4.14 Recreation

4.14.1 Affected Environment

4.14.1.1 Henry Hagg Lake and Vicinity

4.14.1.1.1 Facilities

Henry Hagg Lake offers a variety of recreational facilities and activities, many of which are water-based. Due to its location and large size, the reservoir is an important recreation facility in the Portland metropolitan area. Furthermore, the boat ramps are particularly important facilities in the park since there are relatively few boat facilities in the region. Since 1973, all O&M of the recreation facilities at Scoggins Valley Park have been done by Washington County in partnership with Reclamation.

Information about the existing facilities in this section is based in large part on the description in the Henry Hagg Lake Resource Management Plan (Reclamation 2004).

Recreation facilities at Henry Hagg Lake/Scoggins Valley Park are shown on Figure 4.14-1. They are located in six primary areas: Recreation Area A-West, Recreation Area A-East, Scoggins Creek Picnic Area, Recreation Area C, Sain Creek Picnic Area, and Elks Picnic Area. Table 4.14-1 lists existing recreation facilities at each area. One of the areas, Recreation Area A-East, was closed in 1989 due to vandalism and other security concerns; however, plans to reopen the area appear in the Resource Management Plan. Recreation Area A-West, Recreation Area A-East, and Recreation Area C were developed by Reclamation as part of the original reservoir project. Washington County later developed Elks Picnic Area, Sain Creek Picnic Area, and Scoggins Creek Picnic Area with cost-share funding from Reclamation.

Figure 4.14-1. Recreation Facilities at Henry Hagg Lake/Scoggins Valley Park (File Name: Fig 4.14-1 Hagg Recreation.pdf)

Table 4.14-1. Recreation Facilities at Henry Hagg Lake/Scoggins Valley Park

<table>
<thead>
<tr>
<th>Recreation Areas</th>
<th>Rec. Area A-West</th>
<th>Rec. Area A-East</th>
<th>Rec. Area C</th>
<th>Sain Cr. Picnic Area</th>
<th>Scoggins Cr. Picnic Area</th>
<th>Elks Picnic Area</th>
<th>Trails</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recreation Site Acreage (approximate)</td>
<td>2</td>
<td>25</td>
<td>38</td>
<td>6</td>
<td>2</td>
<td>6</td>
<td>79</td>
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<tr>
<td>Road Access</td>
<td>paved</td>
<td>paved</td>
<td>paved</td>
<td>paved</td>
<td>gravel</td>
<td>gravel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interior Circulation</td>
<td>paved</td>
<td>paved</td>
<td>paved</td>
<td>paved</td>
<td>gravel</td>
<td>gravel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car Parking Spaces</td>
<td>38</td>
<td>129</td>
<td>146</td>
<td>104</td>
<td>85</td>
<td>11</td>
<td>513</td>
<td></td>
</tr>
<tr>
<td>Boat Trailer/Car Parking</td>
<td>61</td>
<td>166</td>
<td>n/a</td>
<td>undefined</td>
<td>227</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boat Ramps (lanes)</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boat Ramps (length in feet)</td>
<td>800</td>
<td>800</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Courtesy Docks</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fishing Pier</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fish Cleaning Stations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day Use Areas and Facilities:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.14-1
The existing developed recreation sites are described below, starting from the dam and moving clockwise around the reservoir.

**Elks Picnic Area**
Elks Picnic Area is a six-acre site on the south end of the reservoir and is a popular bank fishing spot. At one time, this site provided an accessible fishing elevator; however, wave action eroded the bank and the elevator was decommissioned. The fishing pier at Recreation Area C was built to replace this fishing elevator. The large gravel parking area is sometimes used as a staging area for special events, and 10 picnic tables provide waterfront picnicking opportunities.

**Sain Creek Picnic Area**
Sain Creek Picnic Area is a six-acre site located in a small cove at the confluence of Sain Creek and Henry Hagg Lake just south of Recreation Area C. The site has newer facilities located on the waterfront with a large grassy area and large, mature trees. This site has two group picnic areas, as well as 34 individual picnic sites. The larger group picnic shelter is known as Torvend Pavilion; it is fully accessible and can accommodate up to 250 people. Sain Creek Picnic Area overlooks the west end of Henry Hagg Lake, offering good water views and easy access to the shoreline when the water levels are high.

A 45-acre, 18-hole disc golf course is located in the southeastern portion of the Sain Creek Picnic Area in an elk meadow. There is some parking on the north end of the course, although many people park along the perimeter road. The disc golf course is one of the most challenging courses in the Portland area, in part due to the location of approximately half of the course in a wooded area. There are no additional restroom facilities in this area; the Sain Creek picnic area is the nearest facility.

**Recreation Area C**
Recreation Area C is a 38-acre site on the west side of Henry Hagg Lake and is the least-sloping site in the park. Facilities at this site include a covered group picnic area, individual picnic areas, restrooms, a boat launch, and a covered accessible fishing pier completed in 2000. The fishing pier is fully accessible and has a high use for persons with disabilities. Recreation Area C has more picnic tables, has a larger area available for shore fishing, and receives more group and special event use than other facilities. The group picnic area, known as the Pavilion, is a large, covered, open-air picnic structure adjacent to the parking area above the boat ramp. The Pavilion overlooks the west end of Henry Hagg Lake, offering good water views and easy access to the shoreline. The site is accessible and can accommodate groups of up to 800 people. Recreation Area C has two sanitary leach fields to serve the restrooms. One leach field has been adequate for both restrooms, and the backup leach field has never been activated.

The covered fishing pier at Recreation Area C is a large, well-built structure situated away from the boat launch near the individual picnic sites. Aside from being popular with anglers, the pier is used by those who watch boat launches. The boat launch, located in the no-wake zone, has three lanes, two docks, and is approximately 800 feet long. This ramp has is used more heavily than the ramp within Recreation Area A, West, which is discussed below. The docks operate on a rail and cable system that is often difficult to operate and maintain with water fluctuations.

**Scoggins Creek Picnic Area**

Scoggins Creek Picnic Area is a two-acre site with a gravel parking area, picnic areas, and a portable toilet. The site is in a shaded spot on the northwest tip of the reservoir where Scoggins Creek flows into the reservoir. This site provides direct access to the creek for wading or fishing and is less developed than the other sites. Scoggins Creek Picnic Area has more of a natural and secluded character than the other sites around the lake.

**Recreation Area A – West**

Recreation Area A-West is a two-acre site with a boat ramp, picnic tables, a large barbecue, potable water, and two six-unit restroom buildings. The boat ramp at Recreation Area A West is on the southern portion of the lake and is used predominantly by motor boaters and personal water craft users. The ramp area has a storage building for a patrol boat and a boat pump out facility. The boat launch has an 800-foot-long concrete ramp with three lanes and a dock. The United States Coast Guard Auxiliary Flotilla operates a vessel safety booth near the boat launch which is operated periodically during summer weekends. The picnic area is on a hillside above the boat launch and is accessible to persons with disabilities. By providing visual and physical separation from the boat launch and parking area, this site provides a quiet, somewhat secluded area for picnicking away from the noise and activity of boat and vehicle traffic. The picnic area has individual picnic sites, as well as a small group area.

**Recreation Area A – East**

This is a 25-acre, densely wooded site with parking for 129 cars, three restrooms, and a picnic area. This area was initially planned to be open for camping, but was only used as a day use area and was closed indefinitely in 1989 because of public safety concerns prompted by vandalism and parties. Since then, Washington County has conducted selective timber harvesting and clearing of nearly all underbrush; this
made it possible to more easily view the site for enforcement and in anticipation that the site would be
reopened as a day-use or camping area as allowed for in the Resource Management Plan.

**Park Administrative Office and Maintenance Yard**
The park administrative office and maintenance yard is a residual facility from the construction of the
dam. The original two-bay shop, three offices and a rest room are housed in a concrete masonry unit
building dating from 1975. A newer three-bay garage is a replacement for the building that was
destroyed by fire in 1992. A recycled modular building of approximately 1,650 square feet was located
at the yard in 2001. It provides five offices, a conference area, and two bathrooms for staff. A wash rack
and fuel point are provided for Washington County Department of Support Services vehicles used for
patrol and maintenance in the park. The gravel hardstand yard of approximately one acre is fenced and
gated.

The park also has an elaborate and high quality entrance station that is staffed. Most visitors must stop
here to enter the park.

**Roads and Trails**
Henry Hagg Lake features an easy-to-moderate, 15-mile shoreline trail referred to as the Master Trail.
This trail offers hiking, bicycling, and wildlife viewing opportunities. It has a natural surface, with some
roots and rocks, and varies in width. There is also over 500 feet of surfaced, accessible trail near
Recreation Area A with edge protection, benches, and scenic views. Volunteer groups perform periodic
litter and debris clearing as well as minor re-grading, while the County clears vegetation to maintain an
unobstructed trail corridor. There are twenty pull-offs from the perimeter road that provide viewpoints
and/or access to short spur trails leading to the Master Trail. Thirteen of these short trails connect to
picnic facilities. The Master Trail utilizes the reservoir’s perimeter road shoulder in three areas where
there are no trail segments along the shoreline: at Scoggins Creek, Sain Creek, and across the dam. The
perimeter road shoulder is also utilized in several other areas because the shoreline has either washed
out or eroded. In these cases, trail users use the access trails up to the perimeter road and utilize the
road shoulder until the next access trail.

The perimeter road provides a 10.5-mile-long, multi-use 7-foot-wide shoulder, maintained by
Washington County; it also serves as overflow parking. These multi-purpose trails are used by individual
cyclists and joggers and also organized groups for events such as running races, bicycle races, triathlons
and biathlons.

**Concessions**
Henry Hagg Lake/Scoggins Valley Park has two concessionaires, both operating daily and located at
Recreation Area C. One concessionaire rents out a variety of boats including paddleboats, rowboats,
electric motorboats, canoes, and kayaks. The concessionaire is open daily from opening day through
Labor Day. In 2008, the concessionaire paid a fee of $2,000 to operate at the park. The other
concessionaire is a mobile food stand that has been operating in the park since 1999 and serves a
variety of food and beverages. This concessionaire paid a fee of $4,800 to operate in 2008. Beginning in
the 2009 season, one concessionaire will hold the contracts for boating and food, and has a three-year contract with fees of $4,800 for 2009, $5,040 for 2010 and $5,292 for 2011.

4.14.1.1.2 Recreation Activities and Use Levels
The recreation season at Henry Hagg Lake/Scoggins Valley Park runs from the first Saturday in March through the Sunday before Thanksgiving in November. The park is used solely for day-use activities. Water-based recreation activities are most prevalent; however, land-based activities are also popular and attract many visitors. Outdoor recreation activities include boating, fishing, swimming, water-skiing, disc golf, picnicking, wildlife viewing, hiking, and bicycling.

The boat launches at Recreation Areas A and C are one of the few boat ramp facilities in the region; there are no other boat ramps that access a deep, slack body of water in Washington County for both motorized and non-motorized watercraft. Also, boat ramps at Henry Hagg Lake provide low water service long after other boat ramps in the area are non-functional. Blue Lake and Bybee Lake in Multnomah County provide some access to a slack body of water, but only for non-motorized craft. Sturgeon Lake in Columbia County is a shallow body of water available to small motorized watercraft. The City of Tigard’s Cook Park provides low water service, although not to a deep and slack body of water.

Henry Hagg Lake is a popular warm water fishing area for both beginners and experienced anglers. Fish species include large- and small-mouth bass, crappie, brown bullhead catfish, yellow perch and bluegill (ODFW 2009). The lake is heavily stocked with rainbow trout several times during spring and early summer. Fishing can be done by boat, most successfully in the northern no-wake zone, or from the shore.

Almost all of the reservoir’s shoreline is accessible for swimming; however, there are no designated swimming areas or lifeguards. Equestrian use is not allowed in the park, although the RMP allows for a future equestrian trail above the perimeter road.

Overall, there has been a trend of increasing annual attendance over the years. Attendance grew to 706,000 in 2002, which is a park record. Attendance was 622,475 in 2005, 656,022 in 2006, and about 650,000 in 2007 (Wayland 2008). Attendance from the mid-1990s until the present has fluctuated primarily due to wet or dry conditions (that is, 1994 through 1998 were generally wet years resulting in a full reservoir; conversely, 1998 through 2001 were dry, low pool years).

