

Appendix N
Cascade WUE Goal and Reclaimed Water Analysis

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SPECIAL MEETING MINUTES OF THE
BOARD OF DIRECTORS
BELLEVUE CITY HALL
OCTOBER 23, 2013

1. CALL TO ORDER

At 3:31 p.m. Chair John Marchione called the meeting to order.

2. ROLL CALL

Board Members or Alternate Board Members from the City of Bellevue (Davidson), Skyway Water & Sewer District (Ault), City of Issaquah (Butler), Sammamish Plateau Water & Sewer District (Warren), City of Redmond (Marchione), City of Kirkland (Sweet), and City of Tukwila (Haggerton).

3. PUBLIC COMMENT

None.

4. EXECUTIVE SESSION

None.

5. APPROVAL OF AGENDA

Motion by Mr. Ault and second by Mr. Haggerton to approve the meeting agenda. Motion carried unanimously (7-0).

6. CHIEF EXECUTIVE OFFICER'S REPORT

Chuck Clarke made the following report:

- Congratulations to Chris Paulucci, Cascade's Business Manager, as he recently earned his CPA license.

7. CONSENT ACTION ITEMS

None.

8. OTHER ACTION ITEMS

- a. Motion to adopt Resolution No. 2013-11 establishing Cascade's water use efficiency goal for 2014 – 2019.

Motion by Mr. Ault and second by Mr. Haggerton to approve Other Action Item 8a.
Motion carried unanimously (7-0).

9. STAFF PRESENTATION

None.

10. COMMITTEE REPORTS

None.

11. NEW BUSINESS

None.

12. NEXT REGULAR MEETING

The next regular Board meeting will be held Wednesday, November 20, 2013, at 3:30 p.m. at Bellevue City Hall.

13. ADJOURN

The meeting was adjourned at 3:41 p.m.

APPROVED BY:



John Marchione, Chair



Jim Haggerton, Vice-Chair



CASCADE WATER ALLIANCE
RESOLUTION No. 2013-11

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE CASCADE WATER ALLIANCE, A
WASHINGTON MUNICIPAL CORPORATION,
CONCERNING WATER EFFICIENCY GOAL SETTING

WHEREAS, the Cascade Water Alliance (Cascade) is a Washington Nonprofit Corporation comprised of Municipal Corporations and special purpose Municipal Corporations which is organized under the authority of the Interlocal Cooperation Act (Chapter 39.34 RCW) for the purpose of providing drinking water supply to meet the growing demands of its Members and to promote the wise and efficient use of resources; and

WHEREAS, Cascade is committed to responsible and proactive management of the region's natural resources through water efficiency efforts; and

WHEREAS, Cascade manages the requirements of the Washington water use efficiency rule and goal setting on behalf of its Members; and

WHEREAS, it is in Cascade's and its Members' financial, resource management and environmental interest to utilize existing water resources and pursue water savings activities that will help delay the development of new drinking water supplies until all current available water supplies are put to maximal use; and

WHEREAS, Cascade can maximize its current available water supply by reducing critical water intensive peak season demand through outreach, education, and identified critical water efficiency programs for its Members that address peak season demand;

NOW THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF THE CASCADE WATER ALLIANCE as follows:

Section 1. Cascade will dedicate outreach, education, and programmatic resources necessary to achieve on behalf of its Members a cumulative drinking water savings of 0.6 million gallons per day on an annual basis and 1.0 million gallons per day on a peak season (June – September) basis by 2020.

Section 2. Cascade will review its water efficiency program annually during the budget process and determine the program budget necessary to effectively optimize its water supply.

Section 3. Cascade will maintain a water efficiency program which ensures that its Members are in compliance with the Washington Department of Health water use efficiency rule.

ADOPTED AND APPROVED by the Board of Directors of the Cascade Water Alliance at the regular meeting thereof, held on the 23 date of October, 2013.

ATTEST:

Chuck Clarke
Chuck Clarke, CEO

CASCADE WATER ALLIANCE

John Marchione
John Marchione, Chair

Jim Haggerton
Jim Haggerton, Vice Chair

Fred Butler
Fred Butler, Secretary/Treasurer

Members

Yes 7

No 0

Demand Share

Yes 100 %

No 0 %

Include in CWAC?

Yes

No

APPENDIX D

Reclaimed Water Opportunities

Reclaimed Water

Chapter 5 of the current TSP discusses Cascade's current outlook on current and potential future uses of reclaimed water in the Cascade service area. This appendix provides additional background information, drawn from Cascade's prior (2004) plan. While some of the specific sites for potential use of reclaimed water may have changed in the interim, the overall opportunities for reclaimed water remain similar at this time.

Reclaimed water is defined by Chapter 90.46 RCW as "effluent derived in any part from sewage from a wastewater treatment system that has been adequately and reliably treated, so that as a result of that treatment, it is suitable for a beneficial use or a controlled use that would not otherwise occur and is no longer considered wastewater."

Reclaimed water can be used for activities such as irrigation to aid water suppliers in meeting the needs of their customers by reducing the demands upon high-quality potable water supplies, especially during peak use times. The use of reclaimed water may also benefit the environment by decreasing the need for withdrawals from streams and groundwater, recharging aquifers that are in hydraulic continuity with streams, and potentially directly augmenting streamflows.

Sources of Reclaimed Water

Municipal wastewater treatment plants are the typical source of reclaimed water. The majority of water customers served by Cascade Members receive wholesale wastewater conveyance and treatment services provided by King County Department of Natural Resources and Parks, Wastewater Treatment Division (King County WTD). At this time King County WTD represents the sole potential generator of reclaimed water for use by Cascade Members. There are three categories of reclaimed water sources owned and operated by King County WTD, as described below.

South Treatment Plant

The South Treatment Plant, located in Renton (see Figure 6.1), is in close proximity to Tukwila and Skyway, and is therefore considered a logical source of reclaimed water supply for Cascade.

The South Treatment Plant's current design capacity for treating wastewater is 115 MGD on an average daily basis. Present flows average approximately 80 MGD. A planned expansion will increase plant capacity to 135 MGD by 2029.

A portion of the South Treatment Plant flows is currently treated to allow for reuse. One of Cascade's Members, the City of Tukwila, has been using Class A reclaimed water from this source since 1998. A supply line extends from the treatment plant to Fort Dent Park in Tukwila. The reclaimed water is used primarily for irrigation of ballfields at the park, as well as a few minor uses such as street sweeping. A delivery system has also been installed to the Foster Golf Links site for future use.

Brightwater

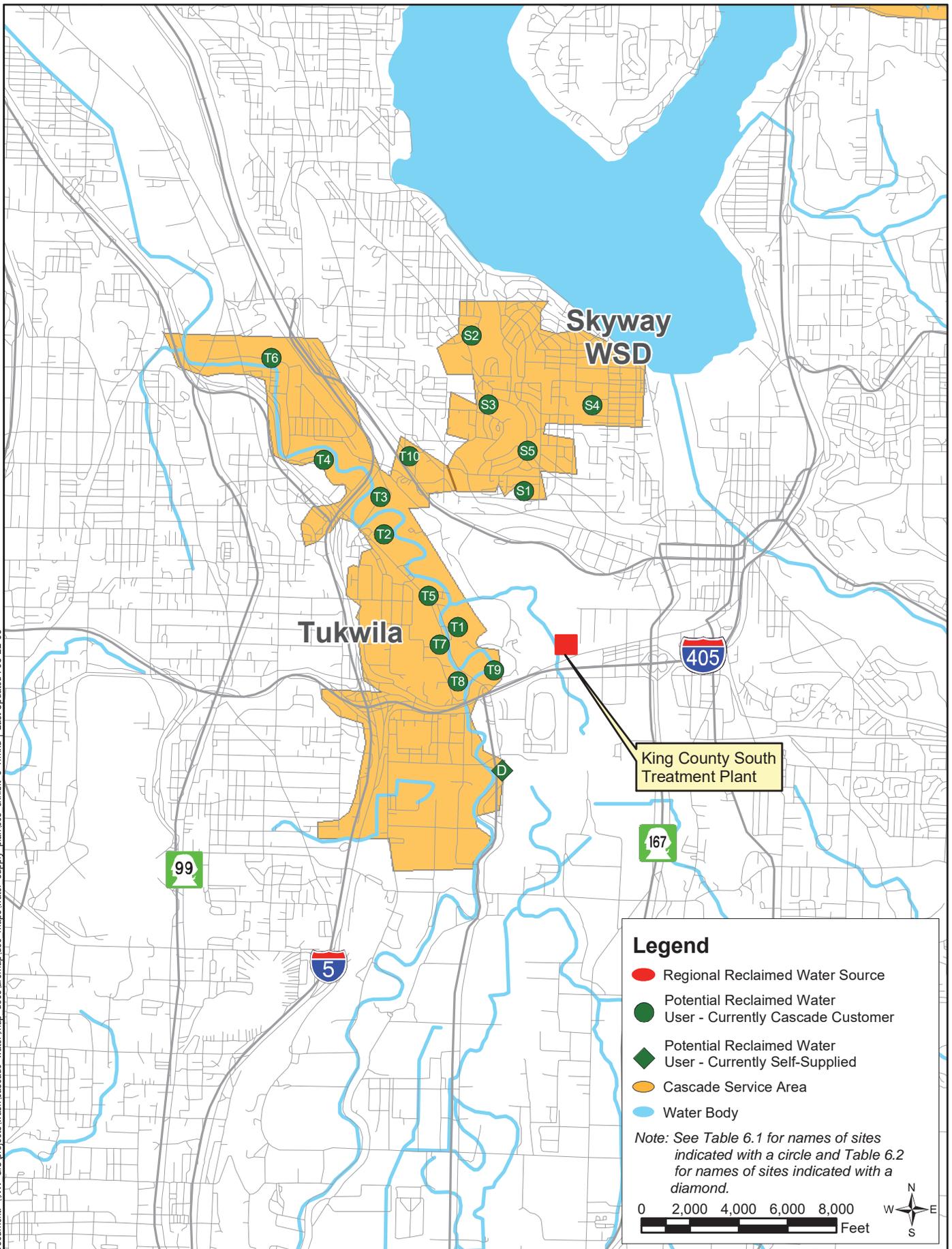
King County WTD recently developed the Brightwater Regional Treatment System, located in Snohomish County northeast of Woodinville (see Figure 6.2). Treatment plant start-up and operations began in September 2011, with the system scheduled to be completed in 2012.

The treatment capacity of Brightwater is anticipated to be 36 MGD, on an average daily basis. Plant expansions will increase capacity to 54 MGD by 2040.

A key feature of the Brightwater project is the planned additional treatment for a portion of the facility's flows, allowing for reuse at the plant site and throughout a sizeable service area. It is anticipated that approximately 10 MGD of reclaimed water will be available from the Brightwater facility. It is anticipated that this supply will be made available to the area west of the facility (along the Brightwater effluent corridor, which runs along the King/Snohomish County line to Puget Sound) and to the south (potentially into the Sammamish Valley). The area south of Brightwater includes the northern end of Cascade's service area.

