

# Synthesis of the Regional Water Supply Planning Process

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# Acknowledgements

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## Coordinating Committee Members

(Coordinating Committee members were appointed by King County Executive Ron Sims. The predecessor group, the Scoping Committee, proposed the entities to be represented on the Executive Committee. Executive Committee members are marked with \*.)

Louise Miller*	Chair
Pam Bissonnette*	King County Department of Natural Resources and Parks (King County DNRP), Director until July 2007 <sup>1</sup>
Walt Canter	Cedar River Water and Sewer District Commissioner
Tim Clark	Suburban Cities Association Representative and Kent City Council Member
Chuck Clarke*	Seattle Public Utilities, Director
Larry Fay	Public Health – Seattle & King County (PHSKC), Community Environmental Health Section Manager
Jane Hague	King County Council Member
Ken Howe	Woodinville Water District, General Manager
Debby Hyde	Pierce County Executive's Office, Special Project Coordinator
Theresa Jennings*	King County DNRP, Director as of July 2007 <sup>1</sup>
John Kirner	Tacoma Public Utilities, Water Superintendent
Jim Kramer <sup>2</sup>	Shared Strategy for Puget Sound, Executive Director
Pete Lewis*	City of Auburn, Mayor
Michael Mayer	Washington Environmental Council, Legal Director
Shirley Nixon	Center for Environmental Law & Policy, Executive Director
Sam Pace	Business Community Representative and Seattle-King County Association of Realtors, South King County Housing Specialist
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## Facilitation

Dan Silver, lead  
Kaleen Cottingham, associate

## Funding from Cascade Water Alliance, King County, Seattle Public Utilities, and Ecology support-ed facilitation of this committee.

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<sup>1</sup>Pam Bissonnette retired from King County in July 2007 and was replaced by Theresa Jennings as Director of the Department of Natural Resources and Parks.

<sup>2</sup>Although appointed by Executive Sims to the Coordinating Committee, no representative from Shared Strategy staff attended any Coordinating Committee meetings.

## **Tributary Streamflow Technical Committee Members**

(Participating entities were self-selected; committee co-leads volunteered prior to convening the technical committee.)

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Steve Hirschey, co-lead	Ecology (2006 - May 2007), King County DNRP (as of June 2007)
Hans Berge	King County DNRP
Carla Carlson	Muckleshoot Indian Tribe
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Brian Footen	Muckleshoot Indian Tribe
Paul Hickey	Tacoma Public Utilities
Keith Kurko	Seattle Public Utilities
Kirk Lakey	WDFW
Jane Lamensdorf-Bucher	King County DNRP
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Keith Macdonald	City of Redmond
Mike Mactutis	City of Kent
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(Participating entities were self-selected; committee lead volunteered prior to convening the technical committee.)

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Geoff Clayton	Woodinville Water District Commissioner, NE Sammamish Sewer and Water District, and Union Hill Water Association
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Paul Fabiniak	Ecology
Judi Gladstone	Seattle Public Utilities
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Jane Lamensdorf-Bucher	King County DNRP
Cindy Lantry	Washington Environmental Council
Mike Mactutis	City of Kent
Judy Nelson	Covington Water District
Steve Nelson	RH2 Engineering
Sarah Ogier	King County DNRP (2006)
Bob Pancoast	East King County Regional Water Association
Kelly Peterson	City of Kent
Larry Stockton	King County DNRP (2007)
Scott Thomasson	City of Redmond
Don Wright	South King County Regional Water Association

### ***Technical Committee Support***

HDR	Consultant
Keta Waters	Consultant to the joint technical subcommittee of Source Exchange and Tributary Streamflow

**Funding from Ecology contributed towards this technical committee's and the joint subcommittee's final work products.**

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(Participating entities were self-selected; committee lead volunteered prior to convening the technical committee.)

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Walt Canter	Cedar River Water & Sewer District
Geoff Clayton	Woodinville Water District Commissioner, NE Sammamish Sewer and Water District, and Union Hill Water Association
Kathy Cupps	Ecology
Paul Fabiniak	Ecology
Bruce Flory	Seattle Public Utilities
Jane Lamensdorf-Bucher	King County DNRP
Terry Martin	Seattle Public Utilities
Judy Nelson	Covington Water District
Don Perry	Lakehaven Utility District
Greg Reed	City of Kent
Jeff Roscoe	City of Auburn
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(Participating entities were self-selected; committee co-leads volunteered prior to convening the technical committee.)

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Mike Ireland	Washington Water Service
Larry Krall	Cedar River Water and Sewer District
Brad Lake	City of Kent
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Sheri Miller	DOH

Judy Nelson	Covington Water District
Jim Nilson	Seattle Public Utilities
Shirley Nixon	Center for Environmental Law & Policy
Sarah Ogier	King County DNRP
Tim Osborne	City of Auburn
Bob Pancoast	East King County Regional Water Association
Doug Rushton	Ecology
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Don Wright	South King County Regional Water Association

**Technical Committee Support**

Tamie Kellogg	Kellogg Consulting, Inc. (facilitator)
Kaleen Cottingham	Consultant (associate facilitator for the Coordinating Committee in 2006)
Jamie Foulk	King County DNRP (report production)
Cathie Scott	King County DNRP (summary notes and report writing)
Ken Johnson	King County DNRP (exempt well mapping and analysis)

**Funding from Ecology contributed towards this technical committee’s final work product. Funding from King County supported facilitation of this committee.**

**Climate Change Technical Committee Members**

(Participating entities were self-selected; committee lead volunteered prior to convening the technical committee.)

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James Battin	National Oceanic and Atmospheric Agency
Geoff Clayton	Woodinville Water District Commissioner
Holly Coccoli	Muckleshoot Indian Tribe
Jefferson Davis	City of Kent
Paul Fleming	City of Seattle
Paul Hickey	Tacoma Public Utilities
Joan Kersnar	Seattle Public Utilities
Erin Leonhart	City of Kirkland
Michael Maher	Steward and Associates
Bruce Meaker	Snohomish Public Utilities District
Jim Miller	City of Everett
Phil Mote	Washington State Climatologist, Speaker
Steve Nelson	RH2 Engineering
Kelly Peterson	City of Kent
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Lee Traynham	UW (technical support)
Matthew Wiley	UW (technical support)

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### **Regional Water Demand Forecast Advisory Committee Members**

(The Central Puget Sound Water Suppliers' Forum (Forum) invited its members and specific other interests to participate; chair and vice-chair were chosen by the advisory committee.)

Jane Evancho, chair	Tacoma Public Utilities
Denise Smith, vice-chair	League of Women Voters
Mike Brent	Cascade Water Alliance
Lynn Coleman	Ecology
Kyle Comanor	King County DNRP
Nancy Davidson	Alderwood Water District
Bruce Flory	City of Seattle
Brad Lake	City of Kent
Michael Mayer	Washington Environmental Council
Souheil Nasr	City of Everett
Shirley Nixon	Center for Environmental Law & Policy
Richard Palmer	UW CIG and Water Resources Management and Drought Planning Group
Bob Pancoast	East King County Regional Water Association
Rebecca Phelps	Sierra Club
Richard Reich	Muckleshoot Indian Tribe
Jim Simmonds	King County DNRP

### **Advisory Committee Support**

Don Wright	Forum (project manager)
Margaret Norton-Arnold	Norton-Arnold & Company (facilitator)
CDM	Consultant

**Funding from the Forum, with assistance from Ecology, contributed to the final work product overseen by the Forum. Funding from the Forum supported facilitation and management of this committee.**

## Regional Water Supply Assessment Advisory Committee Members

(The Forum invited its members and specific other interests to participate; chair and vice-chair were chosen by the advisory committee.)

Jim Miller, chair	City of Everett
Sarah Ogier, vice-chair (2006-07)	King County DNRP
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Paul Fabiniak	Ecology (as of June 2007)
Dennis Fields	Cascade Water Alliance
Steve Hirschey	Ecology (2006 - May 2007); King County DNRP (as of June 2007)
Jeff Johnson	Water Co-op of Pierce County
Joan Kersnar	City of Seattle
Brad Lake	City of Kent
Michael Mayer	Washington Environmental Council
Tom Mortimer	Northshore Utility District
Shirley Nixon	Center for Environmental Law & Policy
Bob Pancoast	East King County Regional Water Association
Don Perry	Lakehaven Utility District
Rebecca Phelps	Sierra Club
Richard Reich	Muckleshoot Indian Tribe
Dan Repp	City of Auburn
Dave Sherman	Tacoma Public Utilities
Denise Smith	League of Women Voters

### **Advisory Committee Support**

Don Wright	Forum (project manager)
Margaret Norton-Arnold	Norton-Arnold & Company (facilitator)
CDM	Consultant

**Funding from the Forum, with assistance from Ecology, contributed to the final work product overseen by the Forum. Funding from the Forum supported facilitation and management of this committee.**

### **Report Preparation**

Lisa Dally Wilson of Dally Environmental and her associate, Alyssa Neir of Golder & Associates, drafted the substance of the first two chapters of the report and the tables that accompany Chapter 2.

The Visual Communications staff of the King County Water and Land Resources Division created the figures and maps and designed the layout of the report.

King County Department of Natural Resources and Parks staff wrote the Executive Summary and the last chapter and finalized the report, taking into account comments from committee members and interested parties.

# Acronyms and Abbreviations

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C	Celsius
c.f.s.	Cubic feet per second
Coordination Act	Public Water System Coordination Act (chapter 70.116 RCW)
CWSP	Coordinated Water System Plan
CWSSA	Critical Water Supply Service Area
DOH	Washington Department of Health
Ecology	Washington Department of Ecology
F	Fahrenheit
Forum	Central Puget Sound Water Suppliers' Forum
GCM	Global Climate Model, also General Circulation Model
King County DNRP	King County Department of Natural Resources and Parks
MOU	Memorandum of Understanding
n.d.	No date
ODW	Office of Drinking Water (in the Washington Department of Health)
Outlook	Central Puget Sound Water Suppliers' Forum's Regional Water Supply Outlook
PHSKC	Public Health–Seattle and King County
RCW	Revised Code of Washington
SDWA	Safe Drinking Water Act (federal)
UW CIG	University of Washington Climate Impacts Group
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WRIA	Water Resource Inventory Area

# Preface

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The King County Department of Natural Resources and Parks (DNRP) commissioned this report to summarize the work products of the technical committees of the regional water supply planning process for the King County Executive and the King County Council. The King County Executive initiated the regional water supply planning process with the voluntary support and participation of numerous stakeholder groups. Most of the work products have been completed; a couple are still under development. **This report summarizes progress through September 2008.**

In addition, the report offers King County's perspective on possible next steps for the consideration of all participants involved. Some next steps may be implemented under the King County planning umbrella; others may be the result of partnerships formed or encouraged through this process and would occur in another venue.

All 150 participants and interests in the process were invited to review a draft of the report and submit comments to King County DNRP. Input based on the 91 written comments received in nine letters and emails from 16 entities was taken into account in finalizing the report, for delivery to the King County Executive, the King County Council, and interested organizations and legislative bodies in spring 2009. A table summarizing participants' comments can be found at the back of the document.

The synthesis consists of summaries of the publicly available reports and work products from each of the technical committees and the Central Puget Sound Water Suppliers' Forum, a review of what was accomplished, and an analysis of what more could be done, particularly in the context of the expectations outlined in the scoping document (the Planning Framework Summary) and the original technical committee charters provided by the Coordinating Committee. The analysis compares the initial scope of each technical topic with the final product(s) developed as of September 2008 and traces the evolution of each technical topic's scope. The report provides King County's conclusions about what was not addressed and how each topic might or will be addressed through future activities. It closes with some overall conclusions from King County about what came out of the process.

The report is organized in three chapters. Chapter 1 explains the history, participants, and process, along with a status of work products of each of the technical committees and the Forum. Chapter 2 summarizes the work of individual technical committees and the Forum as of September 2008, presenting for each committee an overview of the scope, activities, and products generated; a gap analysis that compares what was accomplished to what was originally expected in the Planning Framework Summary; and suggestions for possible next steps. Chapter 3 looks at King County's perspective on what was achieved in the context of the desired process and outcome defined in the Planning Framework Summary and describes the tools and methodologies developed or reviewed by the technical committees and their consultants. Also included are some possible next steps for King County.

King County DNRP hired an independent consultant, Dally Environmental, to draft the substance of the first two chapters and accompanying tables, using technical committee reports and other documents publicly available on the website <http://www.govlink.org/regional-water-planning/>. The consultant also contacted leads and chairs of the technical committees and representatives of the entities that contributed funding to develop the work products. The Executive Summary and the final chapter were drafted by King County DNRP staff who participated in the process.

King County acknowledges the significant participation and support of a diverse group of stakeholders in shaping this effort and appreciates their input throughout the planning process.

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# Executive Summary

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## The Challenge: King County's Perspective

The King County region is facing competing demands for water as the population increases, the climate changes, land is developed, and habitat is altered. Individual utilities have encouraged conservation, implemented habitat conservation plans to protect listed species, and participated in salmon recovery planning efforts. However, because water flows across socio-political boundaries and water law involves a range of responsible entities, some form of cooperative regional planning among multiple jurisdictions is needed to address water issues collectively.

King County has been pursuing a regional water plan for the past decade that would present comprehensive countywide strategies to meet water resource needs for both the increasing human population and the decreasing fish populations and also include reclaimed water as an alternative source of supply. Previous attempts at collaborative regional water planning did not successfully assess both future instream and out-of-stream needs or include conservation and reclaimed water as major future supply sources.

## A Response

King County and Cascade Water Alliance signed a Memorandum of Understanding in February 2005 to work together on regional water planning. In July 2005, King County Executive Ron Sims convened a broad set of stakeholders to discuss how to tackle the topic. After several meetings, this Scoping Committee agreed to a Planning Framework in October 2005. Rather than move directly into another full-scale planning effort, the committee decided to first cooperate on defining and collecting data on specified technical issues. At a minimum, the planning-level technical information was expected to be useful to state agencies, water utilities, cities, counties, other governments, and other parties interested in internal and broader regional water planning activities. Successful collaboration could also encourage participation in coordinated planning efforts.

## The Process

The Scoping Committee was expanded into a Coordinating Committee, which convened seven technical committees in the spring of 2006 to address the following issues: tributary streamflows, source exchange strategies, reclaimed water, small water systems, climate change impacts, regional water demand, and regional water supplies. No requirements were made for committee participation nor use of the resulting work products. The Coordinating Committee provided each technical committee with a charter based on the original scoping document -- the Planning Framework Summary -- which each technical committee then revised through its own process. The technical committees further refined their respective scopes through proposals for portions of a \$250,000 grant that the Legislature appropriated in 2006 to the Washington Department of Ecology (Ecology) to support the King County planning process.

The Central Puget Sound Water Suppliers' Forum (Forum) provided more than \$500,000 to address municipal demand and supply. The Forum convened two advisory committees to offer input to the Forum and its consultant on the development of technical work that will be used in a combined report on the two topics, expected to be available in mid-2009. Each of the other technical committees, whose members were self-selected, produced a report on topics identified in its revised charter and funding proposal. For the most part, the other technical committees made decisions by consensus.

Ecology, King County, City of Seattle, Cascade Water Alliance, and the Forum each contributed direct financial support to the technical committees' work. In addition, other entities funded their own participation (in-kind services) on the various technical committees.

## Context for the Work Products

After convening the technical committees, all participants on the Coordinating Committee agreed in May 2006 to a formal statement regarding the work products to be produced by the committees. The statement said that participants could choose whether or how to use the products as they saw fit, and that the work of the committees did not in any way affect the authority of any of the participants in the planning process.

## Technical Committee Work Products

The technical committees accomplished a significant amount of work. Table ES-1 provides the status and a brief summary of each technical committee's final product(s) **as of September 2008**. Committee materials and reports can be accessed on the regional water supply planning website at <http://www.govlink.org/regional-water-planning/index.htm>.

## New Tools and Methodologies

The technical committees reviewed, developed, or worked with consultants and researchers to generate tools, frameworks, models, and methodologies that participating entities or others may use in their own water supply planning or in other regional processes. Table ES-2 lists these tools and methodologies, which can be found in the reports of the respective technical committees posted on the web at <http://www.govlink.org/regional-water-planning/committees.htm>.