Entry into Henry Hagg Lake/Scoggins Valley Park requires either a daily or seasonal pass for both vehicles and water craft. Annual park revenues correspond with the amount of visitation. The park’s annual operating budget is approximately $700,000 (Wayland 2008). Daily passes are available for purchase at the park entrance fee booth. A 2008 vehicle daily pass was $5.00, while a vehicle with boat daily pass was $6.00. Season passes are also available. Since 2002, the recreation season was extended from the first weekend in March through late November, which corresponds with fishing season. Prior to 2002, the recreation season opened the last weekend in April and closed October 31. Season passes, which allow multiple park visits during the season, are available at several retail outlets throughout the Portland area and surrounding communities. Season passes rates for 2008 were: vehicle pass, $50, boat
pass, $55, and senior citizen pass, $35 (boat or vehicle). No senior citizen rates apply to daily passes. Either a daily pass or season pass must be displayed while visiting the park.

4.14.1.3 Special Events
Throughout the year, there are several special sporting events held at Henry Hagg Lake. These include bicycle, swimming, and running races, triathlons, water-skiing events, and unique events like “hi-tech adventure racing.” The park sees about 10 to 14 large special event uses a year (Wayland 2006). One of the larger events in the 2007 season, the USA Triathlon, had 1,500 participants and 200 to 300 volunteers and spectators. For certain events, specific areas of the park may be closed to the public for the duration of the special event. If this is the case, the event organizers and park rangers provide advance notification of the closures to the public, and signage is erected at the park entrance and the affected areas.

Henry Hagg Lake, especially Recreation Area C, is popular for these types of sporting events because of the ease and safety of competing in slack water, open views to the water for observation, and sufficient open space for staging events. Special events are a significant revenue stream for the park, particularly in the off-season. Not only do the daily passes purchased by the participants contribute revenue, but also the increased exposure from event advertisement draws additional visitors to the park. Maintaining the ability to host these types of special events is a critical component of park operations.

Specific areas of Henry Hagg Lake are also available for group use for events such as reunions and large picnics. These events require an approved Group Use Application, reservation fee, and security deposit based on group size. Four areas are available for reservation: Recreation Area A West and Sain Creek for small groups, and Recreation Area C Ramp Pavilion and Sain Creek (Torvend) Pavilion for large groups.

4.14.1.2 Recreation and Open Space Areas along the RWP
Metro owns two parcels that are identified as public open space that would be crossed by the RWP:

- A publicly owned parcel at 5600 SW Fern Hill Road is approximately 197 acres that appears to be currently used for growing crops.
- A publicly owned parcel at 5420 SW Fern Hill Road is approximately 147 acres and is adjacent to 5600 SW Fern Hill Road. This parcel also appears to be used for agricultural purposes.

While the parcels described above are designated as parks/open space, a review of aerial photographs (Metro 2004) showed that neither appears to be used for recreational purposes. The site of the JWC Water Treatment Plant and water intake facility at 4039 SW Fern Hill is publicly owned and designated as parks/open space by Metro, but no recreational facilities are provided on this parcel.

Metro also proposes to establish a greenway that would extend eastward from Scoggins Dam, generally along Scoggins Creek, and connecting to the Tualatin River. The proposed Hagg Lake Greenway corridor is identified in Metro’s Regional Trails & Greenways publication (Metro 2003b) and is shown on Figure 4-25. The RWP alignment crosses the proposed greenway alignment shown on Metro maps, but the greenway alignment has not been formalized. No land has been acquired for the greenway, and Metro has no plans for land acquisition (Morgan 2007). Land acquisition is based on willing sellers (Morgan 2007).
According to the Metro publication, “Greenways generally follow rivers and streams and may or may not provide for public access. In some cases, greenways may be a swath of protected habitat along a stream with no public access. In other cases, greenways may allow for an environmentally compatible trail, viewpoint or canoe launch site.”

Bicycle lanes are provided along paved roadways within the Scoggins Valley Park boundaries and along OR 47. Spring Hill and Fern Hill Roads are identified as bicycle routes by Metro, but are not striped for bicycle lanes.

**4.14.1.3 Recreation Resources in the Willamette Pipeline Vicinity**

Recreation amenities within 200 feet of the proposed Willamette Pipeline corridor and potential water tank sites include parks, trails, open space, school facilities, and natural areas that provide recreational value. Recreation areas within 200 feet of the proposed pipeline and potential water tank sites are listed in Table 4.14-2 and shown on Figure 4.14-2.

The Willamette Pipeline would cross portions of the FWS Tualatin River National Wildlife Refuge, which is northeast of Sherwood (Frontispiece, Figure 3-5). The Tualatin River National Wildlife Refuge was established as an urban refuge to provide wetland, riparian, and upland habitats for a variety of migratory birds, threatened and endangered species, fish, other resident wildlife, and recreation. Land acquisition and habitat restoration with an emphasis on wetlands have dominated refuge programs in the early stages of refuge development. Two recent high priority management initiatives are to restore native habitats associated with the Tualatin River floodplain and to provide wildlife-dependent public use emphasizing environmental education and interpretation. Infrastructure is in place for public recreation, education, and interpretive facilities and programs, and portions of the refuge are open to the public.

<table>
<thead>
<tr>
<th>Recreation Area</th>
<th>Owner</th>
<th>Site Size (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Treatment Plant Park</td>
<td>City of Wilsonville</td>
<td>11.2</td>
</tr>
<tr>
<td>Morey’s Landing Open Space</td>
<td>Morey’s Landing Homeowners (private)</td>
<td>2.2</td>
</tr>
<tr>
<td>Metro Open Space</td>
<td>Metro</td>
<td>235.2</td>
</tr>
<tr>
<td>Tonquin Trail (proposed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wood Middle School</td>
<td>West Linn-Wilsonville School Dist. #3J</td>
<td>9</td>
</tr>
<tr>
<td>Metro Open Space</td>
<td>Metro</td>
<td></td>
</tr>
<tr>
<td>Tualatin River National Wildlife Refuge</td>
<td>US Fish and Wildlife Service</td>
<td>137.3</td>
</tr>
<tr>
<td>Atley Estates Park</td>
<td>City of Sherwood</td>
<td>1</td>
</tr>
<tr>
<td>Langer Park</td>
<td>City of Sherwood</td>
<td>1</td>
</tr>
<tr>
<td>Lady Fern Park</td>
<td>City of Sherwood</td>
<td>1.3</td>
</tr>
<tr>
<td>Tualatin River Trail</td>
<td>City of Tualatin</td>
<td>14</td>
</tr>
<tr>
<td>Scholls Heights Elementary School</td>
<td>Beaverton School District #48</td>
<td>3.3</td>
</tr>
<tr>
<td>Open Space</td>
<td>Matrix Development Corporation (private)</td>
<td>0.2</td>
</tr>
<tr>
<td>Murrayhill Powerline Park</td>
<td>Tualatin Hills Park &amp; Recreation District</td>
<td>23.4</td>
</tr>
<tr>
<td>Powerline Trail</td>
<td>Tualatin Hills Park &amp; Recreation District</td>
<td>24</td>
</tr>
</tbody>
</table>
Several existing and proposed trails and bicycle lanes provide recreation opportunities near the proposed Willamette Pipeline, as shown on Figure 4.14-2.

Schools also provide the public with recreation amenities. When schools are not in session, school facilities are used by local athletic organizations. Facility availability at each school varies depending on school activities, which have priority over non-school sponsored activities.

### 4.14.2 Environmental Impacts

In general, impacts from the alternatives can be described in terms of physical impacts, O&M impacts, and impacts to the level of service expected by park visitors. Recreational sites and other recreational facilities are described in these terms below. Quantifiable differences in levels of service among the alternatives are summarized in Table 4.14-3 through Table 4.14-7. The total amount of land and water available for recreation, including shoreline and miles of trail, is shown in Table 4.14-3. Access to the water from the fishing pier and the number of days that lake surface would be near to group picnic areas is shown in Table 4.14-4. The distances from boat ramps to the low pool surface under each alternative is shown in Figure 4.14-3. Action Alternatives include a new boat ramp at Recreation Area A and an additional boat ramp is provided at Recreation Area C to access higher water levels. The proposed design for both Action Alternatives is the same. Low pool water levels are the same for all Alternatives.

According to the Oregon Administrative Rules for public park uses in forest zones, parks containing developed facilities (something other than trails and open space) need to have an approved Master Plan. In Washington County this is accomplished through an adopting ordinance. The uses allowed in the master plan are then proposed for approval through the County’s land development review process. The approval process would be concurrent with development review for approval of the other uses associated with the dam raise, such as road relocations and alteration of significant natural resource areas (see preceding Land Use section for more details).

#### Table 4.14-3. Distance from Top of Boat Ramps to Surface of Henry Hagg Lake at Low Pool, All Alternatives

<table>
<thead>
<tr>
<th></th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top of A-ramp to lake surface</td>
<td>764 feet</td>
<td>670 feet</td>
<td>670 feet</td>
</tr>
<tr>
<td>Top of C-ramp to lake surface</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
lower ramp | 410 feet | 410 feet | 410 feet
upper ramp | n/a | upper ramp would not | upper ramp would not
410 feet | provide access at low | provide access at low
pool | pool

Note: Low pool surface elevation is at approximately 235 feet msl.

Table 4.14-4. Recreational Season Water Access, Average Year, All Alternatives

<table>
<thead>
<tr>
<th></th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usable days (approximate) for fishing pier</td>
<td>120</td>
<td>150</td>
<td>120</td>
</tr>
<tr>
<td>Number of days (approximate) lake surface is within 50 feet of Sain Picnic Area</td>
<td>120</td>
<td>60</td>
<td>0</td>
</tr>
<tr>
<td>Number of days (approximate) lake surface is within 50 feet of C-Ramp Picnic Area</td>
<td>0</td>
<td>120</td>
<td>120</td>
</tr>
</tbody>
</table>

Note: Data are for recreation season only: first Saturday in March through late November (260 days).
Source: MWH 2006d

Table 4.14-5. Scoggins Valley Park Water and Land Areas, All Alternatives

<table>
<thead>
<tr>
<th></th>
<th>Alternative 1 (acres)</th>
<th>Alternative 2 (acres)</th>
<th>Alternative 3 (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scoggins Valley Park Total Acres</td>
<td>2,521</td>
<td>2,688</td>
<td>2,636</td>
</tr>
<tr>
<td>Available Land (acres at normal full pool)</td>
<td>1,404</td>
<td>1,201</td>
<td>1,284</td>
</tr>
<tr>
<td>Water surface area (full pool)</td>
<td>1,117</td>
<td>1,487</td>
<td>1,352</td>
</tr>
<tr>
<td>Water surface area (average drawdown, end of October)</td>
<td>495</td>
<td>548</td>
<td>572</td>
</tr>
<tr>
<td>Area of exposed mudflat (average drawdown, end of October)</td>
<td>622</td>
<td>939</td>
<td>780</td>
</tr>
<tr>
<td>Water surface area (low pool/maximum drawdown)</td>
<td>449</td>
<td>449</td>
<td>449</td>
</tr>
<tr>
<td>Area of exposed mudflat (low pool/maximum drawdown)</td>
<td>668</td>
<td>1,038</td>
<td>903</td>
</tr>
<tr>
<td>Miles of shoreline</td>
<td>12.5</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>Miles of trail: Master Trail perimeter road (bike lanes)</td>
<td>15</td>
<td>&gt;15</td>
<td>&gt;15</td>
</tr>
<tr>
<td>perimeter road (bike lanes)</td>
<td>10.5</td>
<td>13</td>
<td>13</td>
</tr>
</tbody>
</table>

Source: MWH 2006d

4.14.2.1 Alternative 1 – No Action

4.14.2.1.1 Potential Impacts (direct, indirect)
Recreation use at Henry Hagg Lake and Scoggins Valley Park would continue and is expected to increase in the future. With the exception of the increased attendance and the subsequent improvements anticipated by the Resource Management Plan, there are no additional changes planned with the No Action Alternative. Table 4.14-6 lists the facilities that would be provided with Alternative 1 and includes improvements proposed by the Resource Management Plan. Recreation Area C would be expanded into
the Cove Area in two phases; Table 4.14-6 includes the total facilities planned for that area. The Recreation Area C—Expansion Area would include additional parking, new accessible parking, a new accessible restroom near the fishing pier and accessible parking, a new accessible pathway to the lakeshore, and a new boat launch for non-motorized boats (canoes, kayaks, etc.) All new facilities developed under Alternative 1 would meet current federal accessibility standards.