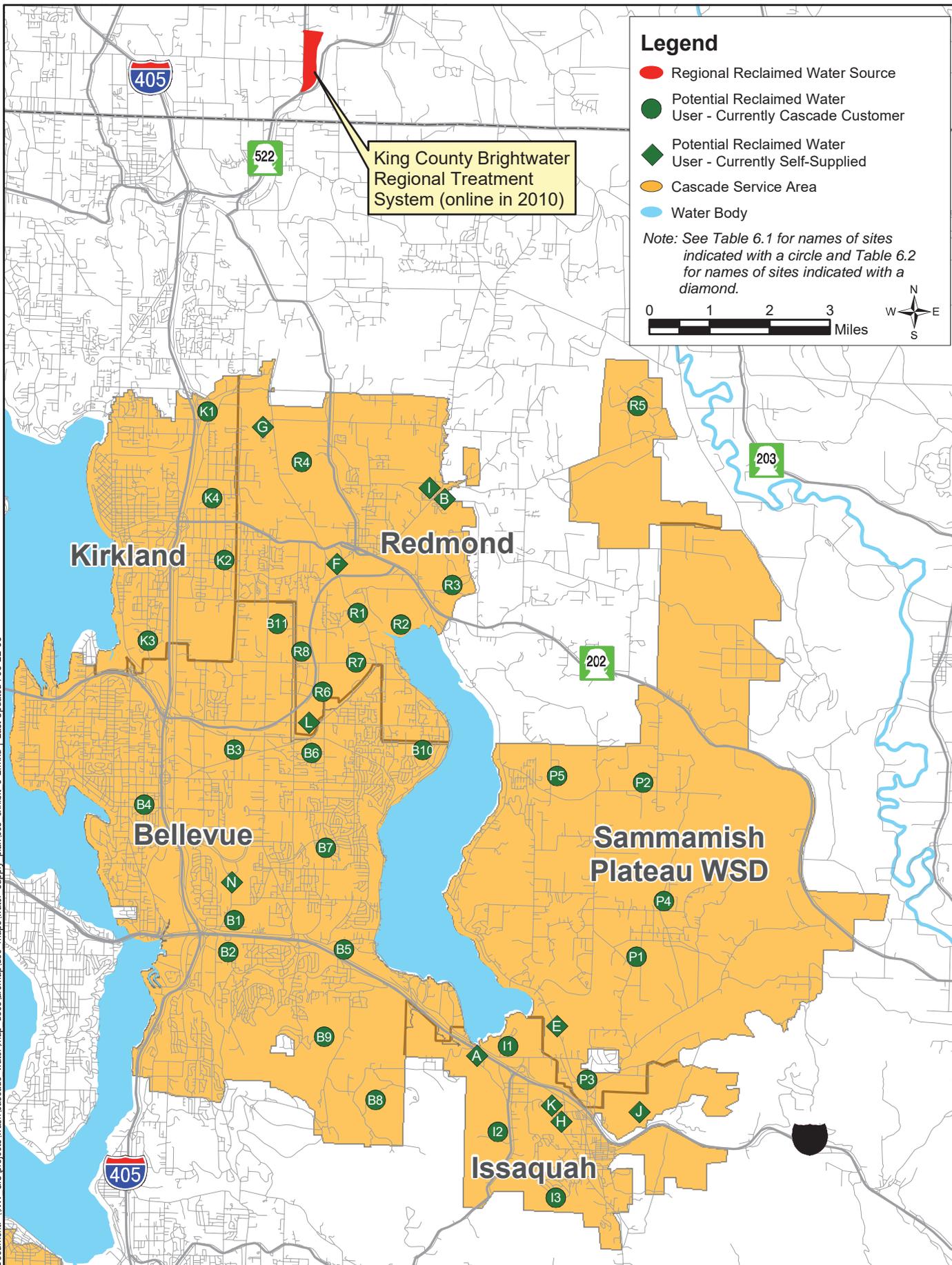
Satellite Facilities

King County WTD's South Treatment Plant and Brightwater Regional Treatment System are the two identified regional sources of reclaimed water supply. However, there is a potential for development of smaller, satellite reuse facilities designed to serve a more local need. King County has expressed a desire to explore the possibilities of constructing one or more satellite treatment plants in cooperation with local communities and/or water purveyors. One Cascade Member that has also shown interest in this concept is Covington Water District. Throughout 2007-2009, the District and the County jointly examined the feasibility of implementing a reuse system utilizing a satellite treatment facility. However, such a concept was determined to not be cost-effective for the near-term, and thus has not been advanced further.



Reclaimed Water Sources and Potential Users - Tukwila and Skyway WSD
FIGURE 6.1

Document: \\www.gis.projects.wash.cascade_water\map_docs\arcmap\doc_maps\water_supply_plan\ees_exhibit_6-2.mxd | Last Updated: 03-22-05



Reclaimed Water Sources and Potential Users - North Cascade Members

FIGURE 6.2

Applications of Reclaimed Water

Water utility planning includes evaluating the cost-effectiveness of various supply options. The feasibility of new sources of supply is partially based on the cost of developing such supplies and examining how these costs compare to existing supplies. Implementation of a water reuse program must also be viewed through this utility management lens when evaluating the feasibility of reuse versus other sources of supply. From this perspective of cost and feasibility, there are two broad categories of reuse programs: 1) service to existing water-using facilities and retrofit of existing systems; and 2) service to new development.

For a utility serving a highly developed area (i.e., a service area that is at or near buildout), a water reuse program will be almost exclusively of the first type, with service to existing customers. While there may be customers for whom the use of reclaimed water seems logical, as they use large quantities of water for non-potable purposes, the cost of delivery may be so great as to make it infeasible. Costs include the extension of water reuse pipelines to such customers and retrofits to the customer's plumbing, which can sometimes be quite extensive.

Many times, a reuse program is more feasible for those utilities that anticipate serving new development. Feasibility increases when provision of reclaimed water can be included in the early planning stages of both the future customer's onsite plumbing and the utility's infrastructure improvements. Early planning and coordination of such activities drastically reduces costs and will make reuse a more feasible option for a utility.

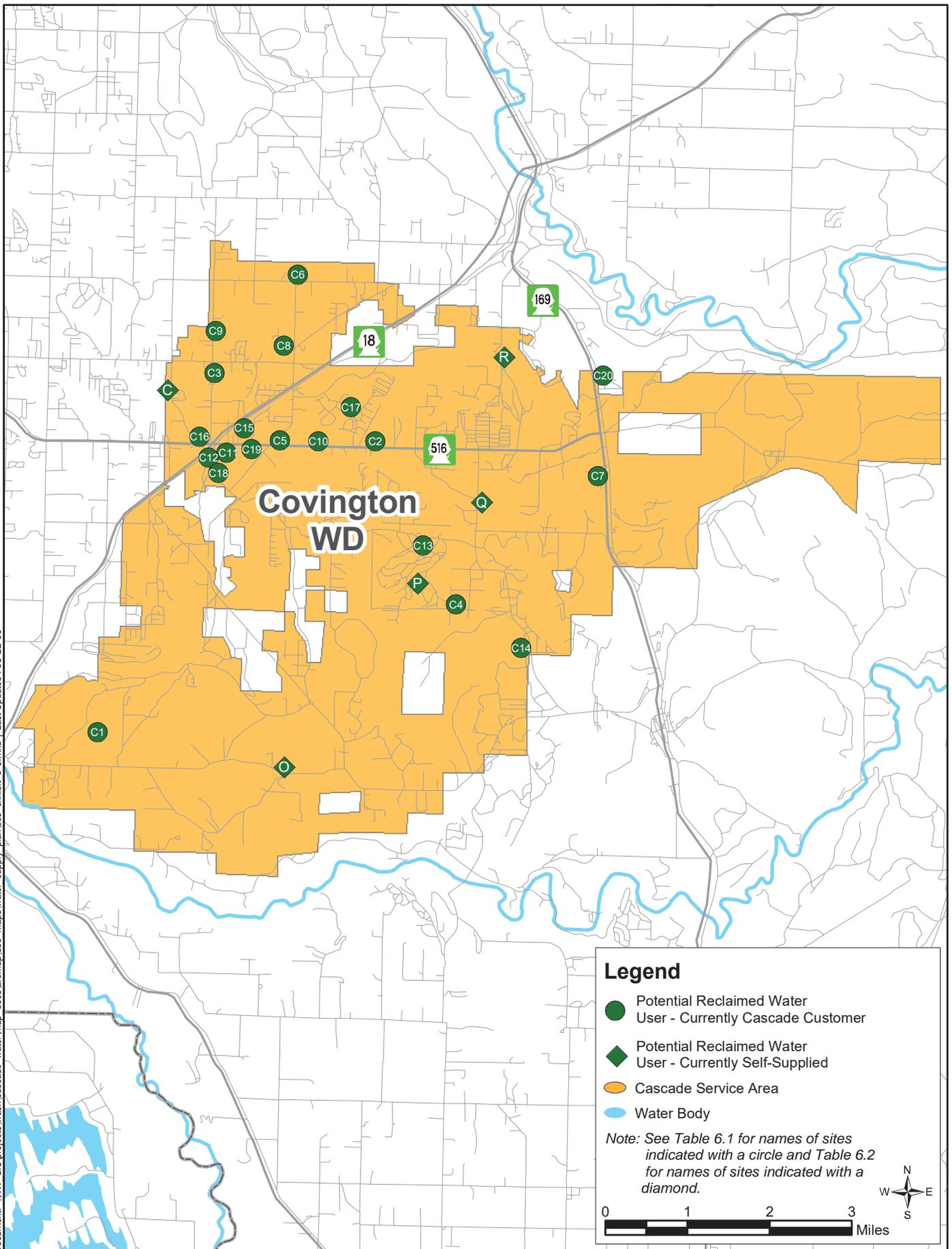
Cascade Members represent a blend of the above opportunities. This section identifies known and potential future applications of reclaimed water by existing Cascade customers. The primary applications of reclaimed water considered in this review are landscape irrigation and non-potable industrial use, as these constitute the largest components of municipal potable water demand that may be replaced by reclaimed water. Other, minor uses of reclaimed water are discussed where specifically identified by Cascade Members.

Application of reclaimed water service to new development is not specifically assessed, as it is challenging to estimate appropriate quantities of demand. However, new developments may also present opportunities for using reclaimed water.

This review is based primarily upon information provided by Cascade Members during preparation of Cascade's 2004 Transmission and Supply Plan, and supplemented by data contained in previous reuse marketing studies conducted by King County. Cascade Members were interviewed and asked to describe their water reuse planning activities, if any. This included identifying any reuse activities through 2004 as well as known planned opportunities or projects at that time. Furthermore, the Members were also asked to provide account information for their top ten largest water customers (i.e., historical usage). From these lists, those accounts were identified that represent irrigation or industrial uses suitable for consideration of reclaimed water. These represent the primary reuse opportunities that exist for Cascade over the next twenty years.

The information provided by the Members was then compared against previous studies performed by King County, in which potential reclaimed water application sites were identified. Where additional opportunities were identified, these are included.

Table 6.1 provides a summary of water demand information obtained for each identified site. Figure 6.1 through Figure 6.3 provide the location for each site specifically listed in the table. For further details of this review, see Chapter 6 of Cascade's 2004 TSP.



