Summary Minutes of the
U.S. Environmental Protection Agency (EPA)
Science Advisory Board (SAB)
Environmental Economics Advisory Committee
Augmented for the Consideration of the
Value of Water to the U.S. Economy
Public Teleconference

Date and Time:	Monday, December 5, 2011, 12:30 PM – 5:00PM ET	
Purpose:	To provide a consultation and early advice to assist EPA scope, plan and develop a report on water's contribution to the U.S. economy.	
Participants:	Environmental Economic Advisory Committee (EEAC) Augmented for the Consideration of the Value of Water to the U.S. Economy (for full roster, see Attachment A)	
Chair	Dr. Stephen Polasky	
Members:	Dr. Joel Ducoste,	Dr. James Shortle
	Dr. Nicholas Flores	Dr. Laura Taylor
	Dr. Russell Ford	Dr. Paul Westerhoff
	Dr. Wayne Gray	Dr. Peter J. Wilcoxen
	Dr. Frank Loge	Dr. JunJie Wu
	Dr. Karen Palmer	Dr. Jinhua Zhao
	Dr. Sujoy Roy	
EPA Staff:	Dr. Michael Shapiro, EPA Office of Water (OW) Dr. John Powers, EPA OW	
SAB Staff Office:	Mr. Thomas Carpenter, Designated Federal Officer (DFO)	
Other Attendees:	See Attachment B	

Opening Remarks

Mr. Carpenter, the DFO for the SAB EEAC Augmented for the Consideration of the Value of Water to the U.S. Economy, hereafter referred to as the committee, convened the meeting. He noted that the meeting was announced in the *Federal Register*[1] and would proceed according to the meeting agenda, as revised. He stated that the EPA Science Advisory Board (SAB) was a chartered federal advisory committee and that the SAB, and its committees and panels, comply with the requirements of the Federal Advisory Committee Act (FACA). Mr. Carpenter stated that as DFO, he would be present during the committee's business and deliberations.

He noted that the committee met to discuss the draft documents on the scope, issues and content that the Office of Water will consider when developing a report on the *Value of Water to the US*

Economy. The consultation will create two products, 1) a letter to EPA Administrator Jackson informing her that the consultation was conducted, and 2) the summary minutes of this teleconference. Once certified as accurate by the Chair the minutes will be posted on the SAB website. In addition to the summary of the teleconference, the minutes will indentify members of the committee, public participants (see Attachment B), and include written comments provided by individual members of the committee (see Attachment C). He also noted that SAB consultations are an opportunity to provide EPA early individual and independent comments from committee members on a project. As such, these comments do not represent a set of consensus recommendations developed by the committee. He also noted that there are members of the public listening to the discussion and a list of participants will be included in the minutes. Mr. Carpenter called the roll and turned the meeting over to Dr. Polasky.

Dr. Polasky, Chair of this augmented committee, welcomed everyone and indicated that the purpose of the meeting was to provide early consultative advice to assist EPA' Office of Water scope, plan and develop a report on water's contribution to the U.S. economy. Dr. Polasky reviewed the meeting agenda[2] and provided an overview of how the meeting would proceed using the agenda as revised. He noted the charge questions ask for comments on the report and provide their advice on the context and framework, economic concepts and analyses, and topics for expert papers. Dr. Polasky briefly reviewed the material provided by EPA and noted that the meeting would walk through the charge questions. He reminded members that the committee members that they would not be developing consensus recommendations but that the members' individual comments would be summarized and made available for the agency to consider. Dr. Polasky noted that staff from the Office of Water would provide an overview of the project and there was one request for public comment to the committee.

Office of Water

Drs. Michael Shapiro and John Powers of EPA's Office of Water (OW) provided an overview of the project. Dr. Shapiro thanked panel members for their interest and taking time from their busy schedules. Dr. Shapiro noted the importance of this novel project. He noted that the project would evaluate currently available information to identify information gaps and encourage innovation to develop needed information to estimate the value of water to the economy. He also noted that this project would be used with other projects to develop and integrate information in market and non-market pricing to support private and public decision-making at multiple scales. The project's goal is to improve information available to support decision-making. Dr. Shapiro introduced Dr. John Powers to provide an overview of the project[3], review the materials[4], and charge questions to the reviewers[5].

Dr. Powers explained that EPA plans to develop a report on the importance of water to the U.S. economy. EPA has been developing a background report based on literature reviews. OW anticipates that the background report, expert papers, results of a technical workshop will be the basis for the technical and non-technical synthesis reports on the *Value of Water to the US Economy*. OW's rationale for the report is to provide information to assist in decision-making on the value of water to the market economy. He noted that the report would not focus specifically on legal or regulatory institutions (i.e., Clean Water Act or Safe Drinking Water Act). OW anticipates the value of water will vary across space, time, sector and other facets as supply and demand varies.

Members asked if the report focus is on qualitative or quantitative analyses and issues as it evaluates and describes the Value of Water to the US economy. Members also asked OW how it could separate non-market and market evaluations and noted the value of water to the citizens of the US was from both non-market and market sources.

Members also noted the regional aspects of water might limit the agency's ability to consider and develop a national big picture value of water. Seasonal and temporal availability also drives the value of water noting that within the same locality drought creates variability in value of water.

Members asked what the period to develop a draft report is. OW responded that the schedule is to convene a workshop in the summer of 2012 and a draft of the report in the fall of 2012.

Public Comment
Diedre Duncan, Water Advocacy Coalition, provided public comment[6] on the convening of the panel. She noted the importance of the issues being discussed and stated that the public was not provided an opportunity to comment on the SAB committee members in this consultation. Ms. Duncan questioned whether there were enough economists on the panel, whether there were enough industry experts, and commented on the limited time available to provide substantive comments.

Overview of the Report
Dr. Polasky led a discussion of the charge questions on the background report.

Context and Conceptual Framework
Members of the panel discussed the context and concepts in the annotated outline and whether the framework provides a coherent structure to describe and evaluate the value of water. One member noted the report seemed to focus on the use of water in various sectors of the U.S. economy. Members asked whether EPA would attempt to "put a dollar value"on the value of water to the U.S. economy? EPA noted that the project and report was not designed to generate a single national dollar level.

Another member noted that the document will be useful and thought the framework was an efficient way to look at the first tier of water usage, he noted that different uses could have different rates. For example, public health (drinking water) and insurance (fire protection) are two uses for water and possible primary layers to evaluate. He also suggested that the agency should evaluate the depth with which this report could mine data and information to support the report's findings.

Another member noted that the framework should address the dynamics in water resources. Would shifts in water scarcity result in corresponding shifts in institutional details? Addressing the dynamics will enable the report to provide needs for future users. Another member noted that marginal costs need to be evaluated. A static analysis may result in an undervaluing of water.