## Conclusions and Next Steps: King County's Perspective

The short-term goal of the regional water supply planning process was to achieve voluntary collaboration on development of planning-level technical information that could be used in individual water system planning as well as in future regional water planning efforts. For that purpose, the process was successful. Relationships were built, and useful data and tools were created. The Coordinating Committee has not yet discussed next steps to build on this shared success.

Although regulatory and financial changes are always occurring, King County believes that the work products and efforts of the many committees from the regional water supply planning process are worth capturing as a snapshot in time. The synthesis report contains recommendations and conclusions from each technical committee and possible next steps for each technical committee topic. The report, produced by King County, closes with possible next steps for the County, noting that it anticipates using information, data, and tools developed through this process where appropriate in its own various planning and management activities and in partnerships with others.

Current and future water needs for both people and fish can best be met in a sustainable way through the commitment and participation of interested and affected stakeholders in a collaborative and comprehensive planning effort. Water knows no political boundaries, and the rules and regulations that govern water require the involvement of many entities. King County looks forward to continuing partnerships to resolve challenging water issues and to prepare for the growth in population and the impacts of climate change. To do so, King County is already using many of the work products from, and building on relationships created and expanded through, the regional water supply planning process.

**Table ES-1.  
Technical Committee\* Work Products**

<b>Name</b>	<b>Chair/Lead</b>	<b>Report Date</b>	<b>Brief Summary of the Report</b>
<b>Tributary Streamflow Technical Committee</b>	Muckleshoot Indian Tribe and Ecology	October 2006	Featured a list of candidate streams prioritized for the purpose of using source exchange to restore future flows and improve salmon viability. Low-flow streams were evaluated in Water Resource Inventory Areas (WRIAs) 8 and 9, the Cedar-Sammamish-Lake Washington and Green-Duwamish watersheds, respectively.
<b>Source Exchange Strategies Technical Committee</b>	Cascade Water Alliance	December 2007	Reviewed the committee's process, work products, and overall findings, and identified important considerations for utilities that might be interested in exploring source exchange projects. Appendices included the work of two consulting firms contracted to explore specific topics related to source exchange in King County.
<b>Reclaimed Water Technical Committee</b>	King County Department of Natural Resources & Parks (DNRP)	November 2007	Summarized the committee's activities. Focused on a new economic framework commissioned by the national WaterReuse Foundation that was designed specifically to identify and evaluate the full economic, environmental, and social benefits and costs of potential reclaimed water projects. Also included summaries of presentations made to the committee.
<b>Small Water Systems Technical Committee</b>	Public Health—Seattle & King County and King County DNRP	October 2007	Identified what was known and not known about small water systems in King County. Included a summary of presentations made to the committee, presented the results of data collection regarding new individual wells and Group B systems, and covered the committee's discussions and recommendations on three priority issues.
<b>Climate Change Technical Committee</b>	King County DNRP	December 2007	Summarized eight technical memoranda and a paper that were drafted by the University of Washington Climate Impacts Group and reviewed by technical committee members. Established a scientific basis for understanding the impacts of climate change on water resources in the region. Included recommendations for further work.
<b>Forum's Regional Water Demand Forecast</b>	Central Puget Sound Water Suppliers' Forum	Expected by mid-2009**	The Forum's 2008 Regional Water Supply Outlook is expected to include municipal water demand forecasts for the portion served by utilities in the three-county region of Pierce, King, and Snohomish counties, for each of the counties separately, and for a variety of sub-regions.
<b>Forum's Regional Water Supply Assessment</b>	Forum	Expected by mid-2009**	The Forum's 2008 Outlook is expected to include an inventory of existing municipal water supplies serving more than 500 connections and a description of potential future water supplies that could provide more than 3 million gallons per day, along with a decision-making framework to evaluate and compare supply portfolios to meet the water demand forecast for the region.

\*For the purposes of this report, the Forum and its advisory committees are included when reference is made to the technical committees.

\*\* Some of the advisory committees' meeting notes, presentation materials, and consultant work products have been posted on the Forum's website: <http://cpswatersuppliersforum.org/Home/default.asp?ID=23>

**Table ES-2.  
Tools and Methodologies Developed or Reviewed by Technical Committees**

Technical Committee	Possible Tools and Methodologies
<b>Tributary Streamflow</b>	Methodology and ranking criteria to prioritize low-flow streams that would benefit from source exchange
<b>Source Exchange</b>	<ul style="list-style-type: none"> <li>• Framework of questions to consider when evaluating feasibility of source exchange</li> <li>• One method for full cost/benefit accounting</li> <li>• *Model and methodology for considering whether to pause groundwater well withdrawals to benefit streamflow. The model assists in predicting the general timing and magnitude of streamflow improvement according to well depth and distance away from streams</li> <li>• *Web-accessible database of large wells and springs in WRIAs 8 and 9 that catalogs site-specific characteristics important for quantifying streamflow impacts from groundwater extraction to help evaluate opportunities to pause groundwater well withdrawals</li> </ul>
<b>Reclaimed Water</b>	<ul style="list-style-type: none"> <li>• WaterReuse Foundation’s economic framework for evaluating the environmental, social, and financial benefits and costs, both quantifiable and non-quantifiable, of reclaimed water projects</li> <li>• Model for estimating costs to produce Class A reclaimed water from various points in the King County wastewater treatment system</li> </ul>
<b>Small Water Systems</b>	<ul style="list-style-type: none"> <li>• Mapping of Group B systems in King County</li> <li>• Geographic analysis of exempt wells drilled in King County since 2000</li> <li>• Possible elements of timely and reasonable service for a water utility to consider describing in its water system plan</li> </ul>
<b>Climate Change</b>	<ul style="list-style-type: none"> <li>• Methodology to downscale global climate (general circulation) models</li> <li>• Application of downscaled global climate models to forecast temperature and precipitation changes in WRIAs 7, 8, 9, and 10 over the next 70 years</li> <li>• Methodology to evaluate impacts of meteorological changes on streamflow in WRIAs 7, 8, 9, and 10 over the next 70 years</li> <li>• Framework for incorporating climate change into water resources planning</li> <li>• Online database of modeled meteorological and hydrologic trends for the next 70 years in WRIAs 7, 8, 9, and 10</li> </ul>
<b>Regional Water Demand Forecast</b>	Model for forecasting future average annual municipal water demand on a regional and sub-regional scale in King, Pierce, and Snohomish counties
<b>Regional Water Supply Assessment</b>	Criteria and model to evaluate potential new water supply sources at the regional scale in King, Pierce, and Snohomish counties

\*Tools developed as part of the work products of a joint subcommittee of the Tributary Streamflow and Source Exchange technical committees and published as an attachment to the Source Exchange Technical Committee’s final report.



Chapter 1

# Background



# Background

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This chapter provides background on the intended purpose and goal of the planning process; an overview of the initiation, participation, and activities through September 2008; and a brief summary and status of work products of each of the five technical committees and the two tasks performed by the Central Puget Sound Water Suppliers' Forum (Forum)<sup>3</sup>.

## 1.1 Purpose and Goal of Regional Water Supply Planning

The regional water supply planning process covered in this report focused on the importance of interested and affected entities collaborating voluntarily to develop substantive technical information regarding current and emerging water resource management issues in and around King County. Here is the description from the oversight body, the Coordinating Committee:

Multiple agencies and organizations are voluntarily participating in a regional water supply planning process for the purpose of identifying, compiling information on, and discussing many of the key issues that relate to or may affect water resources of the region. The goal is to develop the best available data, information, and pragmatic tools that the participants may use, at their discretion, to assist in the management of their respective water systems and resources, and in their water supply planning activities.<sup>4</sup>

Hydrologic boundaries, such as surface water and groundwater divides, do not typically follow socio-political boundaries. (See Map 1 in the Map section at the end of this report.) In addition, Washington water law has assigned roles and responsibilities for water and related resource management to a variety of entities. Hence, to address water issues comprehensively, some form of multi-jurisdictional water

supply planning has been needed. To be complete, such a plan would need to consider issues such as:

- Future demand for potable and non-potable water
- Available and potential supplies of some potable and non-potable water
- Impacts of climate change on water resources in the future
- Role of reclaimed water in meeting non-potable demand
- Prioritization of tributaries that would benefit from source substitution to enhance instream flows to improve salmon viability
- Strategies to encourage substitution of water sources to decrease withdrawals detrimental to salmon viability
- Efficient management of current small water systems and reduction in the proliferation of new small systems.

Past attempts at collaboration have not produced a region-wide water plan that simultaneously assessed both instream and out-of-stream needs and evaluated all major available sources, including conservation and reclaimed water. The current process was not a full-blown planning effort, but instead an initial step of collaboratively defining and collecting data for technical issues related to the seven topic areas listed above. The resulting planning-level technical information was expected to be useful to state agencies, water utilities, cities, counties, other governments, and interested others in both internal and broader regional water planning activities.<sup>5</sup>

The voluntary regional water supply planning process was not required by statute, and it moved forward outside of any specific statutory water planning authority. However, it has provided useful data and tools that might support other processes (both required and voluntary) that any participant might use to address water supply planning, water resource planning, and associated management and habitat issues. For instance, any participant could choose to use the data, information, and analyses generated by the technical committees to address water resource

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<sup>3</sup>Except where stated otherwise, the five technical committees and the Forum and its two advisory committees are referred to as "technical committees" in this synthesis report.

<sup>4</sup>Excerpted from Coordinating Committee (2006e)

<sup>5</sup>Coordinating Committee (2006e)

and water supply issues under relevant state and federal laws. These could include the Public Water System Coordination Act (Coordination Act, chapter 70.116 Revised Code of Washington (RCW)), the Growth Management Act (chapter 36.70A RCW), the Watershed Planning Act (chapter 90.82 RCW), the Salmon Recovery Act (chapter 77.85 RCW), and the federal Endangered Species Act. As examples, the relevant technical committee work products could be considered in comprehensive land use planning and coordinated water system planning, or could be used to help address the water quantity information needs in the federally approved Puget Sound Chinook Salmon Recovery Plan.

## 1.2 Process and Participation

The regional water supply planning process resulted from a February 2005 Memorandum of Understanding (MOU) on water resource and supply planning between King County and the Cascade Water Alliance, which is a group of eight local governments and special purpose districts in King County. The MOU proposed updating existing coordinated water system plans (CWSPs) or producing a single integrated CWSP that would encompass all of the land area in King County<sup>6</sup>, under the authority of the Coordination Act.

In July 2005, King County Executive Ron Sims initiated the regional water supply planning process contemplated in the MOU by inviting a diverse group of stakeholders to participate on a **Scoping Committee**. Involvement was voluntary and included water purveyors, tribes, local governments, environmental groups, and state agencies that had an interest in water resource management in King County. Members of the Scoping Committee were the Muckleshoot Indian Tribe, three state agencies (Washington Departments of Ecology (Ecology), Health (DOH), and Fish and Wildlife (WDFW)), City of Seattle, City of Auburn, King County Council, Tacoma Public Utilities, Cedar River Water and Sewer District, Lakehaven Utility District, Woodinville Water and Sewer District, Public Health–Seattle and King County (PHSKC), Shared Strategy for Puget Sound, Washington Environmental Council, Cascade Water Alliance, and King County Department of Natural Resources and Parks (DNRP).

The Scoping Committee met several times to identify issues and in October 2005, agreed to a

**Planning Framework** as a scope of work for a regional water supply planning process that would develop technical work products and be led by a **Coordinating Committee**. The Planning Framework Summary outlined a schedule for studying water resource conditions, climate change impacts, and management approaches related to meeting out-of-stream and instream water needs of people and fish from all available sources, including reclaimed water and conservation. To gather relevant information and address key questions, the Planning Framework Summary proposed the establishment of technical committees. King County and the Cascade Water Alliance reserved the right, within the Planning Framework, to initiate a planning process under the Coordination Act that would be open to the voluntary participation of other parties.

The King County Executive invited Scoping Committee members to continue on the Coordinating Committee. At the Scoping Committee's recommendation, Executive Sims also invited representatives from Pierce County government, the business community, and another environmental organization, as well as an elected official from the Suburban Cities Association to participate. The Planning Framework Summary defined the Coordinating Committee's role as reviewing, facilitating, and coordinating a number of studies, analyses, and projects that would produce new information and tools useful for water planning activities<sup>7</sup>. The Scoping Committee also selected a subset of the broader Coordinating Committee to serve as a six-member **Executive Committee** charged with managing the logistical and procedural functions of the planning process. The Executive Committee consisted of representatives from King County DNRP, Muckleshoot Indian Tribe, Cascade Water Alliance, Ecology, Seattle Public Utilities, and the City of Auburn. Coordinating and Executive Committee members are listed in the Acknowledgements section of this report. Figure 1-2 shows the structure of the regional water supply planning committees.

As outlined in the Planning Framework Summary, the Coordinating Committee convened five technical committees in the spring of 2006 to address the following topic areas:

- Tributary Streamflows – led by the Muckleshoot Indian Tribe and Ecology
- Source Exchange Strategies – led by Cascade Water Alliance

<sup>6</sup> Cascade Water Alliance and King County (2005)

<sup>7</sup>Scoping Committee (2005, p.1)

- Small Water Systems – led by King County DNRP and PHSKC
- Climate Change Impacts – led by King County DNRP
- Reclaimed Water – led by King County DNRP

The Forum convened two advisory committees to assist with the tasks it volunteered to tackle:

- Regional Water Demand Forecast
- Regional Water Supply Assessment

The Coordinating Committee provided to each technical committee a charter based on the original Planning Framework Summary. The technical committees revised their respective charters through their own processes. The technical committees further refined their scopes to request portions of a \$250,000 grant the Legislature appropriated in 2006 to Ecology to support the King County planning process. The Coordinating Committee convened a funding committee that reviewed and approved proposals from the technical committees to generate information, analysis tools, and, in some cases, recommendations for future study or action.

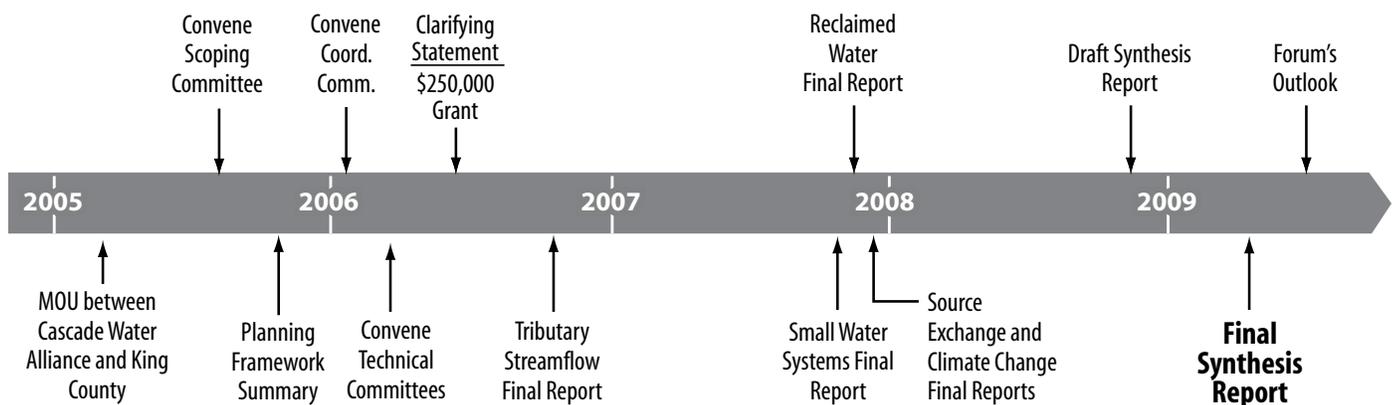
The Forum adjusted the scope of its topics to focus on large and medium-size municipal water providers, hired a consultant to develop the work products, and invited Forum members and selected interests to participate on two advisory committees. The Forum expects to produce a combined report, the 2008 Regional Water Supply Outlook (Outlook),

by mid-2009 on its two topics. The other technical committees each produced reports on topics identified in their revised charters and funding proposals. For the most part, these other technical committees, whose members were self-selected, aimed for consensus in their conclusions and recommendations. The Demand and Supply advisory committees provided input to the Forum as the technical work progressed, but the Forum retained responsibility for the output. Members of all the committees are listed in the Acknowledgements section of this report.

