Project: 6483 – CWS Dam Raise

Date: August 5, 2016

Subject: 2009 Draft Planning Report/Environmental Impact Statement (PR/EIS) – Cover for Website

From: Laura Porter, Water Resources Analyst

To: Project File

The attached 2009 Draft Planning Report/Environmental Impact Statement (PR/EIS) was based on the Tualatin Basin Water Supply Project (TBWSP) alternatives in development at that time. The draft underwent reviews by the U.S. Bureau of Reclamation (Reclamation) and natural resource agencies, including Clean Water Services. It was never finalized.

The project was delayed when Reclamation decided to conduct a Safety of Dams analysis to meet concerns related to the Cascadia Subduction Zone.

In March 2010, work on the PR/EIS was discontinued. The attached draft represents the work that was done until that point in time.

Visit tualatinbasinwatersupply.org/resources for an extensive document archive, including the 2009 Draft PR/EIS.
Draft Planning Report/Environmental Impact Statement

Tualatin Basin Water Supply Project

Washington County, Oregon

Lead Agency: US Department of the Interior
Bureau of Reclamation
Pacific Northwest Region

Abstract: This Draft Planning Report/Environmental Impact Statement (PR/EIS) documents the analysis of three alternatives, including a “no action” alternative (Alternative 1), for meeting projected water needs in Washington County. Both action alternatives include a raise of the Bureau of Reclamation Scoggins Dam on Henry Hagg Lake. Alternative 2 includes a 40-foot dam raise plus a new pipeline to carry raw water directly from Henry Hagg Lake to the Joint Water Commission water treatment plant. The raw water pipeline would be operated in reverse, when needed, to fill the reservoir with water withdrawn from the Tualatin River. Alternative 3 includes a 25-foot dam raise and a raw water pipeline from the reservoir to the water treatment plant, plus an approximately 22-mile-long transmission pipeline to carry water from the Willamette River in Wilsonville to serve water users in southeastern Washington County, including the cities of Tualatin, Sherwood, Tigard, and Beaverton. The Bureau of Reclamation (“Reclamation”) has not yet identified a preferred alternative.

The alternatives evaluated in this Draft PR/EIS were developed through a process involving numerous local water providers and Reclamation, as well as state and federal agencies and the public. A range of potential structural and non-structural water supply options were considered assessed for their ability to meet projected water demands and reliability, and either eliminated or refined to eventually become the alternatives evaluated herein. After public review of this Draft PR/EIS, the alternatives may be further refined—or a new alternative may be developed—as a result of comments received. A Final PR/EIS will be published that responds to public comments and presents Reclamation’s preferred alternative along with an assessment of potential environmental effects.

This Draft PR/EIS has been developed to comply with the requirements of the National Environmental Policy Act. It also provides the public review required under Executive Order 11988 (Floodplain Management) and Executive Order 11990 (Protection of Wetlands).

For further information, contact:
David R. Nelson, Resources Management
US Bureau of Reclamation, Lower Columbia Area Office, Mailstop LCA-6000
1201 NE Lloyd Blvd., Ste. 750
Portland, OR 97232-1295
503-872-2801

This Draft PR/EIS is available for a 90 review with comments due ( )
Tualatin Basin Water Supply Project

Draft Planning Report/
Environmental Impact Statement

USBR Administrative Draft

July 2011

Bureau of Reclamation
Pacific Northwest Region
Lower Columbia Area Office
Portland, Oregon

And

Tualatin Basin Water Supply Project Partners:
Clean Water Services
Tualatin Valley Water District
Lake Oswego Corporation
   City of Beaverton
City of Forest Grove
   City of Hillsboro
City of Tigard
City of Tualatin

Note: All maps have been prepared in NAVD88 and will need to be updated to NGVD29
**LIST OF ABBREVIATIONS AND ACRONYMS**

(terms in **bold italic** are defined in the Glossary)

- **µg/L** micrograms per liter
- **µg/m³** micrograms per cubic meter
- **7Q10** average 7-day flow (“Q) for 10-year exceedance
- **ADT** average daily traffic
- **AF-10** Agriculture and Forest, 10-acre minimum lot size (land use designation)
- **AF-20** Agriculture and Forest, 20-acre minimum lot size (land use designation)
- **AF-5** Agriculture and Forest, 5-acre minimum lot size (land use designation)
- **ASR** aquifer storage and recovery
- **BLM** Bureau of Land Management, US Department of the Interior
- **BPA** Bonneville Power Administration, US Department of Energy
- **CBOD** carbonaceous biological oxygen demand
- **cfs** cubic feet per second
- **CO** carbon monoxide
- **Corps** US Department of the Army, Corps of Engineers
- **dB** decibel(s)
- **dBA** A-weighted decibel(s)
- **DEA** David Evans and Associates, Inc.
- **DLC** Donation Land Claim
- **DO** dissolved oxygen
- **EFC** Exclusive Forest and Conservation (land use designation)
- **EFH** Essential Fish Habitat
- **EFU** Exclusive Farm Use (land use designation)
- **EIS** environmental impact statement
- **EPA** US Environmental Protection Agency
- **ESA** Endangered Species Act of 1973
- **ESU** Evolutionarily Significant Unit
- **FHWA** Federal Highway Administration, US Department of Transportation
- **FKH** in Table 8-3
- **FR** *Federal Register*
- **FWS** Fish and Wildlife Service, US Department of the Interior
- **GIS** geographic information system
- **GLO** General Land Office
- **gpcd** gallons per capita per day
- **gpm** gallons per minute
- **GWUDI** Groundwater Under the Direct Influence
- **H:V** horizontal to vertical (slope)
- **HEC-RAS** Hydrologic Engineering Center River Analysis System
- **HGM** hydrogeomorphic
- **HPA** high probability area
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDC</td>
<td>Interest During Construction</td>
</tr>
<tr>
<td>IMPLAN</td>
<td>Impact Analysis for Planning</td>
</tr>
<tr>
<td>IWRM</td>
<td>Integrated Water Resources Management</td>
</tr>
<tr>
<td>JWC</td>
<td>Joint Water Commission</td>
</tr>
<tr>
<td>LCDC</td>
<td>Oregon Land Conservation and Development Commission</td>
</tr>
<tr>
<td>LCP/EA</td>
<td>Land Conservation Plan and Environmental Assessment</td>
</tr>
<tr>
<td>Ldn</td>
<td>day-night noise levels</td>
</tr>
<tr>
<td>LWI</td>
<td>Local Wetland Inventory</td>
</tr>
<tr>
<td>M&amp;I</td>
<td>municipal and industrial, a category of water use</td>
</tr>
<tr>
<td>MBTA</td>
<td>Migratory Bird Treaty Act</td>
</tr>
<tr>
<td>MG</td>
<td>million gallon</td>
</tr>
<tr>
<td>mg/L</td>
<td>milligrams per liter</td>
</tr>
<tr>
<td>mgd</td>
<td>million gallons per day</td>
</tr>
<tr>
<td>MKL</td>
<td>in Table 8-3</td>
</tr>
<tr>
<td>mph</td>
<td>miles per hour</td>
</tr>
<tr>
<td>MSA</td>
<td>Murray, Smith &amp; Associates, Inc.</td>
</tr>
<tr>
<td>msl</td>
<td>mean sea level</td>
</tr>
<tr>
<td>MTBM</td>
<td>micro-tunnel boring machine</td>
</tr>
<tr>
<td>NAAQS</td>
<td>National Ambient Air Quality Standards</td>
</tr>
<tr>
<td>NED</td>
<td>National Economic Development</td>
</tr>
<tr>
<td>NEPA</td>
<td>National Environmental Policy Act of 1969</td>
</tr>
<tr>
<td>NHPP</td>
<td>National Historic Preservation Act</td>
</tr>
<tr>
<td>NMFS</td>
<td>National Marine Fisheries Service (also known as NOAA Fisheries) of the US Department of Commerce, National Oceanic and Atmospheric Administration</td>
</tr>
<tr>
<td>NO2</td>
<td>nitrogen dioxide</td>
</tr>
<tr>
<td>NPDES</td>
<td>National Pollutant Discharge Elimination System</td>
</tr>
<tr>
<td>NRCS</td>
<td>Natural Resources Conservation Service, US Department of Agriculture (formerly the Soil Conservation Service)</td>
</tr>
<tr>
<td>NRHP</td>
<td>National Register of Historic Places</td>
</tr>
<tr>
<td>NWI</td>
<td>National Wetland Inventory</td>
</tr>
<tr>
<td>O&amp;M</td>
<td>operations and maintenance</td>
</tr>
<tr>
<td>O3</td>
<td>ozone</td>
</tr>
<tr>
<td>OAR</td>
<td>Oregon Administrative Rule</td>
</tr>
<tr>
<td>ODA</td>
<td>Oregon Department of Agriculture</td>
</tr>
<tr>
<td>ODEQ</td>
<td>Oregon Department of Environmental Quality</td>
</tr>
<tr>
<td>ODF</td>
<td>Oregon Department of Forestry</td>
</tr>
<tr>
<td>ODFW</td>
<td>Oregon Department of Fish and Wildlife</td>
</tr>
<tr>
<td>ODOT</td>
<td>Oregon Department of Transportation</td>
</tr>
<tr>
<td>ODSL</td>
<td>Oregon Department of State Lands</td>
</tr>
<tr>
<td>OED</td>
<td>Oregon Employment Department</td>
</tr>
<tr>
<td>ONHP</td>
<td>Oregon Natural Heritage Project</td>
</tr>
<tr>
<td>OR</td>
<td>Oregon Route</td>
</tr>
<tr>
<td>ORNHI</td>
<td>Oregon Natural Heritage Information Center</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>ORS</td>
<td>Oregon Revised Statute</td>
</tr>
<tr>
<td>OWRD</td>
<td>Oregon Water Resources Department</td>
</tr>
<tr>
<td>P&amp;W</td>
<td>Portland and Western</td>
</tr>
<tr>
<td>P.L.</td>
<td>Public Law (federal)</td>
</tr>
<tr>
<td>Partners</td>
<td>TBWSP Partners – see Section 1.1 (does not include Reclamation)</td>
</tr>
<tr>
<td>PGE</td>
<td>Portland General Electric</td>
</tr>
<tr>
<td>PHABSIM</td>
<td>Physical Habitat Simulation</td>
</tr>
<tr>
<td>PM(_{10})</td>
<td>particulates with a diameter less than 10 microns</td>
</tr>
<tr>
<td>PM(_{2.5})</td>
<td>particulates with a diameter less than 2.5 microns</td>
</tr>
<tr>
<td>ppm</td>
<td>parts per million</td>
</tr>
<tr>
<td>PR/EIS</td>
<td>planning report/environmental impact statement (federal)</td>
</tr>
<tr>
<td>Reclamation</td>
<td>Bureau of Reclamation, US Department of the Interior</td>
</tr>
<tr>
<td>R-IND</td>
<td>Rural Industrial (land use designation)</td>
</tr>
<tr>
<td>RLIS</td>
<td>Regional Land Information System</td>
</tr>
<tr>
<td>RM</td>
<td>River Mile</td>
</tr>
<tr>
<td>ROD</td>
<td>Record of Decision (federal)</td>
</tr>
<tr>
<td>RR</td>
<td>Rural Residential (land use designation)</td>
</tr>
<tr>
<td>RWP</td>
<td>raw water pipeline</td>
</tr>
<tr>
<td>Section 10</td>
<td>Section 106 of the National Historic Preservation Act</td>
</tr>
<tr>
<td>SHPO</td>
<td>State Historic Preservation Officer</td>
</tr>
<tr>
<td>SO(_{2})</td>
<td>sulfur dioxide</td>
</tr>
<tr>
<td>SOD</td>
<td>sediment oxygen demand</td>
</tr>
<tr>
<td>TBWSP</td>
<td>Tualatin Basin Water Supply Project</td>
</tr>
<tr>
<td>TCP</td>
<td>Traditional Cultural Property</td>
</tr>
<tr>
<td>TES</td>
<td>Threatened, Endangered, and Sensitive (species)</td>
</tr>
<tr>
<td>TMDL</td>
<td>Total Maximum Daily Load</td>
</tr>
<tr>
<td>TRWC</td>
<td>Tualatin River Watershed Council</td>
</tr>
<tr>
<td>TSP</td>
<td>transportation system plan</td>
</tr>
<tr>
<td>TVID</td>
<td>Tualatin Valley Irrigation District</td>
</tr>
<tr>
<td>TVWD</td>
<td>Tualatin Valley Water District</td>
</tr>
<tr>
<td>UGB</td>
<td>urban growth boundary</td>
</tr>
<tr>
<td>USC</td>
<td>United States Code</td>
</tr>
<tr>
<td>USFS</td>
<td>Forest Service, US Department of Agriculture</td>
</tr>
<tr>
<td>USGS</td>
<td>US Geological Survey, Department of the Interior</td>
</tr>
<tr>
<td>v/c</td>
<td>volume-to-capacity</td>
</tr>
<tr>
<td>WACCCA</td>
<td>Washington County Consolidated Communication Agency</td>
</tr>
<tr>
<td>WSFS</td>
<td>Water Supply Feasibility Study</td>
</tr>
<tr>
<td>WUA</td>
<td>weighted usable area</td>
</tr>
<tr>
<td>WWTF</td>
<td>wastewater treatment facility</td>
</tr>
</tbody>
</table>
EXECUTIVE SUMMARY

INTRODUCTION
The Draft Planning Report/Environmental Impact Statement (PR/EIS) for the Tualatin Basin Water Supply Project (TBWSP) documents the analysis of three alternatives, including a “no action” alternative, for meeting projected water needs in Washington County. The alternatives were developed through a number of studies, the most recent of which include the Tualatin Basin Water Supply Feasibility Study (WSFS) and the TBWSP, which expanded upon and refined alternatives evaluated in the WSFS. Both action alternatives include raising Scoggins Dam and increasing storage capacity in its reservoir, Henry Hagg Lake. The dam, reservoir, and Scoggins Valley Park, which surrounds the reservoir, are owned by the United States and are under the jurisdiction of Reclamation. The Tualatin Valley Irrigation District is responsible for operation and maintenance of the dam and reservoir, which are operated for water supply and flood control. Stored water is currently used for agricultural irrigation, municipal and industrial (M&I) supply, and flow augmentation of the Tualatin River in the summer and fall months. Henry Hagg Lake and Scoggins Valley Park are active recreation areas.

The TBWSP Partners (entities that could use water from the project) include Clean Water Services; Tualatin Valley Water District (TVWD); Lake Oswego Corporation; Tualatin Valley Irrigation District; and the cities of Banks, Beaverton, Cornelius, Forest Grove, Hillsboro, North Plains, Sherwood, Tigard, and Tualatin.

The Bureau of Reclamation (Reclamation) has been working with the TBWSP Partners (the Partners) to develop the Draft PR/EIS and is the Federal lead agency responsible for compliance with the National Environmental Policy Act and NHPA. Consultation and coordination actions under the ESA and FWCA are also discussed in the document.

PROJECT AREA LOCATION
The alternatives evaluated in the Draft PR/EIS include potential project components in a number of locations. The major components could include: a raise of Scoggins Dam to increase the storage capacity of Henry Hagg Lake; a new raw water pipeline (RWP) between Scoggins Dam and the Joint Water Commission (JWC) Fern Hill Water Treatment Plant; a new water transmission pipeline (Willamette Pipeline) between the Willamette River Water Treatment Plant and a connection to TVWD’s water distribution system in Beaverton; and new water storage tanks to hold water from the Willamette Pipeline. A project vicinity map is shown as the frontispiece.

Scoggins Dam and its reservoir, Henry Hagg Lake, are in southwestern Washington County, Oregon. The dam is located on Scoggins Creek, a tributary of the Tualatin River, approximately five miles southwest of the city of Forest Grove and 25 miles west of Portland. The locations of the dam and reservoir are shown on the frontispiece.
The RWP would be about 6½ miles long and would be constructed from Scoggins Dam through the lower Scoggins Creek valley, then northeastward to the JWC Fern Hill Water Treatment Plant in Forest Grove, with a connection to the Spring Hill Pumping Plant on the Tualatin River, as shown on the frontispiece. It would lie entirely within Washington County.

The Willamette Pipeline would begin at the Willamette River Water Treatment Plant in the city of Wilsonville in Clackamas County, Oregon. The Willamette Pipeline would travel approximately 22 miles northward through Wilsonville and unincorporated Clackamas County, then into Washington County and through Sherwood, and possibly Tigard, before ending in Beaverton near the intersection of SW Western Avenue and SW Beaverton-Hillsdale Highway. The Willamette Pipeline would follow public rights-of-way for nearly all of its length. Associated with the Willamette Pipeline would be water storage tanks. Specific locations for the water tanks have not been selected, but potential areas have been identified on the southern slopes of Cooper Mountain in unincorporated Washington County and just southwest of Tualatin. The proposed pipeline alignment and potential water tank locations are shown on the frontispiece.

PURPOSE AND NEED

On December 13, 2001, Reclamation published a Notice of Intent in the Federal Register (Volume 66, No. 240) to prepare a PR/EIS “to identify alternatives to meet future water supply needs in the Tualatin River Basin in Oregon. The purpose of the PR/EIS is to evaluate alternative methods of meeting future water supply needs for river flow restoration, municipal water, and agricultural irrigation.” The Notice of Intent stated that “50,000 additional acre-feet (15 billion gallons) of water per year could be needed by the year 2050 to meet demands in the three water-use sectors of river flow restoration, municipal and industrial demand, and agricultural demand.” However, based upon current growth projections, future needs are expected to be higher than estimated in 2001.

Under Oregon state land use law (Oregon Revised Statutes, Chapter 197), cities and counties must plan for and accommodate future growth. Cities and counties must adopt public facility plans to provide adequate services and facilities to meet the needs of the future populations identified in the comprehensive plans. Considering the needs identified in the local comprehensive plans, combined with analysis conducted for the WSFS and TBWSP, the Partners have determined that an additional 52,550 acre-feet (17.2 billion gallons) of water per year could be needed to meet future (2050) demands. Table ES-1 summarizes the projected additional demands for the Partners.