Reclaimed Water Sources and Potential Users - Covington WD
FIGURE 6.3

Table 6.1 Summary of Existing Sites with Potential for Reclaimed Water Application (1)

Customer	Map Key (see Fig 6.1-6.3)	2003 Total Consumption (ccf) ⁽²⁾	2003 Total Consumption (gal) ⁽³⁾	2003 Average Day Demand (gpd) ⁽⁴⁾	2003 Peak Season Demand (gpd) ⁽⁵⁾
Bellevue					
Bellevue Community College	B1	4,571	3,419,108	9,367	28,025
Bentall Capital/Five Newport	B2	10,040	7,509,920	20,575	61,557
Foothill Commons Apts.	B3	4,062	3,038,376	8,324	24,905
Double Tree Inn	B4	5,251	3,927,748	10,761	32,195
Boeing Computer Services	B5	5,145	3,848,460	10,544	31,545
Central Park East Apts.	B6	5,332	3,988,336	10,927	32,691
Colony Woods Apts.	B7	6,223	4,654,804	12,753	38,154
Montreux-Glacier Ridge	B8	14,413	10,780,924	29,537	88,368
Overlook at Lakemont	B9	4,023	3,009,204	8,244	24,666
Tam O'Shanter Golf Course	B10	10,066	7,529,368	20,628	61,716
Bellevue Municipal Golf Course ⁽¹⁰⁾	B11	N/A	N/A	N/A	61,716
Subtotal - Bellevue		69,126	51,5076,248	141,661	485,538
Covington					
Washington National	C1	72,024	53,873,952	147,600	441,590
Cedar Heights Jr. High	C2	9,876	7,387,248	20,239	60,551
Kentwood High School	C3	5,968	4,464,064	12,230	36,591
Kentlake High School	C4	5,124	3,832,752	10,501	31,416
Covington Medical Park	C5	4,704	3,518,592	9,640	28,841
Tahoma school district #4	C6	3,554	2,658,392	7,283	21,790
Glacier Park Elementary	C7	3,336	2,495,328	6,837	20,454
Crestwood Elementary	C8	3,289	2,460,172	6,740	20,165
Mattson Jr. High	C9	2,922	2,185,656	5,988	17,915
Jenkins Creek Elementary	C10	2,480	1,855,040	5,082	15,205
Covington Retail Assoc.	C11	2,474	1,850,552	5,070	15,168
Chevron - Carwash	C12	2,242	1,677,016	4,595	4,595
Remington Homeowners Assoc.	C13	1,861	1,392,028	3,814	11,410
Sawyer Woods Elementary	C14	1,771	1,324,708	3,629	10,858
Covington Apartments LLC	C15	1,632	1,220,736	3,344	10,006
King County Library System	C16	1,511	1,130,228	3,097	9,264
Cedar Valley Elementary	C17	1,416	1,059,168	2,902	8,682
Fred Meyer	C18	1,337	1,000,076	2,740	8,197
Covington Square N.E.	C19	1,075	804,100	2,203	6,591
Rock Creek Elementary	C20	1,064	795,872	2,180	6,524
Subtotal - Covington		129,660	96,985,680	265,714	785,813
Issaquah					
Port Blakely Communities	I1	13,716	10,259,568	28,108	84,095
Talus Residential Property	I2	4,645	3,474,460	9,519	28,479
Darigold	I3	50,000	37,400,000	102,466	102,466
Subtotal - Issaquah		68,361	51,134,028	140,093	215,040
Kirkland					
Lake Washington Technical College	K1	3,682	2,754,136	7,546	22,575
Rose Hill Car Wash	K2	3,657	2,735,436	7,494	7,494
Carillon Properties	K3	14,194	10,617,112	29,088	87,026
Costco	K4	5,725	4,282,300	11,732	35,101
Subtotal - Kirkland		27,258	20,388,984	55,860	152,196
Redmond					
Marymoor Park	R1	ND	ND	ND	1,100,000
TTM Technologies	R2	49,834	37,275,832	102,126	305,540
Genie Industries	R3	27,631	20,667,988	56,625	169,410
Willows Run Golf Course ⁽⁹⁾	R4	NA	NA	NA	320,000
Trilogy Golf Course	R5	45,165	33,783,420	92,557	276,913
Honeywell International	R6	23,492	17,572,016	48,143	144,033
Microsoft	R7	284,811	213,038,628	583,667	1,746,218
Nintendo	R8	10,982	8,214,536	22,506	67,332
Subtotal - Redmond		441,915	330,552,420	905,623	4,129,446

**Table 6.1 Summary of Existing Sites with Potential for Reclaimed Water Application (1)
(cont.)**

Customer	Map Key (see Fig 6.1-6.3)	2003 Total Consumption (ccf) ⁽²⁾	2003 Total Consumption (gal) ⁽³⁾	2003 Average Day Demand (gpd) ⁽⁴⁾	2003 Peak Season Demand (gpd) ⁽⁵⁾
Sammamish Plateau					
Issaquah School District, Skyline	P1	5,316	3,976,368	10,894	32,593
Inglewood Junior High	P2	5,289	3,956,172	10,839	32,428
Timbers 3169, Simpson Housing	P3	4,644	3,473,712	9,517	28,473
Beaver Lake Ballfields	P4	4,238	3,170,024	8,685	25,984
East Sammamish Park	P5	3,318	2,481,864	6,800	20,343
Subtotal - Sammamish Plateau		22,805	17,058,140	46,735	139,821
Skyway					
King County Parks	S1	2,371	1,773,508	4,859	14,537
The Lakeshore	S2	2,290	1,712,920	4,693	14,040
Campbell Hill Elementary	S3	1,822	1,362,856	3,734	11,171
Dimmitt Middle School	S4	1,698	1,270,104	3,480	10,411
Bryn Mawr Elementary	S5	1,051	786,148	2,154	6,444
Subtotal - Skyway		9,232	6,905,536	18,919	56,603
Tukwila					
Fort Dent Park (6)	T1	ND	ND	ND	20,000
Foster Golf Links (7)	T2	ND	ND	ND	100,000
Seattle Rendering Plant (8)	T3	ND	ND	ND	60,000
Jorgesen Forge	T4	8,927	6,677,396	18,294	54,733
Boeing PSAM 12-0380	T5	19,770	14,787,960	40,515	121,213
Boeing PSAM 12-0370	T6	18,148	13,574,704	37,191	111,268
Fairway Center Office Park	T7	ND	ND	ND	ND
A.K. Pacific Erect Inc.	T8	ND	ND	ND	ND
Eriks West	T9	ND	ND	ND	ND
Towne and Country Suites	T10	ND	ND	ND	ND
Subtotal - Tukwila		46,845	35,040,060	96,000	467,214

Notes:

ND = No Data Provided or Available; NA = Not Applicable

- These sites represent either planned opportunities (where specifically noted) or potential opportunities based on analysis of the largest current irrigation and industrial water customers for each purveyor.
- From Cascade Member billing records, except where noted.
- Converted from ccf to gpd.
- Annual amount divided by 365 days per year.
- Converted from annual amount to average day demand during peak season. The following assumptions are made:
Irrigation sites - Peak season use only. Peak season assumed to be 122 days (4 months) long.
Industrial sites - Annual use divided by 365 days (full year).
- Currently served customer.
- Tukwila plans to provide reclaimed water to the golf course by 2010. The use of reclaimed water by the golf course will help offset demand from its water right on the Green River. As this will not reduce Tukwila's potable water demand, the amount associated with the golf course is not included in the reclaimed water demand forecast presented in Table 6.3.
- Tukwila plans to provide reclaimed water to the rendering plant by 2010.
- Willows Run Golf Course obtains some water from Redmond, though a majority of irrigation water used is obtained from its own Sammamish River supply.
The peak season demand shown here is obtained from the Brightwater Final Environmental Impact Statement – Appendix 3-D, Reclaimed Water Technology Review and Evaluation of Potential Water Reuse Opportunities (September 2003).
- Bellevue Municipal Golf Course obtains irrigation from a City-owned well that has a 100 gpm instantaneous water. No meter records were available for review. Therefore, peak season demand is assumed to be equal to that of Tam O'Shanter Golf Course, for purposes of this analysis

Potential Opportunities with Self-Supplied Water Users

A review of self-supplied water users located within Cascade Members' service areas was also conducted for the 2004 TSP to determine if there are large irrigation or industrial water uses not

presently served by Cascade that might benefit from use of reclaimed water. This is of interest to King County because of the possibility of reducing well withdrawals that might have local impacts on nearby streams. There may be an opportunity for Cascade Members to convey and deliver reclaimed water to new customers currently obtaining water from their own sources of supply.

To investigate the reclaimed water potential associated with self-supplied water users, an analysis of water right information was performed. Data contained within the Department of Ecology’s Water Rights Application Tracking System (WRATS) database were reviewed for the areas served by Cascade Members. Only those irrigation and industrial water rights translating to potential water uses of 50,000 gpd or greater were considered. For landscape irrigation, this translates to water rights with instantaneous quantities greater than 100 gallons per minute (gpm) for groundwater rights and 0.23 cubic feet per second (cfs) for surface water rights, assuming maximum daily pumping/diversion times of 8 hours. In terms of industrial water rights, which are typically exercised year-round, this translates to an annual water right quantity of 56 acre-feet or greater.

Based upon the above criteria, the water rights review revealed that there are 41 records associated with irrigation water rights having points of diversion/withdrawal within Cascade Members’ service areas. Thirty of these are surface water rights, with an associated total instantaneous quantity of 17.77 cfs. The remaining 11 rights are groundwater rights with an associated total instantaneous quantity of 4,112 gpm. In addition, there are water rights of 4.0 cfs and 160 gpm associated with a golf course located outside of, but adjacent to, the service area boundary of the Sammamish Plateau Water and Sewer District.

The review also indicated that there are 14 commercial/industrial water rights located within the area of interest. One of these is a surface water right for 5.2 cfs, while the others are groundwater rights with an associated total instantaneous quantity of 5,820 gpm.

For clarity purposes, only the largest of the identified self-supplied users are depicted on Figure 6.1. This includes surface water rights greater than 1.0 cfs, and groundwater rights greater than 500 gpm. Also included are four golf courses located within the Covington service area.

Although these sites did not meet the criteria described above for mapping, they are included because they may become pertinent to the satellite reuse program that Covington is considering.

Table 6.2 provides information regarding those sites depicted on Figures 6.1 to 6.3.

Table 6.2 Summary of Largest Currently Self-Supplied Water Users Located Within Cascade Member Service Areas		
<i>Surface Water Rights ⁽¹⁾</i>		
Map Key (see Fig 6.1-6.3)	Name of Water Right Holder	Qi (cfs) ⁽²⁾
A	King County Dept. of Natural Resources	5.2
B	Private Landowner (irrigation)	1.1
C	Private Landowner (irrigation)	1.0
D	Private Landowner (irrigation)	1.0
E	Private Landowner (irrigation)	1.0
F	Dickey Farms, Inc.	1.0
G	Private Landowner (irrigation)	1.0
<i>Groundwater Rights ⁽¹⁾</i>		

Map Key (see Figure 6.1-6.3)	Name of Water Right Holder	Qi (gpm) ⁽²⁾
H	Consolidated Dairy	1,100
I	Cadman Gravel Co.	1,000
J	Lakeside Gravel	1,500
K	Issaquah Creamery	500
L	United Control Corp.	1,000
M	Willows Run Golf Course ⁽³⁾	715
N	Sunset Hills Memorial Park	500
<i>Self-Supplied Golf Courses Located within Covington Service Area ⁽⁴⁾</i>		
Map Key (see Figure 6.3)	Name of Golf Course	Qi (gpm)
O	Jade Green	N/A
P	Druids Glen	N/A
Q	Elk Run	N/A
R	Lake Wilderness	N/A

Notes:

1. Based on analysis of water right information, as obtained from Department of Ecology's Water Rights Application Tracking System (WRATS), November 2004.
2. Qi = Maximum allowed withdrawal on an instantaneous basis. Only those water rights having Qi greater than or equal to 1.0 cfs (for surface water) or 500 gpm (for groundwater) are shown.
3. This site is shown on Figure 6.1 as item R4 (see Table 6.1), as the site also receives water from Redmond.
4. Information provided by Covington.