According to the Resource Management Plan, in addition to the facilities shown in Table 4.14-6, a new equestrian trail and support facilities (parking, restrooms) would be developed on the upper side of the perimeter road. Equestrian trail development would be dependent upon receiving funding from local equestrian groups (Reclamation 2004a). Also, the Master Trail would be fully developed and located completely off of the perimeter road. Additional connections between the road and the Master Trail would be developed, and the perimeter road shoulder would be widened from 7 feet to 10 feet where feasible.

Table 4.14-6. Proposed Recreation Facilities at Henry Hagg Lake, Alternative 1

<table>
<thead>
<tr>
<th>Facility</th>
<th>Rec. Area A-West</th>
<th>Rec. Area A-East</th>
<th>Rec. Area C</th>
<th>Sain Cr. Picnic Area</th>
<th>Scoggins Cr. Picnic Area</th>
<th>Elks Picnic Area</th>
<th>Roads and Trails</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recreation Site Acreage (approximate)</td>
<td>2</td>
<td>25</td>
<td>38</td>
<td>6</td>
<td>2</td>
<td>6</td>
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<td>79</td>
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<tr>
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<td>paved</td>
<td>paved</td>
<td>paved</td>
<td>paved</td>
<td>paved</td>
<td>paved</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interior Circulation</td>
<td>paved</td>
<td>paved</td>
<td>paved</td>
<td>paved</td>
<td>paved</td>
<td>paved</td>
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<td></td>
</tr>
<tr>
<td>Car Parking Spaces</td>
<td>58</td>
<td>129</td>
<td>245</td>
<td>104</td>
<td>85</td>
<td>11</td>
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<td>Boat Trailer/Car Parking</td>
<td>91</td>
<td>166</td>
<td>n/a</td>
<td>undefined</td>
<td></td>
<td></td>
<td></td>
<td>257</td>
</tr>
<tr>
<td>Boat Ramps (lanes)</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1**</td>
<td></td>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Boat Ramps (length in feet)</td>
<td>800</td>
<td>800</td>
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<td></td>
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<td>Courtesy Docks</td>
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<td>2</td>
<td>1</td>
<td></td>
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<td>3</td>
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<tr>
<td>Fishing Pier</td>
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<td></td>
<td>1</td>
</tr>
<tr>
<td>Fish Cleaning Stations</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Day Use Areas and Facilities:</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Picnic Sites - Single Units</td>
<td>22</td>
<td>46</td>
<td>34</td>
<td>21</td>
<td>10</td>
<td>13</td>
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<td>146</td>
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<tr>
<td>Group Picnic Shelters</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Trails/Paths</td>
<td>*</td>
<td>*</td>
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<tr>
<td>Turnouts</td>
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<td>20</td>
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<tr>
<td>Play Structures</td>
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<td>1</td>
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<tr>
<td>Disc Golf Course Acreage (approximate)</td>
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<td></td>
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<tr>
<td>Support Facilities:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flush Restrooms, 2-Unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1**</td>
<td>2</td>
</tr>
<tr>
<td>Flush Restrooms, 6-Unit</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Portable Toilets, 1-Unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

4.14-10
The additional facilities developed in accordance with the Resource Management Plan would help meet the needs of more recreation use at Scoggins Valley Park, which is anticipated under the No Action and Action Alternatives. Paving the parking and access at the Scoggins Creek and Elks picnic areas would reduce maintenance requirements.

Under Alternative 1, the recreation experience would be affected somewhat by the longer periods of lower reservoir levels, compared to current conditions. Impacts on visual quality are described in Section 4.22. The reservoir would remain accessible for boating and other recreation throughout the year. However, the fishing pier at Recreation Area C would be usable for about 120 days each season, compared with about 180 days under current conditions due to longer periods of lower reservoir levels.

4.14.2.1.2 Cumulative Impacts
Recreation impacts of Alternative 1 are limited to the Hagg Lake vicinity. No other planned projects have been identified that would contribute to cumulative recreation impacts in the area.

4.14.2.2 Alternative 2 – Scoggins Dam 40-Foot Raise

4.14.2.2.1 Potential Impacts (direct, indirect)
Many of the recreation areas and facilities at Henry Hagg Lake would be inundated by a 40-foot dam raise. To mitigate for this impact and maintain recreational use, most inundated recreation facilities would be removed and replaced with new facilities upslope. The Elks, Sain Creek, and Scoggins Creek Picnic Areas would be relocated. Recreation Area C and Recreation Area A-West, which have boat ramps, would be moved uphill and reconfigured. Recreation Area A-East (currently closed) would be closed permanently; its facilities would be replaced at other recreation areas. The 18-hole disc golf course would be relocated and would be reduced to 9-holes. This may decrease revenue derived from this facility since few courses in Washington County have 18 holes; thus a main attractant of the course is its size. The location of the proposed disc golf course somewhat overlaps an existing elk habitat meadow. Potential conflicting outcomes and appropriateness of use will be considered as the project reaches permitting. Refer to the Upland Habitat report for details. Twelve of the 20 turnouts along the perimeter road would be replaced. Expansion potential for some sites would be lost due to moving sites to steeper and more forested ground. Similarly, the recreational quality of the relocated facilities may be diminished due to the steeper terrain and heavier tree coverage, reducing the amount of large,
gently sloped open space, which likely may decrease facility revenues generated from large group events. Potential for such impacts will be discussed below for each recreation area.

Additional land (about 167 acres) would be acquired and incorporated into Scoggins Valley Park. With the land acquisition, the amount of park land not inundated (above the reservoir surface) at normal full pool would decrease by 203 acres – from 1,404 acres to 1,201 acres. Thus, generally speaking, upland-based recreation opportunities would decrease at Henry Hagg Lake under Alternative 2 while water-based recreation opportunities would increase.

Table 4.14-7 indicates the access and parking, number of day use facilities and support facilities proposed by the mitigation plan for impacts of the Action Alternatives. All recreation facilities would be required to meet current federal accessibility standards under the Architectural Barriers Act and the Americans with Disabilities Act. Off-road vehicle access would be restricted with design features.

Table 4.14-7. Proposed Recreation Facilities at Henry Hagg Lake, Action Alternatives

<table>
<thead>
<tr>
<th>Facility</th>
<th>Rec. Area A West</th>
<th>Rec. Area A East</th>
<th>Rec. Area C</th>
<th>Sain Cr. Picnic Area</th>
<th>Scoggins Cr. Picnic Area</th>
<th>Elks Picnic Area</th>
<th>Trails</th>
<th>Total</th>
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<tr>
<td>Recreation Site Acreage (approximate)</td>
<td>30</td>
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</tr>
<tr>
<td>Interior Circulation</td>
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<td>174</td>
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<td>44</td>
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<td>609</td>
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<tr>
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<td>175</td>
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</tr>
<tr>
<td>Boat Ramps (lanes)</td>
<td>3</td>
<td>3</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Boat Ramps (length in feet)</td>
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<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Fishing Pier</td>
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<td></td>
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<td>1³</td>
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<tr>
<td>Fish Cleaning Stations</td>
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<td>1</td>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td>Day Use Areas and Facilities:</td>
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<td>Picnic Sites - Single Units</td>
<td>30</td>
<td>46</td>
<td>34</td>
<td>15</td>
<td>10</td>
<td>13</td>
<td>148</td>
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</tr>
<tr>
<td>Group Picnic Shelters</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
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<tr>
<td>Disc Golf Course Acreage</td>
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<td>Trails/Paths</td>
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<td>Play Structures</td>
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<td></td>
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<td>12</td>
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<tr>
<td>Support Facilities:</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flush Restrooms, 2-Unit</td>
<td></td>
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<td></td>
<td></td>
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<td>Flush Restrooms, 6-Unit</td>
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<td>1</td>
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<td>8</td>
<td></td>
</tr>
<tr>
<td>Portable Toilets, 1-Unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

4.14-12
No federal Land and Water Conservation Act funds were used to construct the recreation areas at Henry Hagg Lake: consequently, no specific Land and Water Conservation Act requirements would trigger mitigation for conversion of land from recreation use.

Construction impacts for the Action Alternatives are similar. However, construction impacts from road and dam building for Alternative 2 would affect park visitation and revenues for up to five years, which is a year longer than for Alternative 3. Additionally, the loss of viewing and staging areas at Recreation Area C will affect park revenues beyond the period of construction since most of the park revenue comes from special events in this area.

Impacts to the individual recreation sites are described below, starting at Elks Picnic Area west of the dam and moving clockwise around the reservoir. The proposed mitigation plans shown on Figure 4.14-3 through Figure 4.14-9 are conceptual and would be modified to some extent during final project design.

**Elks Picnic Area**
The existing Elks Picnic Area would be inundated. The relocated picnic area would be 1,000 feet west and uphill from the existing site, with steeper topography (Figure 4.14-4). The steeper slope from the parking area to the waterfront and facilities would make recreation access more difficult. All new facilities within the site would need to meet current federal accessibility standards; this may be difficult and expensive due to the steep slope.

The proposed site has more trees and better views to the north end of the lake than the existing site. The proposed site would include piped water—an improvement over the current system of water...
trucked and stored in a cistern on site. The multiple functions of the large open parking area currently provided at the Elks Picnic Area may not be fully replicated at the new Elks Picnic Area.

An accessible fishing pier and fish cleaning station would be located at the Elks Picnic Area to replace the fishing pier that would be lost at Recreation Area C. The fishing pier would be usable for fishing for about 150 days each season—about 30 days more than Alternative 1 and Alternative 3. Currently, many people use the fishing pier to view the reservoir, as well as special events based at Recreation Area C. Relocating the pier would offer visitors different views of the lake, but would virtually eliminate its use for viewing special events. The steep terrain would make it more difficult for people with disabilities to access and utilize the pier as they were able to use at Recreation Area C. Relocating the pier would move it from the “no wake zone” to the unrestricted portion of the reservoir, which may affect both fishing success and the quality of the fishing experience. At higher water levels inundated vegetation may also affect the fishing experience.

**Sain Creek Picnic Area**

The existing Sain Creek Picnic Area, including the water system and leach fields would be completely inundated. The proposed site for the new Sain Creek Picnic Area is approximately one mile south of Sain Creek Road on West Shore Drive, south of its existing location (Figure 4.14-5). The proposed site is heavily wooded, with an elk meadow between the north end of the site and the lakeshore. The 18-hole disc golf course would be reduced to 9 holes and would be located mainly within the elk meadow, but extending into the wooded area. There is a potential conflict with the dual use of the site as elk meadow and disc golf course; however, elk use occurs primarily in the winter when human use of the site is rare. Refer to the Upland habitat report for more details.

Currently, Torvend Pavilion provides a scenic waterfront setting with mature trees and good views of the lake. At the new site a large group picnic area would include a comparable pavilion and would provide direct views to the lake in the foreground and background, over the elk meadow. The proximity of the pavilion to the water, however, would be reduced.

**Recreation Area C**

Most of Recreation Area C, the largest and flattest recreation site in the park, would be inundated under Alternative 2. The boat ramp, the parking areas, restrooms, fishing pier, and picnic facilities would be inundated at higher reservoir levels. Two wells that currently provide water for facilities on the west side of the reservoir would be inundated. The sanitary fields would not be inundated but would be relocated to allow development of new recreation facilities in their place.

The new site for Recreation Area C would be located uphill from the existing site, and the road would be relocated uphill to maximize the usable recreation area space (Figure 4.14-6). The steep topography in this area will change the character of the site in Recreation Area C; this could reduce some of its function as a large-group use area.