Several of the participating entities provided financial support to the process. Ecology contributed direct financial support to the work products of the technical committees. King County provided funding for facilitation of several committees. Seattle Public Utilities, the Cascade Water Alliance, and King County contributed additional funding for the climate change work. The Forum contributed in excess of \$500,000 to fund a consultant to develop the Outlook and to facilitate and manage the Regional Water Demand Forecast and the Regional Water Supply Assessment advisory committees. Cascade Water Alliance, King County, Seattle Public Utilities, and Ecology supported facilitation of the Coordinating, Executive, and Scoping committees. In addition, other entities have funded their own participation (in-kind services) on the various committees.

Figure 1-1 shows a timeline of the regional water supply planning process.

**Figure 1-1.**  
**Regional Water Supply Planning Process Timeline**



## 1.3 Clarifying Statement

After convening the technical committees, all participants on the Coordinating Committee agreed in May 2006 to a formal statement regarding the work products to be produced by the technical committees. The statement noted that participants could choose whether or how to use the products as they saw fit and that the work of the technical committees did not in any way affect the authority of any of the participants in the planning process. The clarifying statement said:

Multiple agencies and organizations are voluntarily participating in a regional water supply planning process for the purpose of identifying, compiling information on, and discussing many of the key issues that relate to or may affect water resources of the region. The goal is to develop the best available data, information, and pragmatic tools that the participants may use, at their discretion, to assist in the management of their respective water systems and resources, and in their water supply planning activities. Information developed by each technical committee is advisory only and development of that information in no way expands or limits the authority of any entity. All information generated will be shared among all those interested in receiving it. The planning process is not required by statute, but is expected to provide useful data that may support other processes that any participant may use to address water resource and water supply issues. Each of the participants is free to accept or reject the results of this process.<sup>8</sup>

## 1.4 Status of Technical Committee Work Products

The technical committees have accomplished a significant amount of work. The following is a summary of the status of each technical committee's final product(s) **as of September 2008**. Chapter 2 provides more details. Technical committee materials and reports can be accessed on the regional water supply planning website at <http://www.govlink.org/regional-water-planning/index.htm>.

The **Tributary Streamflow Technical Committee's** report, dated October 2, 2006, featured a list of candidate streams prioritized for the purpose of

future flow restoration to improve salmon viability using source exchange in Water Resource Inventory Areas (WRIAs) 8 and 9, the Cedar-Sammamish-Lake Washington and Green-Duwamish watersheds respectively. The report included a rationale that explains the methodology and the results of the prioritization.

The **Source Exchange Technical Committee's** report, dated December 2007, summarized the committee's process, work products, and overall findings. It was intended by the committee to identify important considerations for utilities that might be interested in exploring source exchange projects. Appendices to the report included the work of two consulting firms contracted to explore specific topics related to source exchange in King County. A joint subcommittee of the Source Exchange and Tributary Streamflow technical committees oversaw the work of one of these consultants.

The **Reclaimed Water Technical Committee's** report, dated November 2007, summarized the committee's activities from March through December 2006. The report focused on a new economic framework commissioned by the national WateReuse Foundation that was designed specifically to identify and evaluate the full economic, environmental, and social benefits and costs of potential reclaimed water projects. The report also included summaries of a variety of presentations made to the committee.

The **Small Water Systems Technical Committee's** report, dated October 2007, identified what was known and not known about small water systems in King County. The report included a summary of presentations made to the committee on a variety of small system topics, presented the results of data collection regarding new individual wells and Group B systems, and covered the committee's discussions and recommendations on three priority issues.

The **Climate Change Technical Committee's** final report, dated December 10, 2007, summarized and incorporated eight technical memoranda and a paper that were drafted by the University of Washington Climate Impacts Group and reviewed by technical committee members. This work established a scientific basis for understanding the impacts of climate change, particularly on water resources in the region.

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<sup>8</sup> Coordinating Committee (2006e)

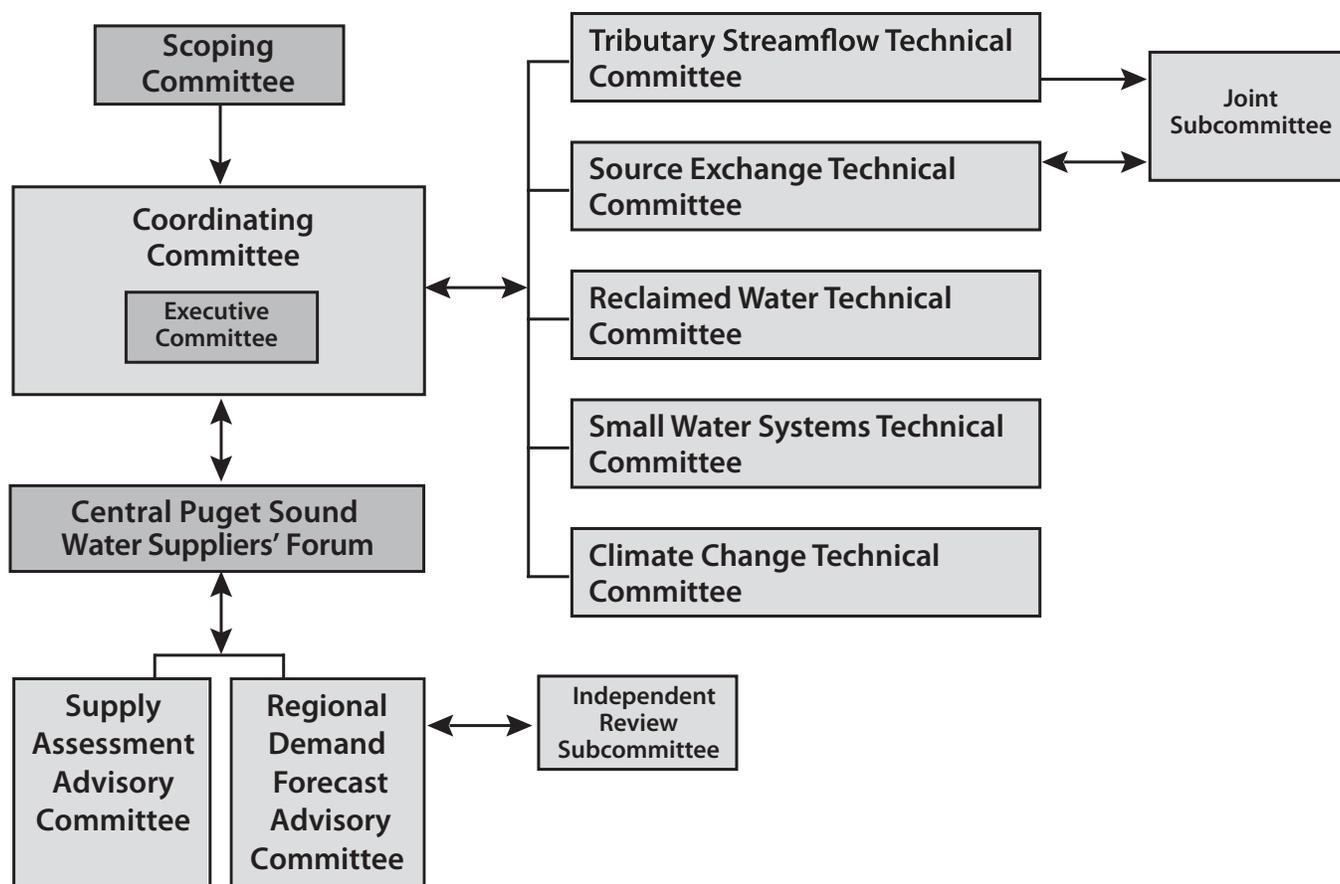
## 1.5 Status of Forum Work Products

The **Forum** is expected to have the Outlook, which will contain the regional municipal demand forecast and supply assessment, publicly available by mid-2009. In the meantime, some of the meeting notes and presentation materials have been posted on the Forum's website. The Outlook is anticipated to include municipal water demand forecasts for the three-county region of Pierce, King, and Snohomish counties, the individual counties, and for selected sub-regions. Also expected to be included is

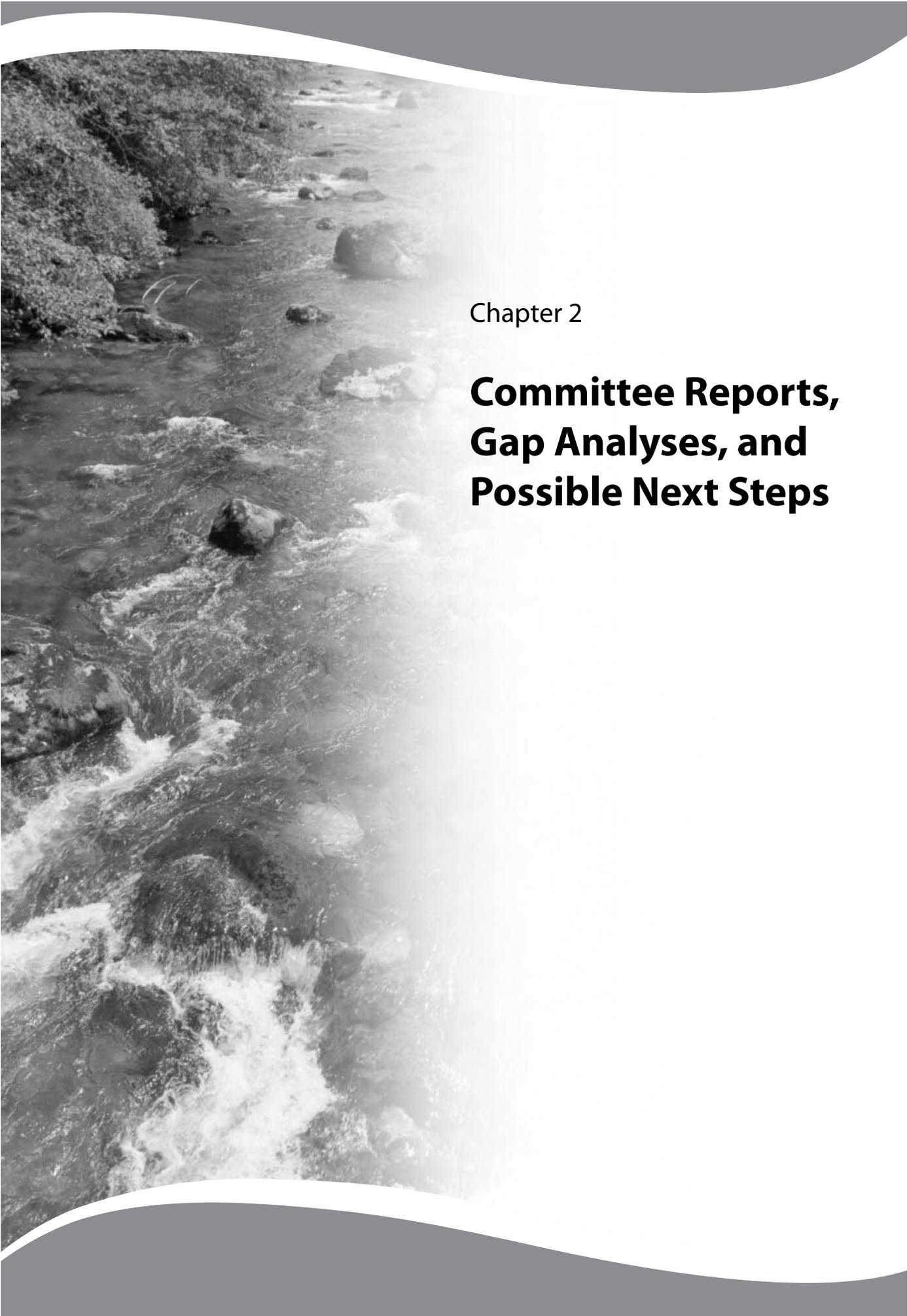
an inventory of municipal water systems that serve more than 500 connections and a description of potential future water sources that could provide more than 3 million gallons per day. A decision-making model is being developed that may be used to evaluate future water supply.

Some meeting materials for the Forum's advisory committees can be accessed at: <http://cpswatersuppliersforum.org/Home/default.asp?ID=22>

**Figure 1-2.**  
**Regional Water Supply Planning Committees**





A black and white photograph of a river with rapids, overlaid with a semi-transparent white box containing text. The river flows from the top left towards the bottom right, with several large rocks visible in the water. The background is a light, hazy sky. The text is positioned on the right side of the white box.

Chapter 2

**Committee Reports,  
Gap Analyses, and  
Possible Next Steps**



# Committee Reports, Gap Analyses, and Possible Next Steps

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The technical committees and their respective work product(s) are reviewed in this chapter in the following order:

- 1) **Tributary Streamflow**
- 2) **Source Exchange Strategies**
- 3) **Reclaimed Water**
- 4) **Small Water Systems**
- 5) **Climate Change**
- 6) **Regional Water Demand Forecast (Forum)**
- 7) **Regional Water Supply Assessment (Forum)**

There is a section for each committee that is organized as follows:

- An **overview** of the desired and actual outcome (purpose) and scope
- A **summary** of the technical committee report as of **September 2008**
- Highlights of the **conclusions and recommendations** taken directly from the individual reports
- A brief **gap analysis** that compares what was accomplished by each committee to what was originally outlined in the Planning Framework Summary
- Suggestions for possible **next steps** that are based on the committee reports and on input provided by technical committee leads and chairs to the consultant hired by King County DNRP.

This regional water supply planning effort is a multi-step process that has engaged diverse stakeholder groups at varying stages. The objectives and scope of each technical work product were refined throughout the process in order to achieve consensus among participants, whether technical committee members or Forum members, depending on the topic. The desired outcome and process for each technical topic were first developed by the Scoping Committee as part of the Planning Framework Summary. The Scoping Committee then transitioned into the Coordinating Committee, which drafted specific charters for each technical committee based on the Planning Framework Summary. Once convened, many of the technical committees made significant revisions to

their respective charters as did the Forum to its two topics. When funding became available to assist in the creation of work products, most of the technical committees developed funding proposals that further distilled their scopes and final products. Unless otherwise specified in a technical committee's section below, some funding was provided by a grant from Ecology. The Forum funded technical and committee work to address the demand forecast and supply assessment. Tables are appended to this report that document for each technical topic how its scope, purpose, and objectives evolved over the course of the process

It should be noted that the Planning Framework Summary, charters, funding proposals, and technical committee reports did not use consistent language. The Planning Framework Summary called for desired outcomes, processes, and sometimes goals; the charters set forth purposes and objectives; and the funding proposals and committee reports varied among these terms. In order to follow the evolution of a committee work product, this report groups together these terms for comparison purposes.

Technical committee work products and related documents used as the foundation for the analyses can be found on the web at <http://www.govlink.org/regional-water-planning/>. Rosters of technical committee members can be found in the Acknowledgments section of this report.

### Overview

Co-led by the Muckleshoot Indian Tribe and Ecology, the Tributary Streamflow Technical Committee held meetings from February through August 2006 and issued its final report on October 2, 2006.

According to the Planning Framework Summary, the Tributary Streamflow Technical Committee's desired outcome was to develop a prioritization matrix that identified (1) short-term opportunities to match the tributary instream needs with source substitution and (2) longer term opportunities and needs in the tributaries.<sup>9</sup> (See Table 2-1.) According to the committee's final report, the purpose of its work was to create a prioritized list of candidate streams for the purpose of future flow restoration using source exchange.<sup>10</sup> The objective of the committee's prioritization was to identify streams where source exchange would have the potential to improve flows and associated water temperatures, and thereby help increase the abundance and distribution of salmon and steelhead populations.<sup>11</sup>

The committee's scope was first described in the Planning Framework Summary and subsequently modified as part of the committee's planning process. Table 2-2 traces the evolution of the scope from the Planning Framework Summary through the final report. The scopes in the Planning Framework Summary, proposed charter, and revised charter are very similar. However, the charters are more specific and identify processes and factors to consider in ranking tributaries as well as the geographic scope of the analysis. The technical committee decided to focus on tributary streams in the Cedar-Sammamish-Lake Washington and Green-Duwamish watersheds as appropriate for the interests, knowledge, and authorities of committee members. In addition, the committee deferred matching tributary needs to source exchange opportunities and the technical investigation on the impact of seasonal groundwater pausing (resting or non-pumping of wells) to the Source Exchange Technical Committee.

The committee developed a funding proposal to investigate the impact that resting (or pausing) groundwater extractions could have on instream flows. The study was overseen by a voluntary joint subcommittee of the Tributary Streamflow and Source Exchange technical committees and was included as an attachment to the Source Exchange Technical Committee's report.<sup>12</sup> The funding request did not address any of the other tasks or questions identified in the Planning Framework Summary or charters.