Transmission and Supply Plan



July 2012



In association with

CDM

5. Long-term Sources of Supply

For the 2010 TSP Update, Cascade reviewed a wide range of potential water supply sources to meet the needs of its Members through at least the next 50 years. This chapter summarizes how this review was performed and identifies Cascade’s preferred portfolio of water supplies to meet future needs to at least 2060.

5.1. Source Analysis Overview

The supply alternatives analysis was performed in stages, starting with a lengthy list of potential water supply sources and narrowing them to a preferred “portfolio” of supplies. Steps in the process are shown in Figure 5.1.

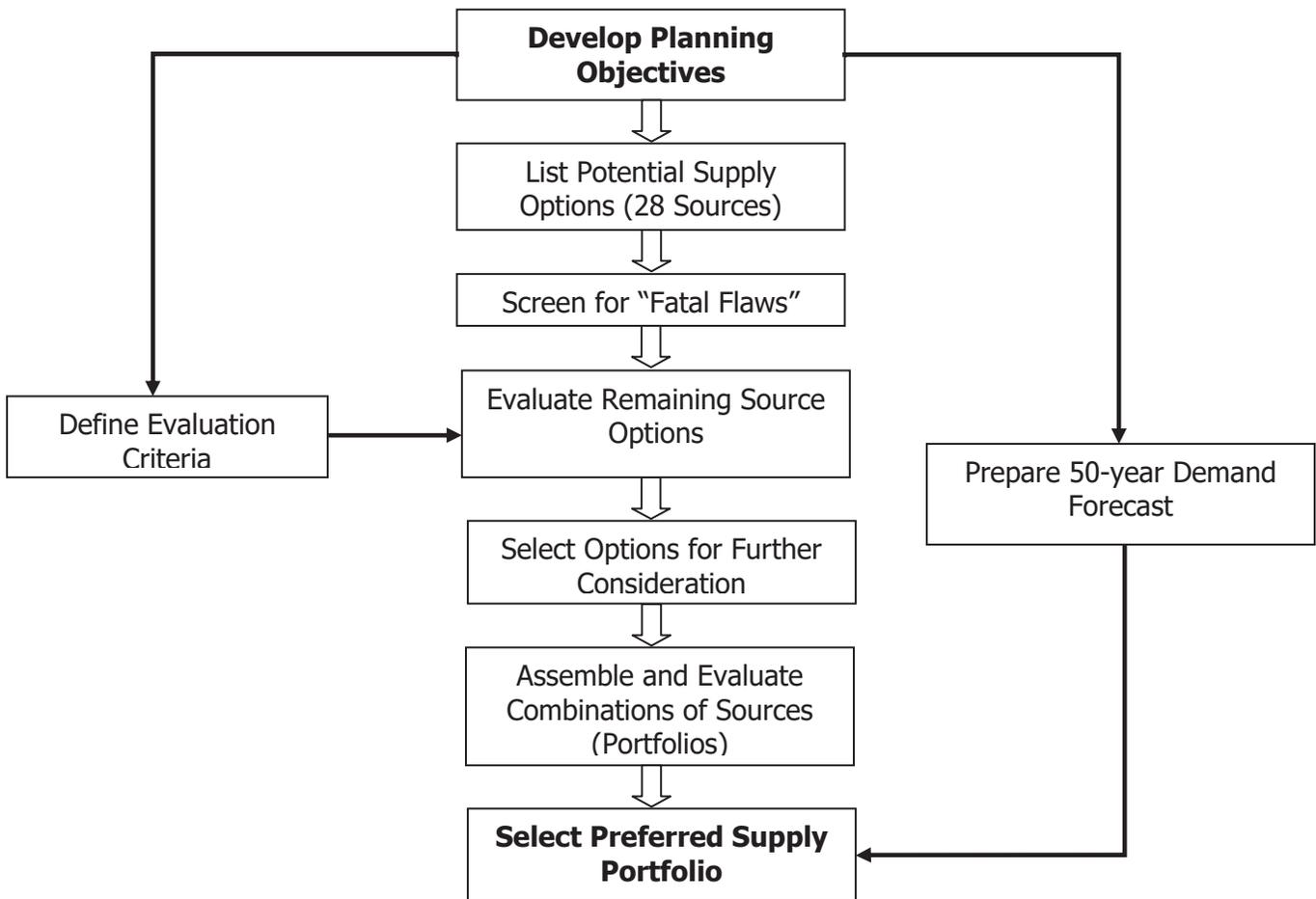


Figure 5.1: Source Analysis Overview

Cascade used the process described above to identify a combination of supplies for the period 2010 to 2060. Cascade reviewed data and results at each step with a stakeholder group formed to provide external input on the process. Information on the Cascade Connections Working Group is included in Appendix F.

Further information on the source analysis process and the specific sources selected is presented in the subsections that follow. Additional documentation of the source analysis is presented in two technical memoranda prepared for Cascade:

- *Supply Alternatives Assessment, Task 700*, December 2009 (CDM)
- *Supply Portfolio Analysis*, June 2010 (HDR)

5.2. Planning Objectives

Cascade held a Planning Objectives Workshop in February 2009. Participants included Cascade Board Members, Cascade Member staff, Cascade staff, and consultants. The following list of objectives was developed to guide the long-range planning process for the 2010 TSP:

- The TSP should identify a viable portfolio of water sources that can provide Cascade with secure and reliable supplies through at least 2050. A broad range of supply alternatives and project partnerships should be considered.
- The TSP should identify adequate supplies to at least serve the eight current Members of Cascade. It should also consider how investments in supply and infrastructure could serve additional water systems seeking new or replacement supplies and how these investments could improve reliability of supplies in the Central Puget Sound Region (King, Pierce and Snohomish Counties).
- The TSP should enable water rates to be managed at levels acceptable to water customers over the short and long terms.
- The TSP should provide flexibility to Cascade to adjust to changing circumstances or new opportunities. To this end, smaller supply projects, interim supplies, and phased development of larger supplies should be considered in the mix of source alternatives.
- The TSP should recognize the drop in current, contracted supplies at year 2024 and should outline a clear and viable path toward addressing Cascade's needs at that time.
- The plan should apply clear criteria and rationale for recommended actions. It should provide a sound basis for communication with elected officials, regulators, and water resource stakeholders in the Central Puget Sound Region.

These objectives guided decisions throughout the planning process. In addition, they served as the basis of a detailed set of criteria used to evaluate individual water supply options (see Section 5.4).

5.3. Identification and Screening of Potential Supply Sources

Several regional water studies have been carried out in the Central Puget Sound Region over the past 20 years. Cascade and its Members have participated in these studies and are familiar

with the range of water supply and management alternatives considered. An initial list of potential water supply options was developed based on the following sources:

- *Central Puget Sound Regional Water Supply Outlook (2009).*
- *East King County Coordinated Water System Plan (1996).*

Additional supply options were identified in workshops involving Cascade Members, Cascade staff, and the consulting team for the TSP. The resulting list of supply options considered in the initial screening step is shown in Table 5.1. Details on each option are presented in the Technical Memorandum *Supply Alternatives Assessment, Task 700* (December 2009).

Table 5.1: Initial List of Potential Water Supply Options

Existing Source Management	New Surface Water Options	New Ground Water Options	Reclaimed Water and Conservation
Tacoma “Light” TCP w/ Wheeling TCP w/ North Segment TCP Expanded SPU Expanded Block	Lake Tapps North Fork Tolt Everett- Sultan River Supply Expansion SRRWA – Snohomish River Supply Lake Washington Lake Sammamish Off-Stream Storage – Sammamish, Green River, Issaquah Creek Desalination	Chambers Creek Wells Snoqualmie Aquifer Deep Resource Aquifer Withdrawal (DRAW) OASIS Phases 1 & 2 OASIS Phase 3 Cascade Member ASR	Brightwater Reclaimed Water, South Segment South Treatment Plant Reclaimed Water, Tukwila Satellite Treatment Plants Reclaimed Water, King County Direct Potable Use of Reclaimed Water, Brightwater Enhanced Cascade Conservation 2 Stormwater Capture, Satellite Package Plants Rainwater Collection for golf courses Reduction in Regional Unaccounted-for-Water

ASR = Aquifer Storage and Recovery
OASIS = Lakehaven Utility District ASR Project
SPU = Seattle Public Utilities
SRRWA = Snohomish River Regional Water Authority
TCP = Tacoma-Cascade Pipeline

Six “fatal flaw” criteria were identified to eliminate any options that were clearly infeasible for Cascade to develop as regional sources. Failure on any one of these criteria led to removal of the option from further consideration. These criteria included the following:

- legal complications
- permitting/institutional complications
- water rights
- public acceptance
- quantity of supply yield (one million gallon per day threshold)

- location of supply (Sources outside Pierce, King and Snohomish County were not considered.)

Based on the fatal flaw criteria, eight sources were eliminated, as follows:

- North Fork Tolt
- Everett-Sultan River Supply Expansion
- Lake Sammamish
- Off-stream Storage
- OASIS Phases 1 and 2
- South Treatment Plant Reclaimed Water
- Rainwater Collection
- Reduction in Regional Unaccounted-for Water

Elimination of projects for purposes of the TSP does not mean these projects are not viable for local purposes or for development by other parties. For example, Tukwila uses reclaimed water from the South Treatment Plant, and either Tukwila or other water systems could expand local uses of that supply in the future.

5.4. Multi-criteria Evaluation of Supply Sources

The next step in the process was to further define and evaluate each of the remaining 20 supply options. Each of these projects is described in detail in the Technical Memorandum: *Supply Alternatives Assessment, Task 700*, December 2009 (CDM). The technical memorandum also provides details of the evaluation process.

Six criteria were defined to evaluate and compare the 20 source options. These criteria were developed at workshops with Cascade Members and staff held in March and April 2009. Each criterion was weighted so that more important criteria would have more influence in the evaluation. The criteria and weights are listed below:

- Financial considerations (26%)
- Supply reliability (weight: 22%)
- Operational considerations (18%)
- Environmental Considerations (16%)
- Implementation considerations (10%)
- Regional/intergovernmental considerations (8%)

The criteria were also discussed with the Cascade Connections stakeholder group that met periodically to provide input to Cascade’s planning process. A separate weighting exercise was held with this group. Criteria weights assigned by the stakeholder group were similar to those assigned by Cascade.

Each criterion was further broken down into sub-criteria. For example, the reliability criterion was broken down into three sub-criteria: 1) availability of the supply; 2) variability of yield; and 3) vulnerability to emergency disruptions. All 20 sources considered in this step were then “scored” based on performance metrics defined for each sub-criterion.

