (1992-94).

Member, Board of Directors, Association of Environmental& Resource Economists (1995-97).

Member of the National Academy of Sciences/National Research Council Committee to Review the Glen Canyon Environmental Studies Program (1986-91) and the Committee on Wolf and Beak Control in Alaska (1996-97).

KATIE SHULTE JOUNG

3420 Grant Park Drive, Carmichael, California 95608
(916) 552-5885 office; (916) 284-0988 cell
Katie@cuwcc.org

SUMMARY: Broad-based experience in Project and Contract Management, Environmental Policy Analysis and Research, Public Relations and Communications. Comprehensive knowledge of water policy, environmental regulations, the legislative process, web site development, commercial real estate and construction, media relations, contract negotiation and cost management. Project driven with proven ability to work effectively and diplomatically with both internal and external stakeholders at all levels. Solid analytical and research writing background.

PROJECT MANAGEMENT & ADMINISTRATION

- Prepared Requests for Proposals, coordinated consultant interview and selection processes, wrote contracts, developed schedules and budgets, and managed 17 projects for $1.9 million CALFED Cooperative Agreement
- Managed activities of multiple Project Advisory Committees (e.g. Potential Best Management Practices, BMP Cost and Savings Study, BMP 11 Revision, Avoided Costs and Environmental Benefits) and Council Subcommittees (Research & Evaluation, Communications) and facilitated resolution of policy issues
- Managed projects and contracts for statewide environmental and planning information database development (www.ceqanet.ca.gov and www.calpin.ca.gov) and academic research on environmental policy
- Secured operating contract with a vendor that provided more efficient and technologically advanced services at a lower price and incurred a 30% savings by negotiating preferential lease buyout terms
- Developed an organized, systematic process for tracking and collecting past due accounts resulting in an 87% reduction of past due accounts in ten months

POLICY ANALYSIS & RESEARCH

- Integrated the policies of the CALFED Bay Delta Authority's Record of Decision, the State Water Plan (Bulletin 160), and the Council's Memorandum of Understanding regarding Urban Water Conservation into project planning and implementation
- Developed a water policy strategy for the Governor's Office of Planning and Research integrating water use efficiency, land-use planning, and sustainability principles
- Researched tax, zoning and other pertinent subject and market information; conducted rent surveys in all areas of the San Francisco Bay Area commercial real estate market
- Published in *California Legal Studies Journal* for environmental policy paper entitled, "Selenium Emissions into San Francisco Bay"
- Responded to constituents' inquiries; researched and analyzed current issues with an emphasis on water policy and the California Environmental Quality Act (CEQA)

COMMUNICATIONS & OUTREACH

- Facilitated workshops and presented information on water and planning issues; topics included the Council's BMP, water supply planning (SB 221 and SB 610), CEQA, and land-use planning
- Wrote advisory publications, technical manuals, press releases, and marketing materials

- Represented organizations at water and planning conferences and as a member of the State Water Plan Advisory Committee and the Public Information and Outreach working group of the State's Recycled Water Task Force
- Disseminated information regarding environmental issues, initiatives, regulations and organizations as a representative of several community based associations
- Provided information to columnists, editors, and customers
- Created marketing and presentation materials including: designing brochures, preparing tenant surveys and compiling demographic surveys/analyses

PROFESSIONAL EXPERIENCE

California Urban Water Conservation Council **2002-Present**
Project Manager

Governor's Office of Planning and Research (OPR) **1999-2002**
Associate Planner/Policy Analyst

Dome Construction Corporation **1998-1999**
Marketing Coordinator

CB Commercial Real Estate Group, Inc. **1995-1998**
Research Assistant/Software Specialist, 1996-1998
Marketing Specialist/Project Coordinator, 1995-1996

California State Assembly, A.D. 18 **1994**
Legislative Assistant

MCR Agency, Inc. **1984-1994**
Office Manager

COMMUNITY ACTIVITIES

Richardson Bay Audubon Sanctuary **1993-1995**
Bay Shore Studies Docent
Boat Patrol

San Francisco BayKeeper, The Bay Institute & Save the Bay **1991-1994**
Public Outreach, Community Relations

California Coastal Cleanup **1990-1999**
Beach Captain

EDUCATION AND PROFESSIONAL ORGANIZATIONS

- B.A. Environmental Policy and Planning, U.C. Berkeley, 1994
- California Chapter of the American Planning Association
- Association of Environmental Professionals
- American Water Works Association

ROBERT D. VAN BUSKIRK, PH.D.