A new boat ramp, about 520 feet long, would be constructed to provide access to the reservoir at high water levels. The new boat ramp would have a slope of about 13.4 percent. The existing 800-foot-long boat ramp would remain in place to be operated when drawdown of the reservoir exposes the lower
parking area and ramp access. Sediment would accumulate on the boat ramp and lower parking area while inundated and would be removed when exposed to allow public use. This is expected to increase maintenance costs as sediment must be cleared and courtesy docks relocated. The existing adjacent parking area would also remain, with the shoreline edge of the area requiring reinforcement with rock gabions to reduce erosion of the asphalt parking during drawdown. These rock gabions could pose a hazard to boaters at high water level.

The special events held at Recreation Area C require a large, relatively flat, open, waterfront area for staging as well as adequate parking and traffic flow for large crowds of participants and spectators. Easy access to the shoreline and expansive views of the waterfront area from the Pavilion is a feature of Recreation Area C. While the number and types of facilities at Recreation Area C would be replaced, they would not fully reproduce the existing character of the area in their new locations. The quality of the recreation experience would decline to some degree and may reduce the number of visitors, special events, and park revenues. The fishing pier would be relocated to the new Elks Creek Picnic Area. Relocating the pier could reduce its use by anglers and would virtually eliminate its use for viewing special events. The fishing pier at the new Elks Creek Picnic Area is also located in the southern half of Henry Hagg Lake outside the no-wake zone. This location would reduce the attractiveness of the fishing experience.

The recreation opportunities that could be provided by the Recreation Area C – Expansion Area (Cove Area), as described in the Resource Management Plan (Reclamation 2004a) and summarized under Alternative 1, would be inundated and not replaced.

**Scoggins Creek Picnic Area**

At the north end of the reservoir, Scoggins Creek Picnic Area facilities would be completely inundated by the 40-foot dam raise. The Scoggins Creek Picnic Area provides one of the few areas for quiet, passive creekside recreation within Scoggins Valley Park. No similar sites exist around the lake. There are no potential relocation sites near the existing picnic area that would be suitable because of the steep topography. Scoggins Creek Picnic Area would be relocated farther northwest, along Scoggins Creek, on land to be acquired (Figure 4.14-7). The proposed site would provide a similar wooded setting and secluded picnic area. The relocation site is in a steep draw. At high water levels, the site would be on the lakeshore. At low water levels, it would have direct creek access, although exposed lake bed would lie between the picnic area and the creek.

Sight distances for vehicle access to and from the perimeter road would need to be considered, and safety and security would also need to be addressed at this heavily wooded site. Clearing the land for facility development and adequate sight lines poses maintenance concerns. The secluded character desired for this recreation facility must be balanced with personal safety and the need for monitoring the site for illegal activity.

**Recreation Area A-West**

The higher reservoir would inundate a portion of the entrance road to Recreation Area A-West and the boat launch ramp. The restroom, sanitary pump station, boat trailer parking, and accessible trail would
be relocated (Figure 4.14-8). The existing US Coast Guard Auxiliary booth would be relocated near the boat ramp at Recreation Area A-West. The sanitary drain fields built with the original recreation facilities to serve Recreation Areas A and B (which was never built) should be adequate to continue to serve the proposed combined facilities in Recreation Area A. The original construction of the sanitary drain fields included a duplicate field at the same site for reserve, but it was never activated.

The proposed design includes building a new, longer, boat ramp in the current location to provide access to the reservoir at low water levels. The new boat ramp would be approximately 990 feet long and would have a slope of about 11 percent. The existing marine patrol boat house would remain and be expanded, which would require coordination with the new ramp. Picnic facilities would meet the level of service currently provided, although they may not be in close proximity to the boat ramp. The surfaced accessible trail would be relocated to a similar site.

**Recreation Area A-East**
Recreation Area A-East would be displaced and used as a borrow area for material to raise and extend the dam. Although the site has been closed to public use since 1989, the Resource Management Plan indicates that the site would re-open in the future and a group picnic area, group shelter, and play structure would be added. The Resource Management Plan also calls for allowing limited special event use including periodic overnight use. This site would not be relocated and these opportunities would be lost. Additional parking and restroom facilities provided at Recreation Area A-West would compensate for some of the lost capacity.

**Park Administrative Office and Maintenance Yard**
The access road to Recreation Area A-East and the park administrative office and maintenance yard facility adjacent to the recreation area would also be inundated. The office, conference room and other facilities would be relocated on the north side of the road above the borrow area (Figure 4.14-9). The ease of vehicular access and turnaround space would be replicated or improved in the proposed design. The proposed facility would provide privacy and access adequate to the needs of the office and maintenance operations. The proposed site for the relocated office and maintenance facility is located in existing elk meadow. Loss of the elk meadow would be mitigated, as described in Section 4.8.3.

**Roads and Trails**
The perimeter road and Master Trail would be relocated and would provide a greater length of road and trail opportunities than currently exist. The quality of the recreation experience may not be as high, however, due to views of a larger exposed lake bed during drawdowns (Section 4.22, Visual Resources, provides more information on visual impacts). Also, physical modifications were made at several locations to the existing perimeter road to prevent off-road vehicle use. There may be an increased problem with illegal use of off-road vehicles if new potential access routes to the lake bed appear due to the road relocation.

Several sections of the 10.5-mile-long perimeter road, particularly West Shore Drive, would be inundated. The multi-purpose trail on the shoulder of the road currently serves as overflow parking as...
well, and this overflow parking would be replaced. Twelve of the turnout sites and all thirteen of the picnic sites along the perimeter road would be inundated and would be relocated. The relocated perimeter road shoulder would be widened from 7 feet to 10 feet where feasible to meet the intent of the RMP and to increase safety for bicyclists.

The 15-mile-long Master Trail would be inundated and would be relocated above the new high water line. More than 500 feet of surfaced, accessible trail near Recreation Area A with edge protection, benches, and scenic views would be replicated elsewhere. Other facilities affected by Alternative 2 include the connecting trails to the shoreline and picnic areas, which would be replaced. The Master Trail would provide the same level of recreational access as today, since it would follow the shoreline and connect to recreation areas. The Master Trail will be designed to meet federal accessibility standards; the location of the trail will be determined during the design phase. Trail maintenance needs would increase slightly, simply to maintain the additional length of trail.

Road reconstruction would be completed prior to increasing the height of the reservoir, preserving access to existing recreation facilities until those facilities are relocated to other portions of the reservoir or built onsite above the proposed inundation line. Access to recreational facilities would be preserved during construction, and construction of new recreational facilities would be completed prior to closure of the existing recreational areas.

During construction, recreational users would likely hear and see construction occurring within the park from road- and recreation-related construction activities, as well as work on the dam. Short-term impacts could include conflicts with spring, summer, and fall recreation use, including traffic and noise conflicts that could reduce the number of people using the area for recreation during construction. Reduced visitor use during construction would result in decreased revenues to the park to cover staffing and O&M expenses. The large events that utilize the perimeter road, such as triathlons, would be displaced if temporary road closures occur, reducing park revenues.

Levels of truck traffic expected to be generated for construction of Alternative 2 would create temporary traffic delays at intersections near Henry Hagg Lake, as described in the Transportation and Access Section (4.21). To minimize traffic conflicts, ODOT and Washington County would post signs during hauling to warn drivers of heavy equipment at road intersections. Temporary closures of recreational areas would also be signed to alert park visitors.

Outside of the park, few impacts to recreation are anticipated. Metro-owned open space along Fern Hill Road does not appear to be used for recreation, although boaters along the Tualatin River may hear and see construction of the RWP occurring on those parcels. Short-term delays could occur for users to access the park depending of the number of trucks entering the construction area.

RWP construction would occur along and outside of public right-of-way, except for portions that cross OR 47, and would have little, if any, impact to bicyclists that travel along the highway and other roads in the area. Because the RWP would be underground, no long-term impacts are anticipated. The RWP may cross the proposed Hagg Lake Greenway; however, buried utilities are typically compatible with greenways, especially for trail use (Morgan 2007). Trails allow for pipeline maintenance access. If the
greenway were developed and maintained as wildlife habitat, there is potential for conflict with the utility use. Metro is coordinating with the Partners to limit potential conflicts with wildlife use along all portions of the RWP alignment that would cross Metro properties.

4.14.2.2 Cumulative Impacts
Recreation impacts of Alternative 2 are limited to the Hagg Lake vicinity. No other planned projects have been identified that would contribute to cumulative recreation impacts in the area.

4.14.2.3 Alternative 3 – Multiple Source Option

4.14.2.3.1 Potential Impacts (direct, indirect)

Henry Hagg Lake and Vicinity
At Scoggins Valley Park, effects of Alternative 3 would be similar to Alternative 2, but less land would be inundated resulting in less compromise to recreation settings and facilities, and a smaller area of exposed mudflats at low pool. Additional land (approximately 115 acres) would be acquired and incorporated into Scoggins Valley Park, as described in Section 4.13.3. With the land acquisition, the amount of park land not inundated (above the reservoir surface) at normal full pool would decline by 120 acres – from 1,404 acres to 1,284 acres. Table 4-26 compares the land and water areas at Scoggins Valley Park and Henry Hagg Lake that would result with each of the alternatives.

Some recreation areas and facilities would be inundated and relocated or replaced as necessary to provide recreation facilities similar to what is provided today. Most recreation facilities would be relocated to higher and steeper ground though not as high as 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 recreation mitigation proposed for Alternative 3 would be essentially the same as that proposed for Alternative 2 and as shown on Figure 4.14-3 through Figure 4.14-8, although the lower lake level would allow for facilities to be at lower elevations and would allow for larger recreation sites than shown for Alternative 2 (Table 4.14-7). Under Alternative 3, distances from most recreation facilities will be farther from the shoreline than Alternative 2. Alternative 3 would also have less mudflat exposure and less illegal off-highway vehicle use area on those exposed mudflats. The mitigation plans are conceptual and would be modified to some extent during final project design.

Table 4.14-7 indicates the access and parking, number of day use facilities and support facilities proposed by the mitigation plan for impacts of the Action Alternatives. All recreation facilities would be required to meet current federal accessibility standards under the Architectural Barriers Act and the Americans with Disabilities Act.

At high water levels, Alternative 3 would result in less inundation and more land for recreation sites than Alternative 2. The number of acres of water surface would be less, however than Alternative 2. The perimeter road relocation would be the same as for Alternative 2. The Master Trail would be relocated and would provide a similar or greater length of road and trail opportunities than currently exist, though probably shorter than Alternative 2.
Construction impacts from road and dam building would be similar to Alternative 2, although the construction period for Alternative 3 would be shorter. Alternative 2 construction could affect park visitation and revenues for up to five years. Alternative 3 construction would last for about four years, and therefore would have less of an impact on park use revenues. Additionally, the loss of viewing and staging areas at Recreation Area C will affect park revenues beyond the period of construction since most of the park revenue comes from special events in this area.

Impacts to the individual recreation sites are described below starting from the dam and moving clockwise around the reservoir.

**Elks Picnic Area**
Impacts would be largely the same as with Alternative 2. Under Alternative 3, the fishing pier would be shorter and less expensive to build and maintain. It would be usable for fishing about 120 days of each season, compared with 120 days for Alternative 1 and 150 days for Alternative 2. Steep slopes would limit access at this site for both of the Action Alternatives. All facilities within the site would need to meet current federal accessibility standards, which may be slightly easier for Alternative 3 than for Alternative 2 because the additional site area (4 acres) would allow more flexibility in design.

**Sain Creek Picnic Area**
Impacts would be similar under both Action Alternatives. Less usable land would be inundated under Alternative 3 than under Alternative 2, resulting in about 9 more acres and allowing for better site designs and parking configurations. The disc golf course is partially inundated with both Action Alternatives. The proposed disc golf course contains 9 holes and is 18 acres. The location of the proposed disc golf course in the northern portion of the Sain Creek Picnic Area is the same under both Action Alternatives.

**Recreation Area C**
As with Alternative 2, Alternative 3 would inundate most of Recreation Area C. However, the proposed site area would be 12 acres more than with Alternative 2, so impacts would be less severe, especially for staging special events, providing waterfront picnic sites, and maintaining a large open space—all special characteristics of the existing Recreation Area C. However, loss of this staging and viewing area are expected to reduce revenues for the park. Accommodating boat launching would be easier under Alternative 3 than under Alternative 2.