A member noted it would be good to know what is defined as "water" in the context of this study. EPA should consider whether treated municipal effluent is a valued resource, when it is

reused for irrigation or for electricity generation. Additionally, water resources in the coming decades may use alternative or non-traditional sources of water that do not require the highest quality water. Besides municipal wastewater, these sources might include stormwater or agricultural drainage.

One member asked what specific data, methods, or models would improve estimation of the value of water to the economy and what would be the benefit of this improved information? Members noted that U.S. Geological Survey (USGS) withdrawal data is a good starting point, but issues of reduced USGS monitoring on water quality, water quantity and water use over the past years due to budget cuts is one issue. Perhaps more important is the ability to capture 21st century high value added economic drivers (e.g., semi-electronics, biotechnology, etc) which tend to use public water supplies. The value of water can depend greatly upon its existing quality, or the incremental cost required to treat the water to the required quality (i.e., ion exchange for semi-conductor production). EPA will need more detailed dataset to get at these questions.

Members discussed how alternatives to existing water use could be considered. For example – water distribution systems are designed largely for fighting fires (capacity and pressure) which influence local insurance rates. What if alternative fire fighting techniques were developed which did not require water – how would that influence insurance rates? Another example is the incremental cost of energy based upon use of water-cooling versus air-cooled systems – especially with increasing numbers of smaller more urban natural-gas fired turbine power generating systems.

Members noted that the exclusion on non-market value for water limits the report and may be problematic. Another member noted that there are other non-market efforts under way and that the other efforts would need to be integrated to provide a fuller picture of the value of water. EPA staff noted that the agency is working on non-market values and other issues in parallel and anticipates integrating these reports and analyses. One member noted that the agency should make sure the market and non-market efforts are structured to facilitate the integration. They also noted that the SAB report, *Valuing the Protection of Ecological Systems and Services: A Report of the EPA Science Advisory Board*, should be considered as a resource. The report represents a significant discussion on the concept of valuation and different valuation methods. The interdisciplinary analysis and methods addressed demonstrate the complexity of valuation analyses and stresses that "value is not a single, simple concept, and disciplines often have different understandings of what value is and how it should be measured."

Members identified the need to account for economic growth in various sectors and how that growth may affect the demand for water and its associated value. Another member advise that population growth and changes in density should be incorporated in the consideration of economic growth and impact on the value of water.

Members also cited reports that EPA should consider as it develops the report:

> Electric Power Research Institute. 2011. *Water Use for Electricity Generation and Other Sectors: Recent Changes (1985-2005) and Future Projections (2005-2030).*

American Water Works Research Foundation /Water Research Foundation. 2005.*The Value of Water: Concepts, Estimates, and Applications for Water Managers.* (Project 2855)

Economic Values of Freshwater in the United States. 1996. Frederick, K.D., Vandenberg, T., Hanson, J. Discusssion Paper 97-03. Resources for the Future. Washington, DC

Determining the Economic Value of Water. 2005. Robert A. Young RFF Press Resources for the Future. Washington, DC

Perspectives on Sustainable Resources in America.2008. Roger A. Sedjo, editor RFF Press Washington, DC

General Economic Concepts

Members discussed the key concepts the report should take into consideration. The concepts -- competing options, substitution, opportunity costs, values of water to ecosystems and ecosystem services, and economic and environmental sustainability – are fundamental to the value of water to the U.S. economy. Member discussed how the agency might consider those concepts when evaluating the value of water to the U.S. economy and provided examples the agency should consider.

Accounting for Variability and Regional Differences

Members discussed the differences in water resource management and public perspectives by regions of the country. One member noted that even within regions, transfers or basin diversions are extremely controversial. Others noted the differences in governance, water resource management, and public response and suggested that these issues are topics an expert paper could address on regional variability. Regional variability should account for resiliency in the region, management options and decisions and may be highly marginal. Members identified governance as an important issue noting the report will need to consider state and local water policy issues and markets. One member suggested that EPA should evaluate if the water rights model of the western U.S. is functioning and suitable to expand to value water. Other members agreed that governance was an important topic and could influence the value of water.

Members agreed that there is regional variability in water availability as well as in water withdrawal and consumption. A member suggested comparing water withdrawal rates versus consumption rates to demonstrate regional patterns. He noted there are withdrawal rate data that indicate the highest use in the eastern U.S. is for power generation while the largest use in the west is irrigation. Another member suggested these irrigation and non-irrigation differences may be attributable to low water quality in some areas and general limited water availability in other areas.

Members noted that setting an appropriate price structure for water usage by sectors would need to consider the agricultural, power, and manufacturing industries, as they will be the largest consumers of water. Another member suggested the agency find "natural experiments" where

either availability or pricing of water in some area changed dramatically, to see how usage responded. Did water users adapt and continue producing in the same location, or did they move.

One member suggested including an analysis of water conservation and impacts on the value of water. This could include consideration of different conservation approaches for public or private sector users and should be part of the report. Another member noted that water conservation by consumers tends to lower demand and reduces the water system's revenues while costs are largely fixed so that the water system will need to raise its rates or lose money.

Economic Perspectives
Members discussed the economic approaches and perspectives listed in the report overview that will be used to evaluate how water is of value to the U.S. economy. A member noted that comparison of the analysis of microeconomic efficiency and the value of marginal product of water might benefit from a section that discusses short-term valuation and long-term valuation.

Members suggested that the sustainability discussion include green infrastructure and alternatives as a topic. Members noted that the overview is not clear whether the focus of the report will be on the total or marginal value of water. Members noted that marginal value would be more useful to the agency and decision-makers.

A member noted that the role of water is critical to adaptation and there may be benefit to adding macroeconomic trend analysis to the three other perspectives listed in the annotated outline.

Another member stated that value and long-term performance analysis is one method to evaluate tradeoffs, transition or migration to locales with adequate water resources. A member noted that the agency would need to develop methods to quantify the cost associated with migration in the valuation of water. That is, if businesses move away from areas with declining water availability, how will the agency quantify the one-time moving cost in the valuation of water?

Tradeoffs may also exist between groundwater and surface water and the use of renewable or water reuse practices. Another member noted that short-term considerations include issues on the cumulative water value and ownership of existing institutions and these may be highly variable. Long-term considerations world include location of industry and additional water sources such as ground water mining. Another member thought that long-term elements have a high degree of uncertainty and will require critical understanding of the potential dynamics in which long-term choices are made in water resource use. Another member agreed that there is uncertainty in evaluating long-term consideration and cautioned that many factors would need to be considered. Some member's expressed support for an analysis of both short-term and long-term consideration and believed it would solidify the report.