Table ES-1. Additional Projected Water Demands for Stored Water in 2050, Tualatin Basin.

<table>
<thead>
<tr>
<th>TBWSP Partner</th>
<th>Future Demand Increment (acre-feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M&amp;I:</td>
<td></td>
</tr>
<tr>
<td>Tualatin Valley Water District</td>
<td>12,400</td>
</tr>
<tr>
<td>City of Tigard</td>
<td>10,300</td>
</tr>
<tr>
<td>City of Hillsboro</td>
<td>7,650</td>
</tr>
</tbody>
</table>
City of Beaverton 4,100
City of Tualatin 1,900
City of Forest Grove 1,000

Total M&I Demand 37,350

Water Quality:
Clean Water Services 15,200

Agricultural:
Tualatin Valley Irrigation District 0

TOTAL ADDITIONAL DEMAND 52,550

Source: MWH 2006b

In addition, the Partners recognize that the water supplies must be substantially reliable and cost-effective. For example, while agricultural demand is not expected to increase, higher demand for M&I water could reduce the amount of water available for agriculture, especially during dry years. (Currently, Tualatin Valley Irrigation District allocations are reduced during dry years to make more M&I water available.) Therefore, a more reliable supply for all users, including agriculture, is needed. To adequately serve users and meet the current standards for provision of reliable M&I water supplies, greater than 90 percent reliability (i.e., ability to meet demand in more than nine out of ten years) is needed. In the past, inflows to the Scoggins Creek Valley/Henry Hagg Lake have been able to meet the existing reservoir contracted amounts in nearly all years, but, assuming future inflows are similar to past ones, they would be able to meet future demands less than one-quarter of the time.

A major component of the unmet need in the Tualatin Basin is water for flow restoration in the Tualatin River. The Tualatin River historically experiences low flows in the summer months and yields less than 2 percent of its total annual discharge between the months of June and September. Low water flows coupled with high ambient (natural) phosphorous levels and high water temperatures have created chronic water quality problems, particularly in the lower reaches of the river’s mainstem. Impacts from urban development, farming, and increased water withdrawals have contributed to the degradation of water quality in the Tualatin River and its tributaries.

Numerical standards have been established by the Oregon Department of Environmental Quality for nutrients, bacteria, dissolved oxygen (DO), and temperature. As one strategy to meet those standards, Clean Water Services maintains contracts for the release of stored water from Henry Hagg Lake and Barney Reservoir to augment river flow. However, additional flow augmentation is needed in order to meet water quality standards. Clean Water Services has also been charged by the Washington County Board of Commissioners to coordinate the Tualatin watershed’s response to the listing of upper Willamette spring chinook and winter steelhead as threatened species under the Federal Endangered Species Act (ESA). The ESA may require higher instream flows and/or changes to flow patterns during critical seasons.

Table ES-2 shows Clean Water Services’ existing and future (2050) flow targets at the Farmington gaging station on the Tualatin River at river mile (RM) 33.3. The flow targets are higher for the future to meet
water quality standards and improve fish habitat, as discussed above. While additional supply that could be provided to Clean Water Services as a result of the TBWSP would not provide enough water to meet these flow targets, it would contribute. Clean Water Services will continue to coordinate with the Oregon Department of Environmental Quality regarding changes to regulatory processes and water quality standards affecting the Tualatin River to improve fish habitat.

Table ES-2. Clean Water Services Flow Targets at Farmington (RM 33.3)

<table>
<thead>
<tr>
<th>Month</th>
<th>Existing cfs</th>
<th>acre-feet per month</th>
<th>Future (2050) cfs</th>
<th>acre-feet per month</th>
</tr>
</thead>
<tbody>
<tr>
<td>May</td>
<td>120</td>
<td>7,378</td>
<td>230</td>
<td>14,142</td>
</tr>
<tr>
<td>June</td>
<td>120</td>
<td>7,140</td>
<td>230</td>
<td>14,142</td>
</tr>
<tr>
<td>July</td>
<td>150</td>
<td>9,223</td>
<td>290</td>
<td>17,831</td>
</tr>
<tr>
<td>August</td>
<td>150</td>
<td>9,223</td>
<td>290</td>
<td>17,831</td>
</tr>
<tr>
<td>September</td>
<td>180</td>
<td>10,710</td>
<td>350</td>
<td>21,520</td>
</tr>
<tr>
<td>October</td>
<td>180</td>
<td>11,067</td>
<td>350</td>
<td>21,520</td>
</tr>
</tbody>
</table>

Source: MWH 2006d

cfs = cubic feet per second

Description of Alternatives

Three alternatives are evaluated in the TBWSP Draft PR/EIS: a no action alternative and two action alternatives. Both action alternatives include a raise of Scoggins Dam on Henry Hagg Lake. All three alternatives include water conservation and reuse methods, as well as “aquifer storage and recovery” (ASR), to help meet future demands. The demand projections used for the alternatives analysis assumed implementation of water conservation and reuse and ASR. Reclamation has not yet identified a preferred alternative.

Alternative 1 – No Action

Under the No Action Alternative, the actions proposed in Alternatives 2 and 3 would not be implemented. Instead, individual water providers in the Tualatin Basin would expand their existing facilities to fully utilize existing water rights and permits. JWC would expand capacity at the Fern Hill Water Treatment Plant from 75 million gallons per day (mgd) to 105 mgd.

Reclamation may make future modifications to meet current safety of dam or other design standards. However, the effective height of Scoggins Dam would probably not be increased, and there would be no increase in water storage in the reservoir. Improvements may include a small raise in dam height, increasing freeboard (space between top of full pool and crest of dam) without increasing reservoir storage.

Some Tualatin Basin water providers currently have contracts to purchase water from the City of Portland. The No Action Alternative assumes that contracts with the City of Portland would extend existing contract water quantities for 10 years or, potentially, 20 years. Over time, City of Portland
contracts will become a less reliable source for Tualatin Basin water providers. Portland’s first priority is to serve the water needs of its residents, and those needs are expected to increase, leaving less water available for contracts.

The high water level at Henry Hagg Lake (when reservoir is full) would be the same as at present (normal full pool elevation of 303.5 feet). However, the additional water demands (water providers demanding full Henry Hagg Lake contract amounts each year) would mean that the reservoir would be drawn down to lower elevations than under current conditions. Even with increased drawdown, Henry Hagg Lake would still fill on a regular basis. Reservoir water levels would reach within 5 feet or less of the normal full pool in about 85 percent of the years.

Clean Water Services would continue to augment Tualatin River flows with stored supplies from Henry Hagg Lake and Barney Reservoir, but additional flow augmentation for water quality improvement would not occur. Clean Water Services would release all of its stored water each year for flow augmentation, with releases determined by river conditions and storage availability.

**Alternative 2 – Scoggins Dam 40-foot Raise**

Under Alternative 2, Scoggins Dam would be raised by 40 feet. The active storage of the reservoir would be increased from 53,323 acre-feet (17.4 billion gallons) to 105,873 acre-feet (34.5 billion gallons). The raised dam crest elevation would be 353.0 feet. The 40-foot raise would require construction of a new spillway on the left abutment to replace the existing spillway. A second outlet works would be added. Most all recreation sites will be inundated and relocated to higher ground. Portions of the perimeter road around Henry Hagg Lake would be relocated above the proposed new area of inundation. The road would continue to provide access to the reservoir, recreation sites on the shoreline, and surrounding properties.

Alternative 2 includes a new, 6½–mile-long RWP. During the peak season (June through October), when contract holders are releasing stored water from the reservoir, the RWP would deliver water by gravity directly to the JWC Fern Hill Water Treatment Plant, which would be expanded to accommodate the additional water. New stored water allocations of Henry Hagg Lake water would be routed through the connecting pipeline to the Spring Hill Pumping Plant, allowing Clean Water Services to release water to the Tualatin River mainstem just downstream of the pumping plant.

An expanded Henry Hagg Lake could not be filled every year with only the natural inflow from the upstream drainage area. Therefore, in the winter (December through April), the RWP would operate in the reverse direction and would pump available¹ winter water from the Tualatin River into the reservoir to supplement the natural inflows and fill the reservoir. In years when such pump-back is needed

---

¹ “Available” water is water available for appropriation. To appropriate the water, a water right must be obtained. The Oregon Water Resources Department would determine the amount of “available” surface water for this use during the water rights application process for the TBWSP.
(expected to be in dry and normal years), an average of about 30,000 acre-feet and up to a maximum of 53,000 acre-feet of river water would be withdrawn during winter and early spring flows at the Spring Hill Pumping Plant and pumped through the RWP to Henry Hagg Lake. The pumping plant would be expanded to provide the required pumping capacity, to a maximum of 300 cfs of capacity. Modifications to the inlet channel and the intake infrastructure at the pumping plant would also be made.

Scoggins Dam does not provide fish passage now, and fish passage would not be provided under any of the alternatives under consideration. Therefore, both Action Alternatives would provide mitigation for the lack of fish passage, in accordance with a fish passage waiver agreement, dated April 11, 2005, between Reclamation and the Oregon Department of Fish and Wildlife (ODFW) Commission.

Two major fish passage mitigation measures are included in Alternatives 2 and 3. The first requires removal of Balm Grove Dam on Gales Creek (at approximately stream mile 13) and restoration of the channel and riparian area within the footprint of the existing dam structure. Removal of the dam has been identified as a priority project in various reports including the Gales Creek Watershed Assessment Project developed by the US Bureau of Land Management (BLM) and the Tualatin Subbasin Fish Management Plan developed by ODFW. The second mitigation measure requires making improvements to the fish ladder at the Lake Oswego Corporation Diversion Dam. The diversion dam and fish ladder are at RM 3.8 of the Tualatin River; therefore, the proposed modifications would improve fish access to the entire Tualatin River Basin and improve connectivity of aquatic habitats between the Tualatin and Willamette river subbasins.

**Alternative 3 – Multiple Source Option**

Under Alternative 3, an additional water source—the Willamette River—would be used to serve the future M&I needs of some of the Partners, resulting in less future demand on Henry Hagg Lake than Alternative 2. Because less water would need to be stored at the reservoir, Scoggins Dam would be raised by 25 feet, instead of 40 feet. Similar to Alternative 2, the RWP would be installed and used for both gravity flow and pump-back. An additional transmission pipeline would be installed to provide water from the Willamette River to TVWD, Tualatin, and Tigard for M&I use. This water would be treated at the existing Willamette River Water Treatment Plant in the city of Wilsonville (near RM 39), and capacity of the treatment plant would be increased to treat the additional water withdrawn from the river.

With a Scoggins Dam raise of 25 feet (normal full pool elevation of 328.5 feet), the active storage of the reservoir would be increased from 53,323 acre-feet (17.4 billion gallons) to 84,317 acre-feet (27.5 billion gallons). As with a 40-foot raise (Alternative 2), Alternative 3 would require construction of a new spillway, in a new location on the left abutment, and removal of the existing spillway. Portions of the perimeter road around Henry Hagg Lake would be relocated above the proposed new area of inundation. Most all recreation facilities will be inundated and relocated to higher ground. The road would continue to provide access to the reservoir, recreation sites on the shoreline, and surrounding properties.
Alternative 3 includes a RWP from Henry Hagg Lake to the JWC Fern Hill Water Treatment Plant and Spring Hill Pumping Plant, as described under Alternative 2. It would be used to deliver water by gravity in the peak season (June through October) and for pump-back in the winter and early spring (December through April). Because the reservoir would be smaller, less river water would need to be pumped back to assist in re-filling it. In years when pump-back is needed (expected to be in dry years and most normal years), between 10,000 and 31,000 acre-feet of available river water would be withdrawn at the Spring Hill Pumping Plant and pumped through the RWP to Henry Hagg Lake. The pumping plant would be expanded to provide the required pumping capacity, to a maximum of 200 cfs of capacity. Modifications to the inlet channel and the intake infrastructure at the pumping plant would also be made.

Alternative 3 also includes an approximately 22-mile-long transmission pipeline that would begin at the Willamette River Water Treatment Plant in the city of Wilsonville and would extend generally northward to connect with TVWD's water distribution system. The pipeline would be constructed primarily within public rights-of-way. Terminal storage facilities (one or more water tanks) would be built on the south side of Cooper Mountain, although specific locations have not yet been identified. An additional water tank would be built to serve the City of Tualatin. Delivery points with meter connections for the various Partners would be placed at numerous locations along the route. Capacity at the Willamette River Water Treatment Plant would be increased to accommodate the additional water. The new and upgraded plant facilities would be contained within the existing treatment plant boundaries.

As with Alternative 2, Alternative 3 includes two major fish passage mitigation measures: removal of Balm Grove Dam on Gales Creek with associated habitat restoration, and improvements to the fish ladder at the Lake Oswego Corporation Diversion Dam.

**Elements Common to All Three Alternatives**

Water conservation, wastewater reuse, and ASR would be utilized to meet the future water demands in Washington County, no matter which alternative is selected. As noted above, the demand projections used for the alternatives analysis in the Draft PR/EIS assumed implementation of water conservation, reuse and ASR. The extent to which these elements would be implemented under each alternative will vary dependent upon a variety of factors, including available technologies and water supply and demand.

**Water Conservation**

Conservation is considered a water source option that is important to meeting future water needs. Successful water conservation programs can delay or reduce the need for capital investment, thereby saving money and reducing the environmental impacts of water supply projects. Conservation is also consistent with the values of the community. Conservation will be a part of any long-term water supply alternative for the Tualatin Basin.

Water conservation reduces demand for both agricultural and M&I water. In the Tualatin Basin, the Tualatin Valley Irrigation District has an ongoing conservation program. The municipal water providers
have reduced water consumption in the Tualatin Basin, and all M&I users have implemented water conservation and management plans.

**Wastewater Reuse**
Wastewater reuse includes the infrastructure to distribute treated wastewater for irrigation. It is assumed that reuse water would primarily be used for outdoor irrigation (golf courses, lawns). Wastewater reuse has not been considered in previous regional water supply planning efforts because they have focused exclusively on municipal needs. Since the WSFS considered total water resources needs for the Tualatin Basin, wastewater reuse is an appropriate source option.

**Aquifer Storage and Recovery**
A method which is already in use for municipal supply, ASR involves the recharge of underground aquifers. Treated municipal supply is injected through groundwater wells into aquifers in times of the year when supply exceeds demand. Surplus supply can potentially be stored in large quantities underground. In peak demand periods, the water is then withdrawn through the same groundwater wells and put into the system.

**Environmental Consequences**
Table ES-3 presents a summary of the environmental impacts of each alternative.
Table ES-3 presents a summary of the environmental impacts of each alternative.

<table>
<thead>
<tr>
<th>Methodology used to Identify existing conditions and impacts</th>
<th>Alternative 1 – No Action</th>
<th>Alternative 2 – Scoggins Dam 40-foot Raise</th>
<th>Alternative 3 – Multiple Source Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geology and Soils</td>
<td>No impact.</td>
<td>In short-term, increased risk of erosion, landslide potential and excavation failure from dam raise. No long-term impacts.</td>
<td>In short-term, increased risk of erosion, landslide potential and excavation failure from dam raise; less than Alternative 2. No long-term impacts.</td>
</tr>
<tr>
<td>Water Quality</td>
<td>No impact.</td>
<td>Water quality in Hagg Lake, Scoggins Creek, and Tualatin River would improve over Alternative 1. DO is up in the lake, ammonia goes down.</td>
<td>Water quality in Hagg Lake, Scoggins Creek, and Tualatin River would improve over Alternative 1, but not as much as in Alternative 2.</td>
</tr>
<tr>
<td>Water Rights</td>
<td>No impact.</td>
<td>Water storage and use permits for an additional 60,000 acre-feet would be needed for expanded Hagg Lake.</td>
<td>Water storage permit for an additional 31,000 acre-feet and a water use permit for 40,000 acre-feet would be needed for the expanded Hagg Lake. Existing water rights to Willamette River would be exercised.</td>
</tr>
</tbody>
</table>

Geology and Soils
Information for this section was taken from the Earth Resources Environmental Impacts Technical Report (MWH 2006c), which summarized a multitude of project-specific technical documents and geologic reports. In addition, two reconnaissance-level field inspections were performed in October and November 2005.

Water Quality
Much of this section was based on the Water Quality Technical Report prepared for the TBWSP (CH2M Hill 2006). Computerized water quality modeling provided quantitative results that were used to evaluate the effects of the project alternatives on Henry Hagg Lake, Scoggins Creek and the Tualatin River. Where modeling was not available, a semi-quantitative assessment was conducted using insights from previous modeling and/or monitoring information. In addition extensive field modeling was performed in 2002-2003 and simulated models used by USGS were reviewed.