### Summary of Tributary Streamflow Technical Committee Report

The technical committee ranked a limited number of tributary streams in Water Resource Inventory Areas (WRIAs) 8 and 9 (Cedar-Sammamish-Lake Washington and Green-Duwamish watersheds, respectively) to establish relative priorities for potential streamflow restoration using source exchange. The tributary ranking process began with a list of 20 candidate streams in WRIAs 8 and 9 that had been identified in the Central Puget Sound Low Flow Survey report<sup>13</sup> as being flow-impaired. The list was modified and some streams were added or deleted based on technical committee expertise and concurrence.<sup>14</sup>

Many streams in these two watersheds were not ranked by the committee because they were not previously identified in the Central Puget Sound Low Flow Survey report as flow-impaired for salmon and steelhead or had no major water withdrawals that would make them a priority for source exchange.<sup>15</sup> The technical committee felt it was important to start this work in WRIAs 8 and 9 to address urgent needs and concerns given the intensive urban and water resources development in these basins. The committee's report encouraged prioritizing streams for source exchange in the remaining King County basins and in Pierce and Snohomish counties' watersheds, but noted this would require involvement from different tribes, individuals, and organizations.<sup>16</sup>

<sup>9</sup> Scoping Committee (2005, p. 12)

<sup>10</sup> Tributary Streamflow Committee (2006b, p. 1)

<sup>11</sup> Tributary Streamflow Committee (2006b, p. 1)

<sup>12</sup> Source Exchange Technical Committee (2007, Attachment B)

<sup>13</sup> Somers and Lombard, 2004

<sup>14</sup> Tributary Streamflow Technical Committee (2006b, p. 4)

<sup>15</sup> Tributary Streamflow Technical Committee (2006b, p. 1)

<sup>16</sup> Tributary Streamflow Technical Committee (2006b, p. 1)

The technical committee rated 12 ranking criteria under three main categories in a spreadsheet matrix to develop relative priorities for source exchange among the candidate streams in each WRIA. Criteria for streamflow protection and enhancement developed by Ecology and WDFW<sup>17</sup> were adapted and integrated into the prioritization matrix. The committee modified this methodology to add criteria reflecting local conditions, including thermal migration barriers and observed pre-spawning mortality. The main prioritization categories were (1) Relative Biological Importance, (2) Hydrologic Need, and (3) Probability of Measurable Benefit. Only streams where source exchange was a possibility were ranked, but the ranking did not take into account the likelihood of the source exchange itself occurring. Opportunity or acceptability of source exchange/source substitution was not used as a criterion for ranking streams because it was expected that these considerations would be addressed by the Source Exchange Technical Committee.<sup>18</sup>

When prioritizing streams for flow improvement opportunities, the technical committee decided to use a flow restoration threshold of two cubic feet per second (c.f.s.) in order to standardize the comparison of potential benefits among candidate streams.<sup>19</sup> The rationale for the two c.f.s. threshold was twofold: (1) it was equivalent to roughly what a typical municipal well might produce and was therefore a realistic flow rate for source exchange; and (2) most of the streams evaluated were small, and as such, would benefit from an additional two c.f.s. during low-flow times. It should be noted that the committee did not intend to limit potential flow restoration to this amount.<sup>20</sup>

Given the qualitative approach of the methodology, the total numeric scores for each stream in each of the three main prioritization categories were then converted into a High, Medium, or Low value by splitting the spread of the scores into thirds. The committee assembled the results into five groups of relative priority of streams for flow restoration, based on the 12 ranking criteria and a subsequent discussion.<sup>21</sup> The committee identified the following relative priorities of streams for flow restoration in WRIA 8:

- **Highest Likelihood of Benefit:** Bear Creek and East Fork Issaquah Creek
- **Moderately High Likelihood of Benefit:** Issaquah Creek and Rock Creek
- **Moderate Likelihood of Benefit:** Sammamish River, North Fork Issaquah Creek, and Cottage Lake Creek
- **Low Likelihood of Benefit:** Cedar River, Taylor Creek, Little Bear, North Creek, Evans Creek, and the Ship Canal
- **Poor Likelihood of Benefit:** None.

The committee identified the following relative priorities of streams for flow restoration in WRIA 9:

- **Highest Likelihood of Benefit:** Covington Creek, Jenkins Creek, and Big Soos Creek
- **Moderately High Likelihood of Benefit:** North Fork Green River and Newaukum Creek
- **Moderate Likelihood of Benefit:** Lower Green River
- **Low Likelihood of Benefit:** None
- **Poor Likelihood of Benefit:** Upper Green River.

Map 2 (in the Map section at the end of this report) shows the location of streams evaluated for low flows.

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<sup>17</sup> Ecology and WDFW (2006)

<sup>18</sup> Tributary Streamflow Technical Committee (2006b, p. 5)

<sup>19</sup> Tributary Streamflow Technical Committee (2006b, p. 6)

<sup>20</sup> Tributary Streamflow Technical Committee (2006b, p. 6)

<sup>21</sup> Tributary Streamflow Technical Committee (2006b, p. 7 to 8)

## Conclusions and Recommendations

The objective of the prioritization was to identify streams where source exchange could have the potential to improve flows and associated water temperatures. Because the summer flow of most tributary streams in WRIs 8 and 9 comes from groundwater seeping into streams at about 50°F (10°C), restoring groundwater contributions to streams would have the potential to enhance both the quality and quantity of instream habitat and help mitigate the trend toward warmer water temperatures in local watersheds. The committee noted that the rankings for some streams would change if a restoration threshold higher than two c.f.s. had been used to reflect greater amounts of source exchange or substitute sources that could be available in the future, such as reclaimed water.<sup>22</sup>

The committee also noted that source exchange by itself would not address all instream flow needs for fish. An implemented source exchange program would not diminish the importance of other activities to protect and restore more natural flow regimes, water temperatures, and riverine habitats in all streams by preventing and reversing degradation of certain land uses and excessive surface or ground water withdrawals.<sup>23</sup>

Current degraded fish habitat conditions are typically the result of the cumulative effects of many actions. Improving fish habitat often requires combinations of both short- and long-term actions as opposed to single actions. Rather than being alternatives to one another, actions that restore flows (which this committee focused on) and actions to improve other habitat attributes such as pools, riparian vegetation, channel diversity, and hyporheic exchange are essential and complementary in order to help recover and sustain salmon and steelhead populations.<sup>24</sup>

Actions that restore and increase riparian shade, the complexity of channel morphology, and habitat diversity (for example, pools, large wood, cover, and side channels) and actions that promote recharge and interactions of streams with their floodplains are all urgently needed. The committee recommended that these other habitat improvement actions be pursued vigorously by appropriate entities in addition to source exchange projects as part of salmon recovery and other environmental stewardship initiatives.<sup>25</sup>

## Gap Analysis

The Tributary Streamflow Technical Committee produced a report that is generally consistent with the original objectives outlined in the Planning Framework Summary<sup>26</sup> and the committee's charter.<sup>27</sup> The committee's final report addressed all of the questions identified in the Planning Framework Summary that were not deferred to another technical committee except, "What metrics can be developed to assure that water which is substituted actually becomes instream flow and is not diverted to support another water right?" (See Table 2-2.)

The success of a streamflow augmentation project is dependent upon having the water that is not extracted remain in the stream, so this is a key question for future consideration.

Unanswered questions from the committee's subsequent charters are listed in Table 2-2. These questions address other considerations for prioritizing streams, implementing streamflow improvement projects, and measuring the success of a streamflow improvement project, and would likely be answered by a utility and its partners when moving forward with an actual source exchange or low-flow improvement project.

<sup>22</sup> Tributary Streamflow Technical Committee (2006b, p. 6)

<sup>23</sup> Tributary Streamflow Technical Committee (2006b, p. 2)

<sup>26</sup> Scoping Committee (2005)

<sup>27</sup> Tributary Streamflow Technical Committee (2006a)

<sup>24</sup> Tributary Streamflow Technical Committee (2006b, p. 3)

<sup>25</sup> Tributary Streamflow Technical Committee (2006b, p. 3)

## ***Next Steps for Ranking Tributary Streamflows***

Next steps would include the following:

- Rank tributary streams in WRIAs 7 and 10 (the Snohomish-Snoqualmie-Skykomish and Puyallup-White watersheds, respectively), using expertise and documentation from appropriate tribes, jurisdictions, and knowledgeable parties.
- Evaluate stream systems or stream segments where salmonids would benefit from the addition of volumes of water greater than two c.f.s.
- Regularly re-evaluate streams ranked in the report as additional data become available (for example, fish use, temperature, flow, and depth measurements).

The next steps in achieving the goals of both the Tributary Streamflow and the Source Exchange technical committees would be for a utility to voluntarily step forward with partners and identify a potential opportunity for source exchange or other appropriate low-flow enhancement measures. Partner involvement would depend on the type of source exchange identified. Such a partnership is discussed further under Next Steps for Source Exchange Strategies. The relative ranking of streams with flow impairments can be used to determine locations or basins where source substitution opportunities could be further explored.

### Overview

Led by the Cascade Water Alliance, the Source Exchange Technical Committee held meetings from March 2006 through October 2007 and oversaw the work of two consulting firms contracted to explore specific topics related to source exchange in King County.<sup>28</sup> The technical committee issued its final report in December 2007.

The original goal of the Source Exchange Strategies Technical Committee was to develop a source exchange plan or program that had as its purpose the temporary or permanent replacement of water supply sources that adversely affect salmon runs with water from supply sources having less impact on salmon runs.<sup>29</sup> The committee's purpose changed with the development and subsequent revision of its charter to focus on the development of an array of possible strategies, policies, and implementation criteria that would assist in determining the manner in which a particular exchange of water might be accomplished.<sup>30</sup> This evolution from developing a source exchange program to exploring the issues associated with the implementation of a source exchange project occurred because the committee felt it would be more useful to first enumerate and discuss issues to be considered and that a site-specific source exchange program would depend on willingness of water utilities and partners to address these issues. (See Table 2-3.)

The Scoping Committee identified a number of factors to explore regarding source exchange in the Planning Framework Summary, which included pricing, the potential for source exchange as part of the Cascade Water Alliance's proposed Lake Tapps water right permit, availability of substitute water, infrastructure for transporting the substitute water, using reclaimed water, and prioritization strategies to improve instream flows. Subsequent development of the technical committee's charter by the Coordinating Committee and the technical committee included many of these topics; however, the charter focused at a higher level on evaluating financial, legal, and managerial strategies that could be used

to implement a source exchange project. The charter also established a geographic focus on WRIs 8 and 9 to match the Tributary Streamflow Technical Committee. Table 2-4 traces the evolution of the committee's scope from the Planning Framework Summary to its final product.

In addition, the charter recognized that information pertinent to this committee's work might be drawn from two other technical committees formed for this overall planning process. These were the Tributary Streamflow and the Reclaimed Water technical committees. As noted in the preceding section on the Tributary Streamflow Technical Committee, that committee ranked streams in the study area to identify relative priorities for flow restoration or enhancement to benefit salmonid viability using source exchange.<sup>31</sup> The work of the Reclaimed Water Technical Committee is covered in the next section of this chapter.

The committee's funding proposal focused on the development of an economic analysis and did not specifically identify the other topics or questions listed in the Planning Framework Summary. As noted in Table 2-4, the final work product, a report by the technical committee, addressed the scope of the funding proposal as well as the various strategies and issues that a utility would need to consider, but it did not specifically address the remaining topics.

### Summary of Source Exchange Technical Committee Report

The report summarized the committee's process, work products, and overall findings. Because water suppliers that used groundwater wells were willing to submit data for illustrative examples, the committee chose to focus on pausing or resting municipal wells and using potable supplies to replace these groundwater withdrawals. However, the committee noted that in some cases it could be appropriate to evaluate replacing surface water withdrawals, and that reclaimed water could be suitable as a replacement source for non-potable uses.<sup>32</sup>

<sup>28</sup> Source Exchange Technical Committee (2007)

<sup>29</sup> Scoping Committee (2005, p.10)

<sup>30</sup> Source Exchange Technical Committee (n.d.) – Proposed Charter

<sup>31</sup> Source Exchange Technical Committee (2007, p. 2)

<sup>32</sup> Source Exchange Technical Committee (2007, p. 1)

The committee identified important considerations for entities that might be interested in exploring source exchange projects. As part of a preliminary assessment, the following four key questions should be answered:<sup>33</sup>

- Is the source exchange project expected to provide meaningful benefit to nearby streams?
- Does the current supply source have characteristics suitable to source exchange?
- Does an alternate source of water exist that is reasonably available?
- Does the utility have capacity and willingness to engage in source exchange?

The committee also identified potentially significant issues and related questions for interested utilities to explore.<sup>34</sup> The issues were categorized as follows:

- Technical/Infrastructure
- Hydrogeological
- Environmental
- Organizational or Institutional
- Economic/Financial
- Social and Cultural
- Potential Endangered Species Act and Third Party Liability Concerns
- Water Rights.

The report included two illustrative examples of potential source exchange projects. These examples were used to better understand and identify the issues that would be required in a more detailed analysis of a potential source exchange project and were not intended to propose a specific project.<sup>35</sup> Both of the examples were for seasonal pausing of municipal groundwater well-pumping in order to reduce aquifer withdrawals and promote base flow from the groundwater system into local streams during the low-flow season. Neither example involved decommissioning the existing water sources.<sup>36</sup>

Keta Waters, a consultant overseen by a joint subcommittee of the Tributary Streamflow and Source Exchange technical committees, led a study that looked at improving the quality and quantity of instream habitat by resting groundwater extraction wells.<sup>37</sup> The study, labeled Attachment B to the Source Exchange Technical Committee's report, cre-

ated a model that could assist in predicting the general timing and magnitude of streamflow improvement according to well depth and distance away from streams. The potential time lag between changes in groundwater withdrawals and resulting changes in streamflow was determined by modifying a U.S. Geologic Survey steady-state aquifer system model to simulate the time-varying effects of groundwater extraction.<sup>38</sup> The study also included a literature review related to resting groundwater wells; a map and spreadsheet of large wells and springs, wellhead protection areas, and water purveyors in WRIs 8 and 9; and identification of municipal wells in WRIs 8 and 9 that would have potential for flow restoration from seasonal pausing.<sup>39</sup>

Another consultant, HDR, worked with the committee on an evaluation of the costs and benefits of the source exchange opportunities involved in each of the two illustrative examples. The generalized list of costs and benefits was divided into the three categories of financial, social, and environmental, which is sometimes called a "triple bottom line" analysis.<sup>40</sup> The purpose of this exercise was to better understand how costs and benefits could be distributed among various parties, and how this might lead to cost-sharing arrangements that could fund source-exchange projects. HDR, under the committee's direction, contributed two attachments to the report. These were a literature review of source exchange projects in the western United States (Attachment C to the committee's report) and a technical memorandum that described the cost-benefit analysis and the triple bottom line as approaches for evaluating the social and economic costs of a source exchange project (Attachment D to the committee's report). However, committee members did not reach consensus on the methodology and the results of the evaluation of social and economic costs.<sup>41</sup>

The final report from the committee and the work of the consultants (who were funded under the Ecology grant) could serve as a starting guide to assist an entity in evaluating a potential source exchange project. Additional evaluation of who would pay for the source exchange would be needed.

<sup>33</sup> Source Exchange Technical Committee (2007, p. 3-4)

<sup>34</sup> Source Exchange Technical Committee (2007, p. 5)

<sup>35</sup> Source Exchange Technical Committee (2007, p. 17)

<sup>36</sup> Source Exchange Technical Committee (2007, p. 17)

<sup>37</sup> Massmann (2008)

<sup>38</sup> Source Exchange Technical Committee (2007, p. 7)

<sup>39</sup> Massmann (2008)

<sup>40</sup> Source Exchange Technical Committee (2007, p. 19)

<sup>41</sup> Source Exchange Technical Committee (2007, un-numbered page following p. 25)

## Conclusions and Recommendations

Individual committee members differed in their viewpoints about the viability of source exchange. However, most members agreed on three general concepts:

- Participation in a source exchange project should be voluntary.
- Source exchange could provide a valuable means of enhancing flows in certain streams and rivers for the benefit of salmon and other endangered or depleted species.
- A number of legal, economic, organizational, and other obstacles would have to be surmounted.

