

WATER SUPPLY INVENTORY

AND

LONG-TERM WATER SUPPLY AND DEMAND FORECAST

Submitted to:

Washington State Department of Ecology

Submitted by:

Golder Associates Inc.
18300 NE Union Hill Road, Suite 200
Redmond, Washington 98052

Anchor Environmental
811 Kirkland Avenue, Suite 200
Kirkland, WA 98083-2517

November 15, 2006

Ecology Publication No. 06-11-043

This report is available on the Department of Ecology website at:
<http://www.ecy.wa.gov/biblio/0611043.html>

For a printed copy of this report, contact:

Water Resources Program Publications
PO Box 47600
Olympia WA 98504-7600
E-mail: WRPublications@ecy.wa.gov
Phone: (360) 407-6600

Refer to Publication Number 06-11-043

If you need this publication in an alternate format, please call the Water Resources Program at 360-407-6600. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

TABLE OF CONTENTS

CHAPTER 1: BACKGROUND AND OBJECTIVES	1-1
1.1 History	1-1
1.1.1 The Columbia Basin	1-1
1.1.2 Uses of the Columbia	1-1
1.1.3 John Day/McNary Reserve	1-4
1.1.4 Increasing Attention to Instream Flow	1-4
1.1.5 Columbia River Initiative	1-5
1.2 Columbia River Water Management Program	1-5
1.2.1 Engrossed Second Substitute House Bill (ESSHB) 2860	1-6
1.2.2 Columbia River Water Management Program Components	1-7
1.2.3 Early Activities and Alternatives under SEPA Review	1-8
1.2.4 Twelve-Month Implementation Work Plan for the Management Program	1-9
1.2.5 Goals for this First Legislative Report	1-9
1.2.6 Goals for Future Legislative Reports	1-10
1.3 Report Objectives and Organization	1-10
 CHAPTER 2: STAKEHOLDER OUTREACH	 2-1
2.1 Introduction	2-1
2.2 Comprehensive Communication Strategy	2-1
2.3 Policy Advisory Group	2-2
2.4 Local Government	2-3
2.4.1 Watershed Planning	2-4
2.5 State Government	2-4
2.6 Federal Government	2-5
2.7 Other State Governments and Canada	2-5
2.8 Tribal Governments	2-6
2.9 State Legislature	2-6
2.10 Specialized Governmental Organizations and Non-Governmental Stakeholders	2-7
2.11 Public Outreach	2-8
2.12 Next Steps	2-8
 CHAPTER 3: COLUMBIA RIVER BASELINE ASSESSMENT	 3-1
3.1 Introduction	3-1
3.1.1 Columbia River	3-1
3.1.2 Columbia River Tributaries	3-2
3.2 Physical Factors Affecting the Columbia River	3-3
3.2.1 Climate	3-3
3.2.2 Reservoirs and Hydropower	3-4
3.2.3 Navigation	3-5
3.2.4 Land Cover and Land Use	3-5
3.2.5 Agriculture	3-6
3.2.6 Population	3-6
3.3 State Institutional Factors Affecting the Columbia River	3-7
3.3.1 Water Rights and Instream Flow Rules	3-7
3.3.2 Watershed Planning (RCW 90.82)	3-9