Water Rights
Water rights information in this section was adapted from the WSFS. Hydrology information is summarized from the Surface Water Hydrology Technical Report prepared for the project (MWH 2006d), which documents the hydrologic modeling methodology, assumptions, and effects of the alternatives on surface water hydrology in Henry Hagg Lake, Scoggins Creek, and the Tualatin River.
<table>
<thead>
<tr>
<th>Methodology used to Identify existing conditions and impacts</th>
<th>Alternative 1 – No Action</th>
<th>Alternative 2 – Scoggins Dam 40-foot Raise</th>
<th>Alternative 3 – Multiple Source Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groundwater</td>
<td>Groundwater demand would reach or exceed capacity of local aquifers.</td>
<td>Groundwater levels near Hagg Lake would rise. Between 5 and 14 wells could be inundated.</td>
<td>Groundwater levels near Hagg Lake would rise. Fewer wells may be inundated than Alternative 2.</td>
</tr>
<tr>
<td>Wetlands</td>
<td>No impact.</td>
<td>Impacts on approximately 33.4 acres of wetlands. Potential changes in water surface elevations (as a result of RWP) would have little effect on the frequency and magnitude of overbank flows on the Tualatin R. in the vicinity of the Wapato Unit as well as the main refuge.</td>
<td>Impacts on approximately 27.4 acres of wetlands. Even less impact to Tualatin R. levels as described for Alternative 2.</td>
</tr>
</tbody>
</table>

Information for this section was adapted from Human Environment Environmental Impacts Technical Report (MWH 2007). Included a review and analysis of well and borehole reports (well logs) on file with OWRD (OWRD 2005), well construction reports from OWRD on-line database, and OWRD database of water rights which includes permitted wells. Only a qualitative evaluation of change in groundwater level was possible because conditions and data were inadequate for a quantitative analysis. The qualitative evaluation was accomplished by estimating changes in groundwater level associated with changes in lake level, and by assuming that a change in reservoir level would result in a corresponding, if less substantial, change in groundwater level.

Many documents addressing wetlands in the project area (CH2M Hill 2003 and 2005a, Reclamation 2004b, URS 2003, Adolfson 2006b, and DEA 2007b) were reviewed. Delineation of RWP accomplished in 2005 (expired). Available aerial photographs were examined. The Washington County Soil Survey (NRCS 1982), National Wetland Inventory (NWI) maps (Metro 1998), and Local Wetland Inventories (LWIs) were also consulted. Reconnaissance-level field visits were made to the project sites to verify the validity of existing documents. During the field reconnaissance, scientists used the methods defined in Corps of Engineers Wetlands Delineation Manual (Corps 1987) to delineate wetlands.
<table>
<thead>
<tr>
<th>Methodology used to Identify existing conditions and impacts</th>
<th>Alternative 1 – No Action</th>
<th>Alternative 2 – Scoggins Dam 40-foot Raise</th>
<th>Alternative 3 – Multiple Source Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>determine the presence of wetlands. The information that was available for each of the project area components (Henry Hagg Lake, RWP, and Willamette Pipeline) varied; therefore, different approaches were used to describe the existing environment and impacts.</td>
<td>Earlier and longer drawdowns of Hagg Lake would reduce habitat.</td>
<td>More water in Hagg Lake in spring and early summer for fish. Loss of 1.8 miles of stream above Hagg Lake due to inundation. Improved water quality in Tualatin River. Fish passage mitigation at Balm Grove Dam and Lake Oswego Diversion Dam will also improve fish passage.</td>
<td>More water in Hagg Lake in spring and early summer than Alternative 1, but less than Alternative 2. Loss of 1.6 miles of stream above Hagg Lake due to inundation. Improved water quality in Tualatin River, but less so than with Alternative 2. Fish passage mitigation at Balm Grove Dam and Lake Oswego Diversion Dam will also improve fish passage.</td>
</tr>
</tbody>
</table>

**Non-Listed Fish and Other Aquatic Species**

The analysis of project impacts on stream and river systems was based on an evaluation of three anadromous and one resident species that were species of concern for local fisheries managers: winter steelhead, cutthroat trout, Chinook salmon, and Pacific lamprey. Impacts to Hagg Lake were evaluated based on an ecological guild approach using six representatives as models to assess project impacts to all fish (coho, rainbow trout, smallmouth bass, yellow perch, bluegill, and largescale sucker) using literature reviews and agency consultations, primarily ODFW. Impacts to fisheries habitat in three tributaries (Sain, Scoggins, and Tanner creeks) above Henry Hagg Lake were evaluated using GIS spatial analysis software. Impacts to Scoggins Creek below the dam and impacts to the Tualatin River were evaluated using the “Physical Habitat Simulation” (PHABSIM) methodology as a surrogate indicator. The methodology uses Weighted Usable Area (WUA), a modeled assessment of habitat quantity and quality for fish, and is described in the TBWSP Fish Habitat Technical Report (R2 2006). The technical team also...
<table>
<thead>
<tr>
<th>Methodology used to Identify existing conditions and impacts</th>
<th>Alternative 1 – No Action</th>
<th>Alternative 2 – Scoggins Dam 40-foot Raise</th>
<th>Alternative 3 – Multiple Source Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>conducted numerous site visits. Impacts to stream crossings of the Willamette Pipeline were assessed by field reconnaissance, literature reviews, and agency consultations.</td>
<td>No affect on wildlife. Small increase in potential for invasive species colonizing mud flats due to earlier and longer reservoir draw-downs.</td>
<td>Loss of 691 acres of habitat around reservoir due to construction or inundation. Loss of 58.1 acres of elk meadow. Temporary impact from vegetation clearing along 6.5-mile RWP.</td>
<td>Loss of 614 acres of habitat around reservoir due to construction or inundation. Loss of 52.6 acres of elk meadow. Loss of 11 to 22 acres of developed, agricultural and forested habitat for water tanks associated with Willamette Pipeline. Temporary impact from vegetation clearing along 6.5-mile RWP and 22-mile Willamette Pipeline.</td>
</tr>
</tbody>
</table>
| Non-Listed Wildlife and Vegetation | Field visits were conducted and review of relevant material including the following documents was done:  
• JWC Raw Water Pipeline Corridor Preliminary Environmental Screening Assessment (CH2M Hill 2003).  
• TBWSP Recreation Impact and Master Plan (Atlas 2005)  
• Elk Mitigation Meadows Maintenance and Monitoring Plan Henry Hagg Lake, Tualatin Project, Oregon (Reclamation 2003b)  
• Henry Hagg Lake Biological Resources Final Report (URS 2003)  
• Henry Hagg Lake Resource Management Plan (Reclamation 2004a)  
• Watershed Assessments | | |
| Threatened, Endangered, and Sensitive Species | Review of previous reports, studies and resources included:  
• JWC TES RWP Analysis (CH2M Hill 2005b) and the Fish Habitat Technical Report (R2 2006)  
• FWS consultation letter and county species’ lists for the TBWSP (FWS 2003; FWS 2006a; FWS 2006b)  
• Oregon Natural Heritage Information | Increased potential for warm water from reservoir being released into Scoggins Creek and the Tualatin River. | Increase in steelhead and chinook spawning habitat and loss of juvenile rearing and adult holding habitat within Scoggins Creek below Scoggins dam. Tualatin River, within the project area would experience from no change |
<p>| | | Impacts similar to Alternative 2, but slightly less effects in Scoggins Creek. | |</p>
<table>
<thead>
<tr>
<th>Methodology used to Identify existing conditions and impacts</th>
<th>Alternative 1 – No Action</th>
<th>Alternative 2 – Scoggins Dam 40-foot Raise</th>
<th>Alternative 3 – Multiple Source Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center (ORNHIC) database results (2005a, 2005b, 2006)</td>
<td></td>
<td>to slight increases in adult holding and juvenile rearing habitat. Substantial increase (23 miles) in accessible habitat for salmonids in Gales Creek from Balm Grove Dam removal. Improved passage at Lake Oswego Corp. diversion dam. Either zero or short-term, construction-related impacts to most spp.</td>
<td></td>
</tr>
<tr>
<td>• NMFS website (<a href="http://www.nwr.noaa.gov">http://www.nwr.noaa.gov</a>)</td>
<td></td>
<td>Inundation of a total of 1.8 miles of trib streams. Increased lake surface area = increase in riparian fringe habitat, OR</td>
<td></td>
</tr>
<tr>
<td>• ODFW Distribution and Habitat Maps (2004)</td>
<td></td>
<td>Increase of water level changes (difference between high and low pools) leading to reduction of riparian fringe habitat.</td>
<td></td>
</tr>
<tr>
<td>• TES species identified and described in the Henry Hagg Lake Resource Management Plan, issued by Reclamation in May 2004 (Reclamation 2004a)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• JWC Raw Water Pipeline Threatened and Endangered Species Technical Memorandum. June 30, 2005 (Revised July 1, 2005; December 8, 2005) (CH2M Hill 2005b)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Tualatin Basin Water Supply Feasibility Study (MWH 2004)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Henry Hagg Lake Biological Resources Final Report (URS 2003)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Raw Water Pipeline Preliminary Design Report (MSA 2006)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Henry Hagg Lake Resource Management Plan (Reclamation 2004a)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Henry Hagg Lake Resource Management Plan, Final Environmental Assessment (Reclamation 2004b)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Upper Tualatin-Scoggins Watershed Analysis (BLM 2000)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Tualatin River Watershed Action Plan (1999) and Technical Supplement (1998) (both prepared by the TRWC)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methodology used to Identify existing conditions and impacts</td>
<td>Alternative 1 – No Action</td>
<td>Alternative 2 – Scoggins Dam 40-foot Raise</td>
<td>Alternative 3 – Multiple Source Option</td>
</tr>
<tr>
<td>-------------------------------------------------------------</td>
<td>---------------------------</td>
<td>-------------------------------------------</td>
<td>---------------------------------------</td>
</tr>
</tbody>
</table>
| • Endangered Species Act, Section 7 Considerations technical memorandum regarding the TVWD water supply improvements program (Adolfson 2006a)  
• Environmental Conditions Reconnaissance Memorandum regarding the TVWD pipeline alignment and water tank sites (Adolfson 2006b)  
Field surveys for the presence of terrestrial TES species were conducted in the project area as part of other analyses related to the TBWSP. These include:  
• TES surveys in the vicinity of Henry Hagg Lake in June and July 2002 (URS 2003)  
• Survey of the entire RWP route in October and November 2004 and between March and May 2005 (CH2M Hill 2005b)  
• Rare plant surveys in riparian areas of the RWP route during April 2005 (CH2M Hill 2005b)  
• Reconnaissance survey for rare plants in the vicinity of the Willamette Pipeline and TVWD water tank areas (Adolfson 2006b)  
• Evaluation of the potential for species occurrence and potential impact is based on following factors:  
• Known occurrence in the project area based on information from previous |
Methodology used to Identify existing conditions and impacts

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Alternative 1 – No Action</th>
<th>Alternative 2 – Scoggins Dam 40-foot Raise</th>
<th>Alternative 3 – Multiple Source Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>field surveys, ORNHIC data, and/or other sources</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Correlation between project area habitat types and TES species habitat requirements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Because systematic surveys weren’t recently been performed in the Henry Hagg Lake area and along the Willamette Pipeline corridor, evaluations for these parts of the project area are focused primarily on habitat evaluation and best professional judgment.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Historic Properties
AINW completed a cultural resource survey for the TBWSP in 2006 and 2007. They reviewed records from the Oregon State Historic Preservation Officer (SHPO) for information on previous cultural resource surveys and other archaeological and historical studies in the project area. They also gathered information on previously identified archaeological and historical resources in the project area. A review of published and unpublished information on the environmental history, archaeology, prehistory, Native peoples, and Euroamerican historical development of the project area was done. They also conducted a field reconnaissance survey of the project areas to assess current conditions and environmental setting and identify historic-period buildings, structures, and other features along the alignment was conducted.

<table>
<thead>
<tr>
<th>Historic Properties</th>
<th>Alternative 1 – No Action</th>
<th>Alternative 2 – Scoggins Dam 40-foot Raise</th>
<th>Alternative 3 – Multiple Source Option</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No impact.</td>
<td>Pitman Cabin would be inundated or moved.</td>
<td>Pitman Cabin would be inundated or moved.</td>
</tr>
<tr>
<td>Methodology used to Identify existing conditions and impacts</td>
<td>Alternative 1 – No Action</td>
<td>Alternative 2 – Scoggins Dam 40-foot Raise</td>
<td>Alternative 3 – Multiple Source Option</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>---------------------------</td>
<td>-----------------------------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>Indian Trust Assets</td>
<td>No impact.</td>
<td>Improved fish habitat. Potential impacts to elk habitat.</td>
<td>Improved fish habitat. Potential impacts to elk habitat.</td>
</tr>
<tr>
<td>Indian Sacred Sites</td>
<td>No impact.</td>
<td>No Indian sacred sites have been identified; therefore there are no identified impacts.</td>
<td>No Indian sacred sites have been identified; therefore there are no identified impacts.</td>
</tr>
<tr>
<td>Land Use and Planning</td>
<td>Anticipated water shortage could limit planned growth.</td>
<td>Conversion of 370 acres of forest, pasture, recreation, and residential land around Henry Hagg Lake to the reservoir use. Minor amount of land converted to transportation use. Easements required for RWP construction and maintenance. Water supply available to support projected growth. Scoggins Dam raise would require text amendment in Washington County comprehensive plan.</td>
<td>Conversion of 235 acres of forest, pasture, recreation, and residential land around Henry Hagg Lake to the reservoir use. Between 11 and 21 acres of rural residential land converted to public use (for water tanks). Minor amount of land converted to transportation use. Easements required for RWP and Willamette Pipeline construction and maintenance. Would also require text amendment in Washington County comprehensive plan due to Scoggins Dam raise.</td>
</tr>
<tr>
<td>Recreation</td>
<td>No impact. Most planned improvements in Henry Hagg Lake</td>
<td>Most recreation facilities would be relocated to higher and steeper ground. Quality of recreation</td>
<td>Most recreation facilities would be relocated to higher and steeper ground though not as...</td>
</tr>
<tr>
<td><strong>Methodology used to Identify existing conditions and impacts</strong></td>
<td><strong>Alternative 1 – No Action</strong></td>
<td><strong>Alternative 2 – Scoggins Dam 40-foot Raise</strong></td>
<td><strong>Alternative 3 – Multiple Source Option</strong></td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>-------------------------------</td>
<td>-----------------------------------------------</td>
<td>-------------------------------------------</td>
</tr>
<tr>
<td>evaluated in terms of physical impacts, O&amp;M impacts, and impacts to the level of service expected by park visitors.</td>
<td>Resource Management Plan would be implemented, if funds become available. The recreation experience would be somewhat affected by longer periods of lower reservoir levels as compared with current conditions.</td>
<td>experience and park revenues may decline due to loss of flat, open land and venue for large group events. The type and quantity of facilities would be comparable to Alternative 1, but slightly less than Alternative 1: only replacing 12 out of 20 overlooks, 9 out of 18 disc golf course holes and not replacing Area A - East. Lake surface available for recreation would increase.</td>
<td>high as required for Alternative 2. Quality of recreation experience and park revenues may decline due to loss of flat, open land and venue for large group events. The type and quantity of facilities would be comparable to Alternative 1, but slightly less than Alternative 1: only replacing 12 out of 20 overlooks, 9 out of 18 disc golf course holes and not replacing Area A - East. Lake surface available for recreation would increase.</td>
</tr>
<tr>
<td><strong>Socio-Economics</strong></td>
<td>Evaluation of US Census Bureau information from the 1990 and 2000 decennial censuses, and also included data review from state and local agencies, where appropriate.</td>
<td>Anticipated water shortage could limit planned growth in watershed.</td>
<td>Acquisition of 167 acres of land from 18 privately owned parcels. One residential displacement. Temporary increase in employment and spending for project construction. Water supply available to support projected growth. Cost of additional water approximately $363 per acre-foot.</td>
</tr>
<tr>
<td>Methodology used to Identify existing conditions and impacts</td>
<td>Alternative 1 – No Action</td>
<td>Alternative 2 – Scoggins Dam 40-foot Raise</td>
<td>Alternative 3 – Multiple Source Option</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>---------------------------</td>
<td>------------------------------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td><strong>Air Quality</strong></td>
<td></td>
<td></td>
<td>growth. Cost of additional water approximately $532 per acre-foot.</td>
</tr>
<tr>
<td>Review of DEQ reported data from Hillsboro, Beaverton, and Portland (closest monitoring stations). Typical pipeline construction and dam construction sites were simulated using the SCREEN3 model developed by EPA.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Noise</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Existing information reviewed included Reclamation data collected on noise levels near Scoggins Valley Park. Noise emission levels for construction equipment were obtained from “Noise from Construction Equipment and Operations, Building Equipment and Home Appliances” (EPA 1971). Noise emission levels for pickup trucks were obtained from “FHWA Traffic Noise Model Technical Manual” (FHWA 1998). Noise emission levels for rock drills and pile drivers were obtained from “Land Development and the Natural Environment: Estimating Impacts” (Keyes 1976). Rock blasting noise emission levels were obtained from “Noise Control for Buildings, Manufacturing Plants, Equipment and Products” (Hoover and Keith 1996). Typical day-night noise levels for different areas were obtained from “Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety” (EPA 1974).</td>
<td>No impact.</td>
<td>Short-term, localized decrease in air quality during construction.</td>
<td>Short-term, localized decrease in air quality during construction.</td>
</tr>
<tr>
<td><strong>Public Health and Safety</strong></td>
<td>Information in this section was summarized from the Human Environment Environmental</td>
<td>Slight risk of dam failure from seismic</td>
<td>Reduced risk of dam failure compared to Alternative 1.</td>
</tr>
<tr>
<td>Methodology used to Identify existing conditions and impacts</td>
<td>Alternative 1 – No Action</td>
<td>Alternative 2 – Scoggins Dam 40-foot Raise</td>
<td>Alternative 3 – Multiple Source Option</td>
</tr>
<tr>
<td>-----------------------------------------------------------</td>
<td>---------------------------</td>
<td>----------------------------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>Impacts Technical Report (MWH 2007). Analysis of the impacts of the project alternatives on public safety is based on anticipated conditions in the event of a catastrophic failure (breaching) of Scoggins Dam - includes analysis and modeling of dam failure scenarios. Projections of inundation depths and travel times downstream of the dam were prepared using cross-sections with 30-meter (98.4 feet) resolutions, a limitation imposed by the capabilities of the model used.</td>
<td>event.</td>
<td>Increased flood storage capacity.</td>
<td>Alternative 1. Increased flood storage capacity.</td>
</tr>
<tr>
<td>Public Services and Utilities</td>
<td>Review of public service providers and utilities in project area including Willamette Pipeline vicinity.</td>
<td>No impact.</td>
<td>Short-term impacts due to construction, but no loss of services. New potable water supplies needed to replace wells inundated (see Groundwater).</td>
</tr>
<tr>
<td>Energy</td>
<td>Evaluation of energy sources used in the project area.</td>
<td>No impact</td>
<td>In short-term, energy used for project construction. In long-term, energy used for O&amp;M, including pump-back of Tualatin River water to assist in filling reservoir.</td>
</tr>
<tr>
<td>Transportation/Access</td>
<td>Current traffic conditions were assessed for the year 2006 along the major routes that would be used by construction traffic traveling to and from the dam. Traffic counts were collected at the two</td>
<td>No impact.</td>
<td>Temporary traffic delays during construction.</td>
</tr>
</tbody>
</table>
Methodology used to Identify existing conditions and impacts