Energy Analysis Program
MS 90-4000
Lawrence Berkeley National Laboratory
1 Cyclotron Road
Berkeley, CA 94720, U.S.A.
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EDUCATION:

Ph.D. Physics, 1991 Harvard University
M.A. Physics, 1986 Harvard University
B.A. Physics & Mathematics, 1984 Univ. of California, Berkeley

PROFESSIONAL EXPERIENCE:

Scientist: February 2000 - Present, Energy Efficiency Standards Group, Environmental Energy Technologies Division, Lawrence Berkeley National Laboratory, Berkeley, California, U.S.A.

Planning, development, and production of efficiency policy analysis. Development of policy analysis models, software and spreadsheet tools. Applications include the economic feasibility analysis of appliance efficiency standards and programs in the U.S. and internationally. Supervision of research in the economics of policy impacts, costs and benefits. Policy analysis for the Collaborative Labeling and Appliance Standards Program (CLASP), an international appliance efficiency technical support program. Development of integrated economic, meteorological, and air quality models for air quality policy analysis.

Project Organizer (Volunteer): December 1998 - Present, Eritrea Technical Exchange/ICSEE, San Francisco, California, U.S.A.

Organization and development of technology transfer and development projects. Technical support of traditional stove efficiency improvement, promotion, and dissemination programs. Pilot testing and analysis of ultraviolet water disinfection technology applied to village-level drinking water supply. Supervision, and organization of post-graduate meteorological training for staff from the Eritrean Meteorological Services and Department of Energy. Research and development of climate, renewable energy, and natural resources information systems. Technical support for Eritrean computer communications infrastructure development. In-country technical training of computer systems operation and administration staff in Internet technologies. Supervision and organization of ISO/IEC 10646-1 compliant multi-lingual software development.

Adjunct Professor: October 2002 - present, Department of Meteorology, San Jose State University, California, U.S.A.

Duties include advising Meteorology Masters students on masters research topics. Thesis topics advised include: (1) Estimation of weather impacts on transformer losses and efficiency, (2) Application of the MM5 model to air quality analysis in Central California, and (3) Analysis of sea breeze return flow dynamics in complex topography using the RAMS meso-scale model.

Principal Research Associate: March 1999 - February 2000, Environmental Energy Technologies Division, Lawrence Berkeley National Laboratory, Berkeley, California, U.S.A.

Primary responsibilities include development of policy analysis tools for evaluation of appliance efficiency standards. Includes development of econometric models to forecast appliance sales, national energy savings, manufacturer impacts, and the net benefits and costs of a variety of regulatory alternatives. Analysis tools are primarily developed as Excel spreadsheets and application macros in Visual Basic.

Adjunct Professor: October 1997 - May 1999, Department of Environmental Studies, San Jose State University, California, U.S.A.
Duties include advising Masters students and developing informational resources on renewable energy management and development potential. Research in renewable energy, traditional stove efficiency, and information systems for Eritrea, East Africa. (http://www.punchdown.org/rvb)

Technical Project Manager: November 1997 - November 1998, Calmar Online Communications Ltd., Hong Kong/Beijing, China
Project management of Internet Protocol (IP) telephony network development and services. Also ISP management and Experience includes HTML, CGI, Perl, DNS, NFS, Sendmail, Linux, Windows NT/95, Sun Netra, & Cisco routers.

Research Scientist: October 1995 - August 1997. Department of Energy, Asmara, Eritrea, East Africa.
Initiated research programs for the Energy Research and Training Division of the Eritrean Department of Energy. Organized and supervised on-going research programs in: 1) Biomass Energy Assessment; 2) Solar Radiation Mapping; 3) Stove Efficiency Evaluation and Improvements; 4) Wind Energy Resource Assessment. Conducted training in meteorological monitoring and remote sensing for Department of Energy and related ministries.