Members noted that the overview did not provide enough information on how the report might address competitive advantages in the global economy. Some members expressed concern that there would be insufficient data for such an analysis. Other members noted that investment firms assess water resource information as part of risk analysis. Members suggested that this might be more appropriately addressed in a case study. EPA staff noted that identifying advantages was not intended to provide a comparison to other countries or economies. Members noted that they

wouldn't expect much impact on international competitiveness (aside from agriculture), since it's not clear that many traded goods depend heavily on water availability - but a closer look at specific sectors in the report might identify areas of concern. Pulp and paper mills use water, but they tend to be located in regions where there is plenty of water available.

One member noted that there is no mention of the role of climate change in supply of water for particular uses or its valuation. Perhaps this is less of an economic issue, but it could have impacts on regional distribution of water resources and increased water scarcity in particular locations.

Another member noted the report should include not only the direct cost for securing water, but also costs incurred during treatment and disposal of water and residuals. For example, this includes agriculture runoff because it affects subsequent or secondary "value" of the water.

Sector-based Approach

Members discussed the proposed sector-based approach for the report. Some members thought the sector-based approach is reasonable. Other members noted that this approach might ignore cross-sector or overlap questions among different sectors. Members also noted that evaluating sectors is a standard approach to evaluation but they may not address important water resource decisions. One member noted that water needed for transportation is not addressed in the current list. Another member noted that dams and other water resource management choices are not addressed in the sector approach. Yet another noted that the approach does not account for the value of treated wastewater discharged to streams that may account for a majority of stream flow. One member suggested the EPA provide an introductory section prior to the sector discussions that provides an overview of potential issues and a geographic view of the issues (i.e., a GIS approach).

Cross-sector impacts

Members discussed developing the valuation of water across multiple sectors. A complete pathway for valuing the water resource should be included in the framework and effects of water use in one sector on use or value in other sectors should be identified. Examples of this type of cross-sector impacts are a thermal discharge from the electric power industry might affect a fishery, point source discharges and non-point source pollution may affect drinking water supplies, or excessive withdrawals of surface waters may affect a commercial fishery or an endangered species habitat.

Members suggested the agency consider an explicit assessment of the cost of each type of water use, in terms of its impacts on other downstream human uses and environmental impacts and that this is an important part of the assessment.

Another member noted that water and energy topics should include alternatives like offshore wind and hydro kinetic power (wave power).These uses of the spaces where water is may be limiting of other uses (perhaps ecological services or shipping, particularly access to certain ports, or recreational uses)**.**

Water Quality and Water Availability Considerations
Members discussed the impact of water pollution and quality on the nation's distribution of water. It is unclear how the report will handle regional inequities in water availability and water pricing. Even within the same region water costs can vary widely based upon governmental or hydropower subsidies. In Arizona, the Central Arizona Project charges four times more than Salt River Project (both initially federal projects).

One member suggested the report consider second-best outcomes when modeling responses to shifts in water availability, given political constraints on water pricing. That is the agency should consider modeling what happens to future price disparities between agricultural and domestic uses of water, given declining overall availability in the area.

Another member noted that water availability and value are specific to time and place. They suggested the report could address the issues associated with regional and seasonal differences in water availability and water allocation and transport among regions.

Members noted that the valuation of water use is strongly dependent of the reliability of the resource: the same quantity of water is far more valuable in a drought year than in an average precipitation year. There are short-term extremes in availability, and longer-term drivers, such as climate change, that need to be considered. The sustainability of continuing water use, under conditions of resource depletion or of climatic variability and climatic change, is an important consideration and needs to be addressed. Members noted that agriculture in portions of the U.S. depends on groundwater mining.

Infrastructure
A member noted there is a lack of a driver for water utilities to implement improvements to aging infrastructure unless there is a water quality related issue. The need for water is prevalent in almost every critical industry within the US, which is directly related to the economy.

One member posed the question of proactively addressing infrastructure needs and its value to the U.S. economy. Many of the water systems components are well over 50 years old, but we are trying to address today's issues with yesterday's technologies. Should there be an investment into the infrastructure now so that we are positioned to assist the economic growth in the future.

Report Organization
Members discussed the proposed organization of the report and noted the tension between the sector-based approach and alternative analyses such as a regional approach. Members noted that each of the alternatives to organization would have potential pitfalls and issues. Members noted that an approach based on regional or spatial considerations would need to address the size and boundaries of regions. Many of the data sources have different regions and boundaries that create data consolidation challenges. Members also noted that even if a regional approach were selected, the discussion of economic sectors within those regions would be appropriate. Conversely, a sector approach should discuss regional differences within each sector. Some members preferred the sector approach, noting that it is useful for retrospective data analysis, and can include trends for anticipated water use.

On member suggested organizing the report around themes and then conducting a sector-based analysis. They suggested that the themes should be identified from the conceptual framework section in the annotated outline and the economic perspectives should be discussed in each of the sectors.

Potential Expert Paper Topics

Members discussed the potential expert paper topics and how the papers will be used to develop the report. Members noted that while the charge to the SAB asked reviewers to identify topics that offer the potential for gaining insight in the value of water, members thought that identifying criteria the agency should consider would be an important step in selecting paper topics.

Members suggested that the criteria to select topics should focus on the papers ability to answer the question of what is the benefit of better information about the value of water. Value of water information would be particularly useful if it were able to describe incremental change to allocation and or price change. Additionally, the agency should consider the expert papers ability to compare the short-term and long-term implications of that evaluation and provide a benefit to the overall analysis.

In a review of the potential list of expert paper topics, some members thought the majority of paper topics should focus on the different economic sectors. Some members thought that the expert paper topics should focus more on innovative topics rather than status quo analyses.

Members agreed that the selected expert topic papers need to support the report. One member thought the agency should not include topics being addressed under parallel efforts being conducted by the agency (i.e., ecosystem services). Other members disagreed noting that topics such as flooding, sedimentation and temperature control, provided by ecosystem services, provide insight into a value of water. Members suggested that selected topics could be developed to more directly address the value of water report or provide a cross walk from the market economy report to other efforts. Members suggested EPA should address market/non-market distinctions (i.e., public welfare impact from water) or develop a synthesis of market and non-market benefits.

Members also noted that some of the topics might be candidates for consolidation, particularly among the sector topics. Also domestic macro trends, international macro trends and analytic issues may be appropriate to include in the selected sector expert topic papers.

One member noted that behavioral economics and the public willingness to pay were not directly addressed in the potential topics. The committee continued the discussion suggesting the expert paper topics should address social science and the perception of the value of water in decisions such as greenscapes or housing development.