3.3.3 Other Ecology Rules and Programs	3-9
3.3.4 Other State Agency Programs	3-11
3.4 Other Institutional Factors Affecting the Columbia River	3-12
3.4.1 Tribal Governments	3-13
3.4.2 Federal Authority	3-14
3.4.3 International Agreements	3-16
3.4.4 Interstate Agreements	3-18
3.5 Monitoring and Forecasting on the Columbia River	3-19
3.5.1 Stream Gages and Reservoir Levels	3-19
3.5.2 Irrigation Demand	3-19
3.5.3 Runoff Forecasts	3-20
CHAPTER 4: WATER SUPPLY INVENTORY	4-1
4.1 Introduction	4-1
4.1.1 Overview and Components of the Inventory	4-1
4.1.2 Organization of this Chapter	4-1
4.2 Water Conservation Overview	4-2
4.2.1 Agricultural Production	4-2
4.2.2 Agricultural Water Conservation	4-3
4.2.3 Return Flow from Water Conservation Projects	4-4
4.2.4 Change in Consumptive Use from Water Conservation Projects	4-5
4.2.5 Municipal Water Conservation	4-6
4.2.6 Reclaimed Water	4-7
4.3 Water Conservation Inventory Results	4-8
4.3.1 Conservation District Survey	4-8
4.3.2 Irrigation District Conservation Inventory	4-9
4.3.3 Municipal/County Conservation Inventory	4-10
4.4 Water Storage Overview	4-10
4.4.1 Reservoir Storage	4-10
4.5 Water Storage Inventory Results	4-12
4.5.1 Large Storage Opportunities	4-12
4.5.2 Small Storage Opportunities	4-13
4.5.3 Modification of Existing Storage Facilities	4-13
4.5.4 Aquifer Storage and Recovery	4-14
4.6 Water Rights Overview	4-14
4.6.1 Water Rights	4-14
4.6.2 Inchoate Water Rights	4-15
4.6.3 Trust Water Rights	4-15
4.7 Water Rights Inventory	4-16
4.7.1 Washington Water Rights	4-16
4.7.2 Oregon Water Rights	4-17
4.7.3 Interruptible Water Rights	4-18
4.7.4 Washington Permit-Exempt Water Rights	4-19
4.8 Water Use Overview	4-19
4.9 Water Use Inventory Results	4-20
4.9.1 USGS Water Use Estimates	4-20
4.9.2 Watershed Plan Water Use Estimates	4-21
4.9.3 County Comprehensive Plan Estimates	4-21
4.9.4 DOH Water Use Estimates	4-22

4.9.5 Municipal Water System Plans	4-23
4.9.6 Permit-Exempt Well Water Use Estimates	4-23
CHAPTER 5: WATER SUPPLY AND DEMAND FORECAST	5-1
5.1 Introduction	5-1
5.2 First Tier Water Demand Forecast	5-2
5.2.1 Irrigation	5-2
5.2.2 Domestic	5-2
5.2.3 Commercial/Industrial	5-3
5.2.4 Environment and Wildlife	5-3
5.2.5 Undefined	5-3
5.2.6 Total Demand Based on Water Right Applications	5-3
5.2.7 Comparison to Conservation Potential	5-3
5.2.8 Comparison to Storage Potential	5-5
5.2.9 Comparison to Supply	5-6
5.3 Second Tier Water Demand Forecast	5-6
5.3.1 Agricultural Sector – WSU Survey	5-6
5.3.2 Agricultural Sector – USGS Water Use	5-8
5.3.3 Municipal Sector (Domestic and Commercial/Industrial)	5-9
5.3.4 Comparison of First Tier and Second Tier Demand Projections	5-10
5.3.5 Comparisons to Existing Water Rights and Existing Storage	5-11
5.4 Conclusions	5-12
CHAPTER 6: REFERENCES	6-1
CHAPTER 7: GLOSSARY, ACRONYMS AND ABBREVIATIONS	7-1

LIST OF TABLES

Table 1-1	Federally Listed Fish Species under the ESA in the Columbia River Basin
Table 3-1	Major Tributaries of the Washington Portion of the Columbia River
Table 3-2	Columbia Basin Land Cover Characteristics by County
Table 3-3	Land Use in the Management Zone
Table 3-4	Population Summary
Table 3-5	Key Washington and Federal Water Regulations
Table 3-6	Mainstem Columbia River and Snake River Instream Flow Requirements
Table 3-7	Existing and Proposed Instream Flow Requirements for Tributaries to the Columbia River
Table 3-8	Status of Watershed Planning in the Columbia Basin
Table 3-9	Columbia River Treaty Tribes, Columbia/Snake River TMDL Tribal Contacts, and Tribes with Land in the Washington portion of the Columbia River Basin
Table 3-10	Minimum Daily Dam Outflows and Flow Targets for Bonneville, McNary and Priest Rapids Dams
Table 3-11	Federal Hydro System Operations for Fish
Table 3-12	Key International and Interstate Agreements
Table 3-13	Columbia River Monitoring Network – Mainstem
Table 3-14	Columbia River Monitoring Network - Tributaries
Table 3-15	Columbia River Basin Water Forecasting Activities