System Administrator/Developer: February 1995 - August 1997 Eritrea Technical Exchange, San Francisco, California, U.S.A.
Co-founded, organized, and developed national electronic mail system for Eritrea as in-country volunteer developer (See http://www.punchdown.org/rvb/email)

Assistant Professor/Fulbright Scholar: September 1993-June 1996. University of Asmara, Eritrea, East Africa.
Activities include instruction for undergraduate physics courses (2-3 separate courses per semester), research organization and development, instigation of department seminars in Physics, and assistance and advising of University library staff on library organization and donor development as chair of the Library Committee. Student rating in courses: 4.5/5.

Principal Investigator, EICAP: November 1993-July 1995, University of Asmara, Eritrea, East Africa
Founded and organized Eritrean university/government collaborative research project. Set up university-government collaboration with the Department of Water Resources and the Meteorology Department of the Civil Aviation Authority. Organized team of five research assistants and three collaborators on joint research and data collection. Research at the University of Asmara was supported by the Swedish Agency for Research Cooperation with Developing Countries (SAREC).

Modeling Specialist: December 1991-August 1993. Natural Resources Consulting Engineers (NRCE), Berkeley, California.
Duties included numerical modeling of groundwater and surface water systems. Developed and analyzed groundwater recharge alternatives for the San Xavier Indian Reservation. Formulated initial Conceptual Water Development Plan for the Tule River Indian Reservation. Performed comprehensive review of hydrographic survey reports prepared by Arizona Department of Water Resources.

Research Assistant: October 1987-December 1988, June 1989-November 1991. University of California, Berkeley.
Investigation of the Fluid Dynamics of the Great Red Spot of Jupiter through numerical solution and analysis of the relevant partial differential equations. Developed new accurate and efficient algorithms for solving mathematical equations, and analyzed numerical results using simplified physical models.

Teaching Assistant: January 1989-May 1989. University of California, Berkeley.
Conducted discussion sections and personal homework consultations for Fluid Mechanics, and Applied Fluid Mechanics (pumps and turbines) students in the Department of Mechanical Engineering.

Appendix 3: Letter from California Urban Water Conservation Council

(following page)

January 9, 2005

California Urban Water Conservation Council

455 Capitol Mall
Suite 703
Sacramento
California 95814

PHONE
916/552-5885
FAX
916/552-5877

www.cuwcc.org

James E. McMahon, Ph.D.
Head, Energy Analysis Department
Environmental Energy Technologies Division
Lawrence Berkeley National Laboratory
One Cyclotron Road, 90R400
Berkeley, CA 94720

Subject: Proposition 50 Water Use Efficiency Grant Application "Environmental Benefits of Best Management Practices in Urban Water Conservation: Establishing a Baseline"

Dear Dr. McMahon:

This letter communicates our support for and intent to participate in the *Environmental Benefits of Best Management Practices in Urban Water Conservation: Establishing a Baseline* proposal being submitted by Lawrence Berkeley National Laboratory (LBNL) in response to the Department of Water Resources' (DWR's) 2004 Water Use Efficiency Solicitation.

The proposed project will make important improvements and refinements to the model and methodology now being developed as a deliverable in the $1.9 million CALFED Cooperative Agreement we have with the Department of Water Resources, the U.S. Bureau of Reclamation, and the CALFED Bay-Delta Authority. Improving this tool will facilitate greater implementation of urban water conservation best management practices in the CALFED solution area by further quantifying the numerous environmental benefits associated with that implementation.

We look forward to being a partner with Lawrence Berkeley National Laboratory and helping water utilities throughout the state in understanding and refining environmental benefits valuation tools.

Sincerely,

Mary Ann Dickinson

Mary Ann Dickinson
Executive Director

APENDIX C

PROJECT IMPLEMENTATION COSTS TABLE

Applicant: Ernest Orlando Lawrence Berkeley National Laboratory

Project Title: Environmental Benefits of Best Management Practices in Urban Water Conservation: Establishing a Baseline

THE TABLES ARE FORMATTED WITH FORMULAS: FILL IN THE SHADED AREAS ONLY

Section B Projects - Fill in shaded areas of Column I-IV only

Table C-1: Project Costs (Budget) in Dollars)