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Alternative 1 – No Action</th>
<th>Alternative 2 – Scoggins Dam 40-foot Raise</th>
<th>Alternative 3 – Multiple Source Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intersections of OR 47 (Nehalem Highway) at OR 8 (Pacific Avenue) and OR 47 at OR 6 (Wilson River Highway) from 4 to 6 p.m. on May 11, 2006. Operations of the two intersections were evaluated using the Synchro Software package, and is based on the methodologies outlined in the Highway Capacity Manual. Information used to assess intersection operations includes volume-to-capacity (v/c) ratio, average delay, and 95th percentile queue. The operational standards guiding the analysis are established by ODOT. On OR 8, classified by ODOT as a highway of statewide significance, the maximum v/c ratio is 0.85. On OR 47 and OR 6, both classified as highways of regional significance, the maximum v/c ratio is also 0.85 at the analyzed intersections. Two intersections in the study area were evaluated, one signalized (OR 8 at OR 47) and the other unsignalized (OR 6 at OR 47). Data were not collected at the merge point of OR 47 with OR 6 eastbound; however, observations indicate that the merge operates with minimal slowing and delays.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Visual Resources

| DEA examined the visual resources within Scoggins Valley Park. Based on an analysis of topographical changes, DEA determined potential viewing areas within the park, then visited the site in October 2005 to examine those viewing areas and to determine viewing areas from the lake to surrounding areas. The Mudflats (668 acres) visible for longer periods due to reservoir drawdowns. Larger expanse of mudflats visible at reservoir than Alternatives 1 or 3. Large areas of inundated vegetation visible during drawdowns. At low pool, 1,038 acres visible. Larger expanse of mudflats visible at reservoir than Alternative 1. At low pool, 903 acres. Temporary impacts during construction. Water tanks (Willamette | | |

20
<table>
<thead>
<tr>
<th>Methodology used to Identify existing conditions and impacts</th>
<th>Alternative 1 – No Action</th>
<th>Alternative 2 – Scoggins Dam 40-foot Raise</th>
<th>Alternative 3 – Multiple Source Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>viewing areas were evaluated based on land use, public access, and significance. Visual simulations of the reservoir and dam were prepared for Alternatives 2 and 3 to estimate probable visual impacts. Using AutoCAD 3D modeling tools and Photoshop computer software, DEA created topographical models with associated water levels of the two alternatives, generated a line and angle of sight from which to view the model based on observation points that offered open views of the lake from different angles. DEA then created a visual simulation of likely impacts by superimposing the models over recent photographs taken from the observation points. Simulations were done for the lake with both high and low water levels and for the dam structure at both the 40-foot and 25-foot raises. In addition, relevant and available documents were reviewed.</td>
<td>Temporary impacts during construction.</td>
<td>Pipeline) would be new features visible on Cooper Mountain.</td>
<td></td>
</tr>
</tbody>
</table>
Economic Analysis
Two levels of economic analyses are typically conducted for Reclamation feasibility studies to compare the impacts of the alternatives. They are: (1) the National Economic Development (NED) benefits and costs analysis that describes net benefits that accrue in the planning area and the rest of the nation; and (2) the Regional Economic Development analysis that estimates the regional impacts on sales, income, and employment from the alternative’s regional expenditures. However, because TBWSP construction would be financed by local water providers and Clean Water Services, there is no need to justify federal investment, so a standard NED analysis is not required. As the Draft PR/EIS addresses only two action alternatives and as each provide the same amount of water (benefits), the least-cost method is the most applicable method to rank the alternatives according to their economic efficiency.

Cost Comparison
Table ES-4 compares estimated costs of the alternatives. The cost estimates shown are rounded to the nearest $1,000 and were estimated using a 3.0% real interest rate and a 50-year project life. As shown in the table, the least-cost alternative that would meet the project purpose and need is Alternative 2. Alternative 1 would not meet the project purpose and need.

Table ES-4. Cost Comparison, TBWSP Alternatives

<table>
<thead>
<tr>
<th>Cost</th>
<th>Alternative 1 No Action</th>
<th>Alternative 2 40-foot Raise</th>
<th>Alternative 3 Multiple Source Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction, Total</td>
<td>$464,000,000</td>
<td>$658,000,000</td>
<td></td>
</tr>
<tr>
<td>Construction, Annualized</td>
<td>$18,037,000</td>
<td>$25,573,000</td>
<td></td>
</tr>
<tr>
<td>Annual OM&amp;R</td>
<td>$154,000(^1)</td>
<td>$1,186,000</td>
<td>$2,588,000</td>
</tr>
<tr>
<td>Total Annual Costs</td>
<td>$154,000</td>
<td>$19,224,000</td>
<td>$28,162,000</td>
</tr>
</tbody>
</table>

\(^1\) Based on the 6-year average from 2000 to 2005-Will be updated to include O&M associated with non-reimbursable purposes per Mike Cobell 9/28/06.

Benefits
Benefits currently provided by Henry Hagg Lake include irrigation supply, flood control, M&I water supply, recreation, water quality improvement, and fish and wildlife habitat. The Action Alternatives would have some unquantifiable effects on benefits, summarized as follows.

Irrigation Supply
There would be benefits to irrigation from either of the Action Alternatives due to improved reliability of supply. There would be no changes to the quantity of water supplied to irrigation under the Action Alternatives.

\(^2\) The 2006 30-year real interest rate on Treasury Notes and Bonds was used instead of the Federal Discount Rate because this project will not seek Federal financing, but rather be financed locally.
Flood Control
Flood control would benefit from the increased reliability of flood control storage under the Action Alternatives, with Alternative 2 providing the most flood control storage.

M&I Water Supply
The Action Alternatives would provide approximately 37,350 acre-feet of additional M&I water to the participating entities. This amount of water is estimated to meet the 2050 water demand for the area.

Recreation
During construction of Alternative 2 or 3, visitation and recreation at Scoggins Valley Park would be reduced, but recreation facilities inundated by a higher reservoir would be replaced. Quality of settings may decrease and park revenues may decline.

Water Quality
Water quality in the Tualatin River would be improved by Clean Water Services releasing an additional 15,200 acre-feet into the Tualatin River to supplement low summer flows.

Fish and Wildlife Habitat
Fish would benefit from the water quality improvements resulting from the Clean Water Services releases into the Tualatin River, as well as by the removal of Balm Grove Dam on Gales Creek and modifications at the Lake Oswego Corporation Diversion Dam. Adverse impacts to fish and wildlife would be mitigated.

Water Rates
Due to the costs of the Action Alternatives, M&I water rates are likely to increase as a result of the Partners passing some of the project costs along to customers. Irrigation water rates would not be affected by the project. Based on Reclamation’s economic analysis (Reclamation 2006c), the additional water provided by the TBWSP would cost the Partners $363 per acre-foot under Alternative 2 and $532 per acre-foot under Alternative 3 each year.

Regional Economic Development Analysis
The regional economic impacts of the TBWSP would be created primarily through construction investments that bring economic activity into the region. Therefore, only the Action Alternatives were analyzed. There would also be some payments to landowners for rights-of-way and/or land acquisition, which are also included in the analysis but are minor contributors to the increased economic activity in the region.

Direct, indirect, induced, and total impacts are reported in terms of: (1) sales or industry output, which represents the value of an industry’s total production; (2) income, which includes employee compensation (wages and salaries of workers and benefits such as health and life insurance and retirement payments), plus proprietary income (self-employed workers payments); and (3) employment, which includes full- and part-time workers.
Table ES-5 shows the regional economic impacts of the Action Alternatives during the construction period, when most the employment and income would occur. Regional economic impacts would be reduced when the construction period is complete; however, there would be some effects from the annual O&M that would occur in the study area as a result of the project.

<table>
<thead>
<tr>
<th>Economic Impact</th>
<th>Alternative 2, 40-foot Raise</th>
<th>Alternative 3, Multiple Source Option</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Output/Sales</td>
<td>Labor</td>
</tr>
<tr>
<td>Direct</td>
<td>$282,687,000</td>
<td>$87,431,000</td>
</tr>
<tr>
<td>Indirect</td>
<td>$53,121,000</td>
<td>$20,606,000</td>
</tr>
<tr>
<td>Induced</td>
<td>$94,470,000</td>
<td>$33,020,000</td>
</tr>
<tr>
<td>Total</td>
<td>$429,188,000</td>
<td>$141,057,000</td>
</tr>
</tbody>
</table>

Source: Reclamation 2006c

The least-cost alternative, Alternative 2, would produce the greatest amount of net benefits, that is, benefits with relation to costs. Because Alternative 2 has lower costs, impacts to municipal water users under this alternative would also be lower. Alternative 2 would also produce positive regional impacts in terms of sales, income, and employment, although less than under Alternative 3. However, most of the regional economic benefits would occur only during the construction period.

**Consultation and Coordination**

**Public Involvement**

Reclamation, in coordination with Clean Water Services, held four public scoping meetings for the project in January 2002. A total of 23 people attended the scoping meetings. A copy of the Scoping Report summarizing the process with copies of all materials and comments is in Appendix C of the TBWSP Draft PR/EIS. In addition to the public scoping meetings, Clean Water Services held numerous meetings with a variety of stakeholders and distributed information about the project in various formats. Issues identified during scoping were considered during development of the project alternatives and in the assessment of their potential environmental impacts.

The major issues identified by members of the public during scoping included:

- Consider sources that are geographically and hydrologically distributed to reduce supply vulnerability to earthquakes and drought.
- Consider a number of supply options and assess options according to their cost by unit of benefit.
- Look at options that do not include a raise of Scoggins Dam. Consider rainwater collection, water conservation, wastewater reuse, development of groundwater sources, off-stream storage, and withdrawal from the Willamette River.
- For a Scoggins Dam raise, assess the potential impacts to wetlands and tributaries, impacts to migrating birds, potential to increase landslides, sedimentation impacts, and affect of increased flows in Scoggins Creek and Tualatin River.
• Consider impacts to property owners around Henry Hagg Lake. Property owners must be compensated for losses.
• Consider options for watershed restoration.
• Address water quality and health impacts of potential water sources.
• Address potential impacts to fish.

The major issues identified by public agencies, including the US Army Corps of Engineers, NMFS, US Environmental Protection Agency, ODFW, and Oregon Department of State Lands, included:

• Address impacts to watershed function, that is, effects of the project on hydrology, riparian forest and wetlands, stream migration and habitat, urban development and stormwater runoff, and flow augmentation.
• If resident cutthroat become listed under the ESA, consider impacts to that species.
• When developing options, new dams and off-stream storage would be least desirable.
• For the Willamette Pipeline, assess potential impacts of stream crossings and property acquisition, as well as impacts to land use and wetlands.
• Address impacts to sensitive plant species.
• Access around Henry Hagg Lake and up Scoggins Creek Road must be maintained for fire protection.
• Consider the cumulative impacts of development in the Tualatin Basin.

The issues listed above have been addressed in the process of developing project alternatives and in the impact assessment contained in the TBWSP Draft PR/EIS. Impacts are summarized in Table ES-3.

A 90-day review and comment period is provided for the Draft PR/EIS. During this time, Reclamation will hold formal public hearings at which oral and written comments will be taken. In addition, Clean Water Services will host open houses and provide informational materials in various formats. All comments, with responses, will be included in the Final PR/EIS.

**Agency Coordination and Consultation**

The TBWSP was closely coordinated with the US Fish and Wildlife Service (FWS), ODFW, and National Marine Fisheries Service (NMFS). Those agencies participated in identification of fish passage issues, fisheries and fish habitat in the area, elk habitat and mitigation, issues related to other wildlife, plants, and their habitat, as well as discussions regarding methodology for fish and wildlife habitat assessments and various mitigation proposals.

FWS prepared a draft Fish and Wildlife Coordination Act Report in 2007. Findings of the draft report were used in determining Endangered Species Consultation (citation).

Consultation with FWS and NMFS is required under Section 7 of the ESA. As an initial step in consultation, Reclamation requested a list of threatened and endangered species that may occur in the
A biological assessment of potential effects of the project alternatives on listed species is being prepared and will be submitted to FWS and NMFS for review.

Consultation with the State Historic Preservation Office (SHPO), affected or interested Indian tribes, and other potentially interested parties is required under Section 106 of the National Historic Preservation Act (Section 106). Tribal notifications are outlined below. On June 13, 2007, Reclamation initiated Section 106 consultations with the State of Oregon SHPO, presenting a summary of study purposes and alternatives and archeological investigations completed to date.

Several meetings were held with Washington County Parks Department recreation staff and recreation consultants as the Action Alternatives were developed. The plans for replacement recreation facilities included in the Draft PR/EIS for the TBWSP have been developed in coordination with Washington County.

**Tribal Consultation**

On February 10, 2003, Reclamation notified the Confederated Tribes of the Grande Ronde Community of Oregon, the Confederated Tribes of the Siletz Reservation, and the Confederated Tribe of the Warm Springs Reservation of Oregon of the proposed action and requested information on Indian Trust Assets, Indian sacred sites, and traditional cultural properties (TCPs). The Grand Ronde Tribes respond with a letter expressing interest in the protection, enhancement and restoration of Tribal cultural and natural resources within the project area.

Staff biologists from the Grand Ronde and Siletz Tribes have been invited to participate in multi-agency meetings to discuss proposed methods for analyzing impacts to fish and wildlife resources. Cultural resource specialists from all three Tribes were invited to participate in cultural resources field investigations.
# Table of Contents

1. **INTRODUCTION** ........................................................................................................ 1-1
   1.1 PURPOSE, SCOPE, AND OBJECTIVE ..................................................................... 1-1
   1.2 PROJECT AREA LOCATION AND GENERAL DESCRIPTION ............................. 1-2
   1.3 TUALATIN RIVER BASIN WATER SYSTEM COMPONENTS ............................. 1-3
   1.4 AUTHORITY ......................................................................................................... 1-5
   1.5 PREVIOUS STUDIES ............................................................................................. 1-5
   1.5.1 Tualatin Project .............................................................................................. 1-5
   1.5.2 Regional Water Supply Plan, Phases I and II ................................................. 1-6
   1.5.3 Barney Reservoir Expansion EIS ................................................................. 1-7
   1.5.4 Integrated Water Resources Management Strategy .................................... 1-7
   1.6 OTHER ONGOING ACTIVITIES .......................................................................... 1-7
   1.6.1 Henry Hagg Lake Resource Management Plan ............................................. 1-7
   1.6.2 Clean Water Services Program Activities .................................................... 1-8
   1.6.3 Wapato Lake Unit Land Conservation Plan ................................................ 1-11
   1.6.4 Tualatin River Watershed Council ............................................................ 1-12
   1.6.5 Biological Assessment on Operation and Maintenance of the Tualatin Project 1-12
   1.6.6 Title Transfer ............................................................................................... 1-13

2. **PURPOSE AND NEED** ............................................................................................. 2-1
   2.1 PURPOSE OF AND NEED FOR THE PROPOSED ACTION .............................. 2-1
   2.1.1 River Flow Restoration .................................................................................. 2-2
   2.1.2 Municipal and Industrial Demand ............................................................... 2-3
   2.1.3 Agricultural Demand .................................................................................... 2-4
   2.2 EXISTING AND FUTURE WATER SUPPLIES AND DEMANDS ..................... 2-4
   2.2.1 Supplies ........................................................................................................ 2-4
   2.2.2 Water Supply Demands ............................................................................... 2-5
   2.3 SUMMARY OF WATER RESOURCES PROBLEMS ........................................ 2-5
   2.3.1 Water Quality .............................................................................................. 2-5
   2.3.2 Fish Habitat .................................................................................................. 2-6
   2.3.3 Water Supply ............................................................................................... 2-6