Closing Remarks

Dr. Polasky provided a summary of key points and thanked the committee members for their participation in the teleconference. Dr. Polasky noted that the issues and opinions discussed were those of the individual members and the teleconference goal was to provide the individual advice

from members and not a set of consensus recommendations. He asked EPA staff if they had any closing thoughts on the call.

Drs. Shapiro and Powers thanked the committee members for the time and effort in providing advice on this project. They commented on the breadth and depth of the advice noting the agency has discussed many of the same issues identified during the teleconference.

Dr. Polasky asked the DFO to discuss next steps and action items from the call.

Mr. Carpenter thanked panel members for their advice on scoping, planning, and developing a report that analyzes the value of water to the U.S. market economy. He described the two products that would be developed:

(1) Letter to Administrator Jackson informing her of the consultation; and
(2) Minutes of the teleconference will be posted on the SAB web site as certified by the Chair. Written comments provided by members of the Committee will be included as an appendix to the minutes. He noted that comments from individual members are just that, individual advice from the member and not consensus recommendations from the committee.

Mr. Carpenter also invited members of the public wishing to provide comments on the teleconference to send the comments to his email address for inclusion in the record and posting on the SAB web site. Mr. Carpenter asked for comments from the public by December 16 so that members of the committee could review comments prior to providing their individual comments by January 9.

With the business concluded, the Designated Federal Officer adjourned the meeting at 5:10 PM.

Respectfully Submitted:	Certified as Accurate:
/SIGNED/	***/SIGNED/***
Mr. Thomas Carpenter Designated Federal Officer EPA SAB Staff Office	Dr. Stephen Polsaky Chair SAB EEAC Augmented for the Consideration of the Value of Water to the U.S. Economy

NOTE AND DISCLAIMER: The minutes of this public meeting reflect diverse ideas and suggestions offered by committee members during the course of deliberations within the meeting. Such ideas, suggestions, and deliberations do not necessarily reflect definitive consensus advice from the Panel members. The reader is cautioned not to rely on the minutes to represent final, approved, consensus advice and recommendations offered to the Agency. Such advice and recommendations may be found in the final advisories, commentaries, letters, or reports prepared and transmitted to the EPA Administrator following the public meetings.

Materials Cited

The following meeting materials are available on the SAB website: http://www.epa.gov/sab, at the 12/5/2011 Estimating the Value of Water to the U.S. Economy web page:

[1] Federal Register Notice Announcing the Meeting
[2] Meeting Agenda
[3] Project Summary for The Value of Water to the U.S. Economy
[4] Draft Annotated outline and overview of The Value of Water to the U.S. Economy report and List of potential expert paper topics to accompany The Value of Water to the U.S. Economy report
[5] Charge for Estimating the Value of Water to the U.S. Economy
[6] Public comment submitted by Diedre Duncan, Water Advocacy Coalition

Attachment A
Roster

U.S. Environmental Protection Agency
Science Advisory Board
Environmental Economics Advisory Committee Augmented for the Consideration of the Value of Water to the U.S. Economy

CHAIR

Dr. Stephen Polasky, Fesler-Lampert Professor of Ecological/Environmental Economics, Department of Applied Economics, University of Minnesota, St. Paul, MN

MEMBERS

Dr. Joel Ducoste, Professor, Department of Civil, Construction, and Environmental Engineering, College of Engineering, North Carolina State University, Raleigh, NC

Dr. Nicholas Flores, Professor, Department of Economics, Arts and Sciences, University of Colorado, Boulder, Boulder, CO

Dr. Russell Ford, Deputy Global Service Leader - Drinking Water Infrastructure, CH2M HILL, Parsippany, NJ

Dr. Wayne Gray, Professor, Department of Economics, Clark University, Worcester, MA

Dr. Madhu Khanna, Professor, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, Urbana, IL

Dr. John List, Professor, Department of Economics, University of Chicago, Chicago, IL

Dr. Frank Loge, Professor, Department of Civil and Environmental Engineering, University of California-Davis, Davis, CA

Dr. Nancy Love, Professor and Chair, Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, MI

Dr. Karen Palmer, Senior Fellow, Resources for the Future, Washington, DC

Dr. George Parsons, Professor, Department of Economics, College of Marine Studies, University of Delaware, Newark, DE

Dr. Sujoy Roy, Director, Research and Development, Tetra Tech Inc., Lafayette, CA

Dr. James Shortle, Professor, Agricultural Economics and Rural Sociology, Pennsylvania State University, University Park, PA

Dr. Laura Taylor, Professor, Department of Agricultural and Resource Economics, North Carolina State University, Raleigh, NC

Attachment A
Roster

Dr. Paul Westerhoff, Professor and Director, School of Sustainable Engineering and the Built Environment, Arizona State University, Tempe, AZ

Dr. Peter J. Wilcoxen, Associate Professor, Economics and Public Administration, Syracuse University, Syracuse, NY

Dr. JunJie Wu, Emery N. Castle Professor of Resource and Rural Economics, Department of Agricultural and Resource Economics, Oregon State University, Corvallis, OR

Dr. Jinhua Zhao, Professor, Department of Economics, Department of Agricultural, Food and Resource Economics, Michigan State University, East Lansing, MI

Dr. David Zilberman, Professor, Agriculture Resource Economics Department, College of Natural Resources, University of California - Berkeley, Berkeley, CA

Attachment B
Other Attendees Participating on the December 5 Teleconference
(Persons who requested the teleconference call-in number)

Participant	Affiliation
Neil Barnsdale,	University of California.
Clifford Barrett	
Wm. Brett Barrus	Brownstein Hyatt Farber Schreck, LLP
Donald Bentley	The Metropolitan Water District of Southern California
Scott Biernat	Association of Metropolitan Water Agencies
Tatiana Borisova, PhD	University of Florida
Tim Bryggman	Montana Department of Natural Resources and Conservation
Emily Chatten	Great Lakes Office, Ministry of the Environment, Canada
Kaitlin Chell	Boise State University
Brian Clifford	U.S. Senate Subcommittee on Clean Air and Nuclear Safety
Betsy Cody	Congressional Research Service, Library of Congress
Claudia Copeland	Congressional Research Service Library of Congress
John Crowther	U.S. Senate Committee on Energy & Natural Resources
Mark Decatur	Exxon Mobil Pipeline Company
Casey Deitrich	CQ Transcriptions
Molly Diachok-Mugglestone	MDM Public Affairs Consulting, LLC
Bridget Dicosmo	Inside EPA
Shawn Draney	Snow Christensen & Martineau
Dave Eggerton	El Dorado County Water Agency
Josie Gaskey	
Dorothy Gilbreath	Luminant Corp.
David Gordon	Duke University
Lisa Gordon	U.S. Environmental Protection Agency
W. Roger Gwinn	The Ferguson Group
Kristi Henderson, DVM	American Veterinary Medical Association
William Henneberg	U.S. Senate Committee on Environment and Public Works
Chris Hill	Chesapeake Energy Corporation
Chris Hunter	Jackson Kelly
John Jansen, PhD	Cardno Entrix
Josh Johnson	U.S. Senate Energy Natural Resources Committee
Dan Keppen	Family Farm Alliance
Lisa Kirschner	Parsons Behle & Latimer
Barbara Klieforth	U.S. Senator Casey
Brittney Kohler	American Society of Civil Engineers
Mark Limbaugh	Family Farm Alliance
Tammy Lindenberg	Xenophon Strategies