Figure 5.2 displays the results of this procedure, using weighted scores from the highest ranked projects at the top to the lowest ranked projects at the bottom. The letters “I” and “P” designate interim supplies and permanent supplies, respectively. Water supply quantities shown are

expressed in million gallons per day (mgd) and represent approximate peak yield. Colors on the bars represent the weighted contribution from each major criterion.

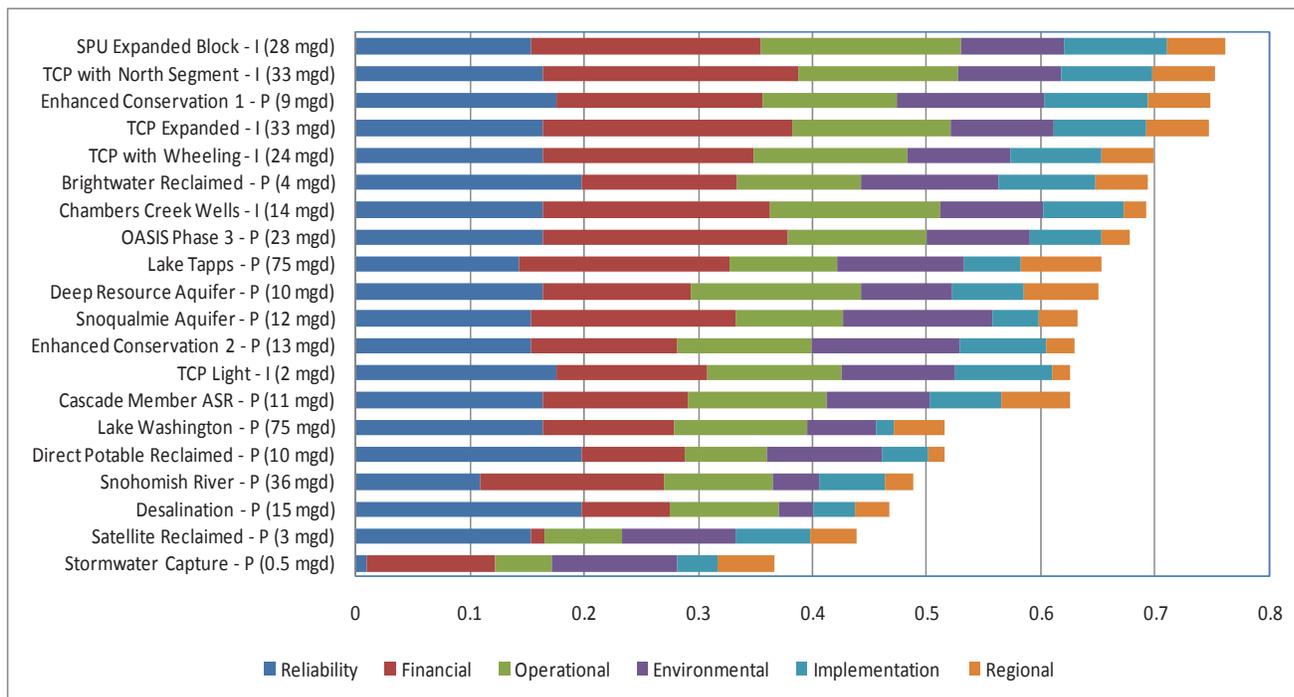


Figure 5.2: Results of Multi-criteria Evaluation

After reviewing the results of the multi-criteria analysis, the Cascade Resource Management Committee selected 11 of the 20 options for further consideration. However, three options representing water supply from Tacoma (TCP with wheeling, TCP north segment, and TCP expanded) were consolidated into a single option. The two options involving enhanced conservation by Cascade were also consolidated into a single option. This resulted in eight options carried forward into the next stage, as listed in Table 5.2.

Table 5.2: Water Supply Options Considered for Supply Portfolios

Existing Source Management	New Surface Water Options	New Ground Water Options	Reclaimed Water and Conservation
TPU Contract Supply* SPU Expanded Block	Lake Tapps	Deep Resource Aquifer Withdrawal OASIS Phase 3 Cascade Member ASR	Brightwater Reclaimed Water, South Segment Enhanced Cascade Conservation

* Includes alternative pipeline routes, wheeling, and/or a variation involving Covington Water District’s share in the Tacoma Second Supply Project.

5.5. Development of Supply Portfolios

The next step of the supply evaluation was to examine how different water supplies could be combined into “portfolios” that could be developed in stages over a period of time to supply the projected needs of Cascade Members. The planning objectives described in Section 5.2 were

used to guide portfolio development. The portfolios include existing, developed sources of supply as well as the potential new supplies listed in Table 5.2.

A water demand forecast was prepared as described in Chapter 4 of this TSP. The demand curves were used to establish a range for the quantity of supply that will be needed year-by-year over the 50-year planning period.

Considerations used in assembling supply portfolios are listed below:

- Cascade’s current Block Contract with SPU calls for the available supply to be reduced, in several stages between 2024 and 2045.
- Because of uncertainty in the long-term demand forecast, it is advantageous to include options that can delay the need for expensive infrastructure. Use of contracted supplies from one or a combination of sources (i.e., SPU, TPU, Covington Water District) can potentially make maximum use of existing regional supplies and infrastructure and reduce the need for new investments.
- At the same time, the White River - Lake Tapps Reservoir Project (Lake Tapps Project) provides a valuable future source of supply to Cascade and the region. If contracted supplies can be expanded in the future, Lake Tapps can serve as a long-term backstop supply for Cascade or its supply partners, or both. If contracted supplies cannot be increased at an economical cost, Lake Tapps can be used to supply Cascade’s needs. Regional backstop supply will be particularly important in the event that climate change reduces water supplies that originate from the Cascade mountain range (SPU’s Cedar and Tolt River sources and TPU’s Green River source).
- Construction of one or more north-south transmission pipelines linking the Tacoma and Seattle regional supplies offers advantages not only to Cascade, but to both of these systems and their wholesale customers. A north-south link allowing water to flow in either direction could enhance reliability of the regional water supply system. These links would be constructed to deliver the Tacoma/Covington contract supplies and Lake Tapps Project supply.
- Of the larger sources of supply considered, the OASIS ASR project (Phase 3) appears less certain and more complex for Cascade participation. Therefore, OASIS was not built directly into the portfolios. However, this source remains a potentially viable supply option (in partnership with the project sponsor, Lakehaven Utility District) that could be substituted for another option.
- Four of the supply sources appear potentially viable yet are relatively small in terms of supply quantities available. These are: deep aquifer, Member ASR, reclaimed water, and enhanced conservation. Each of these sources also involves uncertainties and challenges for implementation. At the same time, the quantities of water available from these sources are highly flexible, and they can be developed more rapidly than large supplies requiring major infrastructure. For portfolio development, Cascade combined these supplies into a “small sources” category. While not directly included in the final portfolio, Cascade views the small sources as a menu of options that can provide additional flexibility if needed and can be activated in the event demands rise more rapidly than expected at any point during the planning period.

Cascade experimented with a variety of alternative portfolios. Three portfolios were reviewed and compared in a Technical Memorandum: *Supply Portfolio Analysis*, June 2010 (HDR). Briefly, these three portfolios are described below:

Portfolio 2: Extension of the top block of SPU-contracted supply through 2030, activation of the Lake Tapps Project at 2030, and activation of small sources at 2055. (One variation of this portfolio also includes participation in Lakehaven's OASIS project [Phase 3] after 2060.)

Portfolio 4: Activation of supply from TPU (and Covington Water District) at 2030, delaying the need for the Lake Tapps Project until 2045. Small sources used to fill supply gaps beginning in 2040 (or as needed at any time).

Portfolio 5: Similar to Portfolio 4, but with additional extension of SPU supplies to defer the need for the Lake Tapps Project beyond 2060. This portfolio would also involve greater reliance on the menu of small sources.

The June 2010 Technical Memorandum presents appraisal-level cost estimates and results of a risk assessment for these three portfolios. In addition, the multi-criteria evaluation procedure described in Section 5.4 was applied to the three portfolios. The three portfolios received similar scores under the various criteria except for the financial criterion. The financial criterion ranked Portfolio 5 highest, then Portfolio 4, then Portfolio 3. This reflects the increased financial burden by constructing major infrastructure associated with the Lake Tapps Project, as opposed to deferring those costs by many years. Results were discussed in workshops and meetings held in 2010 with Cascade Members. Results were also discussed with the Cascade Connections Outreach Group.

5.6. Preferred Supply Portfolio

Cascade held extensive discussions with SPU and TPU aimed at increasing use of contracted supplies in a manner similar to Portfolios 2 and 4. However, at the time the Transmission and Supply Plan was prepared, these discussions had not led to updated agreements. While supply expansion from these sources remains a possibility for the future, Cascade determined the current TSP should treat existing contracts with SPU and TPU as fixed quantities.

Based on this outcome and the supply evaluation discussed earlier in this chapter, Cascade determined that the portfolio shown in Figures 5.3 and 5.4 (for maximum week and average day conditions, respectively) offers the best balance between supply and fiscal objectives, consistent with the planning objectives listed in Section 5.2. This preferred portfolio is similar to Portfolio 4 discussed above, though it does not include expanded use of water supply from SPU.

Figure 7.1 (see Chapter 7) displays the location of the larger supply elements included in this supply portfolio. More detailed information on the supplies and demands shown in Figures 5.3 and 5.4 is included in Appendix G.