3. **DESCRIPTION OF ALTERNATIVES** .................................................................... 3-1
   3.1 INTRODUCTION ................................................................................................... 3-1
   3.2 ALTERNATIVE 1 – NO ACTION ....................................................................... 3-2
   3.2.1 Description .................................................................................................... 3-2
   3.2.2 Facilities ........................................................................................................ 3-4
   3.2.3 Operation and Maintenance ....................................................................... 3-6
   3.3 ALTERNATIVE 2 – SCOGGINS DAM 40-FOOT RAISE .................................... 3-7
   3.3.1 Description .................................................................................................... 3-7
   3.3.2 Accomplishments ....................................................................................... 3-8
   3.3.3 Facilities ....................................................................................................... 3-9
   3.3.4 Construction ............................................................................................... 3-11
3.3.5 Enhancement and Mitigation Measures ............................................................. 3-15
3.3.6 Operation and Maintenance ............................................................................. 3-15
3.3.7 Cost ...................................................................................................................... 3-16
3.4 ALTERNATIVE 3 – MULTIPLE SOURCE OPTION .................................................... 3-16
3.4.1 Description .......................................................................................................... 3-16
3.4.2 Accomplishments .............................................................................................. 3-17
3.4.3 Facilities ............................................................................................................... 3-18
3.4.4 Construction ........................................................................................................ 3-21
3.4.5 Enhancement and Mitigation Measures ............................................................. 3-23
3.4.6 Operation and Maintenance ............................................................................... 3-23
3.4.7 Cost ...................................................................................................................... 3-23
3.5 ELEMENTS COMMON TO ALL THREE ALTERNATIVES ......................................... 3-24
3.5.1 Water Conservation ............................................................................................ 3-24
3.5.2 Wastewater Reuse .............................................................................................. 3-27
3.5.3 Aquifer Storage and Recovery (ASR) ................................................................... 3-29
3.6 HYDROLOGIC CHANGES, COMPARISON OF ALTERNATIVES (ACTION AND NO ACTION) ............................................................................................................... 3-30
3.7 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER STUDY ........... 3-37
3.7.1 Scoggins Dam 20-Foot Raise ............................................................................... 3-37
3.7.2 Scoggins Dam 40-Foot Raise ............................................................................... 3-38
3.7.3 Scoggins Dam 40-Foot Raise Plus Sain Creek Tunnel .......................................... 3-38
3.7.4 Stimson Dam ....................................................................................................... 3-38
3.7.5 Irrigation Exchange Pipeline from the Willamette River .................................... 3-39
3.7.6 New In-Line Tributary Storage ............................................................................ 3-40
3.7.7 Off-Stream Tributary Storage .............................................................................. 3-42
3.7.8 Henry Hagg Lake Dredging .................................................................................. 3-42
3.7.9 Other Regional Water Supply Options ................................................................ 3-43
3.7.10 Groundwater ....................................................................................................... 3-43
3.7.11 Hydropower ......................................................................................................... 3-43
4 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES .......... 4.1-1
4.1 Introduction ........................................................................................................... 4.1-1
4.2 GEOLOGY AND SOILS ......................................................................................... 4.2-1
4.2.1 Affected Environment ......................................................................................... 4.2-1
4.2.2 Environmental Impacts ...................................................................................... 4.2-3
4.2.3 Mitigation Measures ......................................................................................... 4.2-11
4.3 WATER QUALITY .............................................................................................. 4.3-1
4.3.1 Affected Environment ......................................................................................... 4.3-1
4.3.2 Environmental Impacts ...................................................................................... 4.3-4
4.3.3 Mitigation Measures ......................................................................................... 4.3-32
4.4 WATER RIGHTS .............................................................................................. 4.4-1
4.4.1 Affected Environment ......................................................................................... 4.4-1
4.4.2 Environmental Impacts ...................................................................................... 4.4-2
4.4.3 Mitigation Measures ......................................................................................... 4.4-5
List of Figures

Figure 1 1. Tualatin River Basin ................................................................. 1-4
Figure 2 1. Annual Inflow to Henry Hagg Lake ......................................... 2-2
Figure 3 1. Henry Hagg Lake Surface Elevations in 2050, Alternative 1 .... 3-4
Figure 3 2. Study Area for Alternative 2 .................................................... 3-8
Figure 3 3. Alternative 2, Components near Henry Hagg Lake ................. 3-8
Figure 3 4. Alternative 2, 40-Foot Dam Raise General Plan and Section ...... 3-10
Figure 3 5. Study Area for Alternative 3 .................................................... 3-16
Figure 3 6. Alternative 3, Components near Henry Hagg Lake ................. 3-16
Figure 3 7. Alternative 3, 25-Foot Dam Raise General Plan and Section ...... 3-18
Figure 3 8. Hydrologic Model Node Locations, TBWSP ......................... 3-32
Figure 4.3 1. Water Surface Elevations in Henry Hagg Lake with 2001 and 2002 Conditions 4.3-7
Figure 4.3 2. Tualatin River Model Time Series for 2001; 7 Day average of daily maximum; Scoggins Creek downstream of Scoggins Dam 4.3-12
Figure 4.3 3. Tualatin River Model Time Series for 2002; 7 Day average of daily maximum; Scoggins Creek downstream of Scoggins Dam 4.3-13
Figure 4.3 4. Measured 7-Day Average of Daily Maximum Temperature for 2001-2002; Scoggins Creek Upstream and Downstream of Henry Hagg Lake 4.3-14
Figure 4.3 5. Tualatin River Model time series for May-November 2001; Dissolved Oxygen, 7 Day average of daily minimum; downstream of Forest Grove 4.3-16
Figure 4.3 6. Tualatin River Model time series for May-November 2002; Dissolved Oxygen, 7 Day average of daily minimum; downstream of Forest Grove 4.3-17
Figure 4.3 7. Tualatin River Model time series for May-November 2001; Dissolved Oxygen, 7 Day average of daily minimum; Elsner 4.3-18
Figure 4.3 8. Tualatin River Model Time Series for May-November 2001; Dissolved Oxygen, 7 Day average of daily minimum; Stafford 4.3-19
Figure 4.3 9. Tualatin River Model Time Series for May-November 2002; Dissolved Oxygen; Elsner 4.3-20
Figure 4.3 10. Tualatin River Model Time Series for May-November 2002; Dissolved Oxygen; Stafford 4.3-21
Figure 4.3 11. Tualatin River Model Time Series for August through November; Chlorophyll a (microgram/L) at Stafford and Elsner 4.3-22
Figure 4.6 1. Reservoir Wetland Impacts Based on Cowardin Classifications 4.6-2
Figure 4.6 2. Reservoir Wetland Impacts Based on HGM Classifications 4.6-2
Figure 4.6 3. Raw Water Pipeline Wetland and Water Crossings 4.6-6
Figure 4.6 4. Willamette Pipeline Wetland and Water Crossings 4.6-6
Figure 4.6 5. Flood Elevations at Tualatin River Cross-Section near Wapato Lake Unit, Existing Condition and Action Alternatives 4.6-12
Figure 4.6 6. Flood Elevations at Tualatin River Cross-Section near Tualatin River National Wildlife Refuge, Existing Condition and Action Alternatives 4.6-13
Figure 4.8 1. Vegetation Associations, Henry Hagg Lake 4.8-3
Figure 4.8 2. Elk Meadow Habitat, Henry Hagg Lake 4.8-3
Figure 4.8 3. HHL Habitat Types 4.8-6
Figure 4.8 4.  RWP Habitat Types ............................................................................................................. 4.8-7
Figure 4.8 5.  Historical Scoggins Dam & Hagg Lake Storage and Elevation Data ......................... 4.8-31
Figure 4.8 6.  Projected Future Scoggins Dam & Hagg Lake Storage and Elevation Data under Alternative 2 ............................................................................................................. 4.8-32
Figure 4.9 1.  Predicted average monthly flows under Alternatives 1 and 2 and corresponding estimates for steelhead spawning WUA within the upper study reach of Scoggins Creek ............................................................................................................. 4.9-32
Figure 4.9 2.  Predicted Average monthly flows for Alternatives 1 and 2 and corresponding estimates of steelhead rearing WUA within the upper study reach of Scoggins Creek. ............................................................................................................. 4.9-33
Figure 4.9 3.  Historical Scoggins Dam & Hagg Lake Storage and Elevation Data ......................... 4.9-35
Figure 4.9 4.  Projected Future Scoggins Dam & Hagg Lake Storage and Elevation Data under Alternative 2 ............................................................................................................. 4.9-37
Figure 4.13 1.  Henry Hagg Lake and Raw Water Pipeline Land Use Designations ....................... 4.13-2
Figure 4.13 2.  Willamette Pipeline Land Use Designations .............................................................. 4.13-2
Figure 4.13 3.  Henry Hagg Lake and Properties affected by 40-foot Dam Raise and 25-foot Dam Raise .......................................................................................................................... 4.13-12
Figure 4.14 1.  Recreation Facilities at Henry Hagg Lake/Scoggins Valley Park ................................. 4.14-1
Figure 4.14 2.  Recreation areas in the vicinity of the Willamette Pipeline ........................................ 4.14-8
Figure 4.14 3.  Proposed recreation sites, actions alternatives ........................................................................... 4.14-13
Figure 4.14 4.  Proposed Elks picnic area .............................................................................................. 4.14-13
Figure 4.14 5.  Proposed Sain Creek picnic area ....................................................................................... 4.14-13
Figure 4.14 6.  Proposed recreation Area C ............................................................................................ 4.14-13
Figure 4.14 7.  Proposed Scoggins Creek picnic area .............................................................................. 4.14-13
Figure 4.14 8.  Proposed recreation Area A ............................................................................................. 4.14-13
Figure 4.14 9.  Proposed park administrative office and maintenance yard ........................................ 4.14-16
Figure 4.15 1.  Census and Jurisdictional Boundaries .............................................................................. 4.15-2
Figure 4.15 2.  Unemployment Trends, Project Vicinity, 1995-2004 .................................................... 4.15-8
Figure 4.21 1.  Major Roadways in the Project Area ............................................................................... 4.21-1
Figure 4.22 1.  Looking northwest from dam with a water surface elevation of 252 (November 1999). ................................................................................................................................. 4.22-2
Figure 4.22 2.  Looking West from Scoggins Valley Road south of Tanner Creek (October 2005).4.22-2
Figure 4.22 3.  Existing conditions (October 2005) with a water surface elevation of 268 looking south from Scoggins Valley Road east of Scoggins Creek Picnic Area................................................................. 4.22-8
Figure 4.22 4.  Conditions circa 1999 with a water surface elevation of 252 looking south from Scoggins Valley Road near Scoggins Creek Picnic Area. ................................................................. 4.22-8
Figure 4.22 5.  Photo simulation – High water level with 40-foot dam raise (looking south) from Scoggins Valley Road east of the Scoggins Creek Picnic Area .......................... 4.22-9
Figure 4.22 6.  Photo simulation – low water level with 40-foot and 25-foot dam raise (looking south) ................................................................................................................................. 4.22-9
Figure 4.22 7.  Photo of existing crest of dam (from south side looking northwest) ......................... 4.22-10
Figure 4.22 8.  Photo simulation – crest of dam with 40-foot dam raise ............................................ 4.22-10
Figure 4.22 9. Existing Conditions (October 2005) looking south from Scoggins Valley Road east of Scoggins Creek Picnic Area ......................................................... 4.22-13
Figure 4.22 10. Photo simulation: High water level with 25-foot dam raise (looking south) 4.22-13
Figure 4.22 11. Photo simulation: Low water level with 40-foot and 25-foot dam raise (looking south) .................................................................................................................. 4.22-14
Figure 4.22 12. Existing Crest of Dam (from south side looking northwest) ............. 4.22-14
Figure 4.22 13. Photo simulation: Crest of Dam with 25-foot dam raise .................... 4.22-15

List of Tables
Table 1 1. Tualatin River — River Miles and Key Features ........................................ 1-4
Table 1 2. Scoggins Creek — River Miles and Key Features .................................... 1-5
Table 2 1. Additional Projected Water Demands for Stored Water in 2050, Tualatin Basin 2-1
Table 2 2. Clean Water Services Flow Targets at Farmington (RM 33.3) .................. 2-3
Table 3 1. Henry Hagg Lake Storage Capacity, Elevation, and Surface Area Summary, All Alternatives ........................................................................................................ 3-1
Table 3 2. Summary of Demand Reductions Due to Conservation, Portland System ...... 3-25
Table 3 3. Water Management and Conservation Methods Currently in Use by Municipal Project Participants ........................................................................................................... 3-26
Table 3 4. Henry Hagg Lake Contract and Barney Reservoir Allocation Volumes ....... 3-30
Table 4.3 1. Average Annual Temperature of the Henry Hagg Lake Outflow .............. 4.3-11
Table 4.3 2. Dissolved Oxygen in the Henry Hagg Lake Outlet .................................. 4.3-14
Table 4.3 3. Average Annual Chlorophyll a and Orthophosphate in Henry Hagg Lake Outflow .................................................................................................................. 4.3-15
Table 4.3 4. Average Annual Temperature of the Henry Hagg Lake Outflow .............. 4.3-27
Table 4.3 5. Dissolved Oxygen in the Henry Hagg Lake Outlet .................................. 4.3-27
Table 4.3 6. Average Annual Chlorophyll a and Orthophosphate in the Henry Hagg Lake Outflow .................................................................................................................. 4.3-27
Table 4.3 7. Summary of Henry Hagg Lake Model Results ........................................ 4.3-31
Table 4.3 8. Summary of Henry Hagg Lake Outfall Model Data for Three Alternatives .... 4.3-31
Table 4.3 9. Summary of Water Quality Effects for Mainstem Tualatin River During the Critical Period (August through Mid-November) ........................................ 4.3-31
Table 4.6 1. Wetland Impacts at Henry Hagg Lake, Scoggins Dam 40-Foot Raise .......... 4.6-8
Table 4.6 2. Wetland Impacts at Raw Water Pipeline, Scoggins Dam 40-Foot Raise ...... 4.6-10
Table 4.6 3. Changes to Water Surface Elevation Adjacent to Tualatin River National Wildlife Refuge and Wapato Lake Unit, Action Alternatives .............................................. 4.6-11
Table 4.6 4. Wetland Impacts at Henry Hagg Lake, Scoggins Dam 25-Foot Raise .......... 4.6-14
Table 4.7 1. Non-Listed Fish Species that Occur within the Project Area ....................... 4.7-5
Table 4.7 2. Typical and approximate timing of steelhead and coho within the Tualatin River tributaries .............................................................................................................. 4.7-21
Table 4.8 1. Henry Hagg Lake Resource Management Plan Vegetation Associations .... 4.8-2
Table 4.8 2. Raw Water Pipeline Corridor Vegetation Associations ............................ 4.8-4
Table 4.8 3. As illustrated in Figures 1 and 2, the following permanent impacts can be anticipated from the implementation of the TBWSP Preferred Alternative: 4.8-12
Table 4.8 4. Common mammal species occurring in the vicinity of Henry Hagg Lake. 4.8-13
Table 4.8 5. Common amphibian and reptile species occurring in the vicinity of Henry Hagg Lake. 4.8-18
Table 4.8 7. Common bird species occurring in the vicinity of Henry Hagg Lake. 4.8-19
Table 4.8 8. Vegetation Impacts at Henry Hagg Lake from Alternative 2, in Acres 4.8-25
Table 4.8 9. Wetland Impacts at Henry Hagg Lake, Scoggins Dam 40-Foot Raise 4.8-27
Table 4.8 10. Breeding and Birthing Season of selected common mammal species occurring in the vicinity of Henry Hagg Lake. 4.8-28
Table 4.8 11. Direct Impacts to Elk Meadow Habitat at Henry Hagg Lake, Alternative 2 4.8-29
Table 4.8 12. Amphibian and Reptile Reproductive Timeline and Habitat Use 4.8-32
Table 4.8 13. Vegetation Impacts along the Raw Water Pipeline Corridor, in Acres 4.8-36
Table 4.8 14. Wetland Impacts at Raw Water Pipeline, Scoggins Dam 40-Foot Raise 4.8-39
Table 4.8 15. Long-Term Vegetation Impacts at Henry Hagg Lake, Alternative 3 4.8-43
Table 4.8 16. Impacts to Elk Meadow Habitat at Henry Hagg Lake, Alternative 3 4.8-45
Table 4.9 1. Federally Listed Threatened, Endangered, Candidate, and Species of Concern, State Threatened and Endangered Species, State Sensitive Plant and Wildlife Species, and Oregon Conservation Strategy Key Species addressed further in this document 4.9-4
Table 4.9 2. Characteristics of Scoggins Creek study reaches (CWS 2007) 4.9-11
Table 4.13 1. Tax Lots near Henry Hagg Lake that May Be Affected under the Action Alternatives 4.13-11
Table 4.14 1. Recreation Facilities at Henry Hagg Lake/Scoggins Valley Park 4.14-1
Table 4.14 2. Public and Private Recreation Areas, Willamette Pipeline Vicinity 4.14-7
Table 4.14 3. Distance from Top of Boat Ramps to Surface of Henry Hagg Lake at Low Pool, All Alternatives 4.14-8
Table 4.14 4. Recreational Season Water Access, Average Year, All Alternatives 4.14-9
Table 4.14 5. Scoggins Valley Park Water and Land Areas, All Alternatives 4.14-9
Table 4.14 6. Proposed Recreation Facilities at Henry Hagg Lake, Alternative 1 4.14-10
Table 4.14 7. Proposed Recreation Facilities at Henry Hagg Lake, Action Alternatives 4.14-12
Table 4.15 1. Population in the Project Vicinity 4.15-2
Table 4.15 2. Housing Supply and Availability in Project Vicinity 2000 4.15-3
Table 4.15 3. Poverty in the Project Vicinity, 1999 4.15-4
Table 4.15 4. Race/Ethnicity within Washington County and Project Vicinity 2000 4.15-6
Table 4.15 5. Covered Employment by Industry, Washington County 2004 4.15-7
Table 4.16 1. Measured Air Pollutant Concentrations in the Region around the Project Area Compared to Ambient Air Quality Standards 4.16-2
Table 4.16 2. Simulated Equipment Exhaust and Dust Emissions at Alternative 2 Construction Sites (Dam Raise, Reservoir Enlargement, and Road Relocation) 4.16-4
Table 4.16 3. Simulated Equipment Exhaust and Dust Emissions from Alternative 2, RWP Construction 4.16-5
Table 4.17 1. Typical Day-Night Noise Levels for Different Settings in Project Area 4.17-1
Table 4.17 2. Maximum Expected Hourly Equivalent Noise Level at Varying Distances from the Dam and RWP Construction Sites, Alternative 2 4.17-3
Table 4.18 1.  Towns, Cities, and Bridge Crossings Downstream of Scoggins Dam .............. 4.18-1
Table 4.18 2.  Estimated Population at Risk, Scoggins Dam Failure, All Alternatives .......... 4.18-2
Table 4.21 1.  Traffic Operations for 2006 Existing Condition............................................... 4.21-2
Table 4.21 2.  Comparison of Traffic Operations. Existing and During Alternative 2 Dam Construction.................................................................................................... 4.21-4
Table 4.21 3.  Transportation Facilities that Would Be Affected by Willamette Pipeline Construction.............................................................................................................. 4.21-8
Table 6 1.  Cost Comparison, TBWSP Alternatives................................................................. 6-3
Table 6 2.  Comparison of Regional Economic Impacts, Action Alternatives....................... 6-5
Table 6 3.  Comparison of Regional Economic Impacts from Annual Operation, Maintenance and Repair, Action Alternatives ................................................................. 6-6
Table 8 1.  Cost Estimate Basis................................................................................................ 8-3
Table 8 2.  Level of Cost Estimate Matrix................................................................................ 8-3
Table 8 3.  National Economic Development Account, All Alternatives.............................. 8-8
Table 8 4.  Regional Economic Development Account, All Alternatives............................. 8-10
Table 8 5.  Environmental Quality Account, All Alternatives................................................. 8-10
Table 8 6.  Social Well-Being Account, All Alternatives ........................................................ 8-19
1 Introduction

1.1 Purpose, Scope, and Objective
In 2001, the Bureau of Reclamation (Reclamation), in partnership with a number of local water service providers in Washington County, Oregon, undertook a study to identify and evaluate safe, reliable, and cost-effective water supply options to meet the long-term water needs of the Tualatin Basin (Notice of Intent was published in the FR on 12-13-01). Those water needs include instream flow restoration, municipal and industrial (M&I) uses, and irrigated agriculture. The Tualatin Basin Water Supply Feasibility Study (WSFS) was funded and directed by a partnership of local water providers and Reclamation. The WSFS partners included:

- Clean Water Services
- City of Sherwood
- City of Tigard
- City of Tualatin
- Tualatin Valley Water District
- City of Forest Grove
- City of Hillsboro
- City of Cornelius
- City of Beaverton
- City of North Plains
- City of Banks
- US Bureau of Reclamation

The WSFS:

- Developed peak season water demand forecasts to 2050, and estimated future summer supply deficits.
- Screened a range of potential structural and non-structural water supply options.
- Evaluated three structural supply options in more detail to determine the technical, environmental, and economic feasibility of those options. The options included a 20-foot raise of Scoggins Dam, a 40-foot raise of the dam, and an irrigation exchange pipeline from the Willamette River (these are discussed further in Section 3).