	Category (I)	Project Costs $ (II)	Contingency % (ex. 5 or 10) (III)	Project Cost + Contingency $ (IV)	Applicant Share[1] $ (V)	State Share Grant $ (VI)	Life of investment (years) (VII	Capital Recovery Factor (VIII)	Annualized Costs $ (IX)
	Administration[2]								
	Salaries, wages	$139,730	0	$139,730	$20,000	$119,730	0	0.0000	$0
	Fringe benefits	$28,320	0	$28,320	$0	$28,320	0	0.0000	$0
	Supplies	$2,000	0	$2,000	$0	$2,000	0	0.0000	$0
	Equipment	$0	0	$0	$0	$0	0	0.0000	$0
	Subcontract services	$20,000	0	$20,000	$0	$20,000	0	0.0000	$0
	Travel	$2,000	0	$2,000	$0	$2,000	0	0.0000	$0
	Misc. (including space and electricity)	$12,936	0	$12,936	$0	$12,936	0	0.0000	$0
	Other[3]	$115,014	0	$115,014	$0	$115,014	0	0.0000	$0
(a)	Total Administration Costs	$320,000		$320,000	$20,000	$300,000			$0
(b)	Planning/Design/Engineering	$0	0	$0	$0	$0	0	0.0000	$0
(c)	Equipment Purchases/Rentals/Rebates/Vouchers	$0	0	$0	$0	$0	10	0.0000	$0
(d)	Materials/Installation/Implementation	$0	0	$0	$0	$0	0	0.0000	$0
(e)	Implementation Verification	$0	0	$0	$0	$0	0	0.0000	$0
(f)	Project Legal/License Fees	$0	0	$0	$0	$0	0	0.0000	$0
(g)	Structures	$0	0	$0	$0	$0	0	0.0000	$0
(h)	Land Purchase/Easement	$0	0	$0	$0	$0	0	0.0000	$0
(i)	Environmental Compliance/Mitigation/Enhancement	$0	0	$0	$0	$0	0	0.0000	$0
(j)	Construction	$0	0	$0	$0	$0	0	0.0000	$0
(k)	Other (Specify)	$0	0	$0	$0	$0	0	0.0000	$0
(l)	Monitoring and Assessment	$0	0	$0	$0	$0	0	0.0000	$0
(m)	Report Preparation	$0	0	$0	$0	$0	0	0.0000	$0
(n)	**TOTAL**	$320,000		$320,000	$20,000	$300,000			$0
(o)	Cost Share -Percentage				6	94			

1- Applicant share is inkind funding from the CUWCC
2- excludes administration O&M.
2- includes LBNL burdens and overhead see attached LBNL Budget Sheet

Applicant: Ernest Orlando Lawrence Berkeley National Laboratory

Project Title: Environmental Benefits of Best Management Practices in Urban Water Conservation: Establishing a Baseline

THE TABLES ARE FORMATTED WITH FORMULAS: FILL IN THE SHADED AREAS ONLY

Section B Projects - Fill in shaded areas of Column I-IV only

Table C-1: Project Costs (Budget) in Dollars)