**Scoggins Creek Picnic Area**
Impacts would be virtually the same as for Alternative 2. The Scoggins Creek Picnic Area would be relocated to the same site under both Action Alternatives. The proposed site would be 2 acres more than with Alternative 2. At high water the lower portion of Scoggins Creek would be inundated and the picnic area would be immediately adjacent to the lakeshore. At low water, there would be access to Scoggins Creek.

**Recreation Area A-West**
Impacts would be slightly less than Alternative 2 because more land would be above the inundation area. The proposed site area would be 2 acres more than with Alternative 2. The boat ramp would not need to be extended as far, and more space would be available for parking and other facilities.

**Recreation Area A-East**
Impacts would be identical to Alternative 2.

**Park Administrative Office and Maintenance Yard**
Impacts would be identical to Alternative 2.

**Roads and Trails**
Impacts to the perimeter road would be identical to Alternative 2. The Master Trail would be relocated to the edge of the new full pool elevation, so it would be longer than the existing trail. Because the lakeshore would be shorter than for Alternative 2, so would the trail, resulting in lower construction and maintenance costs. The quality of the recreation experience on the Master Trail could be expected to be somewhat diminished with both Action Alternatives due to views, in late summer and fall, of more exposed lakebed than under Alternative 1. These impacts would be less under Alternative 3 than Alternative 2, as shown in Table 4-26 and described in Section 4.22 (Visual Resources). Illegal off-road vehicle use would be of concern under both Action Alternatives.

Impacts associated with the RWP would be the same as under Alternative 2, although the area affected during construction could be less because of the pipeline would be smaller in diameter under Alternative 3 (72 inches) than under Alternative 2 (96 inches).

**Willamette Pipeline**
No long-term impacts to recreation resources would occur from construction or operation of the Willamette Pipeline and associated facilities. When construction is complete, affected areas would be returned to pre-construction conditions and any recreational facilities affected by construction would be restored to the extent feasible. None of the potential areas being considered for development of the TVWD and City of Tualatin water tanks contain recreation areas or facilities.

During construction, short-term closures or detours for bicyclists using dedicated bicycle lanes in the construction area would occur, although when construction is complete, existing bicycle lanes would be reconstructed to pre-project conditions.

The proposed pipeline corridor would cross several parcels located west of Wilsonville that Metro has identified as parks/open space. No recreational amenities exist on these properties. The Willamette Pipeline would not affect land within the Tualatin River National Wildlife Refuge. It would be constructed within public rights-of-way or on adjacent private land. The Willamette River crossing would be trenchless, that is, tunneled beneath the river, and would have no long-term effect on recreation or adjacent to the river. However, construction of the Willamette Pipeline could have short-term impacts on recreational users, primarily from noise and traffic.

### 4.14.3 Mitigation Measures
4.14.3.1 Alternative 1 – No Action
No mitigation measures are proposed for Alternative 1.

4.14.3.2 Alternative 2 – Scoggins Dam 40-foot Raise
Table 4.14-7 lists the recreation facilities that would be replaced as mitigation for impacts of the Action Alternative. Mitigation would replace, at least one-for-one by type and number, most of the recreation facilities that would be affected by the Action Alternative, with several exceptions. The disc golf course would be reduced from 18 holes to 9 holes and the Cove Area in Recreation Area C would be lost under the Action Alternatives. It would not be possible to replicate the existing characteristics of existing recreation areas because many facilities would be relocated to areas that are steeper and more heavily vegetated as a result of the increased reservoir levels. All new construction would be required to meet current Federal accessibility standards under the Architectural Barriers Act and the American with Disabilities Act. All inundated and unusable recreation facilities would be removed for visual quality and safety. Submerged vegetation around public use areas in the new recreation sites would be removed for aesthetics and safety. The descriptions of the proposed mitigation sites are based on conceptual plans, illustrated on Figure 4.14-3 through Figure 4.14-8.

The RWP would have no long-term effects on recreation, and no mitigation is proposed. Disturbed areas would be returned to pre-project conditions to the extent feasible, as described elsewhere in this document.

To minimize traffic conflicts related to construction of the RWP, as well as facilities at Henry Hagg Lake, ODOT and Washington County would post signs during hauling to warn drivers and cyclists of heavy equipment at road intersections. Temporary closures of recreational areas would also be signed to alert park visitors.

4.14.3.2.1 Elks Picnic Area
The Elks Picnic Area facilities would be relocated to a site approximately 1,000 feet west of the existing Elks Picnic Area (Figure 4.14-4). This site could use an intact section of West Shore Drive for the parking area and would allow parking to be dispersed along the south side of the entire recreation area. Development of this area would also include a new accessible fishing pier to replace the fishing pier that would be removed at Recreation Area C.

A potential site for two sanitary drain fields to serve the Elk Picnic Area is located south of West Shore Drive. A sanitary pump station would allow for gravity flow from the new restroom building. Electric service would be extended to operate the pump station.

4.14.3.2.2 Sain Creek Picnic Area
A 9-hole disc golf course would be located primarily within the open elk meadow and partially within a forested area. The parking and picnic facilities would be secluded in the forested area with good views of the lake to the east. The terrain of this area is somewhat rough and rolling with some evidence of landslides. However, the site is large enough to accommodate the parking and day use facilities in gently sloped areas, leaving the rougher areas forested and undisturbed. This site would require new water and electrical service to meet the standards of the previously developed area. A site to the south of the
recreation area across West Shore Drive and within the boundary of the park is of sufficient size to accommodate two new sanitary drain fields. A sanitary pump station would serve a gravity collection point from all the proposed facilities in the proposed Sain Creek Picnic Area site.

4.14.3.2.3 Recreation Area C
Recreation Area C facilities would be replaced immediately upslope from the existing recreation area. While the acreage of Recreation Area C and the reserve area for the Cove Area would be significantly reduced by inundation, the portion of West Shore Drive adjacent to these areas would be relocated as close as possible to the park boundary so as to maximize the amount of land available for recreational use.

A new entrance gate and access road to the boat launch ramp and the day use picnic areas would be constructed. The new access road would extend through a new parking area to the existing parking area in the Cove Area reserve. The area between these parking areas and the reservoir would be improved for day use and picnicking to mitigate the loss of area and facilities inundated in Recreation Area C. The access road would also extend south to the existing upper parking area. The shoreline edge of the parking area would be reinforced with rock to reduce erosion of the asphalt parking during drawdown.

The existing boat ramp would remain in place to be operated when drawdown of the reservoir exposes the lower parking area and ramp access. Accumulated sediment would be removed prior to opening the lower ramp and parking for public use. Using the existing boat launch ramp would necessitate a new portable and storable courtesy dock, cable, anchor and winch assembly to attach to the guide rail on the ramp when drawdown allows.

A new boat ramp would be built to provide reservoir access at higher water levels when the existing boat ramp would be inundated. The boat ramp turn-around and boat trailer parking areas would be built where the existing sanitary drain fields and the entrance gate and drive are now located.

The fishing pier would be removed, as it would be a safety hazard and not maintainable after being submerged. A new accessible fishing pier would be built at Elks Picnic area.

Two new sanitary drain fields would be installed to replace the existing fields serving Recreation Area C. The new drain fields would be located west of West Shore Drive and west of the Cove Area reserve. A new sanitary pump station for Recreation Area C would be built to serve the new restrooms and boat waste station. New wells would be developed to replace the ones that currently provide water for recreation facilities on the west side of the reservoir.

4.14.3.2.4 Scoggins Creek Picnic Area
The Scoggins Creek Picnic Area would be relocated farther northwest, along Scoggins Creek, on land to be acquired (Figure 4.14-7).

4.14.3.2.5 Recreation Area A-West
Replacement facilities for Recreation Area A-West would be constructed immediately upslope of the existing recreation area at an elevation above the new level of inundation (Figure 4.14-8). A new
entrance gate and access to the boat launch ramp and the day use picnic areas would be constructed at
the existing entrance to Recreation Area A-West to improve vehicular circulation and management of
the facilities.

A new three-lane boat ramp would be constructed at Recreation Area A. It would replace the existing
boat ramp to better serve boaters in Alternative 2 conditions. Parking and restrooms would be located
adjacent to the boat ramp. The new restroom facilities and a boat dump station can be sited for gravity
flow to a new sanitary pump station near the entry road. The surfaced accessible trail would be
relocated to a similar site.

4.14.3.2.6 Recreation Area A-East
An additional 136 car parking spaces and three additional 6-unit flush restroom facilities provided at
Recreation Area A-West would compensate for some of the lost capacity at Recreation Area A-East.

4.14.3.2.7 Park Office and Maintenance Yard
The park administrative office and maintenance facility would be relocated to an approximately 1-acre
site that is 1,500 feet west and north of Scoggins Valley Road (Figure 4.14-9). It would be served by the
existing Recreation Area A sanitary leach fields. A pump to the leach fields or a gravity line to Recreation
Area A-West would dispose of sanitary waste for the park administrative and maintenance facility.

4.14.3.2.8 Roads and Trails
Prior to increasing the pool height, some of the perimeter road, particularly West Shore Drive, would be
reconstructed. The multipurpose trail would be rebuilt along with the reconstructed sections of the
perimeter road. The proposed multipurpose trail would also provide capacity for overflow parking, as
does the existing one. Twelve turnout sites on the perimeter road and thirteen picnic sites along the
shoreline would also be relocated to the new sections of the perimeter road and the new shoreline. The
surfaced accessible trail at Recreation Area A would be relocated.

The Master Trail, a continuous gravel surface footpath, would be constructed at the full pool shoreline
of the reservoir, connecting to each of the reconstructed recreation areas. Because the distance around
the reservoir would increase with Alternative 2, the Master Trail would be longer as well. Along the trail,
approximately 55 small bridges would be built over the numerous surface drainages. The bridges are
proposed as 8-inch-thick wooden timbers bolted together to form a platform 8 feet wide to
accommodate small service vehicles and meet standards for accessibility. The proposed bridges would
be similar to those now in the Sain Creek Recreation Area. The trail would connect with spur trails from
the parking turnouts along the perimeter road.

4.14.3.3 Alternative 3 – Multiple Source Option
Mitigation measures under Alternative 3 would be nearly the same to those proposed for Alternative 2.
Table 4.14-7 lists the recreation facilities that would be replaced as mitigation for impacts of both
Alternatives 2 and 3. All new construction would be required to meet current Federal accessibility
standards under the Architectural Barriers Act and the American with Disabilities Act.
The RWP and Willamette Pipeline would have no long-term effects on recreation, and no mitigation is proposed. Disturbed areas would be returned to pre-project conditions to the extent feasible, as described elsewhere in this document.

To minimize traffic conflicts related to construction of the RWP, as well as facilities at Henry Hagg Lake, ODOT and Washington County would post signs during hauling to warn drivers and cyclists of heavy equipment at road intersections. Temporary closures of recreational areas would also be signed to alert park visitors. Similar measures would be implemented along the Willamette Pipeline route.

4.14.3.3.1 Elks Picnic Area, Scoggins Creek Picnic Area, Recreation Area A-West, Recreation Area A-East, Park Administrative Office and Maintenance Yard
Mitigation for impacts to the Elks Picnic Area, Scoggins Creek Picnic Area, Recreation Area A-West, Recreation Area A-East, Parks Administrative Office and Maintenance Yard would be the same as for Alternative 2.

4.14.3.3.2 Sain Creek Picnic Area
Mitigation for impacts to the Sain Creek Picnic Area would be the same as Alternative 2, except the disc golf course location may be different. The disc golf course would be reestablished in an open meadow that would have access from the proposed Sain Creek Picnic Area, although only a 9-hole course would be provided due to space limitations. The disc golf course would be relocated to the new Sain Creek Picnic Area, the same location as proposed under Alternative 2.

4.14.3.3.3 Recreation Area C
Mitigation would be similar to those proposed for Alternative 2, although some lakeside facilities, such as picnic tables and barbeques, would be farther downslope than with Alternative 2 so they would be closer to the 25-foot inundation line (rather than at the 40-foot inundation line).

Mitigation for impacts would be the same as proposed for Alternative 2.

4.14.3.3.4 Road and Trails
Portions of the perimeter road would be reconstructed. Mitigation for inundation of the perimeter road, multipurpose trail parking turnouts and picnic areas would be the same as for Alternative 2.