As a result of the WSFS process, the WSFS partners concluded that, individually, none of the options were adequate to meet their long-term (year 2050) needs. For example, while a 40-foot raise of Scoggins Dam was evaluated in the WSFS, hydrologic analysis showed that it would not meet future needs with an acceptable level of reliability because the reservoir would not fill with sufficient frequency.

Because none of the WSFS options would meet the long-term water needs of the Tualatin Basin, a new study was undertaken to develop and assess additional alternatives—The Tualatin Basin Water Supply Project (TBWSP or the Project). The WSFS partners, plus the Lake Oswego Corporation, became the TBWSP Partners (the Partners) to develop the TBWSP. The Tualatin Valley Irrigation District (TVID), Washington County, and Reclamation are interested parties participating in the study, but they are not funding Partners for the TBWSP.
As owner of Scoggins Dam, Reclamation is working with the TBWSP Partners to develop the best information possible. The TBWSP builds upon the WSFS analysis and findings, and also summarizes data and findings of studies completed after the final WSFS was issued in February 2004. The result of this partnership is this Draft Planning Report and Environmental Impact Statement (Draft PR/EIS). This Draft PR/EIS describes and analyzes water supply alternatives that have been modified or developed since preparation of the WSFS, that is, the alternatives being considered for the TBWSP.

This Draft PR/EIS combines Reclamation requirements for a planning report for Feasibility Studies, with the need to develop an environmental impact statement (EIS) under the National Environmental Policy Act (NEPA) for Federal actions that may have a significant impact on the human environment. NEPA provides that any environmental document prepared in compliance with NEPA may be combined with any other agency document to reduce duplication and paperwork. The primary purpose of an EIS is to provide full and fair discussion of significant environmental impacts and inform decision makers and the public of reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment. Following a 90-day public review and comment period, a Final PR/EIS will be prepared, followed by a Record of Decision documenting Reclamation’s decision on which alternative, if any, to present to the U.S. Congress for authorization.

1.2 Project Area Location and General Description

The alternatives evaluated in this Draft PR/EIS include potential project components in a number of locations. The major components could include: a raise of Scoggins Dam to increase the storage capacity of Henry Hagg Lake; a new raw water pipeline (RWP) between Scoggins Dam and the Joint Water Commission (JWC) Fern Hill Water Treatment Plant; a new water transmission pipeline (Willamette Pipeline) between the Willamette River Water Treatment Plant and TVWD’s connection in Beaverton; and new water storage tanks to hold water from the Willamette Pipeline. A project vicinity map is shown as the frontispiece.

Scoggins Dam and its reservoir, Henry Hagg Lake, are in southwestern Washington County, Oregon, in Township 1 South, Ranges 4 and 5 West, Willamette Meridian. The dam is located on Scoggins Creek, a tributary of the Tualatin River, approximately five miles southwest of the city of Forest Grove and 25 miles west of Portland. The locations of the dam and reservoir are shown on the frontispiece.

Henry Hagg Lake and Scoggins Valley Park, which surrounds the reservoir, encompass approximately 2,581 acres. Scoggins Dam is owned by the United States and is under the jurisdiction of Reclamation; it was completed with the initial filling of Henry Hagg Lake in April 1975. The dam is a zoned embankment structure containing about four million cubic yards of material. The dam crest is 2,700 feet long and is 151 feet above the bed of Scoggins Creek, at an elevation of 313 feet. A spillway and outlet works are located on the left abutment of the dam, and a paved county road is on the crest of the dam.

---

1 In August 1983, TVID assumed responsibility for operation and maintenance of Scoggins Dam and Henry Hagg Lake (Reclamation 2002).
The existing dam and reservoir are operated for water supply, flood control, recreation, and fish and wildlife habitat. Stored water is currently used for agricultural irrigation, M&I supply, and flow augmentation of the Tualatin River in the summer and fall months. Henry Hagg Lake and Scoggins Valley Park are active recreation areas with over 600,000 visitor-days per year. They also provide habitat for fish and wildlife.

The RWP would be about 6½ miles long and would be constructed from Scoggins Dam through the lower Scoggins Creek valley, then northeastward to the JWC Fern Hill Water Treatment Plant in Forest Grove, as shown on the frontispiece. It would lie entirely within Washington County.

The Willamette Pipeline would begin at the Willamette River Water Treatment Plant in the city of Wilsonville in Clackamas County, Oregon. The Willamette Pipeline would travel approximately 22 miles northward through Wilsonville and unincorporated Clackamas County, then into Washington County and through Sherwood, and possibly Tigard, before ending in Beaverton near the intersection of SW Western Avenue and SW Beaverton-Hillsdale Highway. The Willamette Pipeline would follow public rights-of-way for nearly all of its length. Associated with the Willamette Pipeline would be water storage tanks. Specific locations for the water tanks have not been selected, but potential areas have been identified on the southern slopes of Cooper Mountain in unincorporated Washington County and just southwest of Tualatin. The proposed pipeline alignment and potential water tank locations are shown on the frontispiece.

1.3 Tualatin River Basin Water System Components

Henry Hagg Lake is a component of the Tualatin River Basin water system. To provide some context for the proposed project, existing components of the Tualatin River Basin water system are described below. Figure 1-1 shows the river basin and water system components.

Henry Hagg Lake is the main storage reservoir in the Tualatin Basin, with a total storage capacity of 62,216 acre-feet and a full active storage of 53,323 acre-feet. Water released from the reservoir into Scoggins Creek flows into the Tualatin River. From there, it may be diverted at the Spring Hill Pumping Plant or one of many other irrigation pumps on the Tualatin River; if not diverted, it is conveyed downstream to improve water quality in the lower Tualatin River. Barney Reservoir is located in the Trask River Basin on the Middle Fork of the North Fork of the Trask River and stored water is transferred to the upper Tualatin River through a pipeline. Barney Reservoir has a total storage capacity of 20,000 acre-feet, and 17,000 acre-feet are allocated to Hillsboro, Beaverton, Forest Grove, TVWD, and Clean Water Services.

Major diversion facilities on the Tualatin River include the City of Hillsboro (Haines Falls) intake, Spring Hill Pumping Plant, and the Lake Oswego Corporation Diversion Dam. Numerous unmeasured diversions

\[^2\] Capacity derived from recent Reclamation sedimentation survey. Prior to the survey, the active capacity was 53,640 acre-feet, which is equal to the contracted amounts of storage at Hagg Lake. Reclamation can still supply the full contracted amount of 53,640, if needed, by utilizing inactive space in the reservoir.
(smaller unmeasured pump stations with natural flow water rights) also exist on the Tualatin River. The Spring Hill Pumping Plant, located about four miles downstream of Scoggins Creek on the Tualatin River, is the main diversion point for stored water from Henry Hagg Lake and Barney Reservoir. TVID diverts about two-thirds of their storage releases from the Spring Hill Pumping Plant; the cities of Hillsboro, Forest Grove, and Beaverton divert all of their storage releases at Spring Hill.

Inflows to the Tualatin River include natural flow (gains from precipitation, runoff, and groundwater), releases from Henry Hagg Lake and Barney Reservoir, and Clean Water Services discharges from the Rock Creek and Durham wastewater treatment plants.

Figure 1-1. Tualatin River Basin (File Name: Fig 1-1 Tualatin River Basin.pdf)

Table 1-1. Tualatin River — River Miles and Key Features

<table>
<thead>
<tr>
<th>River Mile</th>
<th>Key Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>Tualatin River enters Willamette River at RM 28.5 (left bank)</td>
</tr>
<tr>
<td>1.75</td>
<td>West Linn stream gage (#14207500)</td>
</tr>
<tr>
<td>3.45</td>
<td>Lake Oswego Corporation diversion dam</td>
</tr>
<tr>
<td>5.38</td>
<td>Stafford Bridge (Stafford Road)</td>
</tr>
<tr>
<td>6.7</td>
<td>Oswego Canal diversion</td>
</tr>
<tr>
<td>8.91</td>
<td>Tualatin elevation recording station (#14206960)/Southern Pacific Railroad bridge</td>
</tr>
<tr>
<td>9.32</td>
<td>Fanno Creek enters Tualatin River (left bank)</td>
</tr>
<tr>
<td>9.33</td>
<td>Durham wastewater treatment plant outfall</td>
</tr>
<tr>
<td>15.5</td>
<td>Chicken Creek enters Tualatin River (right bank)</td>
</tr>
<tr>
<td>16.22</td>
<td>Shamberg Bridge (Elsner Road)</td>
</tr>
<tr>
<td>33.3</td>
<td>Farmington stream gage (#14206500)/Harris Bridge (State Highway 208)</td>
</tr>
<tr>
<td>38.08</td>
<td>Rock Creek wastewater treatment plant outfall</td>
</tr>
<tr>
<td>38.09</td>
<td>Rock Creek enters Tualatin River (left bank)</td>
</tr>
<tr>
<td>38.44</td>
<td>Rood Bridge Road Bridge stream gage (#14206295)</td>
</tr>
<tr>
<td>44.73</td>
<td>Dairy Creek enters Tualatin River (left bank)</td>
</tr>
<tr>
<td>51.54</td>
<td>Golf Course Road stream gage (#14204800)</td>
</tr>
<tr>
<td>55.24</td>
<td>Clean Water Services Forest Grove wastewater treatment plant outfall/Fern Hill wetlands</td>
</tr>
<tr>
<td>56.1</td>
<td>Spring Hill Pumping Plant intake channel/JWC water treatment plant</td>
</tr>
<tr>
<td>56.8</td>
<td>Gales Creek enters Tualatin River (left bank)</td>
</tr>
<tr>
<td>57.84</td>
<td>Dilley Creek enters Tualatin River (left bank)</td>
</tr>
<tr>
<td>58.82</td>
<td>Dilley stream gage (#14203500)</td>
</tr>
<tr>
<td>60.0</td>
<td>Scoggins Creek enters Tualatin River (left bank)</td>
</tr>
<tr>
<td>60.8</td>
<td>Wapato Creek — Wapato Improvement District return flow</td>
</tr>
<tr>
<td>62.0</td>
<td>Wapato Improvement District headgate</td>
</tr>
<tr>
<td>63.13</td>
<td>TVID Patton Valley pump station outfall #1</td>
</tr>
<tr>
<td>River Mile</td>
<td>Key Feature</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>63.87</td>
<td>Gaston stream gage (discontinued)</td>
</tr>
<tr>
<td>64.26</td>
<td>TVID Patton Valley pump station outfall #2</td>
</tr>
<tr>
<td>70.7</td>
<td>Raines Bridge/Tualatin River below Lee Falls</td>
</tr>
<tr>
<td>73.3</td>
<td>City of Hillsboro Haines Falls intake</td>
</tr>
<tr>
<td>78.0</td>
<td>Barney Reservoir aqueduct outfall</td>
</tr>
<tr>
<td>79.3+</td>
<td>Headwaters of Tualatin River</td>
</tr>
</tbody>
</table>

Sources: Reclamation 2002, Bonn 2005
RM = River Mile

Table 1-2. Scoggins Creek — River Miles and Key Features

<table>
<thead>
<tr>
<th>River Mile</th>
<th>Key Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>Scoggins Creek enters Tualatin River at RM 60.0</td>
</tr>
<tr>
<td>1.7</td>
<td>TVID Patton Valley pumping plant</td>
</tr>
<tr>
<td>1.71</td>
<td>Former USGS stream gage #14203000</td>
</tr>
<tr>
<td>4.8</td>
<td>Stream gage #14202980 (January 1975 to present)</td>
</tr>
<tr>
<td>5.1</td>
<td>Scoggins Dam</td>
</tr>
<tr>
<td>16.7</td>
<td>Headwaters</td>
</tr>
</tbody>
</table>

Source: Bonn 2005
USGS = US Geological Survey; RM = River Mile

1.4 Authority


1.5 Previous Studies

1.5.1 Tualatin Project

Construction of the Tualatin Project Phase I was essentially completed in 1978, and its major feature, Scoggins Dam, was, completed in 1975. Phase I was not designed to satisfy all of the water demands and needs of the area.

The planning for the Tualatin Project Phase II was authorized by Congress in 1966 (Public Law 89-561). Planning studies of the Tualatin Project Phase II were undertaken to identify actions that could help satisfy the water needs that are beyond the capability of the first phase. Many plan possibilities were analyzed at a preliminary level, and the most promising plans were subsequently analyzed in greater depth. In all, seventeen storage sites in the Tualatin Basin were evaluated; the Gaston and Mount Richmond sites on the Tualatin River, near the town of Gaston, were determined to be the most favorable sites. The Mount Richmond site was eventually recommended for implementation. However, due to public concerns and anticipated environmental effects, the project was not completed (see Section 3.7.6 for more discussion).
While the Mount Richmond reservoir was not built, the needs identified in the Tualatin Project Phase II studies remain. The primary conclusion of the Phase II studies was that additional M&I and irrigation water supplies, improved water quality in the Tualatin River, flood control measures, fishery preservation, and outdoor recreational opportunities are needed in the service area of the Tualatin Project.

1.5.2 Regional Water Supply Plan, Phases I and II

In 1989, water providers in the Portland region recognized that the region would face supply shortfalls. Several regional water supply studies were begun in 1991 by a consortium of water providers to address future water supply needs. Three studies were commissioned by the City of Portland and the regional providers. Those “Phase I” studies estimated future regional water demand to the year 2050, evaluated potential regional source options, and identified opportunities for water conservation. The studies were completed in 1992.

Several of the Partners involved in the TBWSP also participated in the financing and management of the Phase I studies. They included the cities of Beaverton, Hillsboro, Forest Grove, and Tigard, and TVWD.

The Phase I Source Options Study evaluated 29 different water source options and made recommendations as to which options should be further investigated. New sources were identified based on their ability to provide significant quantities of water and acceptable water quality at a reasonable distance from demand centers. The study area included the Tualatin Basin. Dam raises were considered viable supply options for both the Portland Bull Run system and for the Barney Reservoir. New dams were also considered in the Tualatin, Bull Run, and Clackamas watersheds. Four reservoir sites were evaluated in the Tualatin Basin. All of the sites were rejected on the basis of cost, environmental impact, or limited water availability. A raise of the Scoggins Dam on Henry Hagg Lake was not considered as a potential source option in the study. The study ranked sources against a set of evaluation criteria. The report concluded that 6 of the 29 options should be studied further, in Phase II:

- Clackamas River development to the full extent of water rights
- Expansion of the Barney Reservoir
- Bull Run Dam Number 3
- Columbia River diversion
- Willamette River diversion
- Aquifer storage and recovery (ASR)

In 1993, 27 water providers signed an intergovernmental agreement to fund Phase II of the Regional Water Supply Plan. Phase II was intended to develop an integrated water supply plan for the region to provide clear guidance on how to meet regional water demands to the year 2050. The Regional Water Supply Plan was adopted in 1996 and included an updated demand forecast and a detailed evaluation of potential regional supply sources, transmission requirements, and conservation programs. An update to the plan is underway.
Key source options evaluated in Phase II included: conservation, construction of Bull Run Dam Number 3, expansion of the Clackamas and Columbia River supplies, development of a Willamette River supply, and development of ASR. Construction of the Barney Reservoir expansion project, recommended for further study in Phase I, was begun in 1995 and, therefore, was not included in the Phase II work.

1.5.3 Barney Reservoir Expansion EIS
In May 1994, the US Army Corps of Engineers (Corps) issued a Final Environmental Impact Statement for an expansion of Barney Reservoir, a reservoir on the Middle Fork North Trask River in the Oregon Coast Range. The reservoir serves as a M&I water supply for TVWD, the cities of Hillsboro, Forest Grove, Beaverton, Tigard, and several smaller communities in the Joint Water Commission (JWC) service area. The JWC is a water authority formed to provide water treatment and stored water supplies to its members.