	Category (I)	Project Costs $ (II)	Contingency % (ex. 5 or 10) (III)	Project Cost + Contingency $ (IV)	Applicant Share[1] $ (V)	State Share Grant $ (VI)	Life of investment (years) (VII	Capital Recovery Factor (VIII)	Annualized Costs $ (IX)
	Administration[2]								
	Salaries, wages	$139,730	0	$139,730	$20,000	$119,730	0	0.0000	$0
	Fringe benefits	$28,320	0	$28,320	$0	$28,320	0	0.0000	$0
	Supplies	$2,000	0	$2,000	$0	$2,000	0	0.0000	$0
	Equipment	$0	0	$0	$0	$0	0	0.0000	$0
	Subcontract services	$20,000	0	$20,000	$0	$20,000	0	0.0000	$0
	Travel	$2,000	0	$2,000	$0	$2,000	0	0.0000	$0
	Misc. (including space and electricity)	$12,936	0	$12,936	$0	$12,936	0	0.0000	$0
	Other[3]	$115,014	0	$115,014	$0	$115,014	0	0.0000	$0
(a)	Total Administration Costs	$320,000		$320,000	$20,000	$300,000			$0
(b)	Planning/Design/Engineering	$0	0	$0	$0	$0	0	0.0000	$0
(c)	Equipment Purchases/Rentals/Rebates/Vouchers	$0	0	$0	$0	$0	10	0.0000	$0
(d)	Materials/Installation/Implementation	$0	0	$0	$0	$0	0	0.0000	$0
(e)	Implementation Verification	$0	0	$0	$0	$0	0	0.0000	$0
(f)	Project Legal/License Fees	$0	0	$0	$0	$0	0	0.0000	$0
(g)	Structures	$0	0	$0	$0	$0	0	0.0000	$0
(h)	Land Purchase/Easement	$0	0	$0	$0	$0	0	0.0000	$0
(i)	Environmental Compliance/Mitigation/Enhancement	$0	0	$0	$0	$0	0	0.0000	$0
(j)	Construction	$0	0	$0	$0	$0	0	0.0000	$0
(k)	Other (Specify)	$0	0	$0	$0	$0	0	0.0000	$0
(l)	Monitoring and Assessment	$0	0	$0	$0	$0	0	0.0000	$0
(m)	Report Preparation	$0	0	$0	$0	$0	0	0.0000	$0
(n)	**TOTAL**	$320,000		$320,000	$20,000	$300,000			$0
(o)	Cost Share -Percentage				6	94			

1- Applicant share is inkind funding from the CUWCC
2- excludes administration O&M.
3- includes LBNL burdens and overhead see attached LBNL Budget Sheet

Applicant:

THE TABLES ARE FORMATTED WITH FORMULAS: FILL IN THE SHADED AREAS ONLY

Table C-2: Annual Operations and Maintenance Costs

Operations (1) (I)	Maintenance (II)	Other (III)	Total (IV) (I + II + II)
$0	$0	$0	$0

(1) Include annual O & M administration costs here.

Table C-3: Total Annual Project Costs

Annual Project Costs (1) (I)	Annual O&M Costs (2) (II)	Total Annual Project Costs (III) (I + II)
$0	$0	$0

(1) From Table C-1, row (n) column (IX)
(2) From Table C-2, column (IV)

Table C- 4: Capital Recovery Table (1)

Life of Project (in years)	Capital Recovery Factor
1	1.0600
2	0.5454
3	0.3741
4	0.2886
5	0.2374
6	0.2034
7	0.1791
8	0.1610
9	0.1470
10	0.1359
11	0.1268
12	0.1193
13	0.1130
14	0.1076
15	0.1030
16	0.0990
17	0.0954
18	0.0924
19	0.0896
20	0.0872
21	0.0850
22	0.0830
23	0.0813
24	0.0797
25	0.0782
26	0.0769
27	0.0757
28	0.0746
29	0.0736
30	0.0726
31	0.0718
32	0.0710
33	0.0703
34	0.0696
35	0.0690
36	0.0684
37	0.0679
38	0.0674
39	0.0669
40	0.0665
41	0.0661
42	0.0657
43	0.0653
44	0.0650
45	0.0647
46	0.0644
47	0.0641
48	0.0639
49	0.0637
50	0.0634

(1) Based on 6% discount rate.

Applicant:

THE TABLES ARE FORMATTED WITH FORMULAS: FILL IN THE SHADED AREAS ONLY

Table C-5 Project Annual Physical Benefits (Quantitative and Qualitative Description of Benefits)

	Qualitative Description - Required of all applicants[1]				**Quantitative Benefits - where data are available [2]**
	Description of physical benefits (in-stream flow and timing, water quantity and water quality) for:	Time pattern and Location of Benefit	Project Life: Duration of Benefits	State Why Project Bay Delta benefit is Direct[3] Indirect [4] or Both	Quantified Benefits (in-stream flow and timing, water quantity and water quality)
Bay Delta					0
Local				**Not applicable.**	

[1] The qualitative benefits should be provided in a narrative description. Use additional sheet.

[2] Direct benefits are project outcomes that contribute to a CALFED objective within the Bay-Delta system during the life of the project.

[3] Indirect benefits are project outcomes that help to reduce dependency on the Bay-Delta system. Indirect benefits may be realized over time.

[4] The project benefits that can be quantified (i.e. volume of water saved or mass of constituents reduced) should be provided.