The Master Trail would be relocated to the edge of the full pool shoreline above elevation 330 feet. Other than being shorter under Alternative 3 than Alternative 2, the Master Trail would be built in the same manner for both Action Alternatives.
4.14 RECREATION ........................................................................................................ 4.14-1
  4.14.1 Affected Environment ............................................................................... 4.14-1
  4.14.2 Environmental Impacts ........................................................................... 4.14-8
  4.14.3 Mitigation Measures ................................................................................... 4.14-20

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
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Figure 4.14-1. Recreation Facilities at Henry Hagg Lake/Scoggins Valley Park (File Name: Fig 4.14-1 Hagg Recreation.pdf) 4.14-1
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4.14-25
Recreation Areas in the Vicinity of Henry Hagg Lake

Tualatin Basin Water Supply Project
Henry Hagg Lake, Washington County

- Hagg Lake, existing
- Proposed Regional Greenway
- Bike Lane
- Raw Water Pipeline Alignment
- 25' Dam Raise
- 40' Dam Raise
- Recreation Areas
- Scoggins Valley Park
- Drinking Water
- Comfort Station
- Picnic Table and Grills
- Group Picnic Areas
- Covered Pavilion
- Fishing Pier
- Boat Launching
- Boat Waste Station
- Accessible Areas
- Fee Booth
- Park Administration Office

Data Sources:
Parks & Recreation Areas - Metro RLIS
Reclamation 2004a

Henry Hagg Lake Greenway (Proposed)

Scoggins Creek Picnic Area
Recreation Area C
Sain Creek Picnic Area
Elks Picnic Area
Recreation Area A West

Fee Booth
Park Administration Office and Maintenance Yard

0 500 1,000 1,500 2,000 Feet
Recreation Areas in the Vicinity of the Willamette Pipeline

Tualatin Basin Water Supply Project
Henry Hagg Lake, Washington County

Data Sources:
Parks & Recreation Areas - Metro RLIS

Locator Map

Map Document: (P:\C\CWSD00000013\0600INFO\GS\arcmap\EIS\EIS_figures\April 2007\Draft\Fig_4_38_and_recation_rev051007.mxd)

5/10/2007 -- 10:11:51 AM
USCGA Building & Reserve Parking
280' Boat Sanitary Waste Station
Full Lake - Future
Full Lake - Current
Low Lake - Current
Scoggins Valley Road
Park Boundary
Existing
Sanitary Drainfield
Sanitary Pump Station
Restroom
Group Picnic Area
Parking
Boat Trailer Parking
Fish Cleaning Station
Accessible Trail
Buoy Line
Lake Trail
Lake Trail
340' 320' 300' 260' 240'
New Ramp 990' LF 11% Slope

Tualatin Basin Water Supply Project
Henry Hagg Lake, Washington County

Proposed Recreation Area A

Legend:
- Full Pool - 40-foot Dam Raise
- Full Pool - Existing
- Low Pool - Existing
- Highway Turnout

Scale:
0 150 300 500 (Feet)
4.15 Socio-Economics

4.15.1 Affected Environment
Figure 4.15-1 shows the location of incorporated cities and census tract boundaries used for the socioeconomic analysis. This section uses primarily US Census Bureau information from the 1990 and 2000 decennial censuses but, where appropriate, also includes data from state and local agencies. Washington County, Clackamas County, and the incorporated cities in the project vicinity are the census areas that were evaluated for identifying the potential impact to the socioeconomic characteristics in the project area. The TVWD boundary encompasses both urban incorporated and urban unincorporated areas. Census tract data were used to identify the socioeconomic characteristics of the TVWD area. Data from census tracts roughly corresponding to the TVWD boundary were compiled to represent the TVWD service area although census tract boundaries do not directly correspond with the TVWD service area boundary and include some areas that the TVWD does not serve.1 Because variations in the boundaries between census tracts and the TVWD service area boundary are generally small, the socioeconomic characteristics of the census tracts are assumed to be reflective of the TVWD service area. TVWD serves only a minimal portion of Multnomah County, so data for that county were not included in the analysis.

One census tract (336) covers Henry Hagg Lake and vicinity, as well as the larger surrounding rural area. The RWP would run from Hagg Lake in tract 336, through tract 330, to the Spring Hill Pumping Plant in tract 331. The Willamette Pipeline would pass through more than one dozen census tracts, mostly outside the TVWD boundary.

4.15.1.1 Population
Population in the vicinity of the project area is shown in Table 4.15-1. The project area is entirely within Washington County with the exception of the southern portion of the proposed Willamette Pipeline, which is in northern Clackamas County. Local jurisdictions in the vicinity of the proposed project include the cities of Banks, Beaverton, Cornelius, Forest Grove, Hillsboro, North Plains, Sherwood, Tigard, Tualatin, and Wilsonville, as well as Washington and Clackamas counties. The estimated population of the TVWD service area, according to Metro’s population estimates by census tract, was nearly 200,000 people in 2004, or about 40 percent of Washington County’s population. Washington County grew considerably between 1990 and 2000, increasing its population by over 40 percent. Between 2000 and 2004, growth has slowed slightly compared to the previous decade; averaging about 1.9 percent annually (2000-2004) compared to 3.6 percent annually between 1990 and 2000, but the county population is still growing faster than the state of Oregon as a whole.

1 The TVWD service area includes all or portions of Census Tracts 301; 302; 304.02; 305.01; 305.02; 306; 307; 308.04; 309; 313; 314.02; 314.03; 314.04; 315.04; 315.06; 315.07; 315.08; 315.09; 315.10; 315.11; 315.12; 316.05; 316.06; 316.09; 316.10; 3.16.11; 316.12; 316.13; 317.03; 317.04; 317.05; 317.06; 318.04; 318.05; 318.06; 318.08; and 318.09; 324.05; 324.06; 327.
Within the cities, population increased rapidly in the 1990s, particularly in Sherwood, which grew by over 280 percent, and Beaverton, which grew by nearly 130 percent. All jurisdictions, with the exception of Forest Grove, grew by at least 40 percent between 1990 and 2000 with high growth rates continuing between 2000 and 2004, particularly in Beaverton, Hillsboro, Sherwood, and Wilsonville.

The population growth experienced within Washington County has occurred primarily in cities and urban unincorporated areas, areas generally served by the TVWD, which would account for the 138 percent population increase within the census tracts covering TVWD’s service area. In contrast, rural areas such as Census Tract 336 in the vicinity of Henry Hagg Lake have experienced little growth and are sparsely populated is likely because land is zoned for forest and farm uses and generally restricts most forms of residential development. Between 1990 and 2000, the number of residents actually declined slightly, but since 2000 has rebounded to a population slightly higher than it was 1990, increasing by approximately 90 residents.

### 4.15.1.2 Housing

Housing data are shown in Table 4.15-2. Like the state, owner-occupied units accounted for the majority of housing units in Washington and Clackamas Counties at 57 percent and 67 percent, respectively. The
percentage of rental units varied more depending on the local jurisdiction. Beaverton, Forest Grove, Hillsboro, Tualatin, and Wilsonville were split roughly even between owner-occupied and rental units. In contrast Banks, Sherwood, and Census Tract 336 in the vicinity of Henry Hagg Lake are at least 70 percent owner-occupied units.

Table 4.15.2. Housing Supply and Availability in Project Vicinity 2000

<table>
<thead>
<tr>
<th>Census Area</th>
<th>Total Units</th>
<th>Owner occupied</th>
<th></th>
<th>Renter occupied</th>
<th></th>
<th>Vacant Units</th>
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<tr>
<td></td>
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<td>Number</td>
<td>Percent</td>
<td>Number</td>
<td>Percent</td>
<td>Number</td>
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<td>Washington County</td>
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<td>Cornelius</td>
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<td>69.3%</td>
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<td>26.6%</td>
<td>123</td>
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</tr>
<tr>
<td>Forest Grove</td>
<td>6,702</td>
<td>3,479</td>
<td>51.9%</td>
<td>2,857</td>
<td>42.6%</td>
<td>366</td>
<td>5.5%</td>
</tr>
<tr>
<td>Hillsboro</td>
<td>27,211</td>
<td>13,117</td>
<td>48.2%</td>
<td>11,962</td>
<td>44.0%</td>
<td>2,132</td>
<td>7.8%</td>
</tr>
<tr>
<td>North Plains</td>
<td>633</td>
<td>448</td>
<td>70.8%</td>
<td>146</td>
<td>23.1%</td>
<td>39</td>
<td>6.2%</td>
</tr>
<tr>
<td>Sherwood</td>
<td>4,412</td>
<td>3,350</td>
<td>75.9%</td>
<td>903</td>
<td>20.5%</td>
<td>159</td>
<td>3.6%</td>
</tr>
<tr>
<td>Tigard</td>
<td>17,369</td>
<td>9,627</td>
<td>55.4%</td>
<td>6,880</td>
<td>39.6%</td>
<td>862</td>
<td>5.0%</td>
</tr>
<tr>
<td>Tualatin</td>
<td>9,218</td>
<td>4,773</td>
<td>51.8%</td>
<td>3,878</td>
<td>42.1%</td>
<td>567</td>
<td>6.2%</td>
</tr>
<tr>
<td>Census Tract 336</td>
<td>835</td>
<td>649</td>
<td>77.7%</td>
<td>147</td>
<td>17.6%</td>
<td>38</td>
<td>4.6%</td>
</tr>
<tr>
<td>Clackamas County</td>
<td>136,954</td>
<td>91,142</td>
<td>66.5%</td>
<td>37,059</td>
<td>27.1%</td>
<td>8,753</td>
<td>6.4%</td>
</tr>
<tr>
<td>Wilsonville</td>
<td>6,407</td>
<td>3,199</td>
<td>49.9%</td>
<td>2,738</td>
<td>42.7%</td>
<td>470</td>
<td>7.3%</td>
</tr>
</tbody>
</table>

Source: US Census Bureau 2000

Vacancy rates are also shown in Table 4.15.2. In 2000, housing vacancy rates in the county were low at 5.5 percent, nearly 3 percent lower than the state, with the highest vacancy rates found in Banks at approximately 11 percent and Hillsboro at 7.8 percent. Other jurisdictions had vacancy rates similar to Washington County, generally between 4 and 6 percent. Clackamas County had a slightly higher vacancy rate but was still lower than the state overall.

The fast population growth (Table 4.15-1) within much of the project area has kept vacancy rates generally low even with construction of new single and multifamily housing units. Several jurisdictions added a considerable amount of housing in the 1990s. The US Census reported that Washington County added nearly 54,000 units between 1990 and 2000 with the majority of those built in Hillsboro (13,827), Beaverton (8,418), Tigard (4,787), and Sherwood (3,217). Over 17,000 dwelling units were added in unincorporated Washington County for the same time period.

4.15.1.3 Poverty

The US Census Bureau determines poverty status by evaluating several indicators including income earned in the previous 12 months (in this instance 1999 income reported in the 2000 Census), income threshold and family size, presence and number of children, and age. The percentage of the population with an income below the federal poverty level in 2000 is shown in Table 4.15-3. Census data used for this analysis cover the project area as well as other areas that may be directly or indirectly affected by
the proposed project. Washington County serves as the point of comparison for the population within or near the project area. The state of Oregon is also included for reference.