Attachment B
Other Attendees Participating on the December 5 Teleconference
(Persons who requested the teleconference call-in number)

Participant	Affiliation
Aaron Lovell	Inside EPA
Robert Lynch,	Robert S. Lynch & Associates
N. Mahasenan	HSEC Strategy
Kim Maloy	Colorado River Commission of Nevada
Deirdre Mason	Association of State Drinking Water Administrators
Patrick McCormick	U.S. Senate Energy Natural Resources Committee
Brian Morrison	Industrial Economics,
Damon Nelson	Deputy Chief of Staff & Legislative Director to U.S. Congressman
Jeffrey Odefey	American Rivers
Bob Oliphint	Luminant Corp.
Don Parrish	American Farm Bureau Federation
Tim Petty	Legislative Director to U.S. Senator James Risch
Kris Polly	Water Strategies LLC
Christine Reimer	National Ground Water Association
Steven Renzetti	Brock University
J. Alan Roberson	American Water Works Association
Amena Saiyid	Bureau of National Affairs
Eric Sapirstein	ENS Resources, Inc.
Neil Schild	Sacramento Suburban Water District
Abby Schneider	Association of California Water Agencies
Benjamin Simon	U.S. Department of the Interior
Sanjiv Sinha, PhD, PE	Environmental Consulting & Technology, Inc.
Usha Turner	Luminant Corp.
Esther Valle Rojas	South Nevada Water Authority
Abby Vandebogert	Duke University
Jolene Walsh	Eastern Municipal Water District
Linda Wilson	Office of the New York State Attorney General
Thane Young	Van Scoyoc Associates

Attachment C
Comments from Individual Committee Members

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Comments from Dr. Nicholas E. Flores

Report

Since natural supply and legal institutions vary so dramatically by region, analyzing and discussing regional variations on just about every topic would strengthen the report.

The concept of total value, in additional and in relation to marginal value, needs to have a specific place in the report. In particular total consumer surplus for users is a concept that must be adequately communicated. The marginal cost of water is often very low, and free of charge in many cases.

Drought is one of the best indicators of the value of water and how marginal values in good times may not be good indicators of total value. The report should consider a specific discussion of drought and the economic losses associated with drought. This will help readers comprehend the total value of water.

The context and conceptual framework would be improved by a discussion of dynamics. New users enter the market and that can impact current users. Planning is often carried out to meet the needs of future users. Here I am thinking a general discussion.

Following on the theme of bad times, the efficiency of allocation of shortage is very important for maximizing the value of water. For example, many communities require across the board reductions for users. This can be very inefficient.

The current outline on economic perspectives does not appear to address water quality. For some sectors this is unimportant, but for other sectors this is very important. The economic perspectives section should address this for both market based activities and non-market based.

There needs to be a discussion of how uncertainty affects valuation concepts.

Expert Topics

Should there be a specific expert paper topic that deals with regional differences in supply and legal institutions? This topic has important implications on how market information can be used to infer value across the economy. What are the sources of inefficiency that most plague allocation of water under the categories just mentioned (supply shortages, water quality, etc.)? Are there obvious remedies or do institutional details/history provide an insurmountable inefficiency wedge?

All expert topic papers should address regional differences in vulnerabilities.

For each sector, to what extent do users face prices? And when users face prices, how closely do prices reflect marginal, capital, and ownership costs?
For each sector, how costly are supply shortages? How costly is diminished water quality?

Attachment C
Comments from Individual Committee Members

How should we infer the costs of impaired water quality for various users?
Thinking about the value of water quality revolves around this question. For some users we have health issues, for others increased costs for treatment, and still for others degraded conditions for recreation and habitat. I think it is worth space in the report to develop a conceptual framework for water as an input for users and quality is an important attribute.

On Topic 13, what are the specific state transboundary problems? For example Colorado River, Swanee River, etc.

On Topic 14, what are their specific transboundary problems related to our neighbors (Mexico, Canada)?

Attachment C
Comments from Individual Committee Members

Comments from Dr. Karen Palmer

I want to preface my remarks by noting that I do not have any expertise related to water and that my expertise on valuation is fairly limited as well. Thus I will only address a subset of the charge questions and most of my comments will be brief.

1. **Questions about the OVERVIEW of the Background Report**

a. Is the Purpose of the report clear and consistent with the Panel's understanding of the scientific and analytic challenges associated with valuing water? Is the report addressing an important problem in an efficient and clear manner?

I think there needs to be a clearer discussion of the relationship between this effort and policymaking. The effort is large and will need to be focused. One way to do that is to think about what types of information about the value of water will be most useful for policy making at all levels of government. Where can policy decisions have an effect on water uses or water quality that might be actionable? What are the most important areas? The discussion of the links between water availability and quality and regional economic development seems like an interesting exercise in economic history but tough to do prospectively as it involves predicting what industries will be the growth areas in the future (farther into the future, the tougher this is to do).

b**. Does the Context and Conceptual Framework section provide a coherent framework for describing and evaluating the value of water to the U.S. economy? Do you have advice for improving the logic and structure of this framework?**

c. Are the Economic Perspectives for Evaluating the Value of Water described logical and consistent with economic theory? Do they provide an effective and efficient lens for evaluating the value of water in the U.S. economy? Do you have advice for improving the way in which we are looking at the concept of "value" and how to evaluate it?

Response: This section should also include some discussion of the role of water quality in its value for different uses. Many of the regulations that EPA is involved in are related to water quality more than water quantity and there should be some discussion of how this aspect of water will fit into this study. Also, the value of water in many uses depends on its quality (recreation, fishing, etc.) and this link needs to be explicitly acknowledged and explored.

d**. Does the sector-based approach to organizing the Background Report provide a sound foundation for evaluating the value of water to the U.S. economy? Do you have advice for improving the organization of the report?**

Response: We discussed this extensively in the meeting. I believe that a value of information approach should be used for selecting which sectors and which topics would be most important to focus on. The EPA should ask itself where greater information about the value of water would be

likely to have consequences for policymaking that could have a substantive effect on policy outcomes.