Nothing the committee learned during this process changed these basic assumptions, but the committee did gain significant insights into the issues surrounding these concepts.<sup>42</sup>

### Site-specific Nature of Source Exchange Projects

There were no established strategies or cookbook methods to evaluate or implement source exchange projects. The technical feasibility, design, analysis of environmental and social benefits, estimation of costs, utility willingness, and funding strategy would all ultimately depend on the specific details of a potential source exchange project and the particular circumstances of the utility considering the project. Attention would be necessary to ensure that the project would actually benefit flows, and localized hydrogeologic work might be required to properly understand the interrelationship between a utility's well(s) and streamflows. In short, the feasibility of any source exchange project would be very site-specific.<sup>43</sup>

### Benefit/Cost Analysis

It would be important to consider benefits and costs of a source exchange project on both the source being exchanged and the replacement source. Environmental, social, and cultural benefits and costs would need to be evaluated along

with financial considerations to give decision-makers a full picture of the options.<sup>44</sup> The environmental costs and benefits would be principally related to the improvement in water quality and supply to support the aquatic ecosystem as well as the enjoyment of this ecosystem by people. These benefits and costs would include values people place on water (and the riparian landscape) for recreational purposes along with the inherent values that people ascribe to the water, simply because of its existence.<sup>45</sup>

### Cost of Source Exchange and Perceived Risks

The technical committee understood going into this process that cost would be a primary factor, if not the primary factor, that would need to be addressed to make a source exchange project viable. Additionally, the committee quickly learned that potential risks, either perceived or real, would have to be addressed before a utility would feel comfortable participating in a source exchange project.<sup>46</sup> Utility concerns about the risk of losing water rights as well as the risk of lawsuits under the Endangered Species Act would need to be addressed to some degree before a utility might feel comfortable proceeding with hydrogeologic testing of its wells and water sources. Under current law, the risk of losing water rights did not appear to be an issue for holders of municipal water rights. Other risks appeared to be relatively small and were thought to be manageable if there were a desire to develop source exchange projects.<sup>47</sup>

### Partnerships

The committee explored ways that the risks and costs to a utility participating in a source exchange project could be reduced. Partnerships with other purveyors, local and state agencies, tribes, and interest groups might provide ways to make the project technically feasible, offer cost-sharing opportunities and hence, financial feasibility, and ensure environmental benefits. Such partnering arrangements might require utilities to conduct

<sup>44</sup> Source Exchange Technical Committee (2007, p. 24)

<sup>45</sup> Source Exchange Technical Committee (2007, Attachment D, p. 5)

<sup>46</sup> Source Exchange Technical Committee (2007, p. 24)

<sup>47</sup> Source Exchange Technical Committee (2007, p. 25)

<sup>42</sup> Source Exchange Technical Committee (2007, p. 24)

<sup>43</sup> Source Exchange Technical Committee (2007, p. 24)

business differently than they have done in the past. The technical committee suggested that some sort of formalized partnering program could help provide a degree of protection or reduce the perceived risks.<sup>48</sup>

## Gap Analysis

While the committee's report generally discussed the issues affecting an entity's ability to successfully implement a source exchange project, it did not detail specific strategies or policy and implementation criteria as called for in the Planning Framework Summary and the original committee charter. However, this would have been difficult to do because each project (and site) would be unique and would have a unique set of policy and implementation hurdles to overcome.

Additional unanswered questions from the Planning Framework Summary and subsequent charters are identified in Table 2-4. These questions focused on pricing, how source exchange obligations from the Lake Tapps water right permit could fit into the discussion, infrastructure constraints, how to ensure the replaced water would not be removed downstream, and who might bear the burden of the cost, although the committee noted that partnerships would be needed to pay for a source exchange project. The economic analysis discussion did not contain the type of perspectives analysis that a few members felt was necessary to determine who would pay and how fiscal responsibility would be allocated. In fact, the economic analysis section proved to be the most difficult on which to achieve committee consensus.

Use of reclaimed water was not addressed as one of the considerations in evaluating source exchange opportunities because the Source Exchange Technical Committee deferred this topic to the Reclaimed Water Technical Committee. However, the Reclaimed Water Committee did not address it either.

## Next Steps for Source Exchange

The next step would be a site-specific source exchange project, which would occur when a utility voluntarily came forward with supportive partners and identified a potential opportunity for source exchange.<sup>49</sup> Partner involvement would depend on the type of source exchange project identified. A simplified example of a phased approach could be as follows:

- 1) Utility indicates interest, further technical or feasibility assessments are completed, and preliminary funding and implementation partners are identified. (Relationships established through the Tributary Streamflow and Source Exchange technical committees may facilitate partner identification.) Partners are determined based on options for source substitution.
- 2) Site-specific hydrogeologic testing is conducted, if necessary, to confirm benefits of the project to answer questions such as whether the pausing of groundwater wells would actually influence low flows in the receiving water body, and whether the increase would be significant and worth continuing pursuit of the project. The Keta Waters hydrogeologic study and associated modeling may help answer questions at a site-specific level, once hydrogeologic data are available.
- 3) If hydrologic testing indicates a high likelihood for flow enhancement of impaired streams or reaches, and if partners concur, a pilot project can be undertaken and funding opportunities can be further refined. Environmental and social costs and benefits need to be considered along with financial considerations.

One key question that would warrant additional discussion is who would pick up the additional cost that would result from the change in source water being used by a utility in a source exchange project. This issue would likely be discussed among participating partners in a particular source exchange project.

<sup>48</sup> Source Exchange Technical Committee (2007, p. 25)

<sup>49</sup> The goal of the Source Exchange Technical Committee was to develop strategies to help in the implementation of a source exchange project, not to actually implement a project, although many committee members hoped that the work of the committee would eventually lead to such a project.

### Overview

Led by King County, the Reclaimed Water Technical Committee held meetings from March through December 2006 and issued its final report in November 2007.

According to the Planning Framework Summary, the Reclaimed Water Technical Committee's desired outcome was to develop a phased analysis that could be used to identify reclaimed water opportunities, issues, and potential solutions for use in Coordinated Water System Plans.<sup>50</sup> The purpose changed over the course of the planning process to focus on learning more about reclaimed water, reviewing a framework to evaluate reclaimed water projects, and running through two case studies that demonstrated how to apply the framework. (See Table 2-5.)

Table 2-6 traces the evolution of the committee's scope. The Planning Framework Summary called for the committee to recommend (1) potential users of reclaimed water and (2) potential for source exchange using reclaimed water as a source substitute.<sup>51</sup> Neither of these two initial goals was actively pursued, although some committee members voluntarily identified and mapped several preliminary potential users of reclaimed water. The report noted that this initial effort would need to be refined as it was not intended to be complete.<sup>52</sup> In addition, the Scoping Committee posed questions on how to allocate costs and whether opportunities existed for reclaimed water to augment streamflows through ground application.<sup>53</sup> The committee decided that selection and evaluation of specific projects was premature in the absence of any generally agreed-upon model or tool for analyzing projects and that policy questions should be left to the decision-makers of the various agencies. So the committee modified its charter and elected to develop planning-level technical information concerning the use of reclaimed water.<sup>54</sup> A specific objective was to identify a uniform framework that could be used to evaluate the full economic, environmental, and social benefits and costs of potential projects. Such a tool could be applied by any agency, at its discretion, to assist in

the management of its water systems and in its water supply planning activities.<sup>55</sup>

The committee's funding proposal covered workshops conducted by the authors of an economic framework so members could review the new tool. The committee also devoted time to (1) identifying many of the issues to consider regarding reclaimed water use in this region; (2) accumulating some data about potential users of reclaimed water; and (3) learning about reclaimed water in the region from guest speakers.

### Summary of Reclaimed Water Technical Committee Report

The final report is a summary of the technical committee's activities, which included presentations on reclaimed water, review of a particular economic framework, and collection of other planning-level technical information. Rather than develop its own economic model or attempt to modify others, the committee elected to review a new framework that was designed to be used by any agency in the country to conduct a full accounting of economic, environmental, and social benefits and costs of a reclaimed water project. Commissioned by the national WaterReuse Foundation and developed by Dr. Robert Raucher of Stratus Consulting, the framework was designed to track both quantifiable and non-quantifiable costs and benefits. Under a grant from Ecology, Dr. Raucher and an associate conducted two workshops with the technical committee on the use of the framework.<sup>56</sup> At the first workshop, a wider invited audience of 80 people learned the general principles; at the second workshop, the committee and Dr. Raucher discussed how to apply the framework in the context of two test cases.

Carollo Engineers, a consulting firm under contract to King County, presented another technical tool to the committee. Carollo had designed a spreadsheet model to estimate the cost to produce Class A reclaimed water at a facility, such as a treatment plant or satellite plant, from various points in the

<sup>50</sup> Scoping Committee (2005, p.8)

<sup>51</sup> Scoping Committee (2005, p. 9)

<sup>52</sup> Reclaimed Water Technical Committee (2007, p. 3)

<sup>53</sup> Scoping Committee (2005, p. 20)

<sup>54</sup> Reclaimed Water Technical Committee (2007, p. 2)

<sup>55</sup> Reclaimed Water Technical Committee (2007, p. 2)

<sup>56</sup> Reclaimed Water Technical Committee (2007, p. 2 to 3)

King County wastewater treatment system.<sup>57</sup> That tool could be used to provide comparative cost figures for developing such facilities in different areas of King County's regional wastewater service area.

The report also summarized the committee's discussions about issues that affect the production and use of reclaimed water in this region. A starter list of potential users of reclaimed water was identified and mapped. Since technical committee members had differing levels of familiarity with reclaimed water, guest speakers were invited to present information on their programs and on the state's existing policies and guidelines.<sup>58</sup>

#### Reclaimed Water Technical Committee

### **Conclusions and Recommendations**

The report is a summary of the committee's meetings and the presentations members heard. Since there was no consensus on the need for reclaimed water, the committee did not attempt to either develop solutions to long-standing policy and jurisdictional questions or to evaluate opportunities for source exchange or enhancement of vulnerable streams as part of its report.<sup>59</sup> Two technical tools, the full benefit/cost framework and the cost model, were presented for committee members to consider. In keeping with its interpretation of the Coordinating Committee's Clarifying Statement (see Chapter 1), the technical committee made no recommendations regarding the framework, leaving each agency free to make its own decisions about the use of the tool.<sup>60</sup>

### **Gap Analysis**

The committee's assignment was to develop a phased reclaimed water analysis that was to begin with a review of basic assumptions and result in a list of potential reclaimed water opportunities. However, lack of agreement among committee members and differing levels of familiarity with the subject resulted in the need to provide a common foundation that could be used to guide future reclaimed water discussions. Therefore, the committee's report could serve as an introduction to reclaimed water use in this region. It provided an overview of existing reclaimed water programs and a potential tool for evaluating reclaimed water projects.

<sup>57</sup> Reclaimed Water Technical Committee (2007, p. 9)

<sup>58</sup> Reclaimed Water Technical Committee (2007, p. 3)

<sup>59</sup> Reclaimed Water Technical Committee (2007, p. 3)

<sup>60</sup> Reclaimed Water Technical Committee (2007, p. 42)

Unanswered questions from the Planning Framework Summary and subsequent charters are identified in Table 2-6. The committee did not evaluate revenue sources, pricing, costs, or the potential for using reclaimed water in a source exchange.

### **Next Steps for Reclaimed Water**

It was apparent during the technical committee's meetings that there was a clear need for King County, as the regional provider of reclaimed water, to have policies that would guide a variety of planning and operational issues, such as purveyor partnerships and roles, benefits and costs, and pricing structures. Some committee members voiced concerns about potential competition from reclaimed water and loss of summer revenues for water utilities, while others were concerned about costs of building a new conveyance system. These issues, among others, were not resolved in the regional water supply planning process.

Building on the work of the Reclaimed Water Technical Committee, in March 2008, King County published a Reclaimed Water Feasibility Study<sup>61</sup> that included:

- 1) Description of King County reclaimed water facilities and programs
- 2) Review of current and developing reclaimed water technologies
- 3) Economic framework for assessing reclaimed water projects, which came out of the WateReuse Foundation's framework that was reviewed by the Reclaimed Water Technical Committee
- 4) Review of revenue sources for reclaimed water distribution facilities
- 5) Review of environmental and regional benefits of reclaimed water
- 6) Business plan for King County's existing and near-term reclaimed water program
- 7) General preliminary scope of a reclaimed water comprehensive plan.

Many of the technical committee members were interviewed during the development of the feasibility study. King County is using the information and data that were gathered, both locally and nationally, in the next phase of its process to refine and expand its reclaimed water program.

*(Continued on next page)*

<sup>61</sup> King County (2008)

### ***Next Steps for Reclaimed Water, Continued***

Over the next three years, King County is working with local jurisdictions, water and wastewater districts, tribes, environmental groups, and other interested parties to develop a Reclaimed Water Comprehensive Plan. The purpose of the Plan is to determine if, how, and when over the next 30 years King County's existing reclaimed water program should expand. The planning process will build on the economic framework reviewed by the Reclaimed Water Technical Committee to evaluate projects.

King County will also work collaboratively with individual utilities and alliances of utilities (for example, Cascade Water Alliance) in their reclaimed water planning efforts. In addition, King County will continue to assist existing customers and develop new customers for reclaimed water from its South Treatment Plant and the South Segment of the Brightwater Reclaimed Water System.

### Overview

Led by King County DNRP and PHSKC, the Small Water Systems Technical Committee held meetings from March 2006 through July 2007 and issued its final report in October 2007.

According to the Planning Framework Summary, the Small Water System Technical Committee's desired outcome was to develop an approach or strategy to control the number of new small systems in King County, to provide an orderly approach to avoid placing failing systems into receivership, and to address the proliferation of irrigation wells within purveyors' service areas.<sup>62</sup> The committee's purpose evolved during the course of the process to examine whether small water systems in King County could, both now and in the future, reliably provide their customers and users with a safe and adequate domestic water supply.<sup>63</sup> (See Table 2-7.) The technical committee's charter characterized "small systems" as (1) public water systems serving fewer than 100 connections and (2) other water users supplied by small wells exempt from Ecology's water right permitting process<sup>64</sup> (which are commonly referred to as "exempt wells").

Table 2-8 traces the evolution of the committee's scope. The committee did not develop an overall countywide approach or strategy for smaller systems and did not include the questions generated in the Planning Framework Summary in its revised charter. Early in the committee's process, it drafted a list of potential issues and questions. Based on information gathered and analyzed through the course of its tenure, the committee refined and prioritized these issues and questions, ultimately ranking the following as its top three:

- 1) Provision of "timely and reasonable" service to new customers within a water utility's service area
- 2) Compliance by small water systems with water quality monitoring requirements and enforcement by DOH and PHSKC
- 3) Receivership of failing small water systems.<sup>65</sup>

<sup>62</sup> Scoping Committee (2005, p. 14)

<sup>63</sup> Small Water Systems Technical Committee (2007, p. v)

<sup>64</sup> Small Water Systems Technical Committee (2007, p. 2-1)

<sup>65</sup> Small Water Systems Technical Committee (2007, p. 4-2)

The committee then made recommendations to address these three issues.

The committee developed a funding proposal to report on locations and uses of new exempt wells and to provide current water quality data for Group B systems. The proposal also included a request for funding to help prepare the committee's report.<sup>66</sup>

### Summary of Small Water Systems Technical Committee Report

Committee members reviewed previous reports and studies, data from other members and outside agencies, and legal documents and policies to identify what was known and not known about small water systems in King County.<sup>67</sup> They also heard presentations from committee members and others on relevant topics. The committee reviewed the data from the work funded by an Ecology grant. The final report included the data collected, the development of the issues list, recommendations for the three priority issues, and summaries of presentations.