Table 3-16	Data Sources for Climate, Water Supply and Streamflow Prediction
Table 4-1	Documents and Databases Reviewed to Develop the Baseline Assessment and Inventory
Table 4-2	Summary of Irrigation Application Efficiency Ranges, Consumptive Use, and Return Flows
Table 4-3	Municipal Conservation Summary
Table 4-4	Allowable Reclaimed Water Class Types for Various Reclaimed Water Uses
Table 4-5	Potential Conservation District Projects by County
Table 4-6	Summary of Water Conservation Projects Obtained from Conservation Districts
Table 4-7	Potential Irrigation District Water Conservation Projects
Table 4-8	Municipal Conservation and Reuse
Table 4-9	Federal Dam Storage by County and Purpose of Use
Table 4-10	Non-Federal Dam Storage by County and Purpose of Use
Table 4-11	Potential Large Storage Opportunities
Table 4-12	Potential Small Storage Opportunities
Table 4-13	Washington Water Right General Use Designations
Table 4-14	Total Existing Washington Water Rights within the Management Zone
Table 4-15	Oregon Management Zone Water Records
Table 4-16	Interruptible Water Rights within the Management Zone
Table 4-17	Estimate of Permit-Exempt Wells within the Management Zone
Table 4-18	USGS Water Use Classifications and Year 2000 Results by County
Table 4-19	Current and Future Water Use as Reported in Watershed Planning Documents
Table 4-20	Comprehensive Plan Summary for Counties along the mainstem of the Columbia River
Table 4-21	Columbia Basin Public Water System Water Use Summary by County
Table 4-22	Summary of Public Water System Connections in the Management Zone
Table 4-23	Columbia Basin Residential Water Use by County
Table 5-1	New Water Right Applications within the Management Zone, Designated Agriculture
Table 5-2	New Water Right Applications within the Management Zone, Designated Domestic
Table 5-3	New Water Right Applications within the Management Zone, Designated Commercial and Industrial
Table 5-4	New Water Right Applications within the Management Zone, Designated Environment and Wildlife
Table 5-5	New Water Right Applications within the Management Zone, Designated Undefined Use
Table 5-6	Tier 1 Monthly Water Use Forecast
Table 5-7	Forecasted Growth in Crops
Table 5-8	Tier 2 Annual Water Use Forecast
Table 5-9	Comparison of First and Second Tier Demand Forecasts

LIST OF FIGURES

Figure 1-1	Columbia River Basin
Figure 2-1	Columbia River Basin Local Jurisdictional Boundaries
Figure 3-1	Management Units of the Columbia River
Figure 3-2	Columbia Basin Flows
Figure 3-3	Columbia River Large Hydropower Dams
Figure 3-4	Average Monthly Outflow for Priest Rapids, McNary, and Bonneville Dams, Average and Dry Water Years
Figure 3-5	Columbia Basin Land Cover Characteristics
Figure 3-6	2006 OFM Population Estimate

Figure 3-7	Minimum Daily Outflows and Flow Targets for Priest Rapids, McNary and Bonneville Dams
Figure 3-8	Status of Watershed Planning in the Columbia Basin
Figure 3-9	Odessa Subarea
Figure 4-1	Conservation and Storage Inventory Results
Figure 4-2	Total Federal Dam Storage by County
Figure 4-3	Total Non-Federal Dam Storage by County
Figure 4-4	Map of Columbia Basin Project
Figure 4-5	Total Water Rights in the Management Zone
Figure 4-6	Estimate of Permit-Exempt Wells in the Management Zone
Figure 4-7	Shape Factors
Figure 4-8	Year 2000 USGS Total Water Use Estimates by County
Figure 4-9	Total Number of Group A and Group B Water System Connections
Figure 4-10	Total Number of Group A and Group B Water System Connections within the Management Zone
Figure 5-1	Water Right Applications in the Management Zone
Figure 5-2	Total Demand Based on Water Right Applications
Figure 5-3	Monthly Water Demand Based on Water Right Applications
Figure 5-4	Total Crop Acreage Forecast
Figure 5-5	Range of Potential Future Irrigation Water Demand in 2025
Figure 5-6	2025 OFM Population Forecast
Figure 5-7	Projected Total Water Use Increase (2000 – 2025)

LIST OF APPENDICES

Appendix A	– Stakeholder Comments
Appendix B (Chapter 3)	– Columbia Basin Baseline Assessment
Appendix C (Chapter 4)	– Water Supply Inventory
Appendix D (Chapter 5)	– Water Supply and Demand Forecast