We also discussed the importance of some broader topics that should be part of this effort including pricing of water and wastewater treatment. An exploration of the potential for and a summary of experience with pricing of water, which would affect many of the uses and sectors on the list, would be an important way to understand the potential for this approach to help rationalize water use. An important issue in that discussion might be the political economy of water pricing and some understanding of what the impediments are to more widespread adoption of an economic approach to rationalizing water use. A discussion of wastewater treatment and how decisions are currently made about the benefits and costs of this activity would help to shed light on the value that society is imputing to improved water quality.

If the sector approach is selected, some consideration should be given to a couple of potentially important uses of water that are not included. The first is water use for transport and shipping. Shipping (both on the ocean and on major in-land rivers) is an important means for transportation of goods and fuel and disruption to this avenue for shipping could mean shifting to other modes of transport (rail or trucking or airfreight) which could be substantially higher cost. Thus water withdrawals from inland rivers or disruptions due to climate change could have important implications for water use in shipping that should be considered as a potential area for consideration in this report.

The other is the future use of waterways for energy generation. This includes off-shore wind, which may have implications for shipping routes, and in-stream hydro generation using hydrokinetic turbines or devices that use tidal forces to generate electricity. Both of these technologies are in the early stage of development (research and demonstration) and are fairly high cost currently, but could become economic at some point and will pose an additional demand on both coastal and inland river water resources at some point.

Two additional water uses related to energy that came up in the EEAC group discussion deserve additional attention. One is the use of water for cooling and steam production at solar thermal facilities to generate electricity. With federal and state policies to promote generation from renewable sources of electricity and greater public and private research and development on solar technologies, demand for solar thermal electricity and the costs of production from that technology are expected to fall. These facilities will likely be located in regions of the country with high insolation and generally not areas with abundant water (such as the southwestern US) and thus solar will be competing for scarce water resources. The second is the use of water for the use of hydraulic fracturing technology to extract natural gas from shale deposits. This technology has expanded dramatically in recent years and is continuing to do so and it requires fast amounts of water and thus will represent an important and growing demand for water resources in those portions of the country where there are large shale gas deposits. There are also concerns about the potential for this use of water to have adverse effects on ground water quality in proximate areas and there is a great deal of uncertainty here that will require regulatory attention both federally and on the state level for the next several years.

More formal thinking about future uses of water may be important to answering questions related to the role of water in future economic development of the US and which industries are likely to be.

2. Questions about the POTENTIAL EXPERT PAPER TOPICS

a. Among the potential topics provided, which offer the greatest potential for gaining insight on the value of water in the U.S. economy?
i. Should any be combined or divided?
ii. Are there other topics we should consider?

Response: See discussion above about additional sectors/uses to be considered for inclusion. Note that the list is already likely too long, so it probably does not make sense to add these additional uses (most of which are non-consumptive, but so is fishing and that is included on the list), but I think they should be addressed to some extent in the effort.

b**. We utilized (1) the sector-based water consumption structure of the Background Report, and (2) the Economic Perspectives for Evaluating the Value of Water to develop the list of topics and questions provided. Is this an effective way to develop potential topics and questions? Is there another perspective that we should consider?**

c**. Are there questions we should be asking that we aren't? Are there questions we should drop?**

Response: I think that you might want to put slightly greater emphasis on the role of global warming in affecting future water supply and demand in the report, particularly in the discussion of regional issues as global warming is likely to have different impacts in different regions.

d. What criteria should we use in making a final decision about which topics to pursue?

Response: I think an important criterion for selecting topics should be areas where federal, state and local policy would make a difference in realizing the most valuable allocation of water resources. The economic growth/development criteria is a difficult one to evaluate, especially prospectively, as it requires forecasting which sectors will be important in the future and this is always a difficult task for government policy makers to do. Perhaps a better approach to thinking about this aspect of water allocation in the future would be to think about mechanisms or institutions for water allocation that will be robust to shifts in water demands in the future and to think about some hypothetical examples (but not to bank on them or try to forecast what the economy of the future will look like).

3. Questions about our approach in general

a. What are the greatest strengths of the approach we have put forth for review? i. How can we build on those strengths?

Response*:* The emphasis on a system wide analysis is important as all of the various uses that you have identified (plus some that are not currently mentioned) are competing demands for water or the use of waterways. These need to be considered in an integrated fashion.

I think engaging experts and other stakeholders in a discussion of the economic value of water and its relationship to policy, including policies to price water, improve water quality and future of water resources and water uses is an important thing to do.

b. What are the greatest weaknesses of the approach we have put forth for review? i. What gaps do you see in our approach?

Response The greatest weakness is the inadequate link between this valuation exercise and policy development. How will the output of this exercise link to policy decisions or infrastructure investment decisions that the various federal government agencies as well as state and local government officials actually make. More discussion of this link to policy is needed and should help EPA to decide how to focus its efforts.

c. What areas of the report are you most interested in seeing highlighted in future SAB consultation and review?

Response The SAB could help to provide names of experts whom EPA might approach to contribute to this effort and also to provide information on existing literature on this topic that should be reviewed as a part of this study. I think the economists on the SAB could help to review the discussion of both methods and data needs to help in the evaluation of water that will be included in this report and several of us have expertise related to particular water uses (in my case that would be energy only) that would be useful in a review of the EPA final report.

Attachment C
Comments from Individual Committee Members

Comments from Dr. Sujoy B. Roy

1. Questions about the OVERVIEW of the Background Report

a. Is the Purpose of the report clear and consistent with the Panel's understanding of the scientific and analytic challenges associated with valuing water? Is the report addressing an important problem in an efficient and clear manner?

Response I believe item 1.a.i and 1.a.ii to be somewhat too broad a generalization. I think there is a great deal of understanding of the importance of water to specific sectors of the economy, both in qualitative terms and in quantitative dollar terms. For example, water annual allocations for different sectors in regions the Western US are keenly evaluated, and their economic impacts debated. The data may not all be present at the national level, but at the scale of individual river basins, aquifers, or other political boundaries, especially in water-short areas, they have been collected and evaluated for decades. What is missing perhaps is a consistent framework that has been applied nationally, and I believe the contribution of the proposed research lies in this area. It would be helpful to highlight this aspect in the report.

Overall, I think the report is highlighting an important area of study and look forward to its success.

b. Does the Context and Conceptual Framework section provide a coherent framework for describing and evaluating the value of water to the U.S. economy? Do you have advice for improving the logic and structure of this framework?

Response I think the conceptual framework is adequate for the level of an outline, although it is more of a refined presentation of study goals than a description of the approach. My preference would be to see more of a description of how the analyses would be performed.

c. Are the Economic Perspectives for Evaluating the Value of Water described logical and consistent with economic theory? Do they provide an effective and efficient lens for evaluating the value of water in the U.S. economy? Do you have advice for improving the way in which we are looking at the concept of "value" and how to evaluate it?