### Data Collection and Development

The committee used Ecology well logs from January 1, 2000 through July 2006 to evaluate the drilling of new water wells in King County. The key findings were as follows:<sup>68</sup>

- 1,540 new wells were drilled in King County since January 1, 2000
- Exempt wells were drilled at an average annual rate of 150 wells over the past four years
- 212 dewatering wells were drilled since January 1, 2000 (According to WAC 173-160-111(21), dewatering wells were "intended to withdraw or divert ground water for the purpose of facilitating construction, stabilizing a land slide, or protecting an aquifer.")
- Many wells had been drilled within existing water utility service areas. The five water utilities with the largest number of domestic and irrigation wells

<sup>66</sup> Small Water Systems Technical Committee (2007, p. 1-3)

<sup>67</sup> Small Water Systems Technical Committee (2007, p. 1-3)

<sup>68</sup> Small Water Systems Technical Committee (2007, p. 3-4)

drilled inside their existing water utility service areas since January 2000 were:

- Covington Water District (168 domestic, 37 irrigation)
- Cedar River Water and Sewer District (92 domestic, 7 irrigation)
- King County Water District 119 (70 domestic, 4 irrigation)
- Sammamish Plateau Water and Sewer District (53 domestic, 5 irrigation)
- Fall City Water District (43 domestic, 3 irrigation)

- There was currently no mechanism in place to notify water utilities of wells being drilled in their service areas.

Map 3 (in the Map section at the end of this report) shows the location of water wells drilled in King County from 1905 to 2006.

### **Compliance by Small Group A and Group B Water Systems**

DOH and PHSKC members of the committee presented basic information on the status of small Group A (fewer than 100 connections) and Group B systems (fewer than 15 connections). The presenters indicated that DOH data on water quality sampling for small Group A systems were up to date and complete, but that the PHSKC database of Group B water system information was not, due to insufficient resources within PHSKC and for other reasons.

There are 213 Group A water systems in King County, ranging from very small (15 connections) to the largest system in the state (Seattle's, which serves a combined population of over 1 million people as retail and wholesale customers).<sup>69</sup> For small Group A water systems, the DOH Office of Drinking Water (ODW) tracked water quality and sampling requirements as part of its compliance strategy that focused on health risks. In King County, as of March 2007, 18 out of 149 small Group A water systems were in some stage of formal enforcement. Five of the 18 were high risk violations. Sixty-eight out of 149 small Group A water systems in King County had blue operating permits, which indicated that the systems had not received ODW design approval; however, DOH considered these systems adequate for their existing connections. ODW used

many measures to encourage the success of small public water systems, such as partnerships; training, education, and technical support; planning; enforcement; operating permits; water quality monitoring; data system; certified operator; sanitary survey; funding options; and publicly available data.<sup>70</sup> The committee expected that ODW would continue to develop new measures and modify existing ones as appropriate.<sup>71</sup>

The PHSKC database showed there were about 1500 Group B systems in King County<sup>72</sup>, of which more than two thirds served four or fewer households. Fewer than 25% of Group B systems had conducted the required basic water quality sampling and monitoring.<sup>73</sup> PHSKC conducted 156 to 350 annual routine site visits to Group B systems since 2001. Those site visits led PHSKC to pursue active enforcement action on systems that had significant public health risks.<sup>74</sup>

PHSKC initiated an effort to track water usage by Group B systems, using its authority to require meters for such systems. Initial information came from a handful of systems, but if this activity could be maintained, it could provide useful information on water usage by Group B systems. The total estimated population served by Group B systems was roughly 1%<sup>75</sup>, which was quite small compared to that served by either Group A systems or individual wells. By comparison, between 12,000 and 20,000 households in King County received their drinking water from unregulated individual water supplies.<sup>76</sup>

### **Timely and Reasonable Water Service**

The committee considered issues and perspectives related to "timely and reasonable" water service. It recommended to King County that each water system plan should include information that would describe and define how the system planned to deliver water in a timely and reasonable manner.<sup>77</sup>

<sup>69</sup> Small Water Systems Technical Committee (2007, p. 4-23)

<sup>70</sup> Small Water Systems Technical Committee (2007, p. 4-24)

<sup>71</sup> Small Water Systems Technical Committee (2007, Appendix G, p. 5, 10)

<sup>72</sup> Small Water Systems Technical Committee (2007, Appendix G, p. 10)

<sup>73</sup> Small Water Systems Technical Committee (2007, Appendix G, p. 6)

<sup>74</sup> Small Water Systems Technical Committee (2007, p. D 8)

<sup>75</sup> Small Water Systems Technical Committee (2007, p. 4-15)

<sup>76</sup> Small Water Systems Technical Committee (2007, p. 4-8)

<sup>69</sup> Small Water Systems Technical Committee (2007, Appendix D, p.1)

## Receivership

State law made counties the receiver of last resort for failing water systems where the owner/operator was not properly operating the system and there was no other party able or willing to assume that role. In such a situation, DOH would file a court action asking that the county be named as the legal operator of the system and be required to develop a long-term strategy for the system.

There have been several instances in the past where DOH considered triggering this receivership provision to assure proper operation of a failing system.<sup>78</sup> One formal receivership action was filed in King County, but the County was not named the receiver. In at least two other situations, DOH seriously considered filing a receivership action, but the need was averted through other means. Receivership actions when filed have been expensive and difficult for counties to administer.

King County is not a water purveyor and generally does not have the expertise to operate such systems. To reduce or eliminate the risk of being named as receiver, King County suggested to the committee that the County undertake the following four possible actions: (1) meet regularly with PHSKC and DOH to discuss status of systems in King County; (2) work with utilities to update existing CWSPs, since the Coordination Act requires that CWSPs include provisions to address failing systems; (3) review King County's 1994 draft Action Plan for Receivership<sup>79</sup> and possibly update and finalize it; and (4) meet with willing utilities to discuss entering into formal agreements regarding their becoming owners/operators of failing systems within or near their service areas.<sup>80</sup>

## Conclusions and Recommendations

Concerning the issue of providing timely and reasonable water service within utility service areas, the committee recommended that utilities do the following in their water system plans:

- Specify the time period between a utility's receipt of a request for service and its written response.
- Identify the elements that should be included in the utility's response to a request for service.
- Identify how the utility defines the elements of timely and reasonable service in its water service delivery policies.<sup>81</sup>

The committee also recommended that King County adopt a definition of timely and reasonable within its authority under the Coordination Act.<sup>82</sup>

Regarding Group B water systems, the committee concluded that:

- The great majority of Group B systems were not regularly conducting required sampling. However, among systems that did sample, the great majority had satisfactory test results.
- The current fee system was a deterrent to reporting sample results.
- Systems tended to be operated on a casual basis by owners and users, which resulted in high levels of non-compliance. Very few systems were managed as satellites of larger utilities or operated by trained operators.
- The number of identified systems serving one connection regulated by PHSKC was expected to increase as the state and county focused more on non-community Group B systems, such as bed and breakfasts and child and adult care facilities.

There were no available data to suggest that the health outcomes for people provided water by small Group B water systems were any better or worse than for the overall population.<sup>83</sup>

*(Continued on next page)*

<sup>78</sup> Small Water Systems Technical Committee (2007, p. 4-24 to 4-26)

<sup>79</sup> Small Water Systems Technical Committee (2007, Appendix K)

<sup>80</sup> Small Water Systems Technical Committee (2007, p. vi)

<sup>81</sup> Small Water Systems Technical Committee (2007, p. v to vi)

<sup>82</sup> Small Water Systems Technical Committee (2007, p. 4-8)

<sup>83</sup> Small Water Systems Technical Committee (2007, p. 4-16)

## Conclusions and Recommendations, Continued

Implications of the data collected concerning exempt well drilling and possible follow-up included:

- A process might be needed to notify water utilities of wells to be drilled within their service areas in order to allow them to address possible health and water management issues.
- Potential impacts to aquifers from dewatering wells needed to be explored.

With regard to changing the current fee system, the committee noted that based on PHSKC information, PHSKC was under-funded and needed additional financial support. The committee recommended that PHSKC impose an effective user-based fee that would include an annual operating permit fee, to be based on required time and effort to manage the program.<sup>84</sup>

The committee supported King County in taking the actions identified in King County's 1994 draft Action Plan for Receivership but did not discuss the issue further.<sup>85</sup>

## Gap Analysis

Although the committee established a goal of examining whether small water systems in King County could reliably provide their customers with safe water supplies into the future, the committee did not directly or fully answer this question. In addition, the committee's report did not include a county-wide or other regional strategy that would ensure long-term capacity of small systems, resolve problems associated with small or failing water systems, or address proliferation of irrigation wells within purveyors' service areas. The committee also did not address issues that might overlap with or be affected by provisions of the state's Municipal Water Law. Implementation of the Municipal Water Law was not considered because DOH was involved in developing the statewide rule at the time and did not want to engage in a separate regional planning process, at least until rulemaking was finished.

<sup>84</sup> Small Water Systems Technical Committee (2007, p. 4-16 to 4-17)

<sup>85</sup> Small Water Systems Technical Committee (2007, p. 4-26)

Unanswered questions from the Planning Framework Summary and subsequent charters developed by the technical committee are identified in Table 2-8. For the issues it did address, the committee did not determine whether a regional strategy should emphasize small or large systems, or whether there should be a clear threshold and process for dealing with the viability of individual systems.

## Next Steps for Small Water Systems

There are several possible next steps to address small water systems, which include pursuing the committee recommendations for King County, PHSKC, and DOH that were outlined in previous subsections. Additional next steps are proposed below.

- As noted earlier, the committee developed some recommendations that could be included in a utility's planning documents or in regional policies. Other groups or processes could more formally develop these recommendations into policy. For example, water system plans could be required to include information on timely and reasonable service within their service areas.
- Map 3 indicates that most water wells in King County are located in future service areas of existing Group A systems in one of the four existing Critical Water Supply Service Areas (CWSSAs), except an area to the east of Black Diamond and Enumclaw. Each of the four CWSPs<sup>86</sup> for these CWSSAs could be updated as needed to be consistent with the regulatory requirement (WAC 246-293-280(1)) that CWSPs be reviewed and updated every five years or sooner, if necessary. Updates could address the following:
  - New data
  - Technical committee recommendations on timely and reasonable service
  - Failing systems and technical committee recommendations on receivership. Currently, only the East King County CWSP contains policies and procedures to address receivership
  - Service area boundaries, particularly if there are utilities serving beyond current CWSSA

<sup>86</sup> The four CWSSAs and related CWSPs in King County are for South King County, East King County, Skyway, and Vashon.

## ***Next Steps for Small Water Systems, Continued***

boundaries or not serving where previous plans stated they would.

- Covington Water District, King County, Ecology, and state and local health departments could partner to address irrigation wells in Covington's service area, since this was where the largest number of new irrigation wells were located. King County could invite other interested water utilities that have large numbers of new wells in their service areas to participate. (Note that King County has included this recommendation in the 2008 Comprehensive Plan update. The Issaquah Creek Valley Groundwater Protection Committee has recommended that exempt wells not be allowed in basins closed to issuance of further water rights.)

As part of a countywide strategy to ensure reliability of small systems, the following could be addressed:

- Create a mechanism to notify water utilities of wells being drilled in their service areas.
- Devise a consistent approach for water utilities to provide new service in rural or urbanizing areas within their respective service areas, including affordability of service line extensions and the use of satellite management/remote service in distant portions of service areas.
- Design a process to secure a hydrogeologic assessment when new development is proposed

that would use exempt wells. The assessment should consider the sustainability of aquifer water yields and the existing water demands on the aquifer, including instream flows.

- Establish or improve monitoring and evaluation of the quantity and quality of water being produced by exempt wells.
- Outline guidelines to manage discharge from dewatering wells to minimize impacts beyond the site.
- Develop a consistent definition of "timely and reasonable" for purposes of determining whether a request for new water within an existing water service area will result in service by the provider, a Group B system, or domestic exempt well. This could include addressing consistency between the Coordination Act and the Municipal Water Law with respect to the definition and ensuring that definitions are included in utility plans. Less preferable options would include King County's separately adopting policies, rules, and standards on the timely and reasonable issue.

Since the technical committee adjourned, the state has begun two efforts related to small water systems. DOH initiated a process to revise rules for Group B water systems. Ecology organized a permit exempt well advisory group. The status of both processes is unclear and may be revisited after the 2009 legislative session and adoption of the 2009-20011 biennial budget.

### Overview

Led by King County, the Climate Change Technical Committee held meetings from March 2006 through December 2007 and issued its final report on December 10, 2007.

According to the Planning Framework Summary, the Climate Change Technical Committee's desired outcomes were to determine what was already known from existing studies about climate change impacts on water resources and then to identify how the information could be integrated into water supply analyses.<sup>87</sup> These goals were expanded in the final report to identify where more information would be useful, to document the findings, and to communicate what was known to other technical committees in the regional water supply planning process.<sup>88</sup> (See Table 2-9.)

Table 2-10 traces the evolution of the committee's scope, which did not change significantly during the process. The committee refined its original tasks to target specific topics and questions that were subsequently addressed in technical memoranda. King County funded the University of Washington Climate Impacts Group (UW CIG) to provide initial technical support. The committee also developed a proposal and received funding from Cascade Water Alliance, Seattle Public Utilities, and Ecology for the UW CIG to establish a scientific basis for understanding the impacts of climate change on water resources in WRIAs 7, 8, 9, and 10 (the Snohomish, Cedar-Sammamish-Lake Washington, Green-Duwamish, and Puyallup-White watersheds, respectively).

Led by Dr. Richard Palmer, the UW CIG staff and engineering students worked with the committee to produce a building blocks paper, eight technical memoranda, and a summary final report that reviewed studies, described and applied methodologies to downscale global climate models (GCMs) to the regional level, and used the results to determine climate change impacts on local watersheds providing drinking water. In addition, a database of climate variables was created for WRIAs 7, 8, 9, and 10 and posted online at <http://www.climate.tag.washington.edu/>.

### Summary of Climate Change Technical Committee Report and Technical Memoranda

The committee worked closely with Dr. Palmer and his technical team to write and review the building blocks paper, the technical memoranda, and the final report that are described below.

The Climate Change Building Blocks summarized 13 accepted facts, based on peer-reviewed literature, regarding global, national, and local impacts of climate change. At this early stage in its process, the committee decided to use, to the extent possible, peer-reviewed literature as the basis for its work. The Building Blocks report<sup>89</sup> discussed and documented the following widely known and scientifically accepted facts about climate change impacts and water resources:

- 1) The global average temperature has increased during the 20th century and is forecasted to increase in the 21st century.
- 2) Warming in the Puget Sound Region has increased at a faster rate during the 20th century than the global average, and increases in temperature are forecasted to continue.
- 3) Increased surface temperatures in the Pacific Northwest will increase the rates of evaporation and transpiration (evapotranspiration).
- 4) Global precipitation is projected to increase in the future, although there is less certainty in predicting changes in precipitation than in temperature.
- 5) The occurrence of heavy precipitation events has increased over the U.S. during the 20th century. This trend is projected to continue during the 21st century.
- 6) The loss of snowpack and glaciers in the Pacific Northwest mountains has been due to increased temperatures in the 20th century.
- 7) Forecasted increases in temperatures associated with climate change will further reduce snowpack and glaciers in the Pacific Northwest mountains.

<sup>87</sup> Scoping Committee (2005, p. 7)

<sup>88</sup> Palmer (2007b, p.iii)

<sup>89</sup> Palmer, et al. (2006)

- 8) Climate change is projected to increase winter flows and decrease summer flows in snowmelt-influenced river systems of the Pacific Northwest, particularly transient watersheds.
- 9) Climate change is projected to increase the frequency of flood events in most western Washington river basins.
- 10) Climate change is projected to increase the frequency of drought events in the Pacific Northwest.
- 11) Climate change is forecasted to raise global mean sea level in the 21st century.
- 12) Climate change is forecasted to increase temperatures of rivers, streams, lakes, and river mouth estuaries in the Puget Sound region.
- 13) Climate change, as described in Building Blocks 1 to 12, is forecasted to contribute toward streamflow and temperature conditions that have been shown to negatively impact freshwater and estuarine habitat of most species of salmonids in the Puget Sound watersheds.

Technical Memorandum #1<sup>90</sup> summarized the peer-reviewed literature regarding the impacts of climate change on water resources, illustrating the extensive literature on the subject dating back to the mid-1980s. One finding of note was that snowmelt-derived water supplies, common in this region, had been identified as candidates for significant climate change impacts.

The process of making outputs from GCMs appropriate for use at a watershed level (downscaling) was explained in Technical Memorandum #2.<sup>91</sup> The Washington State Climatologist, Dr. Philip Mote, paired two greenhouse gas emissions scenarios with three GCMs based on the GCM's ability to replicate 20th century Washington climate and the range of forecasts they provided together.

Technical Memorandum #3<sup>92</sup> documented the creation and use of a web-accessible database that provided access to meteorological and hydrologic forecasts for the four WRIs covered in the study. The memorandum also offered guidance on accessing and using the database.