The Barney Reservoir Joint Ownership Commission is responsible for overseeing the operations of Barney Reservoir and approving annual budgets. The Barney Reservoir Joint Ownership Commission includes TVWD, Clean Water Services, and the cities of Forest Grove, Hillsboro, and Beaverton.

Barney Reservoir is approximately 12 miles west of Henry Hagg Lake. The project involved raising the formerly 72-foot earthfill Trask Dam by 50 feet, increasing the storage capacity of Barney Reservoir from 4,000 to 20,000 acre-feet. The project, the E.S. Mills dam, was completed in 1999.

1.5.4 Integrated Water Resources Management Strategy
In 1997, a group of public and private agencies charged with managing water resources in the Tualatin Basin began a planning process to evaluate resource and environmental needs within the basin. The objective was to develop long-term water resource management strategies as part of a collaborative process. The participating agencies included Clean Water Services, the JWC, the City of Tigard, TVID, Washington County, the Oregon Water Resources Department (OWRD), and the Lake Oswego Corporation. Results and conclusions of the planning process were described in the Integrated Water Resources Management (IWRM) Strategy. The IWRM Strategy indicated that 50,000 additional acre-feet (16 billion gallons) of water per year could be needed by the year 2050 to meet demands in the three water-use sectors of river flow restoration, M&I demand, and agricultural demand. This quantified need compelled the Partners to analyze potential water supplies that could meet the need, resulting in the WSFS and, subsequently, the TBWSP.

1.6 Other Ongoing Activities

1.6.1 Henry Hagg Lake Resource Management Plan
Another recent study is the Henry Hagg Lake Resource Management Plan, issued by Reclamation in May 2004. The Resource Management Plan was prepared in cooperation with Washington County Facilities Management, the local agency responsible for managing recreation facilities at Scoggins Valley Park and Henry Hagg Lake.

The Resource Management Plan is being used as the basis for directing activities on Reclamation lands and Henry Hagg Lake in a way that maximizes overall public and resource benefits, and that provides
guidance for managing the area over the planning period (10 years). It was developed with the understanding that the potential dam raise project would inundate most recreation facilities and portions of the road around the reservoir, and also that, if such inundation occurred, affected recreation amenities and opportunities would be replaced as part of the dam raise project.

It is expected that, should the dam be raised for the TBWSP, construction may begin before the end of the 10-year planning period of the Resource Management Plan. The resource management objectives and actions included in the Resource Management Plan would be subject to revision in 2014. However, the alternative selected through the NEPA process for the TBWSP will be consistent with the existing Resource Management Plan goals and objectives.

1.6.2 Clean Water Services Program Activities
As a water resource management utility, Clean Water Services performs a myriad of functions and is in a constant process of updating or developing plans and policies or responding to changing regulations to advance the health of the Tualatin watershed. The major plans, policies or regulatory changes are summarized below.

1.6.2.1 Watershed-Based NPDES Permit
In February 2004, the Oregon Department of Environmental Quality (ODEQ) issued Clean Water Services the nation’s first integrated, municipal, watershed-based, National Pollutant Discharge Elimination System (NPDES) permit under the Clean Water Act. The permit combines the requirements of Clean Water Services’ four previous municipal wastewater treatment facility permits and a major municipal stormwater discharge permit systems into a single, integrated permit that allows for water quality credit trading. The permit was issued based on addressing goals for the entire Tualatin River watershed, rather than focusing on limits for individual facilities.

The watershed-based permit significantly changed the regulatory framework under which several of Clean Water Services’ programs operate. The permit:

- Allows for water quality credit trading between the Rock Creek Advanced Wastewater Treatment Plant and the Durham Advanced Wastewater Treatment Plant for carbonaceous biological oxygen demand (CBOD) and ammonia.
- Allows for water quality credit trading for thermal loads between treatment facilities and the release of stored water from Henry Hagg Lake.
- Allows for water quality credit trading for thermal loads between treatment facilities and streamside shading improvements outside and inside Clean Water Services’ service boundary.
- Requires the establishment of performance measures—“benchmarks”—for the stormwater management activities of Clean Water Services, the permit member cities, and the Washington County Department of Land Use and Transportation.
- Allows for consolidation of various reporting requirements.

1.6.2.2 Revised Temperature Management Plan
The purpose of the Revised Temperature Management Plan is to describe how Clean Water Services will meet the temperature requirements contained in the watershed-based NPDES permit (see above). It describes the measures that will be used to reduce river temperatures and explains how temperature trading will be conducted. The Revised Temperature Management Plan contains a summary of the applicable water quality criteria, Total Maximum Daily Load (TMDL) allocations, a list of methods for reducing stream temperatures that were considered but not selected, and a list of such methods that were selected, including flow augmentation and creation of stream shade.

1.6.2.3 Incentive Program for Farmers
Clean Water Services worked with the Tualatin Soil and Water Conservation District to establish two incentive programs in 2005 for farmers in rural Washington County. One program is based on a federal program called Conservation Reserve Enhancement Program, and the second is called Vegetated Buffer Areas for Conservation and Commerce. Both programs pay farmers for reserving some of their agricultural land for trees and shrubs along stream corridors as well as removal of invasive plants. The shade improves water quality by reducing stream temperatures.

1.6.2.4 Revision of Tualatin Subbasin Temperature TMDL
The Tualatin Subbasin TMDL that was issued in August 2001 was based on ODEQ’s 1996 temperature standard. ODEQ revised its temperature standard in 2003 to reflect the US Environmental Protection Agency’s (EPA’s) regional temperature guidance for the Northwest. ODEQ’s revised temperature standard was approved by EPA in 2004. The implementation mechanism of the new temperature standard is significantly different than the approach used to develop the 2001 Tualatin Subbasin TMDL. The 2001 Tualatin Subbasin TMDL was based on modeling “system potential” conditions that included the release of water from Henry Hagg Lake; the 1996 temperature standard did not specify where and when the specific elements of the standard applied. The revised standard is based on “natural thermal potential” conditions, which does not include the release of water from Henry Hagg Lake. Additionally, the revised standard includes maps of streams that show where and when the standard applies. Because of ODEQ’s revisions to the temperature standard, Clean Water Services is currently working with ODEQ to conduct a re-evaluation of the 2001 Tualatin Subbasin TMDL for temperature.

1.6.2.5 Storm Water Management Plan
Clean Water Services’ watershed-based NPDES permit includes a requirement to develop and update its Storm Water Management Plan. The Storm Water Management Plan defines Clean Water Services, city, and county programs and activities specific to the management of storm water runoff and its pollutant loads, and covers operation and maintenance (O&M), design and construction standards, monitoring, public education, and illicit connections. The current update includes review of all Storm Water Management Plan elements and adjustments to ensure compliance with ODEQ regulations. The draft Storm Water Management Plan is under review for final approval by ODEQ.

1.6.2.6 Healthy Streams Plan
The Healthy Streams Plan is an update of Clean Water Services’ former watershed/subbasin strategy plans, designed to support the intent and goals of the Clean Water Act and federal Endangered Species Act of 1973 (ESA). The Healthy Streams Plan identifies and prioritizes storm and surface water projects
including: stream preservation and enhancement, flow restoration, **culvert** replacement and repair, storm water outfall retrofits, and community tree planting. It also identifies program and policy options in the categories of storm water regulation, local land use and building codes, sensitive areas and vegetated corridors, O&M of the storm system, inspection and code enforcement, incentives, public education and awareness, monitoring effectiveness and implementation progress, surface water management funding, and capital project implementation.

The Healthy Streams Plan was approved by the Clean Water Services Board of Directors in June 2005. Clean Water Services is working cooperatively with twelve cities, Washington County, nonprofit organizations, and the community to implement the actions outlined in the Healthy Streams Plan.

**1.6.2.7 Reclaimed Water Master Plan**

The Reclaimed Water Master Plan will determine how water reclamation can help Clean Water Services meet its goals of reducing costs, maintaining discharge permit compliance, and improving the health of the Tualatin River and its tributary streams. The Reclaimed Water Master Plan is linked closely with other Clean Water Services initiatives such as the TBWSP, Healthy Streams Plan, and watershed-based NPDES permit, and they will mutually inform each other in guiding decisions about the watershed. The Reclaimed Water Master Plan is being developed concurrently with the West Basin Facilities Plan project, described below, which includes an assessment of the Forest Grove and Hillsboro treatment facilities and the interrelationship with the Rock Creek Facility. The Reclaimed Water Master Plan will be finalized after further analysis of the role of the other Clean Water Services initiatives.

**1.6.2.8 West Basin Facilities Plan**

The West Basin Facilities Plan is being developed to include three stand-alone documents: the Forest Grove and Hillsboro facilities plans and the West Basin Facilities Plan. The Forest Grove and the Hillsboro facilities plans will accomplish the following for their respective treatment facilities:

- Assess the existing facilities and make recommendations for initial improvements.
- Develop and evaluate wet stream alternatives for future improvements.
- Assess the level of wet stream treatment desired. The alternatives may include tertiary treatment depending on the means for effluent disposal.

Results from the Forest Grove and Hillsboro facilities plans, which are expected to be completed in 2007, and results from the Reclaimed Water Master Plan will be used to develop the West Basin Facilities Plan. The West Basin Facilities Plan, also expected to be completed in 2007, will evaluate the overall implementation strategy for the Forest Grove and Hillsboro treatment facilities and their relationship with a reclaimed water program. It will also incorporate information developed by others for improvements at the Rock Creek Facility.

Draft versions of the Forest Grove, Hillsboro, and West Basin plans call for continuing current operations in the near term, i.e., wet weather treatment and river discharge at Forest Grove and Hillsboro, and no treatment at those facilities in the summer when untreated effluent is routed to the Rock Creek facility (VanderPlaat 2006). Longer term operation includes plans for expanding capacity at Forest Grove with
the potential for year-round treatment, while the Hillsboro site is space-limited and likely cannot be expanded (VanderPlaat 2006).

1.6.2.9 Rock Creek and Durham Facilities Plans
A planning process began in 2005 to update the facilities plans for Clean Water Services’ Rock Creek and Durham Advanced Wastewater Treatment facilities. The plans, expected to be completed in mid 2007, will update the previous facilities plans from 1998 and will include:

- Coordination with parallel planning efforts including the West Basin Facilities Plan and Reclaimed Water Master Plan.
- Assessment of changes in flows and loads.
- Compliance with regulatory changes including the watershed-based NPDES permit.
- Identification of operational and downsizing impacts.
- Response to adjoining development.

1.6.3 Wapato Lake Unit Land Conservation Plan
In January 2006, the US Fish and Wildlife Service (FWS) approved the Wapato Lake Unit addition to the Tualatin River National Wildlife Refuge. The Wapato Lake Unit would include Wapato Lake’s historic lakebed and associated wetlands that provide habitat for birds and other wildlife. The Wapato Lake Unit will lie east of Gaston and south of Forest Grove, primarily in Washington County but extending into Yamhill County, as shown on the frontispiece. The Wapato Lake Unit boundaries shown on figures in this Draft PR/EIS represent the area proposed for acquisition by the FWS, not land that has been acquired. Because the Wapato Lake Unit could incorporate land along the Tualatin River in the vicinity of the TBWSP study area, it has some relevance to TBWSP planning.

The FWS has begun the process for acquiring land for the Wapato Lake Unit. Land acquisition will proceed according to the availability of funds and willing sellers. Funding has been appropriated for the first year (2007). Staffing, programs, and facilities will be phased in over time as the land base and management responsibilities expand. The Wapato Lake Unit will be administered by the FWS refuge manager at the Tualatin River National Wildlife Refuge.

FWS issued a “Land Conservation Plan and Environmental Assessment” (LCP/EA) and Finding of No Significant Impact (FONSI) for the Wapato Lake Unit (FWS 2007a). The LCP/EA considered four action alternatives; the Preferred Alternative, which was selected, encompasses approximately 4,310 acres. The boundary will extend from the intersection of Spring Hill Road and Highway 47 upstream (south) to Gaston, and encompassing the historic Wapato lakebed and lands along Ayers Creek and Wapato Creek in Yamhill County. It will include most of the area between Highway 47 and Spring Hill Road.

Key areas of management focus at the Wapato Lake Unit will be protection of existing habitat, and restoration and maintenance of native habitats (FWS 2007a). According to the LCP/EA, “Water rights are a critical component of Wapato Lake Unit management if water dependent habitats and initial establishment of woody plantings are to be successfully restored and maintained.” The FWS would try to acquire water rights from the Wapato Improvement District to irrigate plants and flood wetlands.
prior to fall bird migration. Wetland flooding in fall and winter could be achieved through application of new water storage rights, as is done at the Tualatin River National Wildlife Refuge. The storage rights, regulated by the State of Oregon, allow for storage at one location from November 1 to May 31. 

1.6.4 Tualatin River Watershed Council
The Tualatin River Watershed Council (TRWC), formed in 1993, is a locally organized group focused on improving watershed health in the Tualatin River watershed. TRWC prepared an action plan in 1999 that identifies TRWC goals, objectives, and action items for the watershed. The ten priority action items identified in the plan (TRWC 1999) are:

- Assess watershed conditions to help prioritize restoration activities.
- Conserve and improve fish and wildlife habitat (focusing on anadromous fish).
- Develop, support, and implement a broad-based education/outreach program focusing on reducing non-point source pollution and improving protection and management of riparian areas.
- Develop demonstration projects in priority areas to encourage restoration on private lands in cooperation with willing landowners.
- Establish a Tualatin Watershed Resource Collection and website.
- Promote management practices that improve watershed functions and protect values.
- Work with Tualatin Basin water managers to implement IWRM strategy.
- Assist designated management agencies with implementation of all non-point source water quality management plans.
- Expand existing watershed monitoring programs to broaden citizen involvement and to create greater awareness.
- Promote recreational experiences that foster watershed stewardship.

TRWC also plans and implements projects in high priority areas intended to meet action plan goals and objectives. One TRWC high priority area is Lower Gales Creek. TRWC, with Tualatin Project mitigation funding from Reclamation, is studying existing conditions along Lower Gales Creek to gain information that will be used to design projects to improve riparian conditions. TRWC has also begun a monitoring program to identify winter steelhead spawning areas in Gales Creek. TRWC served as the main stakeholder contact for the TBWSP planning process.

1.6.5 Biological Assessment on Operation and Maintenance of the Tualatin Project
Reclamation has prepared a preliminary draft biological assessment on future O&M of the Tualatin Project (Reclamation 2007) and is consulting with FWS and the National Marine Fisheries Service (NMFS, also known as NOAA Fisheries) under Section 7 of the ESA. The proposed federal action addressed in that biological assessment is the continued storage, release, diversion, and delivery of water, and O&M of federal facilities of the Tualatin Project, including Scoggins Dam and the Spring Hill Pumping Plant, among others. O&M would be consistent with past O&M and pursuant to relevant existing and future contracts (Reclamation 2007). Approximate contract amounts for the Tualatin Project total 67,900 acre-feet.
The existing traveling screens at the Spring Hill Pumping Plant (see Section 3.2.2.4) do not meet current NMFS and Oregon Department of Fish and Wildlife (ODFW) criteria for effective passage of juvenile salmonids. In 1999, Reclamation initiated pre-design activities to upgrade the fish screens and, after evaluating options, proposed construction of a flat plate screen at the face of the pumping plant and restoring the original river channel alignment to pass “sweeping flow” in front of the Spring Hill Pumping Plant (Reclamation 2007). However, the estimated construction cost for the fish screen upgrades ($6 million) was much higher than anticipated because of the channel restoration; therefore, Reclamation deferred further work pending completions of the biological assessment and consultation process (Reclamation 2007). The biological assessment is based on the existing traveling screens remaining in place without meeting current NMFS and ODFW criteria for effective passage of juvenile anadromous fish (Reclamation 2007).

The preliminary draft O&M biological assessment concluded that future O&M of the Tualatin Project would have no effect on the following listed species: upper Willamette River spring Chinook salmon, northern spotted owl, Willamette daisy, howellia, Bradshaw’s lomatium, Kincaid’s lupine, and Nelson’s checker-mallow (Reclamation 2007). (Reclamation determined that future O&M “may effect but is not likely to adversely affect” bald eagles, but the bald eagle was removed from the Endangered Species List on June 28, 2007.) The biological assessment also concluded that future O&M of the Tualatin Project is likely to adversely affect incubating steelhead in Scoggins Creek during July as a result of increased releases from Scoggins Dam. Also, juvenile steelhead rearing and adult steelhead holding habitat in Scoggins Creek would be adversely affected during December as a result of decreased releases from the dam. Adult and juvenile steelhead habitat in the Tualatin River downstream of the Spring Hill Pumping Plant would be adversely affected in October and November under low flow conditions (Reclamation 2007).

The O&M biological assessment and consultation do not address adding storage capacity at Scoggins Dam, construction of the RWP, or construction of the Willamette Pipeline. A separate biological assessment is being prepared and consultation with FWS and NMFS will occur for those actions.

### 1.6.6 Title Transfer

The TBWSP Partners are considering acquiring the Tualatin Project from the United States and are going through a process to investigate that option. The Tualatin Project includes Scoggins Dam, Henry Hagg Lake, the lands surrounding the reservoir, the recreation facilities at the reservoir, the Spring Hill Pumping Plant, the Patton Valley pumping plant, all the irrigation pipelines and associated lands to include fee title lands and easements, and the TVID office and shops with the underlying land.