Response My reading of this section suggested that the focus was on addressing water availability and/or scarcity under long-term growth scenarios. It may be good to be specific about how the *quality* of water will be valued in an economic framework. Although quality is mentioned earlier in the outline, nothing is provided on how society values the protection of water quality, in addition to quantity. Long-term changes such as greater population and

urbanization, and a greater focus on improved water quality for people and ecosystems, can both be additional constraints on water quality.

d. Does the sector-based approach to organizing the Background Report provide a sound foundation for evaluating the value of water to the U.S. economy? Do you have advice for improving the organization of the report?

Response I strongly support the use of the sector-based approach for evaluating the value of water that is consistent with the USGS water use survey data. In large part this is because of the existence of a strong 55-year record of water use by sector across the US (from 1950 to 2005, conducted every 5 years and continuing), and previous research/policy products based on this framework. Policy-makers and researchers, now and in future, are very likely to use these data to better understand how the use of water is changing across the US, geographically and sectorally. Taking an effort to maximize the correspondence between the proposed EPA sectors and the USGS-defined sectors record would be a long-term benefit. This appears to be primarily what has been proposed in the outline, and I would like to emphasize my support.

It is possible that in some sectors, greater resolution of water use could be developed, but given the limited time frame of the EPA study (1 year, as indicated during the phone call), I believe the priority should be on better quantifying the use of water in the agricultural sector. There is limited national-scale data on agricultural water use by individual uses (crop type, for example), and this sector dominates overall water consumption (estimated to be more than 80%). Even if water withdrawals are considered, agriculture is one of the top three sectors (the other two being power generation and municipal/domestic). There is good pre-existing information on the power generation sector and the municipal/domestic sector that the EPA study can tap into. The manufacturing, mining and energy extraction sectors are of course important economically, but from the perspective of water, I think the concern is more related to quality than quantity. Indeed the definition of water quality is more broad, and relates not just to the use that occurs, but also the impacts of the discharge following use, which are costs possibly borne by other users.

I think the organization of these sections is appropriate, except that I would ask the report focus on water quality as it relates to possible use by a sector and impacts of discharge by that sector for *each* of the major sectors.

As an aside, I would like to point the authors to a report I co-authored, that considered trends in certain sectors (power and municipal) under different efficiency scenarios. This public domain report, prepared for the Electric Power Research Institute, is attached as part these comments: *Water Use for Electricity Generation and Other Sectors: Recent Changes (1985-2005) and Future Projections (2005-2030).*

Attachment C
Comments from Individual Committee Members

Comments from Dr. Paul Westerhoff

This letter summarizes my response to each charge question as a member of the SAB. It represents and individual opinion based upon my experience and regional perspective. Short responses are provided to each key question

1.Questions about the OVERVIEW of the Background Report
a. Is the Purpose of the report clear and consistent with the Panel's understanding of the scientific and analytic challenges associated with valuing water? Is the report addressing an important problem in an efficient and clear manner?

Response: Yes the Purpose provides a clear and valuable need. An important, but missing section could be related to how approaching the topic of the value of water intersects with EPA regulatory issues, ranging from Clean and Safe Water Acts to Endangered species, etc. Also missing from the purpose is a clear statement for the need to identify regulatory agencies current involved in overseeing various aspects of the water sector (EPA, USGS, USBR, DOE, FDA?, others?) and identifying their specific contributions toward assessing the value of water. Towards this end, a purpose of the report could be a need for each agency to identify efforts that lead toward improved valuation of water.

b. Does the Context and Conceptual Framework section provide a coherent framework for describing and evaluating the value of water to the U.S. economy? Do you have advice for improving the logic and structure of this framework?

Response: The framework lays the foundation for what the EPA currently does and ultimate goal is very important. Under the ultimate goal, it would be important for this report to "identify data collection gaps that would enable better valuation of water for the US into the future".

c. Are the Economic Perspectives for Evaluating the Value of Water described logical and consistent with economic theory? Do they provide an effective and efficient lens for evaluating the value of water in the U.S. economy? Do you have advice for improving the way in which we are looking at the concept of "value" and how to evaluate it?

Response: This is the weakest section of the OVERVIEW and considerable effort is required to focus the approach to valuation. Most notably, this section fails to grasp the integrative, non-linear, nature of water and its geo-spatial dependent aspects. How does rainfall and flooding in the upper Mississippi River basin effect economies in the Gulf coast? The report needs to clearly state that HAZARDS to the economy (flooding, loss of power, runoff of soil from agricultural fields, etc.) are "not considered," although they have dramatic impact on the US economy. Such rainfall, or lack of it, affects transportation of materials up/down the Mississippi River – is water

for "transportation" included in the report? Rainfall in the upper basin could provide water supplies for the lower basin, but this may change temporarily (past and future), so will the analysis include "average" conditions or should a section be dedicated to "vulnerability" assessment of water supplies which would probably vary regionally (great lakes region versus western Texas).

A few other examples of the missing needs are given below.

An important issue becomes the divergence between the need for what would appear to be a rigorous model, integration of data from many sources, economic models, etc. without clearly identifying an objective function. Will the underlying assessment use a simple metric like $/million gallons and some quantitative function for water quality based upon intended purpose? Perhaps this would emerge as a research need as an outcome of the report, but without working towards identifying an objective function development of usable models may be at too high a level and represent more of a mapping exercise to "track" water through the economy rather than "value" water within the economy.

This section may benefit from a clearer statement relating to differing economic perspectives based upon regional water availability, demands and opportunities. For example, should the report take a "major watershed approach", with upper/lower watershed delineations being potentially important, because in its current form the document appears to consider topics independent of geographic location, but clearly sustainability issues relating to water in arid, inland basins (Phoenix, AZ) differ considerably from wet, seaboard communities (Seattle, WA) or water-stressed seaboard communities (Tampa, FL).

This section does not lay the foundation well to understand how technological changes on the horizon may shift water demands. For example, it would be important to reflect on historic trends in water use by agriculture, energy, industry, commercial, residential over the past 100 years per unit productivity/population/etc. and then comment on the need to track these metrics and data into the future, and the potential role of different governmental agencies in tracking this data into the future.

This section could introduce a growing trend to use "water footprints" of products to value water. This could become extremely important in the agriculture and energy sectors where embedded water in products substitutes for local water availability.

d. Does the sector-based approach to organizing the Background Report provide a sound foundation for evaluating the value of water to the U.S. economy? Do you have advice for improving the organization of the report?