The downscaling technique was used in Technical Memorandum #4<sup>93</sup> to create climate-impacted

meteorological data at key weather stations for five water supply basins (the Sultan, South Fork Tolt, Cedar, Green and White rivers) in the four WRIs. Three different GCM/emission scenario pairs were applied in decades surrounding the years 2000, 2025, 2050, and 2075, with the following results:

- Individual model forecasts of average daily air temperature for 2075 produced increases above the 1928-2004 historic period that ranged from 3.8°F to 9.0°F for summer and from 1.4°F to 8.1°F for winter, when averaged across the weather stations.
- The ensemble average of all three GCMs showed future temperature increases of 6.8°F and 5.4°F by 2075 for the summer and winter seasons, respectively.
- Precipitation changes were less consistent for each model and between models.
- Changes in seasonal precipitation in 2075 relative to the historic period ranged from -29% to +11% in summer and -6% to +48% in winter.
- The ensemble average for seasonal precipitation showed a trend of drier summers and wetter winters.
- The ensemble average of annual precipitation for the 14 stations increased 12% by 2075 relative to the historic period.

Table 2-15 on the next page shows the projected seasonal changes in ensemble average streamflows relative to historic streamflows.<sup>94</sup>

Technical Memorandum #5<sup>95</sup> presented the following results from applying the climate-impacted temperature and precipitation data to hydrology models for the five water supply basins:

- Climate impacts to streamflow were found to be substantial in each of the five basins, although the magnitude differed.
- In all five basins, earlier snowmelt caused the spring peak in the hydrograph to occur earlier. This would lead to lower early summer flows at each location.
- Basins where precipitation fell predominantly as rain (Green River) were less affected in spring shifts than those in which snow was more dominant.
- By 2075, the ensemble average flows across all five basins compared to historic flows decreased by 37% during the summer and increased by 48% during the winter.

<sup>90</sup> Alexander (2007a)

<sup>91</sup> Polebitski (2007a)

<sup>92</sup> O'Neill (2007)

<sup>93</sup> Polebitski (2007b)

<sup>94</sup> Palmer (2007b, p.23)

<sup>95</sup> Polebitski (2007c)

**Table 2-15.**  
**Projected Seasonal Changes in Ensemble Average Streamflow Relative to Simulated Historic\***

(Projected percent seasonal minimum and maximum average streamflows relative to simulated historic are shown in parentheses)

YEAR	SPRING	SUMMER	FALL	WINTER	ANNUAL
<b>Cedar</b>					
2000	10% (8%, 12%)	11% (7%, 13%)	10% (6%, 16%)	8% (6%, 12%)	9% (9%, 10%)
2025	-2% (-6%, 1%)	-11% (-19%, -1%)	19% (15%, 22%)	22% (9%, 33%)	8% (7%, 11%)
2050	-3% (-5%, -2%)	-28% (-38%, -15%)	19% (16%, 21%)	29% (1%, 52%)	8% (1%, 14%)
2075	-12% (-23%, 0%)	-37% (-52%, -12%)	17% (4%, 25%)	48% (8%, 80%)	9% (2%, 17%)
<b>Sultan</b>					
2000	9% (6%, 13%)	1% (-4%, 4%)	8% (0%, 16%)	4% (1%, 9%)	6% (4%, 8%)
2025	-1% (-4%, 1%)	-17% (-27%, -11%)	14% (11%, 16%)	17% (3%, 32%)	6% (2%, 11%)
2050	1% (-2%, 4%)	-33% (-39%, -21%)	13% (9%, 16%)	24% (-6%, 51%)	5% (-3%, 15%)
2075	-8% (-19%, 1%)	-42% (-55%, -18%)	9% (1%, 18%)	47% (1%, 84%)	8% (-2%, 21%)
<b>South Fork Tolt</b>					
2000	8% (6%, 9%)	3% (2%, 3%)	8% (4%, 16%)	6% (0%, 10%)	6% (6%, 7%)
2025	-3% (-7%, 0%)	-16% (-20%, -12%)	16% (10%, 21%)	20% (4%, 35%)	6% (3%, 10%)
2050	-2% (-3%, 0%)	-34% (-41%, -25%)	15% (12%, 17%)	27% (-5%, 55%)	5% (-3%, 12%)
2075	-8% (-19%, 2%)	-41% (-53%, -23%)	10% (0%, 18%)	48% (3%, 85%)	7% (-3%, 17%)
<b>Green</b>					
2000	10% (8%, 13%)	7% (5%, 9%)	12% (8%, 19%)	9% (7%, 11%)	10% (9%, 10%)
2025	-3% (-8%, 1%)	-4% (-8%, 0%)	23% (18%, 30%)	23% (8%, 34%)	11% (8%, 14%)
2050	-5% (-7%, -3%)	-23% (-29%, -17%)	23% (20%, 27%)	28% (0%, 49%)	10% (1%, 16%)
2075	-13% (-25%, 1%)	-27% (-39%, -14%)	18% (5%, 28%)	41% (5%, 71%)	10% (2%, 19%)
<b>White</b>					
2000	9% (7%, 10%)	-5% (-7%, -3%)	14% (11%, 20%)	20% (16%, 23%)	9% (9%, 9%)
2025	3% (1%, 5%)	-18% (-23%, -13%)	20% (17%, 22%)	31% (19%, 43%)	8% (6%, 11%)
2050	6% (0%, 13%)	-28% (-33%, -22%)	16% (16%, 18%)	36% (9%, 59%)	7% (-1%, 14%)
2075	4% (-4%, 11%)	-38% (-48%, -18%)	12% (4%, 16%)	57% (14%, 89%)	9% (1%, 18%)

\*The historic period is 1928-2004. The seasonal periods are: spring (March, April, and May); summer (June, July, and August); fall (September, October, and November); and winter (December, January, and February). Flow points are at the primary USGS stream gauge sites used to measure inflows into reservoirs, except on the Green and the Sultan, where total inflows were used.

Data Source: Palmer, R.N. (2007b)

Technical Memorandum #6<sup>96</sup> offered guidance on approaches to evaluating climate change impacts on water demand and water supply. A series of general principles was provided for using climate change data in evaluations, along with specifics about incorporating the data created by the committee.

Technical Memorandum #7<sup>97</sup> summarized an investigation of the regional relationship between cloud cover and other climatic variables and their implication on future climate change. Current data did not support the hypothesis that warming inland temperatures would increase cloudy days in the Puget Sound region. This suggested that other larger scale climatic factors influenced cloudiness in Western Washington.

Technical Memorandum #8<sup>98</sup> provided a literature review of the impacts of climate change on groundwater, focusing on studies that might be relevant to the Puget Sound lowlands region. The report noted that no single groundwater model had emerged as appropriate for evaluating the impacts of climate change for all watersheds. The studies reviewed suggested substantial differences in the estimates of potential impacts of climate change on groundwater. This was due to the importance of site-specific effects, such as groundwater pumping, rates of recharge, and arid versus humid environments.

## **Conclusions and Recommendations**

The first conclusion of the Climate Change Technical Committee was that climate change was impacting and would continue to impact the meteorology and hydrology of WRAs 7, 8, 9, and 10, which are the watersheds that contain the region's major surface water supply sources (the Sultan, Tolt, Cedar, Green, and White rivers). The research of the committee indicated clearly that temperatures in the region had warmed and were projected to warm further. In addition, the timing and characteristics of seasonal hydrology had shifted to higher runoff in the winter and early spring, and less runoff in the summer.<sup>99</sup>

The second conclusion was that climate change should be considered in evaluating future water supplies and water demands for the region. Without modifications to management and operations, changes in streamflow could impact the ability to meet municipal water demands because of the shifts in the hydrographs and the limited storage capacity in the region. In addition, climate change would reduce summer flows and increase stream temperatures regionally, placing more stress on freshwater aquatic ecosystems.<sup>100</sup>

Another conclusion was that the web-accessible database of forecasted meteorology and hydrology change<sup>101</sup> could be used to evaluate future water

## **Climate Change Technical Committee**

supply and demand as outlined by the committee. Significant effort and resources were used to arrive at a consensus on the potential impacts of climate change on the region and to create data representing potential futures.<sup>102</sup>

The committee also concluded that its understanding of the impacts of climate change on groundwater was limited due to the lack of detailed knowledge available in this region. This was one area, among many others, where further research might be fruitful.<sup>103</sup>

The final conclusion was that because of the importance of climate change and its impacts on water resources, the topic should be revisited at frequent intervals to incorporate advances in understanding. Climate science and climate impact assessment were relatively new fields of science. Significant strides in climate science had occurred; however, global interest in climate change was expected to significantly increase the rate at which the science progressed. Because of these advances, assessments of the impacts of climate change should be made at regular intervals. An appropriate interval would coincide with the release of updated reports from the Intergovernmental Panel on Climate Change, which have been scheduled for release about every six years.<sup>104</sup>

<sup>96</sup> Palmer (2007a)

<sup>97</sup> Alemu (2007)

<sup>99</sup> Palmer (2007b, p. 8 to 9)

<sup>100</sup> Palmer (2007b, p. 9)

<sup>101</sup> Palmer (2007b, p. 9)

<sup>98</sup> Alexander (2007b)

<sup>102</sup> Palmer (2007b, p. 9)

<sup>103</sup> Palmer (2007b, p. 9)

<sup>104</sup> Palmer (2007b, p. 9)

## **Gap Analysis**

This committee may be the only one that not only addressed its tasks as identified in the Planning Framework Summary but also expanded beyond them. The committee received substantial direct financial support from two water utilities and King County, in addition to Ecology grant funding.

Unanswered questions from later charters are identified in Table 2-10. The committee proposed to develop a simple hydrologic balance of selected Puget Sound watersheds and a simple framework for bracketing the range of impacts to groundwater but did not receive funding to do so. The committee did conduct a literature review that concluded that further research was needed to understand the impacts of climate change on groundwater in the local watersheds.

Generally, the committee met most of the intended objectives identified in its revised charter and generated data and information that could be (and have already been) used in related work by other committees and utilities. Seattle, Everett, and Tacoma ran the downscaled data through their respective system models to gauge the potential impacts on supply and gave presentations on how they could manage their operations to address the climate-impacted streamflow and altered hydrology projections generated by the UW CIG and the committee. The committee's work products were also used by the Forum in generating a regional water demand forecast and evaluating current supplies and supply options for the Outlook.

## **Next Steps for Climate Change**

The committee's methodologies and results were made publicly available on the internet and were accessible to utilities, the Forum, and any other entity that would have interest in using the information. King County expects to consider the data and modeling results in its stormwater planning, coordinated water system planning, Utilities Technical Review Committee, groundwater protection program, and reclaimed water planning. Many of the primary participants on the Climate Change Technical Committee expected to continue to consider climate change impacts as well.

The committee recommended several next steps as part of its conclusions that are outlined in the Conclusions subsection above.

### Overview

Under its own process, the Forum invited its members and certain other interests to participate on the Regional Water Demand Forecast Advisory Committee, which provided input to the Forum and its consultant on the development of a regional municipal water demand forecast. The committee held meetings from April 2006 to September 2008. The water demand forecast as part of the 2008 Outlook was expected to be available by mid-2009.

According to the Planning Framework Summary, the desired outcome was to develop an updated water demand forecast for the region of King, Pierce, and Snohomish counties, in which various stakeholders would have a high degree of confidence.<sup>105</sup> Although its final product had not been completed as of the writing of this report, the Forum's goal of developing a "credible" regional demand forecast through a transparent and involved process remained the same. (See Table 2-11.)

Table 2-12 traces the evolution of the topic scope, which has generally been consistent throughout the process. Modifications included adding more specificity about what would and would not be included in the forecast as well as limiting the analysis to projecting average annual regional demand for potable water that would use municipal supplies. A brief review of the technical memoranda that were developed as of September 2008 indicated that the Forum was following its scope as modified. The work was expected to build upon an earlier effort by the Forum in the 2001 Regional Water Supply Outlook. In addition, in response to suggestions from the advisory committee, certain enhancements were added as the work progressed. These included providing demand forecasts for sub-regions in the three-county area, responding to an independent review of the demand forecast model, and allowing stakeholder access to the model.

The Forum contributed more than \$500,000 to develop the 2008 Outlook, which covered hiring CDM as a consultant to create the work products and draft the 2008 Outlook and providing facilitation and management of the advisory committee. Some of the supplementary funding from an Ecol-

ogy grant was used for an independent review of the demand forecast model and to include the results of the Climate Change Technical Committee's modeling and analysis in the demand forecast. The remainder of the amount awarded to the Forum was reserved for additional stakeholder-requested runs of the model.

### Status of the Forum's Regional Demand Forecast

Following recommendations of a selection committee that consisted of some utility and non-utility members from both the Demand Forecast and Supply Assessment advisory committees, the Forum hired CDM, a consulting and engineering firm, to develop the demand forecast model and to draft technical memoranda and a final report to document the work. The consultant created a demand forecast model that included a projection of future average annual municipal water needs in King, Snohomish, and Pierce counties as a region, for each of the three counties individually, and for various sub-regions proposed by the advisory committee. The model was intended to provide a range of forecasts based on differing assumptions (such as different levels of conservation, population growth, income elasticity, and climate change). It is anticipated that the 2008 Outlook will cover the regional demand forecast results as well as the municipal supply assessment (see Section 2.7); when completed, the report is expected to be made available to interested stakeholders.

Some of the presentation materials to the advisory committee and technical memoranda that track data collection and the development of the water demand model have been posted on the Forum's website.<sup>106</sup> The model incorporated water use factors based on data from a survey distributed by the Forum and from comprehensive water system plans, demographic and income information from the Puget Sound Regional Council, weather data from the National Oceanic and Atmospheric Administration,

<sup>105</sup> Scoping Committee (2005, p. 3)  
<sup>106</sup> Presentation materials available at:  
<http://cpswatersuppliersforum.org/Home/default.asp?ID=30>.  
Consultant work products available at:  
<http://cpswatersuppliersforum.org/Home/default.asp?ID=80>.

<sup>105</sup> Scoping Committee (2005, p. 3)

and price/income elasticity data from CDM. Proposed demand forecast scenarios included weather scenarios based on historical weather data, demographic scenarios, and climate change scenarios. The climate change scenarios were based on the results of the Climate Change Technical Committee's models.<sup>107</sup>

Two conservation scenarios of passive (required) conservation and provider conservation goals were incorporated into the demand forecast model. The passive scenario represented conservation from more efficient indoor water use, resulting from the application of current plumbing codes and standards for new construction and substantial remodeling, and without any proactive program by the utility. In the second scenario, provider conservation goals were estimated based on information provided by the region's water systems and on the consultant's experience with municipal water system conservation in other regions of the U.S. These goals could be met through such measures as residential fixture rebates, commercial fixture rebates, irrigation efficiency, water conservation rates, leak detection, and education programs.<sup>108</sup> Conservation beyond a provider's stated goals was included in the original scope of work. However, the advisory committee (over the objections of the non-utility members of the committee) recommended that the Forum treat this third option as an additional supply alternative in the municipal water supply assessment (see Section 2.7).

A self-selected subcommittee of the Demand Forecast Advisory Committee was formed to manage an independent review of the demand forecast model. This subcommittee was comprised of Forum members from the City of Everett, Seattle Public Utilities, and King County as well as representatives from Ecology, the Muckleshoot Indian Tribe, and the UW CIG. Through a competitive process, Dr. John Boland, P.E., emeritus professor from Johns Hopkins University, was selected to perform the independent review in two phases. The first phase, an interim review of available materials (technical memoranda, presentations, etc.), was completed in December 2007.<sup>109</sup> The Forum used some of the findings to incorporate several enhancements into the model. The second and final phase of the independent review was then conducted in spring 2008.<sup>110</sup> Dr. Boland and his associate evaluated the

model against its stated objectives. At a workshop in May 2008, Dr. Boland presented his findings to the independent review subcommittee, interested members of the Forum and the advisory committee, and the consultant. Both the interim and final reports are available on the web at <http://www.govlink.org/regional-water-planning/committees.htm>.