Reclamation is working with the TBWSP Partners to evaluate the possibility of transferring title for all or some specific (to be determined) Tualatin Project facilities from the United States to a regional water management entity, likely consisting of the TBWSP Partners and TVID. The TBWSP Partners have requested that Reclamation consider title transfer with or without a dam raise project, with a goal of localizing Project decisions and controls. The Partners’ main title transfer objective is to receive title prior to implementation of a potential dam raise project in order to realize cost-effectiveness and schedule benefits that they perceive could result from local management of project construction.
Since 1995, Reclamation has considered proposed transfers of title in accordance with six major criteria set forth in the “Framework for Transfer of Title, Bureau of Reclamation Projects” (Reclamation 1995):

- The Federal Treasury, and thereby the taxpayer’s financial interest, must be protected.
- There must be compliance with all applicable State and Federal laws.
- Interstate compacts and agreements must be protected.
- The Secretary of the Interior’s Native American trust responsibilities must be met.
- Treaty obligations and international agreements must be fulfilled.
- The public aspects of the project must be protected.

Title transfer is being conducted as a separate but concurrent process with the TBWSP. Completion of one is not dependent upon completion of the other. The progress of the TBWSP is not dependent on developments or findings of the title transfer review and vice-versa. This Draft PR/EIS outlines the alternatives for meeting future water supply needs in the region and summarizes the environmental and other impacts of each. A Environmental Assessment will be prepared for the title transfer process that analyzes current operations only, on an “as is, where is” basis; without regard for whether, when, or in what form the TBWSP might take place. Because Reclamation will assess the potential effects of the proposed transfer of title for the Tualatin Project in a separate environmental compliance document the potential effects of the title transfer are not discussed in this Draft PR/EIS.
1 INTRODUCTION

1.1 PURPOSE, SCOPE, AND OBJECTIVE

1.2 PROJECT AREA LOCATION AND GENERAL DESCRIPTION

1.3 TUALATIN RIVER BASIN WATER SYSTEM COMPONENTS

1.4 AUTHORITY

1.5 PREVIOUS STUDIES

1.5.1 Tualatin Project

1.5.2 Regional Water Supply Plan, Phases I and II

1.5.3 Barney Reservoir Expansion EIS

1.5.4 Integrated Water Resources Management Strategy

1.6 OTHER ONGOING ACTIVITIES

1.6.1 Henry Hagg Lake Resource Management Plan

1.6.2 Clean Water Services Program Activities

1.6.3 Wapato Lake Unit Land Conservation Plan

1.6.4 Tualatin River Watershed Council

1.6.5 Biological Assessment on Operation and Maintenance of the Tualatin Project

1.6.6 Title Transfer

Figure 1-1. Tualatin River Basin (File Name: Fig 1-1 Tualatin River Basin.pdf)

Table 1-1. Tualatin River — River Miles and Key Features

Table 1-2. Scoggins Creek — River Miles and Key Features
2 Purpose and Need

2.1 Purpose of and Need for the Proposed Action

On December 13, 2001, Reclamation published a Notice of Intent in the Federal Register (Volume 66, No. 240) to prepare a PR/EIS “to identify alternatives to meet future water supply needs in the Tualatin River Basin in Oregon. The purpose of the PR/EIS is to evaluate alternative methods of meeting future water supply needs for river flow restoration, municipal water, and agricultural irrigation.” The Notice of Intent stated that “50,000 additional acre-feet (15 billion gallons) of water per year could be needed by the year 2050 to meet demands in the three water-use sectors of river flow restoration, municipal and industrial demand, and agricultural demand.” However, based upon current growth projections, future needs are expected to be higher than estimated in 2001.

Under Oregon state land use law (Oregon Revised Statutes [ORS], Chapter 197), cities and counties must plan for and accommodate future growth. Cities and counties must adopt public facility plans to provide adequate services and facilities to meet the needs of the future populations identified in the comprehensive plans. Considering the needs identified in the local comprehensive plans, combined with analysis conducted for the WSFS, it was determined that an additional 52,550 acre-feet (17.1 billion gallons) of water per year could be needed to meet future (2050) demands. Table 2-1 summarizes the projected additional water demands.

Table 2-1. Additional Projected Water Demands for Stored Water in 2050, Tualatin Basin

<table>
<thead>
<tr>
<th>TBWSP Partner</th>
<th>Future Demand Increment (acre-feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>M&amp;I:</strong></td>
<td></td>
</tr>
<tr>
<td>Tualatin Valley Water District</td>
<td>12,400</td>
</tr>
<tr>
<td>City of Tigard</td>
<td>10,300</td>
</tr>
<tr>
<td>City of Hillsboro</td>
<td>7,650</td>
</tr>
<tr>
<td>City of Beaverton</td>
<td>4,100</td>
</tr>
<tr>
<td>City of Tualatin</td>
<td>1,900</td>
</tr>
<tr>
<td>City of Forest Grove</td>
<td>1,000</td>
</tr>
<tr>
<td><strong>Total M&amp;I Demand</strong></td>
<td>37,350</td>
</tr>
<tr>
<td><strong>Water Quality:</strong></td>
<td></td>
</tr>
<tr>
<td>Clean Water Services</td>
<td>15,200</td>
</tr>
<tr>
<td><strong>Agricultural:</strong></td>
<td></td>
</tr>
<tr>
<td>Tualatin Valley Irrigation District</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total Additional Demand</strong></td>
<td>52,550</td>
</tr>
</tbody>
</table>

Source: MWH 2006b

In addition, the Partners recognize that the water supplies must be substantially reliable and cost-effective. For example, while agricultural demand is not expected to increase, higher demand for M&I
water could reduce the amount of water available for agriculture, especially during dry years. (Currently, TVID allocations are reduced during dry years to make more M&I water available, as explained in Section 2.2.2.) Therefore, a more reliable supply for all users, including agriculture, is needed. To adequately serve users and meet the current standards for provision of reliable M&I water supplies, greater than 90 percent reliability (i.e., ability to meet demand in more than nine out of ten years) is needed.

Figure 2-1 shows historical inflows to the Scoggins Creek Valley/Henry Hagg Lake between 1929 and 2001, and compares the inflows to the existing contracts and future demands. As shown, inflows have been able to meet the existing contracted amounts in nearly all years but, assuming future inflows are similar to past ones, they would be able to meet future demands less than one-quarter of the time.

![Figure 2-1. Annual Inflow to Henry Hagg Lake](image)

Source: MWH 2006f

2.1.1 River Flow Restoration

A major component of the unmet need in the Tualatin Basin is water for flow restoration in the Tualatin River. The Tualatin River historically experiences low flows in the summer months and yields less than 2 percent of its total annual discharge between the months of June and September. Low water flows coupled with high ambient (natural) phosphorous levels and high water temperatures have created chronic water quality problems, particularly in the lower reaches of the river’s mainstem. Impacts from urban development, farming, and increased water withdrawals have contributed to the degradation of water quality in the Tualatin River and its tributaries.
Numerical standards have been established by ODEQ for nutrients, bacteria, dissolved oxygen (DO), and temperature. As one strategy to meet those standards, Clean Water Services maintains contracts for the release of stored water from Henry Hagg Lake and Barney Reservoir to augment river flow. However, additional flow augmentation is needed in order to meet water quality standards. Clean Water Services has also been charged by the Washington County Board of Commissioners to coordinate the Tualatin watershed’s response to the listing of upper Willamette spring Chinook and winter steelhead as threatened species under the ESA. The ESA may require higher instream flows and/or changes to flow patterns during critical seasons.

Table 2-2 shows Clean Water Services’ existing flow targets at the Farmington gaging station on the Tualatin River at river mile (RM) 33.3. CWS currently uses their stored water in Hagg Lake to meet the Farmington flow targets. The future flow targets at Farmington have not been determined, but are expected to be higher to meet water quality standards with increased Wastewater Treatment Plant (WWTP) discharges and improve fish habitat. Clean Water Services will continue to coordinate with ODEQ regarding changes to regulatory processes and water quality standards affecting the Tualatin River to improve fish habitat.

Table 2-2. Clean Water Services Flow Targets at Farmington (RM 33.3)

<table>
<thead>
<tr>
<th>Month</th>
<th>Existing cfs</th>
<th>acre-feet per month</th>
</tr>
</thead>
<tbody>
<tr>
<td>May</td>
<td>120</td>
<td>7,378</td>
</tr>
<tr>
<td>June</td>
<td>120</td>
<td>7,140</td>
</tr>
<tr>
<td>July</td>
<td>150</td>
<td>9,223</td>
</tr>
<tr>
<td>August</td>
<td>150</td>
<td>9,223</td>
</tr>
<tr>
<td>September</td>
<td>180</td>
<td>10,710</td>
</tr>
<tr>
<td>October</td>
<td>180</td>
<td>11,067</td>
</tr>
</tbody>
</table>

Source: MWH 2006d

cfs = cubic feet per second

CWS additional water needs for the project were estimated for projected growth conditions at the Rock Creek and Durham WWTPs. The development of future CWS demands focused on the additional water needed to offset the incremental increase in thermal loads from the two WWTPs and the additional water needed to ensure that the two WWTPs treat to the same effluent ammonia concentrations as those required by the current permitted design conditions. The additional supply of 15.5 thousand acre-feet needed from the TBWSP would provide additional water to ensure that the similar ammonia concentrations in the river as the permitted design flow conditions and offset the same portion of the incremental increase in thermal load as under current conditions.

2.1.2 Municipal and Industrial Demand

The Tualatin Basin has a population of almost 500,000 people in and around the following 13 cities: Banks, Beaverton, Cornelius, Durham, Forest Grove, Gaston, Hillsboro, King City, North Plains, Sherwood, Tigard, Tualatin, and West Linn. For the municipalities in the Tualatin Basin, peak season demand (defined as demand between the months of May and October) must be met by stored supplies
in Henry Hagg Lake, Barney Reservoir, and the City of Portland’s Bull Run reservoirs. Currently, approximately 30 percent of the M&I demand in the Tualatin River basin is met by importing water from the Bull Run watershed east of Portland. Hagg Lake is the only large water supply reservoir within the basin. Demand for M&I stored water supply from Hagg Lake had almost reached full contract amounts as of the year 2005 (MWH 2006b).

By the year 2050, demands for stored water for M&I use in the Tualatin Basin are projected to increase by about 37,350 acre-feet. The projected summer demand exceeds the capacity of the current supply system.

2.1.3 Agricultural Demand
TVID is currently authorized by contract with Reclamation to irrigate up to 17,500 acres in the Tualatin Valley. Natural flows from the Tualatin River are used to supply irrigation needs at the beginning of the season. As river flows decrease, TVID uses stored water in Henry Hagg Lake to meet irrigation demand. In addition, a number of agricultural water users exercise individual water rights to natural flows on the Tualatin River and its tributaries. Trends in agricultural water demand in the Tualatin Basin will depend on population growth patterns, crop types, and market value for agricultural products. TVID anticipates that its total agricultural uses will show continuing increases as a result of trends toward more use by sprinkler-irrigated container nurseries. However, increases may not occur if irrigators use more conservation and efficiency measures. Future water supply planning should be able to provide the flexibility to adapt to such trends. Increased reliability of the water supply for irrigation would help provide that flexibility. Even if water demands do not increase over time in the agricultural sector, shifts may occur in where and when irrigators withdraw water from the Tualatin River and its tributaries. Such changes may be required as a response to the ESA or other environmental regulations. New water supply projects in the Tualatin Basin may also cause a shift in demand patterns. For these reasons, long-term water supply planning must consider agricultural water use.

2.2 Existing and Future Water Supplies and Demands

2.2.1 Supplies
Barney Reservoir is located in the upper Trask River subbasin on the west side of the Coast Range; there is a transbasin diversion of water into the headwaters of the Tualatin River subbasin. It is one of the three primary sources of water for the Tualatin Basin. The Barney Reservoir was expanded in 1999 and increased the total storage capacity of the reservoir from 4,000 acre-feet to 20,000 acre-feet (see Section 1.5.3.) The potential for future expansion of this source is very limited because natural inflows are not sufficient to fill a larger reservoir.

Henry Hagg Lake was formed when Scoggins Dam was completed in 1974. The reservoir’s active storage is 53,323 acre-feet.

Groundwater use is limited because of the geologic formations within the Tualatin Basin. OWRD has identified several groundwater management areas that have been restricted as a result of declining groundwater levels. This source option is very limited and not adequate for meeting estimated future water demands.
The Bull Run water supply system is owned and operated by the City of Portland. Bull Run currently supplies an average of 30 percent of the Tualatin Basin’s water needs. This water source is not within the control of the Tualatin Basin water users; therefore, the ability of the City of Portland to supply this level of water on a reliable basis in the long term is unknown. It is expected that contracts with the City of Portland would extend existing contract water quantities for 10 or, potentially, 20 years.

Although the current reliability of Barney Reservoir, Henry Hagg Lake, and Bull Run is good, these sources will not meet the long-term demand that Clean Water Services and other water users are required to plan for.

Additional future supplies would include water conservation and reuse methods, as well as “aquifer storage and recovery” (ASR), which are further described in Section 3.5 of this PR/EIS. Increased levels of water conservation, reuse, and ASR in the future were not included in the water demand assumptions; if they had been included, the future (2050) M&I water need identified for the project of approximately 12 billion gallons (37,350 acre-feet) would be about 15 percent higher.

2.2.2 Water Supply Demands

Agencies responsible for supplying water for M&I, agricultural and flow augmentation needs must consider the long term demand and plan for reliable, reasonably priced sources to meet those needs. Based on projected growth in the area, demand for water in the Tualatin Basin is expected to double by 2050. Detailed studies of demand forecast, such as the WSFS and IWRM, have been completed and are discussed in Sections 1.1 and 1.5.4.

Currently, in years when Henry Hagg Lake does not fill and thus not all stored water contract amounts can be delivered, shortage criteria are applied. First, a 15 percent reduction is applied to TVID and Clean Water Services allocations. Then, if there is still insufficient supply to make that reduced level of delivery, an equal percentage reduction (based on contract amounts) is applied to all contractors. The shortage criteria ensure that M&I users have a higher level of reliability than Clean Water Services and TVID (MWH 2006b).

2.3 Summary of Water Resources Problems

2.3.1 Water Quality

Water quality in the Tualatin River is generally poor throughout the summer, and sometimes into autumn. The warm summers often cause the river’s temperature to exceed Oregon State requirements for migration of fish such as salmon and steelhead. Phytoplankton blooms in parts of the river sometimes cause the water to exceed ODEQ targets for chlorophyll a. Algae, pH, and DO concentrations in the Tualatin River have been of concern historically and led ODEQ to list the river as an impaired water body in the 1980s and 1990s. While water quality has been improved in the Tualatin River and its tributaries in recent years, it remains of concern. The most recent (2001) TMDL for the mainstem addressed temperature, ammonia, and phosphorus (chlorophyll a, pH, and DO were related parameters addressed). The TMDL also addressed temperature, phosphorus, bacteria, and DO (via volatile solids which can settle) for the major tributary streams in the subbasin.
Human alteration of the river, its floodplains and surrounding uplands has significantly contributed to the degradation of the river. Farming activities have released phosphorus into the river, contributing to the DO and chlorophyll a problems. Removal of woody vegetation in the riparian area has contributed to the temperature problems. Water quality issues in the Tualatin Basin are discussed further in Section 4.3.

Projected growth in the Tualatin Basin will increase the wastewater discharge from the Rock Creek and Durham Wastewater Treatment Plants. Clean Water Services provides services (managing wastewater, urban runoff and surface water) to urban Washington County and is responsible for meeting federal and state water quality standards established for the Tualatin River and its tributaries. Clean Water Services should be able to offset the thermal and ammonia loads from the wastewater treatment plants through 2015 with currently available sources (Clean Water Services 2005). After that time, additional flow augmentation will be required to meet the water quality permit limits of those plants, resulting in an additional need of about 15,200 acre-feet for water quality.

2.3.2 Fish Habitat
Salmonid fish habitat in the Tualatin River has been degraded by the water quality problems mentioned in Section 2.3.1 and by physical alteration of the river system. Filling of floodplains has reduced rearing habitat for salmonids. Removal of large woody debris and channelization of the river have decreased its habitat complexity; it now has limited riffles and pools that contribute to fish habitat, and is primarily a large glide between Scoggins Creek and its confluence with the Willamette River. Increasing impervious surface within the basin has increased winter flows and flashiness (water level quickly rising and falling) and decreased groundwater recharge that augments summer time flows.

Additional information on fish habitat is contained in Sections 4.7 (Fisheries and Other Aquatic Species) and 4.9 (Threatened, Endangered, and Sensitive Species).

2.3.3 Water Supply
The Tualatin River, as a rain-fed river, has high flows during the wet winter months and low flows during the summer when water supplies are most needed for municipal, industrial, agricultural, and water quality uses. The present sources of water for the basin – Barney Reservoir, Henry Hagg Lake, and Bull Run – are reliable 95 percent of the time, based on current water demand. However, those sources will not meet the forecasted future demand for M&I, agricultural and flow augmentation water. Existing sources will become more and more unreliable, that is, demand will be met in fewer and fewer years over time unless a new source is developed.
2 PURPOSE AND NEED ................................................................. 2-1

2.1 PURPOSE OF AND NEED FOR THE PROPOSED ACTION ............... 2-1
  2.1.1 River Flow Restoration .................................................... 2-2
  2.1.2 Municipal and Industrial Demand ..................................... 2-3
  2.1.3 Agricultural Demand .................................................... 2-4

2.2 EXISTING AND FUTURE WATER SUPPLIES AND DEMANDS .......... 2-4
  2.2.1 Supplies ...................................................................... 2-4
  2.2.2 Water Supply Demands .................................................. 2-5

2.3 SUMMARY OF WATER RESOURCES PROBLEMS ......................... 2-5
  2.3.1 Water Quality ............................................................. 2-5
  2.3.2 Fish Habitat ............................................................... 2-6
  2.3.3 Water Supply ............................................................. 2-6

Figure 2-1. Annual Inflow to Henry Hagg Lake ................................. 2-2

Table 2-1. Additional Projected Water Demands for Stored Water in 2050, Tualatin Basin 2-1
Table 2-2. Clean Water Services Flow Targets at Farmington (RM 33.3) .......... 2-3