Response: The organization of the report is clear, but potentially leaves room for significant data gaps. The USGS withdrawal data is a good starting point, but issues of reduced USGS monitoring over the past years due to budget cuts is one issue but perhaps more important is our ability to capture 21st century high value added economic drivers (e.g., semi-electronics,

biotechnology, etc.) which tend to use public water supplies. The value of water can depend greatly upon its existing QUALITY, or the incremental cost required to treat the water (IX for semi-conductor). Somehow we need more detailed dataset to get at these.

The current structure is very "linear" and assumes water is only used once. In reality agricultural runoff, stormwater, wastewater is used many times throughout a watershed, and sometimes amongst watersheds. To this end**, a major section on "hydrology"** or "water availability" may be important. To capture the complexity of water issues, it would be critical to outline Water Rights law, transbasin water exchanges, intentional water reuse (e.g., domestic and industrial waters). This could include "water law" issues too. It is unclear how we will handle regional inequities in water pricing. Even within the same region water costs can vary widely based upon governmental or hydropower subsidies (e.g., In Arizona, Central Arizona Project charges 4x more than Salt River Project (both initially federal projects)). How do we value treated wastewater discharged to streams? In urban areas who has water rights to stormwater? Is the water rights model of the western US functioning and suitable to expand? Perhaps most striking is the current absence of "SNOWPACK" from the report. In the western US, millions of people, industry, agriculture, recreation, etc. rely heavily upon snowmelt as water seasonal water supply. This seems critical to explain.

The report fails to include description of **major infrastructure components** present in the water supply system. This seems critical to balance against the "water demands" and general 'availability" of the USGS data, because the infrastructure links supply and demand and represents an enormous financial investment. This would include reservoir storage (above ground reservoirs, but also aquifers) are not described, regional storage capacities identified, etc. Trends and costs for water and wastewater treatment and infrastructure (pipes) are completely missing from the report. A Water Research Foundation report partially addresses this topic and could be an excellent resource ("The Value of Water: Concepts, Estimates and Applications for Water Managers", Water Research Foundation, Denver, CO, 2006; "Communicating the Value of Water: An introductory guide for water utilities", Water Research Foundation, Denver, CO (Co-funded by USEPA), 2008)

There are some industries missing from this list. This could include major industries such as "CONSTRUCTION", "DEFENSE and SECURITY", "COMMERCIAL – office space".

Chapter 5 (Manufacturing) This section has several issues, which likewise could be said about other chapters too:

- presents something of an "old world" view of what industries use water. Given the scope of the report to look at the 21st century, it would be critical to recognize that many manufacturing industries of the future may require higher value and higher purity products, often requiring larger water footprints.
- For other industry (say office space – a critical service of water is FIRE FIGHTING. Perhaps this is an opportunity cost, because water is not used 99% of the time – unless a fire exists. Firefighting capabilities drive the design of most water distribution networks and represents a significant sunk cost of water infrastructure.

- The manufacturing chapter must also identify what fraction of the water "used" is discharged as liquid water, into consumer products, or evaporated. This is somewhat analogous to water in energy (withdrawal versus consumption). In many cases a large fraction of the water entering manufacturing is discharged to water sources or to sewers.
- This and many other sections focus to greatly on "water use" and inadequately address "water quality". For example, nearly all water used for evaporative cooling requires additional "treatment" of potable water supplies. Many facilities (food and beverage, chemical manufacturing, etc.) require extensive additional "treatment" to alter water quality before the water can be used. Understanding the general nature of this "treatment to modify water quality" by each industry would appear critical, as these are real costs to "using" the water.
- What is the water footprint of various manufactured goods? For agricultural activities on lands that require irrigation, should a water footprint be calculated to help incentivize certain crops?

Chapters 8 and 9 appear to focus on "wet water". Here and elsewhere the value of "solid water" (snow and ice) seems absent. Not only does snow and ice provide valuable recreational activities directly, but in the western USA snowpack emerges as critical for so many indirect ways for the environment (summer in-stream flows, habitat for large mammals that relate to hunting, etc.).

2. Questions about the POTENTIAL EXPERT PAPER TOPICS a. Among the potential topics provided, which offer the greatest potential for gaining insight on the value of water in the U.S. economy? i. Should any be combined or divided? ii. Are there other topics we should consider?

Response: These seem generally fine. However, the white papers need to consider a common set of metrics to be used (Gallons of water per unit GDP, etc.) to be useful and comparative. I believe a whitepapers on the following topics would be valuable:

- Use of Water Footprints to value water fluxes
- Trends in Desalination
- Trends in industrial and municipal water reuse
- Assessment of existing and future water purification technologies
- Social benefits of water for mental and physical health
- Assessment of what water related data each federal and typical regional or state agencies collect (e.g., USGS collects streamflow data, but plans over the next 25 years may be to reduce monitoring by x%)

b. We utilized (1) the sector-based water consumption structure of the Background Report, and (2) the Economic Perspectives for Evaluating the Value of Water to develop the list of topics and questions provided. Is this an effective way to develop potential topics and questions? Is there another perspective that we should consider?

Response: The data in Chapters 2-7 seem somewhat easily obtained. Therefore, white papers on each seem somewhat redundant perhaps to white papers that may touch upon less clearly defined topics identified above.

c. Are there questions we should be asking that we aren't? Are there questions we should drop?

Response: see above

d. What criteria should we use in making a final decision about which topics to pursue?

Response: A consensus prioritizing approach with a diverse group of experts would be more logical than an EPA staff only selection process. EPA staff should identify 2 to 3 times the number of potential whitepapers and perhaps have the SAB conduct the consensus prioritization using a typical voting and review process.

3. Questions about our approach in general a. What are the greatest strengths of the approach we have put forth for review? i. How can we build on those strengths?

Response: The greatest strength is initiating this report. Recognize that the report should serve two main aims: 1) gather all relevant data on valuation in a single location, and 2) provide a framework for approach the issue of valuation.

b. What are the greatest weaknesses of the approach we have put forth for review? What gaps do you see in our approach?

Response: The greatest weakness appears to be this is an EPA only process that understands the complexity of inter-governmental agency issues of collecting and consensus building about water. However, ultimately this will require inter-agency cooperation. The second greatest weakness is the lack to clearly identify metrics to value water, and much of the current report appears to focus on "tracking" who uses water and how much they use. It would appear that case studies of sorts will be used to illustrate this. To truly "value" water a more sophisticated approach that integrates quantity, quality, infrastructure (upstream & downstream of use) and variability/vulnerability seems required.

c. What areas of the report are you most interested in seeing highlighted in future SAB consultation and review?

Response: Major area would be around 1) reviewing final chapter outline, 2) consensus selection of white papers, 3) discussion of the final approach to computing "value".