### Table 4.15-3. Poverty in the Project Vicinity, 1999

<table>
<thead>
<tr>
<th>Census Area</th>
<th>Percent of population below poverty level</th>
<th>Under 18 years</th>
<th>18 to 64 years</th>
<th>65 years and older</th>
<th>Percent of families in poverty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oregon</td>
<td>11.6%</td>
<td>31.2%</td>
<td>60.5%</td>
<td>8.3%</td>
<td>7.9%</td>
</tr>
<tr>
<td>Washington County</td>
<td>7.4%</td>
<td>31.9%</td>
<td>59.4%</td>
<td>8.5%</td>
<td>4.9%</td>
</tr>
<tr>
<td>TVWD service area</td>
<td>6.8%</td>
<td>30.8%</td>
<td>63.6%</td>
<td>5.6%</td>
<td>4.5%</td>
</tr>
<tr>
<td>Banks</td>
<td>3.2%</td>
<td>22.0%</td>
<td>70.7%</td>
<td>7.3%</td>
<td>3.1%</td>
</tr>
<tr>
<td>Beaverton</td>
<td>7.8%</td>
<td>28.8%</td>
<td>64.1%</td>
<td>7.2%</td>
<td>5.0%</td>
</tr>
<tr>
<td>Cornelius</td>
<td>16.1%</td>
<td>38.8%</td>
<td>56.9%</td>
<td>4.4%</td>
<td>10.8%</td>
</tr>
<tr>
<td>Forest Grove</td>
<td>14.3%</td>
<td>33.7%</td>
<td>55.7%</td>
<td>10.6%</td>
<td>10.4%</td>
</tr>
<tr>
<td>Hillsboro</td>
<td>9.2%</td>
<td>34.9%</td>
<td>60.4%</td>
<td>4.7%</td>
<td>6.0%</td>
</tr>
<tr>
<td>North Plains</td>
<td>5.3%</td>
<td>22.6%</td>
<td>44.0%</td>
<td>33.3%</td>
<td>4.8%</td>
</tr>
<tr>
<td>Sherwood</td>
<td>2.7%</td>
<td>23.0%</td>
<td>54.0%</td>
<td>23.0%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Tigard</td>
<td>6.6%</td>
<td>31.8%</td>
<td>62.7%</td>
<td>5.5%</td>
<td>5.0%</td>
</tr>
<tr>
<td>Tualatin</td>
<td>5.5%</td>
<td>26.3%</td>
<td>69.6%</td>
<td>4.1%</td>
<td>3.0%</td>
</tr>
<tr>
<td>Census Tract 336</td>
<td>3.3%</td>
<td>47.4%</td>
<td>52.6%</td>
<td>0.0%</td>
<td>2.2%</td>
</tr>
<tr>
<td>Clackamas County</td>
<td>6.6%</td>
<td>32.1%</td>
<td>59.4%</td>
<td>8.5%</td>
<td>4.6%</td>
</tr>
<tr>
<td>Wilsonville</td>
<td>5.6%</td>
<td>17.5%</td>
<td>60.9%</td>
<td>21.6%</td>
<td>3.0%</td>
</tr>
</tbody>
</table>

Source: US Census Bureau 2000

According to the 2000 Census, the percentage of individuals and families living in poverty in Oregon was 11.6 percent and 7.9 percent, respectively. This was higher than any demographic area in the project area with the exception of Cornelius and Forest Grove, which both have higher percentages of individuals and families in poverty than either Washington County or the state. Cornelius had the highest poverty rate, where the percentage of individuals and families in poverty was 16.1 percent and 10.8 percent, respectively. Sherwood and Banks had the lowest percentage of individuals in poverty at 2.7 and 3.2 percent, respectively, and some of the lowest percentage of families in poverty at 1.5 and 3.1 percent, respectively. In the vicinity of Henry Hagg Lake, poverty rates for both individuals and families are lower than in most other parts of the project area, with less than 3.3 percent of individuals and 2.2 percent of families in poverty. Most individuals in poverty within the project area are between the ages of 18 and 64. North Plains, Sherwood and Wilsonville had more than twice the rate of residents in poverty over the age of 65 than the other jurisdictions.

### 4.15.1.4 Race/Ethnicity

Race and ethnicity are shown in Table 4.15-4. Both race and ethnicity comprise minority status, since Hispanics or Latinos can be of any race. People who identify themselves as a race other than white only in Washington County account for approximately 17.8 percent of the total population, compared to the state’s 13.4 percent. By jurisdiction, the percentage of racial minorities and Hispanic or Latino varies, with a low of approximately 5 and 3.5 percent, respectively, in Census Tract 336 to a high of 31 and 37 percent in Cornelius. Other jurisdictions where the percentage of racial minorities is higher than
Washington County are Hillsboro (22.5 percent), and Beaverton (21.7 percent). The TVWD service area and Forest Grove racial minority populations (18.6 and 18.5 percent, respectively) are similar to that of Washington County. The Hispanic or Latino populations of Beaverton (11.1 percent) and Tualatin (11.9 percent) are similar to that of Washington County’s 11.2 percent. Forest Grove and Hillsboro have higher proportions of Hispanics or Latinos than Washington County as a whole, with 17.3 and 18.9 percent, respectively.
Table 4.15-4. Race/Ethnicity within Washington County and Project Vicinity 2000

<table>
<thead>
<tr>
<th>Geography</th>
<th>2000 Total Population</th>
<th>White</th>
<th>Black or African American</th>
<th>American Indian and Alaska Native</th>
<th>Asian</th>
<th>Native Hawaiian &amp; Other Pacific Islander</th>
<th>Some other race</th>
<th>Two or more races</th>
<th>Hispanic or Latino*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oregon</td>
<td>3,421,399</td>
<td>86.6%</td>
<td>1.6%</td>
<td>1.3%</td>
<td>3.0%</td>
<td>0.2%</td>
<td>4.2%</td>
<td>3.1%</td>
<td>8.0%</td>
</tr>
<tr>
<td>Washington Cnty.</td>
<td>445,342</td>
<td>82.2%</td>
<td>1.1%</td>
<td>0.7%</td>
<td>6.7%</td>
<td>0.3%</td>
<td>5.9%</td>
<td>3.2%</td>
<td>11.2%</td>
</tr>
<tr>
<td>TVWD</td>
<td>179,009</td>
<td>81.4%</td>
<td>1.4%</td>
<td>0.6%</td>
<td>8.9%</td>
<td>0.4%</td>
<td>4.0%</td>
<td>3.3%</td>
<td>8.2%</td>
</tr>
<tr>
<td>Banks</td>
<td>1,286</td>
<td>91.1%</td>
<td>0.4%</td>
<td>0.3%</td>
<td>1.8%</td>
<td>0.5%</td>
<td>2.8%</td>
<td>3.1%</td>
<td>3.8%</td>
</tr>
<tr>
<td>Beaverton</td>
<td>76,129</td>
<td>78.3%</td>
<td>1.7%</td>
<td>0.7%</td>
<td>9.7%</td>
<td>0.4%</td>
<td>5.5%</td>
<td>3.7%</td>
<td>11.1%</td>
</tr>
<tr>
<td>Cornelius</td>
<td>9,652</td>
<td>68.6%</td>
<td>0.8%</td>
<td>1.2%</td>
<td>1.0%</td>
<td>0.3%</td>
<td>24.3%</td>
<td>3.8%</td>
<td>37.4%</td>
</tr>
<tr>
<td>Forest Grove</td>
<td>17,708</td>
<td>81.5%</td>
<td>0.4%</td>
<td>0.9%</td>
<td>2.1%</td>
<td>0.2%</td>
<td>11.4%</td>
<td>3.5%</td>
<td>17.3%</td>
</tr>
<tr>
<td>Hillsboro</td>
<td>70,186</td>
<td>77.5%</td>
<td>1.2%</td>
<td>0.8%</td>
<td>6.5%</td>
<td>0.3%</td>
<td>10.4%</td>
<td>3.3%</td>
<td>18.9%</td>
</tr>
<tr>
<td>North Plains</td>
<td>1,605</td>
<td>90.8%</td>
<td>0.1%</td>
<td>1.7%</td>
<td>1.9%</td>
<td>0.1%</td>
<td>2.7%</td>
<td>2.7%</td>
<td>7.1%</td>
</tr>
<tr>
<td>Sherwood</td>
<td>11,791</td>
<td>92.4%</td>
<td>0.4%</td>
<td>0.5%</td>
<td>2.2%</td>
<td>0%</td>
<td>1.8%</td>
<td>2.7%</td>
<td>4.7%</td>
</tr>
<tr>
<td>Tigard</td>
<td>41,223</td>
<td>85.4%</td>
<td>1.1%</td>
<td>0.6%</td>
<td>5.6%</td>
<td>0.5%</td>
<td>3.8%</td>
<td>3.0%</td>
<td>8.9%</td>
</tr>
<tr>
<td>Tualatin</td>
<td>22,791</td>
<td>86.9%</td>
<td>0.8%</td>
<td>0.7%</td>
<td>3.6%</td>
<td>0.4%</td>
<td>4.8%</td>
<td>2.8%</td>
<td>11.9%</td>
</tr>
<tr>
<td>Census Tract 336</td>
<td>2,261</td>
<td>94.8%</td>
<td>0.1%</td>
<td>0.5%</td>
<td>1.1%</td>
<td>0.1%</td>
<td>1.5%</td>
<td>1.8%</td>
<td>3.5%</td>
</tr>
<tr>
<td>Clackamas County</td>
<td>338,391</td>
<td>91.3%</td>
<td>0.7%</td>
<td>0.7%</td>
<td>2.5%</td>
<td>0.2%</td>
<td>2.3%</td>
<td>2.5%</td>
<td>4.9%</td>
</tr>
<tr>
<td>Wilsonville</td>
<td>13,991</td>
<td>90.5%</td>
<td>0.7%</td>
<td>0.7%</td>
<td>2.2%</td>
<td>0.2%</td>
<td>3.2%</td>
<td>2.7%</td>
<td>6.9%</td>
</tr>
</tbody>
</table>

Source: US Census Bureau 2000; *Hispanic or Latinos may be of any race
*Percent totals do not equal 100 because of rounding.
4.15.1.5  Employment

Table 4.15-5 shows employment by industry in Washington and Clackamas Counties in 2004. Both counties have similar employment offerings. Private employers account for the majority of employment, with approximately 90 percent of the employment opportunities in both counties. The remaining jobs are public sector jobs, which are dominated by local government positions. Trade, transportation and utilities, which include retail positions, account for the majority of non-government jobs, with over 20 percent of private employment in both counties. Manufacturing accounted for 20 percent of private employment in Washington County, which is higher than Clackamas County with 13 percent of its private employment in manufacturing (OED 2005).

Table 4.15-5. Covered Employment by Industry, Washington County 2004

<table>
<thead>
<tr>
<th>Industry</th>
<th>Washington County</th>
<th>Clackamas County</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Percent*</td>
</tr>
<tr>
<td>Total All Ownerships</td>
<td>224,216</td>
<td></td>
</tr>
<tr>
<td>Total Private Coverage</td>
<td>206,855</td>
<td>92%</td>
</tr>
<tr>
<td>Natural Resources &amp; Mining</td>
<td>3,761</td>
<td>2%</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing, Hunting</td>
<td>3,488</td>
<td>2%</td>
</tr>
<tr>
<td>Mining</td>
<td>274</td>
<td>0%</td>
</tr>
<tr>
<td>Construction</td>
<td>13,022</td>
<td>6%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>45,594</td>
<td>20%</td>
</tr>
<tr>
<td>Trade, Transportation &amp; Utilities</td>
<td>48,223</td>
<td>22%</td>
</tr>
<tr>
<td>Utilities</td>
<td>528</td>
<td>0%</td>
</tr>
<tr>
<td>Wholesale</td>
<td>16,631</td>
<td>7%</td>
</tr>
<tr>
<td>Retail</td>
<td>26,729</td>
<td>12%</td>
</tr>
<tr>
<td>Transportation &amp; Warehousing</td>
<td>4,335</td>
<td>2%</td>
</tr>
<tr>
<td>Information</td>
<td>6,696</td>
<td>3%</td>
</tr>
<tr>
<td>Financial Activities</td>
<td>12,958</td>
<td>6%</td>
</tr>
<tr>
<td>Professional &amp; Business Services</td>
<td>29,511</td>
<td>13%</td>
</tr>
<tr>
<td>Education &amp; Health Services</td>
<td>21,521</td>
<td>10%</td>
</tr>
<tr>
<td>Leisure &amp; Hospitality</td>
<td>17,927</td>
<td>8%</td>
</tr>
<tr>
<td>Other Services</td>
<td>7,572</td>
<td>3%</td>
</tr>
<tr>
<td>Total All Government</td>
<td>17,361</td>
<td>8%</td>
</tr>
<tr>
<td>Total Federal Government</td>
<td>813</td>
<td>0%</td>
</tr>
<tr>
<td>Total State Government</td>
<td>1,263</td>
<td>1%</td>
</tr>
<tr>
<td>Total Local Government</td>
<td>15,285</td>
<td>7%</td>
</tr>
</tbody>
</table>

Source: OED 2006
*Percent totals do not equal 100 because of rounding.