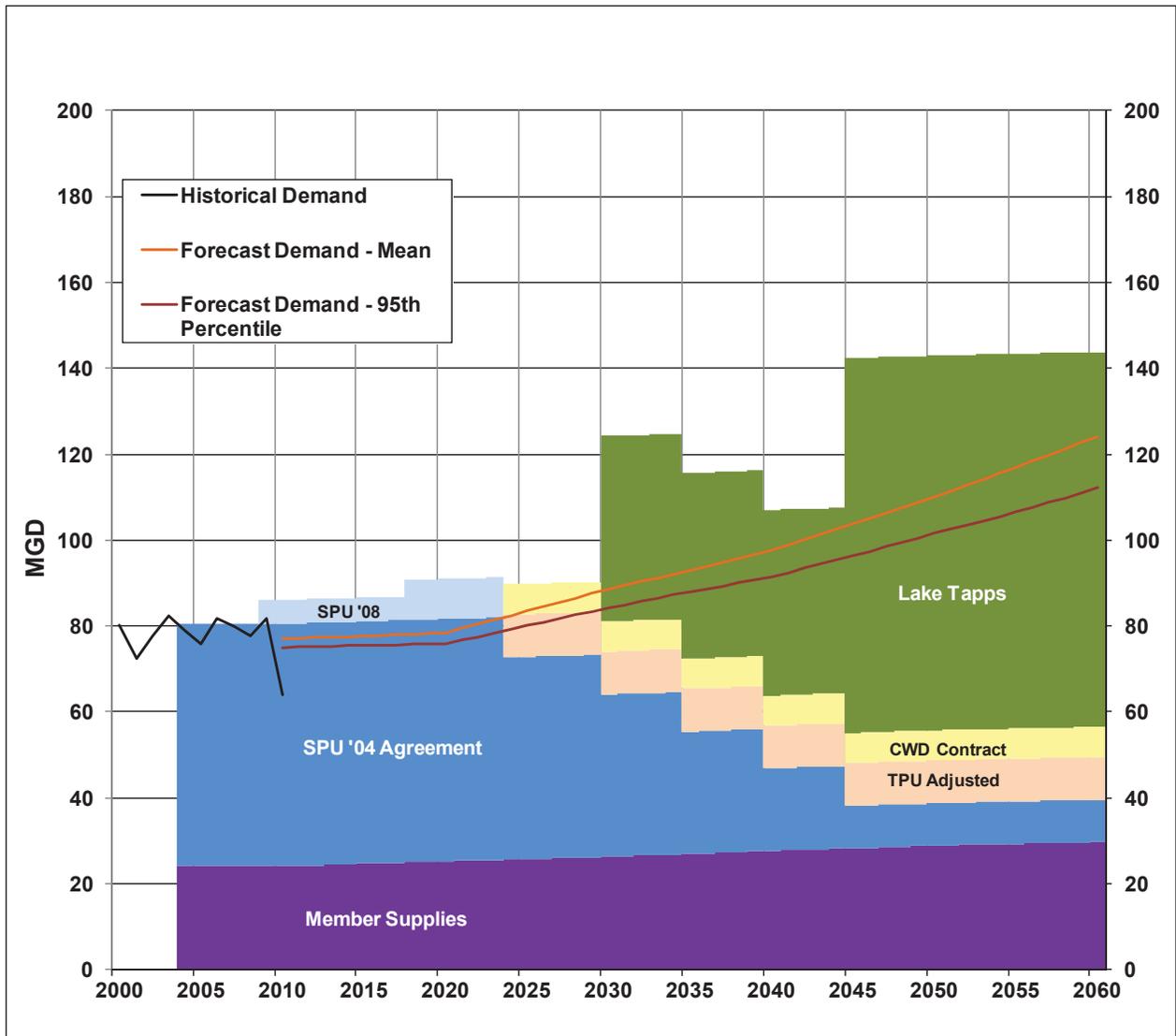


Figure 5.3: Cascade Supply Portfolio (Maximum Week Conditions)

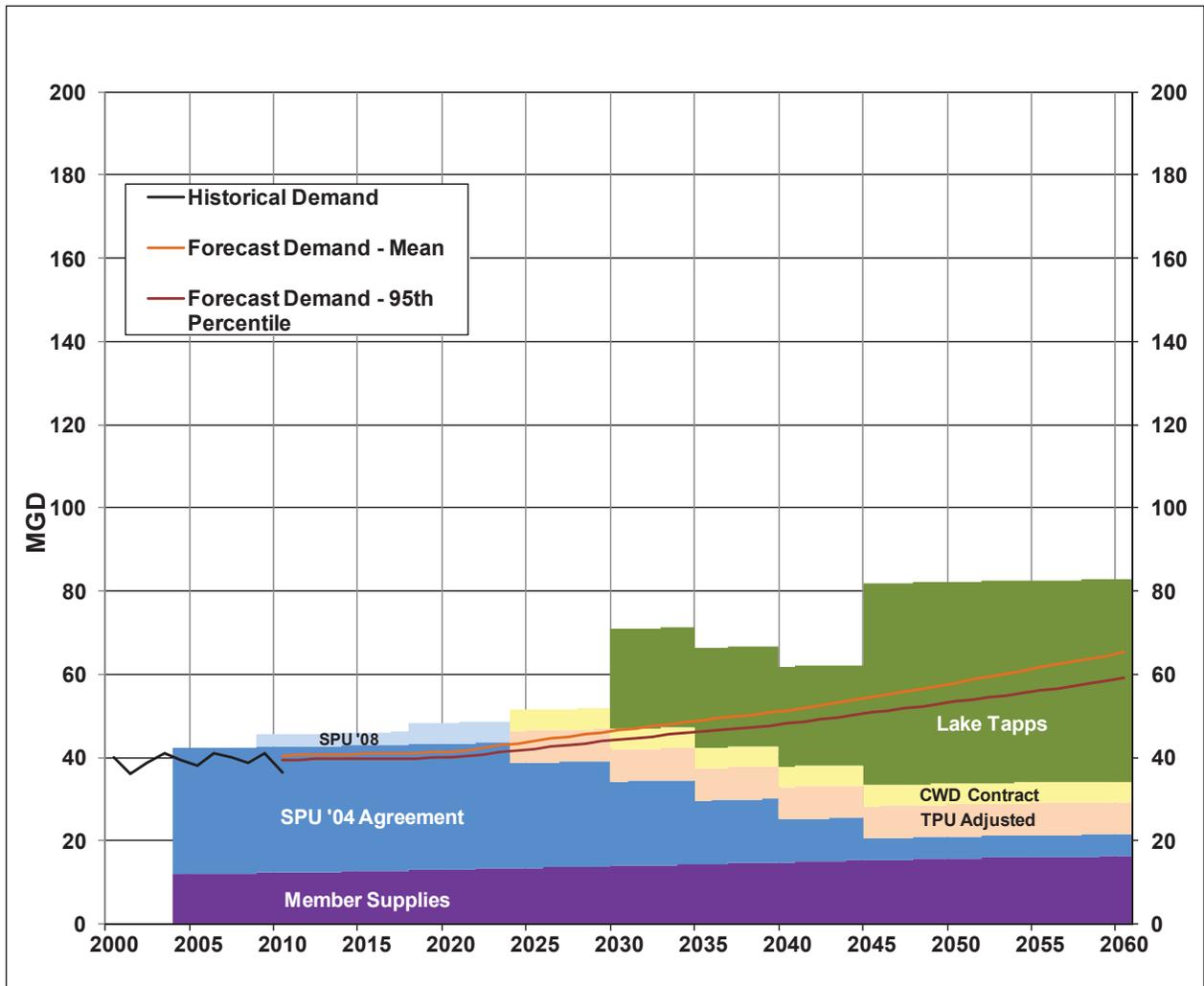


Figure 5.4: Cascade Supply Portfolio (Average Day Conditions)

Table 5.3 lists the various supply agreements that Cascade has with other water suppliers in the region to meet the long-term needs of Cascade Members.

Table 5.3: Agreements Affecting Future Water Supplies

Document	Date	Location
50-Year Declining Block Water Supply Agreement between the City of Seattle (SPU) and the Cascade Water Alliance	December 2008	Appendix B
Agreement for the Sale of Wholesale Water between the City of Tacoma, Department of Utilities, Water Division (TPU), and the Cascade Water Alliance	October 2005	Appendix H
Member Water Audits (Covington, Issaquah, Redmond, Sammamish Plateau, Skyway)	May 2008	Cascade Files
Lake Tapps Area Water Resources Agreement, with Auburn, Bonney Lake, Buckley and Sumner (Four Cities Agreement)	February 2010	Cascade Files

The exact quantities and timing of each supply may change, as supply investments will be made in stages based on actual growth in Cascade Member water demands over the coming decades. Cascade’s supply planning principles call for maintaining a high degree of flexibility to match new supplies with water needs as economically as possible. For example, Cascade anticipates renewed discussions with SPU and TPU from time to time regarding possible expansion of contracted supplies in the future. It appears that both suppliers will have surplus supplies available for several decades, and access to these supplies on mutually-agreeable terms could potentially delay construction of the Tacoma-Cascade Pipeline or the Lake Tapps Project, or both, while reducing costs for all parties involved. Therefore, Cascade expects to review and optimize this portfolio each time the TSP is updated at six-year intervals.

The preferred supply portfolio includes the following sources:

- Continued production from Member supplies serving their respective service areas. (Five Cascade Members have their own sources of groundwater or contracted surface water supply).
- Continued use of water from SPU under the 2004 Block Contract, as amended in 2008.
- Beginning in 2024, Cascade’s initial use of Green River supply from the contract with TPU.
- Beginning in 2024, Cascade’s initial use of additional Green River supply from Covington Water District’s share in the Regional Water Supply System (RWSS)¹ over and above water used within the District’s own service area. A contract between Cascade and the District is under discussion to make this supply available.
- Water from the Lake Tapps Project, to be developed in the future using Cascade’s water rights for Lake Tapps and the White River (see Chapter 6). The exact timing of this source will depend on growth in demand and any future increases in contracted supplies from SPU, TPU, and Covington contracted supplies.

Additional flexibility in the supply portfolio will be developed, if needed, from alternative sources such as further enhanced conservation, reclaimed water, deep groundwater supplies, aquifer storage, and recovery projects within Member service areas. These sources are collectively referred to as “small sources” in the Cascade supply planning process.

These sources are described in greater detail in the subsections below.

As discussed in Section 4.4, demand conditions have shifted in the Puget Sound region in recent years. After decades of rapid growth in population and water needs, all of the regional water suppliers in the Central Puget Sound area have experienced flat or even reduced demands during the past several years. For supply planning, this means that the risk equation has changed; in the past, suppliers in the region faced the risk of growth outpacing supply but today an equally critical risk is that new water supply projects may be built too soon and burden ratepayers with unnecessary costs.

Since the region as a whole currently appears to have an excess of supply, Cascade will continue to seek partnerships among regional water suppliers to use existing supplies and infrastructure for as long as possible. SPU and TPU currently have supplies that exceed their

¹ The RWSS was formerly known as the Tacoma Second Supply Project, or TSSP.

existing and near-term forecasted demands. During 2010 and 2011, Cascade actively engaged with both of these regional suppliers to discuss possible expansions or extensions of existing supply contracts. While mutually-acceptable terms and conditions have not yet been identified, Cascade anticipates returning to these discussions periodically in the future. If regional demand remains flat or grows only slowly, it may be possible to delay some of the projects that Cascade has shown in its supply portfolio, thereby spreading costs over a longer time and reducing rate impacts to Cascade Members.

5.6.1. Member Independent Supplies

In order to provide a complete picture of the supplies serving Cascade Members, the preferred portfolio includes supplies owned and operated by five of the eight Cascade Members (the other three Members meet all of their drinking water needs with Cascade supplies). These include groundwater supplies owned by Covington Water District, the City of Issaquah, the City of Redmond, Sammamish Plateau Water and Sewer District, and Skyway Water and Sewer District, as well as a share in the RWSS held by Covington Water District. Information on Member independent supplies is provided in Section 2.4 of this TSP. The quantities of supply projected are based on Independent Supply Audits issued by Cascade in 2008.

For purposes of the TSP, Covington's RWSS supply is partly included in the Member independent supplies category and partly in a separate category. The portion of the RWSS included as Member independent supply is the quantity needed to exactly serve Covington's projected growth in demand over time. The remaining water available to Covington from its share of the RWSS is shown separately as a source of supply that Cascade can contract from Covington. Because of this approach, the Member independent supplies appear to grow over time, while the Covington RWSS surplus supply appears to decline over time as more and more of the RWSS water is needed for Covington's own service area.

Other Member-specific factors also contribute to the gradual growth in the total quantity of their independent supplies from 2011 to 2060, and these factors are documented in the supply audits. Taking these factors and the Covington considerations into account, the total quantity of independent supplies rises from approximately 12 mgd in 2011 to 17 mgd in 2060 on an annual average basis. Supplies available to meet maximum week needs rise from 25 mgd to 33 mgd during the same time period.

More information on Members' independent supplies and associated water rights can be found in the Members' individual water system plans.