## **Gap Analysis**

The municipal regional demand forecast will not compute at the individual utility level nor will it identify non-municipal water use such as agriculture and self-supplied. The Forum has addressed some of the questions posed as part of the planning process, although a number of items still remain, as noted in Table 2-12. The demand forecast will not include a conservation scenario beyond current goals of water utilities, nor will it address instream flow needs. The final report will not include non-potable demand or demand from self-suppliers. The forecast will also not differentiate for seasonal peak demand, which is the same time as the lowest streamflows and spawning of listed Chinook salmon. It is not clear how the final report will portray the model validation and the backcasting that would apply the model to historic demand to test its performance. A final gap analysis should be conducted when the Outlook becomes available. It would also be useful to analyze whether satisfying average annual demand is sufficient to meet peak seasonal demand while maintaining adequate instream flows.

### **Next Steps for Regional Demand Forecast**

The Forum is working to complete the primary product – a regional municipal water demand forecast that can assist in making more informed decisions about future municipal water supply source options. It is premature to discuss next steps specifically for this work until it has been completed and is fully available.

While not included in this work, it would be useful for the demand forecast model to evaluate potable and non-potable demand separately. It would also be useful for a regional demand forecast to go beyond average annual municipal water demands and consider self-supplied users, instream needs, and peak seasonal demand.

<sup>107</sup> CDM (2007c)

<sup>108</sup> CDM (2007b)

<sup>109</sup> Boland, J. and B.K. Boland (2007)

<sup>110</sup> Boland, J. and B.K. Boland (2008)

### Overview

Under its own process, the Forum invited its members and certain other interests to participate on the Regional Water Supply Assessment Advisory Committee, which provided input to the Forum and its consultant on the inventory of existing municipal supplies and the development of a model to assess potential new supply sources. The committee held meetings from April 2006 to November 2008. The water supply assessment as part of the 2008 Outlook was expected to be available by mid-2009.

According to the Planning Framework Summary, the desired outcome of the regional supply assessment was to update the 2001 Outlook by re-evaluating water supply sources; looking at alternative future water sources such as Lake Tapps, regional conservation strategies, demand management strategies, and reclaimed water; and evaluating the impact of climate change on existing and potential sources.<sup>111</sup> (See Table 2-13.) The Forum modified the original desired outcome to include the development of criteria to evaluate potential supply projects and tools for applying the criteria. (See Table 2-13.) The Forum's scope did not call out Lake Tapps specifically by name. The Forum's objective was to look at both demand and supply regionally rather than by individual utilities; consequently, the effort centered on municipal water systems that served more than 500 connections and potential future water supplies that could provide more than 3 million gallons per day.

A brief review of the technical memoranda that were developed as of September 2008 indicated the Forum's work was generally consistent with its refined scope, which focused on municipal water supplies; it did not address either self-supplied users or non-potable uses. (See Table 2-14.) In addition, many of the questions raised in the Planning Framework Summary were not carried through in the Forum's workplan.

The Forum funded the consultant's work to date as well as facilitation and management of the advisory committee. See Section 2.6 for discussion of funding for development of the 2008 Outlook.

### Status of the Forum's Regional Supply Assessment

The Forum used the same consultant, CDM, to conduct both the demand forecast and the supply assessment, since these were expected to be key components of a single final report, the 2008 Outlook. See Section 2.6 for additional discussion on the Forum's consultant hiring process, which included involvement of the Forum's two advisory committees. For the supply assessment, the tasks were to develop the water supply inventory and the evaluation tools to assess potential regional water supply projects and to draft the 2008 Outlook to document the work. The supply alternatives effort was expected to provide (1) an inventory and assessment of municipal water supply sources providing more than 3 million gallons per day that might be used to meet future water supply needs in King, Pierce, and Snohomish counties, and (2) a decision-making model that could be used to evaluate potential new supply sources. The report was not expected to address how water supplies would be conveyed to address individual utility shortfalls if they were not located in the same service area as the available supplies; this was not part of the Forum's scope, although it was proposed in the Planning Framework Summary.

The Forum assessed trends in historical municipal water supply from 1990 to 2005, using data available from surveyed utilities in King, Pierce, and Snohomish counties. The consultant reviewed background materials on economic valuation, cost/benefit analysis, and other supply planning models and shared the information with the advisory committee. CDM conducted a survey of water suppliers to learn about existing and potential new sources. The Forum worked with the advisory committee and CDM on a model to evaluate potential new supply sources based on an array of criteria that included: (1) environmental impact, (2) ease of implementation, (3) water quality, (4) supply reliability, and (5) cost. CDM worked with the advisory committee to demonstrate how the model and the criteria could be used to evaluate potential supply projects.<sup>112</sup>

Some of the committee's meeting and presentation materials have been posted on the Forum's website

<sup>111</sup> Scoping Committee (2005, p. 5-6)

<sup>112</sup> CDM (2007e)

that tracks the development of the water supply alternatives.<sup>113</sup> When completed in mid-2009, the 2008 Outlook is expected to be made available to interested stakeholders.

## **Gap Analysis**

There were a number of topics outlined in the Planning Framework Summary for the committee to address in its final report, as noted in Table 2-14. Of particular interest were a rigorous environmental assessment of potential new sources as well as how reclaimed water options would be included. Another question was how the reclaimed water projects would be matched up with non-potable demand, since the Forum did not include this issue in its own scope of work and did not compile any comprehensive information on non-potable demand. In addition, consideration of water conservation as a supply alternative appeared to be more limited than originally expected by the non-water utility sector.

The assessment was originally expected to summarize the water available from existing sources, compare it to the estimated future demand at the regional and sub-regional scales for both annual average and daily peak use, and identify a suite of potential regional supplies to meet any identified shortfall. However, recent indications were that the comparison between estimated future demand and existing supply would occur at only the regional (three-county) scale for municipal supplies and only on an average annual basis. Preliminary results at this scale suggested that there did not appear to be significant near-term shortfall on an average annual basis at the regional level, and that the annual shortfalls would likely occur farther out in time (40 to 50 years). However, this assumption was based on yield figures that did not consider instream flow needs for fish as part of a regional salmon recovery plan, nor any droughts or short-term climate change impacts.

The computations of available municipal supply were based on existing water rights and established techniques in the water industry for yield and supply reliability that considered both historic weather variations and the projected effects of climate change. Since an evaluation of sub-regional or local shortfalls or how water could be moved or managed to address these was not included in the Forum's own scope of work, it did not appear that the report

would address these. A final gap analysis should be conducted when the full report becomes available.

## **Next Steps for Regional Supply Assessment**

There are two primary products in process by the Forum – (1) an inventory of existing municipal water supply sources serving more than 500 connections and (2) an identification and assessment of possible municipal water sources providing more than 3 million gallons per day that might be used to meet future water supply needs through 2060 in King, Pierce, and Snohomish counties. Climate change information has been factored into both the demand forecast and the supply assessment.

The results of the assessment could be used to chart a longer term strategy to address any revealed shortfalls in a way that would be consistent with other regional efforts such as salmon recovery and use of reclaimed water. Before new water supply sources would be brought online, analysis should be undertaken to examine possible impacts on instream flows, particularly during the simultaneous season of peak demand and low flow. Modeling and analysis of climate change impacts on groundwater and spring-fed streams should also be conducted, particularly since about 30% of King County municipal demand has been supplied by groundwater.

It is premature to discuss next steps more widely for this work until it has been completed and is fully available.

<sup>113</sup> Presentation materials available at:  
<http://cpswatersuppliersforum.org/Home/default.asp?ID=33>.



Chapter 3

## **Conclusions**



## Conclusions

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This chapter offers some overall conclusions from King County’s perspective about what has been accomplished in the regional water supply planning effort, particularly in light of the desired process and outcome outlined in the Planning Framework Summary. In addition, there is a matrix of tools and methodologies developed through the work of the technical committees that entities can consider using in either their own planning and management activities or in other regional processes. The chapter concludes with some possible next steps for King County related to regional water supply planning.

### 3.1 Desired Process and Outcome from the Planning Framework Summary

The Scoping Committee set out a desired process and outcome in the Planning Framework Summary, recommending topics to be addressed and specifying a role for the Coordinating Committee. As discussed below, these came to fruition in varying degrees.

The Scoping Committee started by outlining topics in the Planning Framework Summary on which entities could work together voluntarily to identify, compile information on, and discuss many of the key issues that relate to or may affect water resources of the region. No commitments were made or requested in order for interested parties to participate on technical committees. The regional water supply planning process was voluntary; it was not mandated by state law. In fact, as noted in the Clarifying Statement agreed to by the Coordinating Committee early in the process, the goal was “to develop the best available data, information, and pragmatic tools that the participants may use, at their discretion, to assist in the management of their respective water systems and resources, and in their water supply planning activities.”<sup>114</sup> The planning process was “expected to provide useful data that may support other processes to address water resource and water supply

issues.”<sup>115</sup> In this, as Chapter 2 shows, all the technical committees achieved some level of success.

The Planning Framework Summary and the original technical committee charters were ambitious; technical committees revised the scopes of their charters (sometimes more than once) to reflect the reality of what they could agree to accomplish. The gaps in achieving the original objectives and deliverables do not indicate that the process was flawed or unsuccessful. On the contrary, revised scopes and objectives reflect the collaborative nature of the committees and the various needs and viewpoints of the participants. Most technical committees did achieve their revised goals.

Topics related to the implementation of the Municipal Water Law of 2003 (Engrossed Second Substitute House Bill 1338) and planning under the Coordination Act were also originally included as potential components of the planning effort.<sup>116</sup> Although both of these were proposed by the Scoping Committee along with the seven topics covered by the technical committees, neither was addressed in this process. Implementation of the Municipal Water Law was not considered as a separate technical committee topic because DOH was involved in developing the statewide rule at the time and did not want to engage in separate regional planning processes until the statewide rule was complete. The Coordinating Committee did not address coordinated water system planning in King County because pursuit of a specific planning process conflicted with the understanding reflected in the Clarifying Statement.

The role of the Coordinating Committee was defined in the Planning Framework Summary as “to review, and to the extent feasible, coordinate and facilitate a number of studies, analyses, and projects [that] will produce new information and findings that will be useful for King County and broader regional water planning activities”<sup>117</sup> The committee fulfilled this role. On the other hand, the Planning

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<sup>114</sup> Clarifying Statement approved by the Coordinating Committee, May 3, 2006

<sup>115</sup> Clarifying Statement

<sup>116</sup> See Planning Framework Summary-October 31, 2005.

<sup>117</sup> Planning Framework Summary (2005), p. 1

Framework Summary called for the Coordinating Committee to issue a final report that would “include a summary of the results and status of the key work elements. . . . [and] provide a recommendation on the scope for Coordinated Water System Planning in King County.”<sup>118</sup> Instead, when it consented to the Clarifying Statement, the Coordinating Committee signaled that it was not comfortable issuing recommendations as a group but preferred to receive information and then allow participating entities to conduct their own individual evaluations.

Some of the committees chose to limit their focus to those served by large and medium-size municipal water suppliers. While useful, this is only part of the total picture of regional water uses. For example, one task yet to be completed in the region would be to respond to the condition laid out by the National Marine Fisheries Service (NMFS) when it reviewed the Shared Strategy’s Puget Sound Salmon Recovery Plan. In its Final Supplement to the plan, NMFS stated: “Given the certainty of increasing demand on Puget Sound water supplies, NMFS believes there is an urgent and inescapable need to ensure sufficient instream flows to recover Puget Sound Chinook salmon.”<sup>119</sup> In the same review, NMFS labeled the Lake Washington, Green River, and Puyallup River watersheds as “water-critical basins that are over-appropriated.”<sup>120</sup> The regional water supply planning process did not address this issue.

On the other hand, one noteworthy success of the regional water supply planning process was the continued involvement by a broad spectrum of interests. King County Executive Ron Sims started the process by inviting a variety of stakeholders that included representatives of local governments, utilities, tribal governments, state agencies, and environmental interests to scope the effort. Participation expanded on the committees that developed the technical work products.

## 3.2 Tools and Methodologies

The Clarifying Statement called for the technical committees to develop tools and methodologies that could be useful in subsequent water planning efforts. Table 3.1 on the next page lists these tools and methodologies, which the technical committees reviewed, developed, or worked on with consultants

and researchers to generate. More specifics can be found in the reports of the respective technical committees posted on the web at <http://www.govlink.org/regional-water-planning/committees.htm>.

## 3.3 Next Steps for King County on Regional Water Supply Planning

Regulatory and financial changes are always occurring, generated as a result of elections, legislative sessions, court cases, and the general course of events. Even so, King County believes that the work products and efforts of the many committees from the regional water supply planning process are worth capturing as a snapshot in time.

King County expects to use information, data, and tools developed through this process where appropriate in its own various planning and management activities and in partnerships with others. In addition to next steps noted for each technical committee in Chapter 2, here are a few examples of King County programs and actions where the work products from the technical committees could be applied.

Over the next few years, King County intends to:

- Work with local jurisdictions, water and wastewater districts, tribes, environmental groups, and other interested parties to develop a Regional Reclaimed Water Comprehensive Plan. The purpose of the Plan is to determine if, how, and when over the next 30 years King County’s existing reclaimed water program should expand
- Engage in discussions with water utilities and examine next steps in coordinated water system planning under the Coordination Act
- Work with the Puget Sound Partnership and others on actions to recover Puget Sound
- Continue discussions with DOH and water utilities around the scope of the King County Utilities Technical Review Committee and DOH reviews of water system plans.

Current and future water needs for both people and fish can best be met in a sustainable way through the commitment and participation of interested and affected stakeholders in a collaborative and comprehensive planning effort. Water knows no political boundaries, and the rules and regulations that govern water require the involvement of many entities. King County looks forward to continuing to build partnerships to resolve challenging water issues and

<sup>118</sup> Planning Framework Summary, p.2

<sup>119</sup> National Marine Fisheries Service (2006), p.10

<sup>120</sup> National Marine Fisheries Service (2006), p. 9

prepare for the predicted population growth and climate change impacts. To do so, King County is already using many of the work products from, and relationships created and expanded through, the regional water supply planning process.

**Table 3-1. Tools and Methodologies Developed or Reviewed by Technical Committees**

<b>Technical Committee</b>	<b>Possible Tools and Methodologies</b>
<b>Tributary Streamflow</b>	Methodology and ranking criteria to prioritize low-flow streams that would benefit from source exchange
<b>Source Exchange</b>	<ul style="list-style-type: none"> <li>• Framework of questions to consider when evaluating feasibility of source exchange</li> <li>• One method for full cost/benefit accounting</li> <li>• *Model and methodology for considering whether to pause groundwater well withdrawals to benefit streamflow. The model assists in predicting the general timing and magnitude of streamflow improvement according to well depth and distance away from streams</li> <li>• *Web-accessible database of large wells and springs in WRIs 8 and 9 that catalogs site-specific characteristics important for quantifying streamflow impacts from groundwater extraction to help evaluate opportunities to pause groundwater well withdrawals</li> </ul>
<b>Reclaimed Water</b>	<ul style="list-style-type: none"> <li>• WaterReuse Foundation’s economic framework for evaluating the environmental, social, and financial benefits and costs, both quantifiable and non-quantifiable, of reclaimed water projects</li> <li>• Model for estimating costs to produce Class A reclaimed water from various points in the King County wastewater treatment system</li> </ul>
<b>Small Water Systems</b>	<ul style="list-style-type: none"> <li>• Mapping of Group B systems in King County</li> <li>• Geographic analysis of exempt wells drilled in King County since 2000</li> <li>• Possible elements of timely and reasonable service for a water utility to consider describing in its water system plan</li> </ul>
<b>Climate Change</b>	<ul style="list-style-type: none"> <li>• Methodology to downscale global climate (general circulation) models</li> <li>• Application of downscaled global climate models to forecast temperature and precipitation changes in WRIs 7, 8, 9, and 10 over the next 70 years</li> <li>• Methodology to evaluate impacts of meteorological changes on streamflow in WRIs 7, 8, 9, and 10 over the next 70 years</li> <li>• Framework for incorporating climate change into water resources planning</li> <li>• Online database of modeled meteorological and hydrologic trends for the next 75 years in WRIs 7, 8, 9, and 10</li> </ul>
<b>Regional Water Demand Forecast</b>	Model for forecasting future average annual municipal water demand on a regional and sub-regional scale in King, Pierce, and Snohomish counties
<b>Regional Water Supply Assessment</b>	Criteria and methodology to evaluate potential new water supply sources at the regional scale in King, Pierce, and Snohomish counties

*\*Tools developed as part of the work products of a joint subcommittee of the Tributary Streamflow and Source Exchange technical committees and published as an attachment to the Source Exchange Technical Committee’s final report.*