5.6.2. SPU Contracted Supply

As described in Section 2.1 of this TSP, Cascade has a contract with SPU for regional water supply, which is delivered to seven of Cascade's eight Members. The sources of this supply are SPU impoundments and treatment facilities on the Cedar and Tolt Rivers. Existing supplies are provided under the "Block Contract" executed in 2004, which is attached as Appendix B. Water supply quantities available under the Block Contract vary over time and are shown in Table 2.1 (see Chapter 2). These quantities are also displayed in Figure 5.3.

While developing the TSP, Cascade held extensive discussions with SPU regarding possible expansion of the supply quantity available to Cascade, or extension of the current "block" for a longer time period. At this time, neither of these options has been negotiated on terms

satisfactory to both parties. However, it appears that SPU will have surplus supply from its regional water supply system for many decades into the future. Cascade anticipates there may be renewed discussion of Block Contract modifications in the future, with an aim toward mutually-beneficial outcomes that make the best use of existing supply infrastructure. Specifically, this could offer the opportunity to delay construction of Cascade’s planned Tacoma-Cascade Pipeline (TCP) or Cascade’s planned water treatment plant and pipeline for the Lake Tapps Project, or both.

5.6.3. TPU-contracted Supply

Cascade and TPU executed an agreement for the Sale of Wholesale Water in October 2005, attached as Appendix H. The contract includes a permanent component and a reserved (temporary) component, as shown in Table 5.4.

Table 5.4: Contracted Supply from TPU

Time Period	Permanent Supply* (mgd)		Reserved Supply (mgd)		Total Supply (mgd)	
	Average Day	Maximum Week	Average Day	Maximum Week	Average Day	Maximum Week
2008-2026	4.0	5.32	6.0	7.98	10.0	13.3
2027	4.0	5.32	4.0	5.32	8.0	10.64
2028	4.0	5.32	3.0	3.99	7.0	9.31
2029	4.0	5.32	2.0	2.66	6.0	7.98
2030	4.0	5.32	1.0	1.33	5.0	6.65
2031 and beyond	4.0	5.32	0.0	0.0	4.0	5.32

mgd = million gallons per day

* Under the contract with TPU, “permanent” means until the date that Tacoma ceases making wholesale water sales to any water systems that resell water to end users.

At the time the 2004 TSP was prepared, Cascade anticipated rapid growth in its service area and a need to begin using the Tacoma supply as early as 2010. Since that time, growth has slowed sharply in the region and the annual growth in water use by Cascade Members has flattened out. Therefore, this updated TSP anticipates use of the TPU supply beginning in 2024 when supply under the SPU Block Contract begins to decline.

While developing the updated TSP, Cascade held extensive discussions with TPU regarding possible changes in the quantity and terms for supply available to Cascade. At this time, changes have not been negotiated on terms satisfactory to both parties. However, it appears that TPU will have surplus supply from its regional water supply system for many decades into the future. Cascade anticipates there may be renewed discussion of TPU contract modifications in the future, with an aim toward mutually-beneficial outcomes that make the best use of existing supply infrastructure. Specifically, this could offer the opportunity to delay construction of Cascade’s planned water treatment plant and pipeline for the Lake Tapps Project.

The existing contract includes a permanent component and a reserved (temporary) component. However, it also permits conversion of the reserved component to permanent status under

certain conditions. Currently, Cascade anticipates it will request conversion as permitted by the contract and that the necessary conditions will be fulfilled. These assumptions appear valid based on current information. Therefore, the portfolio chart shown in Figure 5.3 includes the conversion to permanent status. All of the TPU supply, whether reserved or permanent, is shown as a single block of supply.

The TPU contract permits Cascade to begin taking water deliveries from TPU at any time after October 2008. However, in order to use this supply, Cascade will need to construct a transmission pipeline from the RWSS pipeline north to the vicinity of SPU's Lake Youngs Reservoir (see Figure 7.1 in Chapter 7) and execute an agreement to convey water through SPU's water transmission system. (If an agreement cannot be negotiated, the pipeline would be built to Issaquah instead).

5.6.4. Four Cities Agreement

Cascade has an agreement with the Cities of Auburn, Bonney Lake, Buckley, and Sumner (collectively, the "Four Cities") regarding the availability of a portion of Cascade's TPU supply to meet these Cities' needs in the future. Each City has an allocation that it can purchase from Cascade. The total for all four cities combined is 4.54 mgd on an average day basis and 6.65 mgd on a maximum week basis. At this time, it is not certain how much of this allocation will actually be purchased by the Four Cities. Only Auburn and Bonney Lake have requested specific supplies from their allocation, and the Auburn request is for a temporary supply that would end in 2026. Since the quantities that will ultimately be needed are uncertain, the portfolio chart shown in Figure 5.3 assumes the Four Cities will use only 50 percent of their allocated amounts. This is reflected in a reduction in the TPU supply quantity available to Cascade (TPU supply available to Cascade is assumed to be reduced by 2.27 mgd on an average day basis and 3.33 mgd on a maximum week basis).

Cascade has also analyzed a scenario in which 100 percent of the Four Cities allocation is used by the cities. Under this scenario, Cascade will still have adequate supply, assuming the surplus supply shown as contracted from Covington Water District Cascade is available (see Section 5.6.5).

Cascade is not responsible for financing or constructing infrastructure needed for the Four Cities to access their allocations.

5.6.5. Covington Supply from RWSS

Covington Water District is a partner with TPU, the City of Kent, and Lakehaven Utility District in the Regional Water Supply System (RWSS) that delivers water from the Green River. Covington expects it will be many years before Covington fully utilizes this supply. In the interim, Covington has expressed willingness to allow Cascade to contract for Covington's surplus RWSS water for use by other Cascade Members. This water could be delivered to the other Members once the Tacoma-Cascade Pipeline is built.

Covington's share of the RWSS is 18.47 mgd on an instantaneous basis and 3,889 acre-feet annually. An agreement for Covington to supply Cascade with 5 mgd annual average and 7 mgd peak season is currently under discussion. The supply from this proposed agreement is included in the portfolio chart in Figure 5.3.

Based on Covington’s forecasted water needs, Cascade anticipates that a larger quantity (up to 14 mgd) of Covington’s surplus supply may be available for use by other Cascade Members to meet maximum week demands in 2024. This surplus will decline gradually to approximately 10 mgd by 2060 as Covington requires more of the water for customers within its own service area. Cascade anticipates continued discussion with Covington in future years regarding potential interim use of this surplus supply. For example, if the Four Cities require larger shares of their available allocation than currently anticipated, the additional Covington supply could be needed.

5.6.6. Lake Tapps Project

Cascade’s White River - Lake Tapps Reservoir Project is described in detail in Chapter 6 of this TSP. Cascade acquired Lake Tapps for future use as a municipal water supply. Water rights issued in December 2010 authorize Cascade to produce 87.25 mgd as a maximum quantity and 48.5 mgd as an annual average for municipal supply deliveries. This water right augments Cascade’s supplies to meet its Members’ long-range supply needs and also provides the opportunity to improve reliability of water supplies for the Central Puget Sound region as a whole, particularly in the context of climate change concerns.

Water from Lake Tapps is not currently used for municipal supply. Cascade plans to develop the necessary water treatment and delivery infrastructure in phases over time. The first phase will include construction of a water transmission line and partial development of water treatment capacity. Additional water treatment capacity will then be developed in a later phase of construction. The portfolio chart in Figure 5.3 reflects these assumptions. It shows Phase 1 of the Lake Tapps Project completed in 2030 and Phase 2 in 2045.

However, the ultimate phasing of Lake Tapps Project development will respond to the timing of Cascade needs, as determined by actual growth in demand as well as any increases in other supplies over time. Cascade will likely seek opportunities to delay construction of both phases of the Lake Tapps Project to spread the costs of infrastructure development over a longer period of time. For example, if the Four Cities take less than their nominal allotment, which seems likely, then a larger share of Cascade’s TPU contract supply will be available for use by Cascade. In addition, there may be opportunities to contract for additional supplies from both SPU and TPU in the future. These developments or lower growth in demand, or a combination of these factors, could delay the need for the Lake Tapps Project well beyond 2030.

For more information on the Lake Tapps Project, see Chapter 6.

5.6.7. Additional Supply Sources

Section 5.5 discussed considerations used in assembling a range of supply portfolios that led ultimately to the preferred portfolio. The following four small, potential sources appear potentially viable, yet are relatively small in terms of supply quantities available:

1. Reclaimed water from King County’s Brightwater Treatment Plant
2. Aquifer storage and recovery (ASR) projects that could be developed within Cascade Member service areas
3. Deep groundwater supplies that can potentially be accessed by wells within Member service areas

4. Enhanced water conservation programs to reduce consumption beyond levels achieved by the water conservation program embedded in Cascade's demand forecast.

Each of these sources involves uncertainties and challenges for implementation. At the same time, the quantities of water available from these sources are highly flexible, and they can be developed more rapidly than large supplies requiring major infrastructure. While not directly included in the final preferred portfolio, Cascade views these sources as a menu of options that can provide additional flexibility if needed and can potentially be activated in the event demands rise more rapidly than expected at any point during the planning period.

Information on each of these sources is summarized below. Additional information can be found in the Technical Memorandum: *Supply Alternatives Assessment, Task 700* (December 2009).

- **Reclaimed Water.** Reclaimed water is recycled municipal or industrial wastewater that has been treated to meet rigorous standards for reuse defined under Washington State regulations. Reclaimed water can be used for a variety of non-potable purposes, such as irrigation and industrial supply. King County's new Brightwater Treatment Plant will produce reclaimed water, and King County has been seeking communities able to use the water. King County pipelines will provide capacity to convey reclaimed water to the Sammamish River Valley, which passes through or near the water service areas of four Members of Cascade: the City of Redmond, City of Kirkland, City of Bellevue, and Sammamish Plateau Water and Sewer District.

Potential users of reclaimed water within those communities include parks, golf courses, and commercial sites with large irrigated landscapes. It is anticipated that reclaimed water supply from Brightwater to the Sammamish River Valley would be approximately 1.6 mgd on an average annual basis and 4.0 mgd during the summer irrigation season. Installation of local distribution piping would be needed to deliver the water from King County's pipeline to individual user sites.

Other options also exist to use water from King County's South Treatment Plant in Tukwila (where some of it is already used) or other communities, and to construct satellite plants to produce reclaimed water in outlying areas such as the Covington Water District. Cascade's 2004 Transmission and Supply Plan included an analysis of potential customer sites within Cascade Member service areas. That information is reproduced in Appendix D.

The primary obstacle to using reclaimed water in Cascade Member service areas is the cost of installing distribution mains. Reclaimed water distribution mains are often "redundant" in that they duplicate the function of water lines that deliver potable water supplies to the same customers. Since reclaimed water can be used only for limited purposes, and since the main use is irrigation that occurs only during the summer months, it is more costly on a per-unit basis to deliver reclaimed water than potable water. Despite these limitations, reclaimed water is viewed as a viable element of the "small sources" category for Cascade's future needs.

- **Member ASR Projects.** Western Washington typically receives abundant rainfall from November through June and experiences dry conditions from July through October. One way of managing water supplies in response to this natural pattern is to take water during the winter months and store it for the summer. Where geologic conditions are

favorable, one way to do this is to store the water in underground aquifers. Storing water in aquifers to be pumped and used later is called Aquifer Storage and Recovery (ASR). ASR is a relatively new approach to managing scarce water supplies.

One Cascade Member, Sammamish Plateau Water and Sewer District, has experimented with an ASR system. Another water system in King County, Lakehaven Utility District, has extensively studied ASR and plans to develop an ASR project known as OASIS. It is reasonable to expect that ASR could be viable in other areas within King County, including some additional locations within Cascade Member service areas. If suitable geologic conditions are present, the primary infrastructure requirement is installation of injection and recovery wells. (Sometimes existing supply wells can be retrofitted.) Substantial investigation is required to validate the feasibility of ASR at specific locations and to obtain the necessary permits.

The Supply Alternatives Assessment performed as part of the TSP project assumed that up to 11 mgd could be produced during the peak season using ASR within Member service areas (4.6 mgd annual average). This is based on extrapolation of the production quantity already developed in the Sammamish Plateau service area to the other seven Cascade Members. Water injected into aquifers could potentially come from one or a combination of sources such as SPU, TPU, and Lake Tapps. The viability of ASR in specific areas and the quantities that are feasible will require further study to demonstrate feasibility.

- **Deep Ground Water Resources.** The State of Washington has a series of regulations designed to protect streams and lakes from being depleted by new water uses. As a result, many surface water basins within the state are “closed” to further appropriations for municipal or other uses. New uses of groundwater are also difficult to get permitted, because pumping groundwater can reduce water available to streams and lakes.

The Central Puget Sound region has a productive, deep aquifer zone lying 300 feet to 500 feet below sea level. This is considerably deeper than most existing wells in the region. However, wells drilled on the Sammamish Plateau, and historically in Kirkland, Bellevue, Seattle, and Tukwila have penetrated this deep aquifer zone. Sammamish Plateau WSD taps this aquifer in 3 of its 12 production wells and one of these was permitted as recently as 1998.

Water flowing through this zone likely feeds Puget Sound directly, rather than supporting freshwater streams that require protection under State law. If this is correct, it is possible that Cascade Members could acquire State permits to utilize this deep aquifer zone. Further study would be needed to validate the concept. Where feasible and assuming permits are issued, wells could then be constructed at various locations within Cascade Member service areas.

The Supply Alternatives Assessment performed as part of the TSP project assumed that up to 10 mgd could be produced during the peak season (8 mgd annual average) from wells distributed across the eight Member service areas.

- **Enhanced Water Conservation.** Cascade and its Members administer water conservation programs to assist their customers in using water more efficiently. Assumptions regarding continued implementation of water conservation are built into Cascade’s demand forecast, as detailed in Chapters 3 and 4 of this TSP. However, it

may be possible to achieve even larger reductions in water use, if more aggressive programs were implemented in the future. This element is based on the “Enhanced Conservation - 2” option from the technical memorandum titled *Supply Alternatives Assessment, Task 700* (December 2008). Under this option, three modifications would be made to the conservation assumptions built into the demand forecast:

1. Customers would be required to use the highest-efficiency plumbing equipment available, exceeding current (2010) State plumbing code requirements. This may occur from future actions by the state or federal government, or could be mandated by each local jurisdiction in the Cascade Member service areas.
2. There would be restrictions on landscape design and materials to limit the need for water and to improve efficiency of irrigation systems.
3. Metering requirements and rate structures would be modified to enhance customer incentives to save water. For example, this could include requirements for installation of irrigation meters, sub-metering at apartment complexes, and rate structures based on “water budgets.”

The Supply Alternatives Assessment estimated that water saved by these actions could be up to 13 mgd during the peak season (8 mgd annual average), by full implementation at year 2060. This level of savings depends, in part, on the extent of population growth from 2010 to 2060.

Implementation of these enhanced conservation measures could not occur without actions taken by local governments within the Cascade Member service areas, and would be subject to considerable debate and discussion by the public. Therefore, there is considerable uncertainty regarding feasibility. However, it is likely that if needed, some degree of enhanced conservation savings above the levels built into the demand forecast could be achieved over the 50-year planning period.

Based on the assumptions used in the Supply Alternatives Analysis, all four small sources together could produce up to 38 mgd in the peak season (22 mgd annual average). However, there are considerable uncertainties associated with some of these sources and Cascade anticipates that actual, economically-viable production available from these supplies could be much lower, perhaps on the order of 20 to 30 percent of the nominal total. Cascade will continue to consider how use of one or more of the small sources could be combined with the preferred supply portfolio to provide increased flexibility in meeting water needs.

5.7. Supply Reliability

The preferred supply portfolio described in this chapter is expected to provide a high degree of reliability for Cascade and its Members. This is because the individual supply sources offer high reliability, plus the combination of multiple supplies will provide system redundancies in the event that one source becomes compromised due to emergency conditions.

5.7.1. Reliability of Future Cascade Supplies

Reliability characteristics of the individual Cascade supplies include the following:

- **Member supplies.** Five of the eight Cascade Members have independent supplies separate from Cascade's regional supply. Generally, these consist of groundwater sources. The Covington Water District also has access to a large surface water supply from the RWSS. These supplies and their reliability characteristics are described in the Members' respective water system plans. Groundwater supplies experience very different effects from surface water supplies under conditions that cause shortages. Moreover, local groundwater supplies do not depend on the extensive transmission system used for Cascade's existing surface water supply from SPU. It is very unlikely that emergency conditions would disrupt all of the groundwater sources for any one Member, let alone all five Members. Availability of the Member independent supplies, therefore, provides significant reliability benefits at least within the service areas of these five Members.
- **SPU Supply.** The SPU supply system includes two major surface water sources (Cedar and Tolt Rivers) in addition to a smaller groundwater resource. Treatment facilities and transmission pipelines deliver water to Cascade from both the Cedar and Tolt systems. SPU's 2007 Water System Plan discusses firm yield and supply reliability. The system can produce a firm yield of 171 mgd in 98 years out of 100. SPU's system-wide demand including Cascade and other wholesale customers has been less than 130 mgd over the past five years, meaning the likelihood of a source deficiency is extremely low. SPU has projected that future demands through at least 2060 will remain below firm yield (or beyond 2045 when accounting for high-end uncertainty in the SPU system-wide demand forecast). Cascade could be vulnerable to disruptions in SPU supply caused by emergency failures to SPU treatment facilities or transmission pipelines. SPU has contingency plans in place to repair damaged infrastructure. In addition, the SPU Water Shortage Contingency Plan and Cascade Shortage Management Plan are designed to enable both regional systems to respond appropriately in the event of a shortage caused by infrastructure failures.
- **TPU Supply.** Upon completion of the planned Tacoma-Cascade Pipeline (TCP), Cascade's regional supplies will be augmented by another major surface water source, TPU's Green River. This will further enhance reliability, both due to the source redundancy and the existence of separate treatment and transmission infrastructure. The addition of the TPU supply will coincide with reduction in supplies from SPU under the declining block structure of Cascade's supply agreement with SPU. This will greatly improve the diversity and balance of Cascade's supply, which is an important consideration in reliability.
- **Lake Tapps Supply.** Upon completion of the planned Lake Tapps Project, Cascade's regional supplies will again be augmented. As with the TPU supply, this will further enhance reliability by adding source redundancy and treatment and transmission infrastructure.

Even with a diverse and robust set of supplies, there will be risks of shortages due to a variety of events. As part of the supply source evaluation procedure described earlier in this chapter, Cascade carried out a risk assessment for the various sources and infrastructure elements included in the range of supply portfolios that were considered. The methods and results of this assessment are documented in the technical memorandum *Supply Portfolio Analysis* (June

2010). This included consideration of events that could impede development of Cascade's planned future supplies as well as events that could disrupt water supplies once they come on line. The risk assessment combined qualitative assessments of the probability and consequences of various events. Table 5.5 identifies the risk events that were considered to be the most significant, along with actions Cascade can take to mitigate negative consequences from these events.

Section 2-9 of this TSP discusses Cascade's Shortage Management Plan (see Appendix C) for supplies that currently provide municipal water supply to the Cascade service area. Whenever new supply sources are developed through implementation of the TSP, the SMP will be updated. In addition, Cascade has an Emergency Management Plan for Lake Tapps. At the time Cascade begins using Lake Tapps to provide municipal water supply, the Emergency Management Plan will also be updated to reflect the new use of this facility.

5.7.2. Enhancement of Reliability in the Central Puget Sound Region

Implementation of the TSP offers the potential to improve the reliability of other regional water systems besides Cascade. For example, construction of either the planned Tacoma-Cascade Pipeline (TSP) or the Lake Tapps Pipeline (LTP) could enhance reliability of both the SPU and TPU regional systems if desired. The north-south pipelines associated with either of these projects could potentially provide interties linking the SPU and TPU supply systems and allowing water to flow from one regional system to another in the event of emergency disruptions to the SPU or TPU systems. Cascade will continue to engage SPU and TPU on this opportunity in future years when Cascade begins to develop final designs for these pipelines.

In addition, when the Lake Tapps Project is completed, this will add a significant new source of water supply to the region. If connections are constructed among Cascade, TPU, and SPU that permit this water to be used regionally, either on a regular or emergency basis, it would help provide insurance against the possible effects of climate change on regional supply reliability.

Table 5.5: Risk Events and Mitigation Actions for High-scoring Risks

Supply/Feature	Risk Event	Mitigation
Broad Portfolio Risks or Mitigation (cross-cutting)		
All Surface Sources	Future federal water treatment standards become more stringent.	Monitor potential changes pending. Anticipate needs when new treatment plants are built.
Tacoma Supply		
Tacoma-Cascade Pipeline (or Lake Tapps Pipeline north of Tacoma SSP)	ROW acquisition problems, franchise, easements etc.	Lock up ROW with development conditions.
	Urban development complicates pipeline construction.	Lock up ROW with development conditions.
	Permitting or construction challenges delay construction and increase complexity	Long lead time for pipeline project.
	Damage due to seismic event.*	Intertie with other utilities to have emergency supplies.
Lake Tapps Supply		
Lake Tapps source	Regulatory risk on water right issuance.	Effective communication of regional value of the project (already done).
	Seismic impacts affect dikes or other facilities.	Prioritized rehabilitation of vulnerable facilities.
	Volcanic mud flow (lahar) damages White River facilities.	Contingency plan for short- or long-term replacement supply.
	USACOE does not maintain facilities as planned. *	Monitor Corps activities. Legal action if not compliant with agreements.
Lake Tapps Pipeline (portion south of Tacoma SSP)	ROW acquisition problems.	Lock up ROW with development conditions.
	Urban development complicates pipeline construction.	Lock up ROW with development conditions.
	Permitting or construction challenges delay construction	Long lead time for pipeline project.
	Damage due to seismic event or other disaster. *	Intertie with other utilities to have emergency supplies.
Other Cascade Facilities		
Cascade BKR pipeline	ROW acquisition problems (note alternative configurations)	Lock up ROW with development conditions. Or acquire ESSL.
	Urban development complicates pipeline construction.	Lock up ROW with development conditions. Or acquire ESSL.
	Permitting or construction challenges delay construction	Long lead time for pipeline project.
SPU Supplies (Existing Block Contract)		
SPU Transmission system	Aging pipelines deteriorate or fail.	Encourage replacement by SPU, or acquire lines and carry out replacement.
	Damage due to Seismic Event	Intertie with Tacoma for emergency supply.

* Included in summary due to relatively high severity score (low probability but high severity)