Current and historic unemployment is shown on Figure 4.15-2. Washington and Clackamas Counties have consistently had lower unemployment rates than the state as a whole, but since 2000 their unemployment rates have risen above the national average. The OED described the increase in unemployment in the region as a byproduct of several nationwide factors affecting local industries including: the transportation equipment manufacturing industry’s downturn as a result of an oversupply.
of trucks and rising fuel and insurance costs; increasing energy costs; and a global high-tech industry downturn in the early 2000s. These factors had a particular impact on Washington County because of the strong presence of manufacturing industries, which was the hardest hit of any industry. The only industries that were somewhat shielded from the recession were education and health services, government, and financial activities. These industries continued to add jobs due mainly to increasing population (OED 2006).

Source: OED 2006

Figure 4.15-2. Unemployment Trends, Project Vicinity, 1995-2004

Both Washington and Clackamas counties, as well as the state as a whole, increased in unemployed residents between 2000 and 2003. However, with the recovering economy in the state and region, unemployment has begun to drop from its 2003 high of approximately 7.5 percent in Washington and Clackamas counties. In 2003, unemployment dropped to 6.3 percent in Washington County and 6.8 percent in Clackamas County (OED 2006).

4.15.2 Environmental Impacts

4.15.2.1 Alternative 1 – No Action

Under the No Action Alternative, socioeconomic conditions would remain similar to those of today. Temporary construction-related employment related to the Action Alternatives would not occur. The No Action Alternative would have no impact to population, income, racial/ethnic composition, or poverty rates. The No Action Alternative would not change access, travel patterns and visibility related to existing businesses located in the project area.
Under the No Action Alternative, the amount of water provided to local jurisdictions would be limited to what existing facilities can provide. Future residential and commercial/industrial development would be limited by the amount of available water necessary to support the new connections, potentially affecting the capacity of local jurisdictions and Washington County’s capacity to accommodate the projected population growth and economic development in the area.

4.15.2.2 Alternative 2 – Scoggins Dam 40-foot Raise

Alternative 2 would provide an adequate water supply to meet future demand and would support future, planned, residential, commercial, and industrial development because water shortages would not be a limiting factor for development as they would be under the No Action Alternative. However, local land use plans would guide the type and intensity of future growth and development, regardless of the amount of water that would be provided by the Action Alternatives. The project, by itself, would not induce growth.

Reclamation would purchase additional land for the increased size of Henry Hagg Lake and relocation of the perimeter road. Under Alternative 2, approximately 167 acres, designated for forest uses, would be acquired from private landowners. Acquired land would be incorporated into Scoggins Valley Park and removed from commercial timber production.

Trees would be cleared within areas to be inundated, particularly in the southern portion of the reservoir. Much of the marketable timber would be sold, generating some revenue for the property owner (Federal government). However, some of the larger trees would not be sold but would be used to enhance fish habitat as part of mitigation for project impacts.

Impacts to farmland would occur primarily by constructing the RWP, although those impacts would be temporary because, when construction is complete, farming activities would resume. Landowners would be compensated for crops lost as a result of construction activities. No long-term impacts to farmland are anticipated because the area would be returned to pre-construction conditions.

Scott Quarry, located near Scoggins Creek would be acquired. The quarry’s owner operates the quarry periodically when pit run is needed for the quarry owner’s logging operations. No employment impacts from the quarry’s closure are anticipated because the quarry does not have any permanent employees. The quarry owner would be compensated for the property acquired.

Conversion of forest and agricultural land would have little, if any, impact to the local tax base because forest and agricultural land uses are generally already exempt from property taxes and do not contribute to the local tax roll. Landowners would be compensated at fair market value for lands that would be acquired for the project. Alternative 2 would displace 1 residence. Residents would be compensated at fair market value for loss of property and would be offered relocation assistance services. Washington County would lose some property tax revenue due to the displacements unless the County is compensated for its lost tax revenue. Impact would be minimal.
Construction activities would have short-term positive effects on the local economy during the 4- to 5-year construction period. Alternative 2 would not likely increase long-term employment opportunities at Scoggins Dam or Scoggins Valley Park. Contractors would be hired for construction of the dam, road relocation, recreation facility replacement, and RWP construction, providing construction-related employment opportunities for local residents. Potential effects on employment are described in Section 6 of this document. Since most of workers likely would reside in the Portland metropolitan area, little or no impact on hotel or motel occupancy is anticipated. Should construction workers need temporary lodging, local motels and hotels would be able to accommodate them.

Local businesses that provide services such as gasoline and meals would benefit from patronage by the construction workers. Short-term construction-related employment and revenues generated from purchases of goods and services in the local area would benefit the local economy and businesses. Local businesses supplying construction equipment and materials (such as gravel, rock, pipe, etc.) would also benefit from the project.

Potential impacts to minority and low-income populations are discussed in Section 4.23 (Environmental Justice).

4.15.2.3 Alternative 3 – Multiple Source Option
Like Alternative 2, Alternative 3 would provide an adequate water supply to meet future demand and would support future, planned, residential, commercial, and industrial development. However, local land use plans would guide the type and intensity of future growth and development, regardless of the amount of water that would be provided by the Action Alternatives. The project, by itself, would not induce growth.

As with Alternative 2, land would be purchased in the vicinity of the reservoir by Reclamation to accommodate the increased size of Henry Hagg Lake and the relocated perimeter road. Under Alternative 3, approximately 115 acres designated for forest uses would be acquired from private landowners. Acquired land would be incorporated into Scoggins Valley Park and removed from commercial timber production.

Trees would be cleared within areas to be inundated, particularly in the southern portion of the reservoir. Some marketable timber would be sold, generating some revenue for the property owner (Federal government). Because fewer trees would be cleared under Alternative 3 than Alternative 2, revenue likely would be less. Some of the larger trees would not be sold but would be used to enhance fish habitat as part of mitigation for project impacts, as with Alternative 2.

Effects on the Scott Quarry would be the same as Alternative 2. The impact on farmland resulting from RWP construction would also be the same, except construction activities may temporarily affect a narrower corridor of land because the pipeline diameter would be smaller. Landowners would be compensated for the crops lost as a result of construction activities, and no long-term impacts to farmland are anticipated.
Conversion of forest and agricultural land would have little, if any, impact to the local tax base because forest and agricultural land uses are generally already exempt from property taxes and do not contribute to the local tax roll. Landowners would be compensated at fair market value for lands that would be acquired for the project. Alternative 3 would not displace any residences near Henry Hagg Lake. Owners would be compensated at fair market value for loss of property and would be offered relocation assistance services for any timber operations personal property. Washington County would lose some property tax revenue due to the displacements unless it is also compensated, but the impact would be minimal.

Under Alternative 3, the construction effects in the vicinity of Henry Hagg Lake would be similar to but somewhat less than Alternative 2. Construction near Henry Hagg Lake would occur for approximately 4 years, compared to 4 to 5 years under Alternative 2. Alternative 3 would not likely increase long-term employment opportunities at Scoggins Dam or Scoggins Valley Park. Contractors would be hired for construction of the dam, road relocation, recreation facility replacement, and RWP construction, providing construction-related employment opportunities for local residents. Potential effects on employment are described in Section 6 of this document. Since most of workers likely would reside in the Portland metropolitan area, little or no impact on hotel or motel occupancy is anticipated. Should construction workers need temporary lodging, local motels and hotels would be able to accommodate them.

Construction of the Willamette Pipeline between Wilsonville and Beaverton would result in increased revenues for businesses near the pipeline route during construction, which could take 3½ years. However, businesses immediately adjacent to the Willamette Pipeline construction corridor may be negatively affected by construction activities. Business accesses may be re-routed to avoid construction areas. Dust and noise from heavy equipment could disrupt business and deter customers from visiting businesses in the immediate vicinity.

Construction of the water tanks associated with Willamette Pipeline would take approximately 2 years. One TVWD water tank would likely be built while the pipeline is under construction; the other water tanks would probably be built later, as needed. Construction contractors would likely hire local workers to construct the project. Since workers would reside in the region, little to no impact to hotel or motel occupancy is anticipated. However, in the event construction workers would need temporary lodging, local motels and hotels are assumed to be able to accommodate them.

Constructing the Willamette Pipeline could affect private residents and businesses along the alignment where construction outside of existing right-of-way would occur and permanent utility easements would be required. Landowners whose property would be affected by permanent utility easements would be

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2 Personal property is any property that is not designated by law as real property (permanently affixed to the land).
compensated appropriately. It is expected that no residential displacements would occur along the Willamette Pipeline corridor or in the potential water tank sites.

Potential impacts to minority and low-income populations are discussed in Section 4.23 (Environmental Justice).

4.15.3 Mitigation Measures

4.15.3.1 Alternative 1
No mitigation is proposed.

4.15.3.2 Alternatives 2 and 3
The construction contractors would mitigate construction effects such as temporary disruptions to travel patterns and congestion through the use of signing, construction staging and scheduling. Property access would be maintained during construction.

For land acquisition under either Action Alternative, property owners would be compensated by acquisition and relocation assistance procedures governed by the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 and its revisions. The act ensures fair and consistent treatment of all displaced individuals, families, businesses, farm operations and others who occupy land needed for the project in a way that does not cause a disproportionate hardship to those affected by projects designed for the benefit of the community.
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4.16 Air Quality

4.16.1 Affected Environment
Air pollutants within the project area are primarily background emissions from residential woodstoves and fireplaces, automobiles, and dust from unimproved roads. The background emissions include carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), particulate matter (PM_{2.5} and PM_{10}), and ozone (O₃). PM_{2.5} consists of particulates with a diameter less than 2.5 microns, and PM_{10} consists of particulates with a diameter less than 10 microns. The area surrounding Scoggins Dam and Hagg Lake is sparsely populated, with the majority of ambient air quality conditions resulting from recreational uses on the reservoir and agricultural uses near the reservoir. Commercial logging operations in the reservoir vicinity contribute fugitive dust particulate matter and internal combustion emissions. Vehicle traffic along OR 47 southeast of the reservoir contributes air pollutants within the project area.

ODEQ monitors air quality within Oregon. Pollutants of particular concern in the region around the Project area include PM_{2.5} and PM_{10}, CO, and/or O₃, which could lead to designation of non-attainment or maintenance areas. Non-attainment means that a geographic area has not consistently met the clean air levels set by the EPA for National Ambient Air Quality Standards (NAAQS). Maintenance areas are those geographic areas that had a history of non-attainment, but are now consistently meeting the NAAQS. ODEQ has not identified non-attainment or maintenance areas within the project area, although the Portland metropolitan area, which includes Forest Grove northeast of the project area, is an air quality maintenance area for O₃ and CO (ODEQ 2005). Table 4.16-1 shows measured air pollutant concentrations in the region around the Project area and compares them to the NAAQS.

The closest air quality monitoring stations to the Project area are located in Hillsboro, approximately 12 miles east of Henry Hagg Lake. Reported data from the Hillsboro air quality monitoring stations are limited to PM_{2.5} and PM_{10}. The next closest air quality monitoring station is located in Beaverton, approximately 20 miles east of Henry Hagg Lake. The reported data from the Beaverton air quality monitoring station are limited to PM_{2.5}. The closest air quality monitoring station that records the full spectrum of NAAQS pollutants is located in Portland, approximately 28 miles east of Henry Hagg Lake. The data shown in Table 4.16-1 are representative of urban ambient air quality conditions and likely are much higher than ambient air quality conditions within the project area. All of the pollutant concentrations shown in Table 4.16-1 are lower than the NAAQS. Table 4.16-1 also shows the Oregon Ambient Air Quality Standards. The NAAQS and Oregon standards are the same for most pollutants, but are different for SO₂.
Table 4.16-1. Measured Air Pollutant Concentrations in the Region around the Project Area Compared to Ambient Air Quality Standards

<table>
<thead>
<tr>
<th>Nearest Station</th>
<th>Pollutant (units)</th>
<th>Averaging Time</th>
<th>Measured Concentrations (see units under Pollutant)</th>
<th>Ambient Air Quality Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>2001</td>
<td>2002</td>
</tr>
<tr>
<td>Hillsboro</td>
<td>PM$_{10}$ (µg/m$^3$)</td>
<td>Annual Mean</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Max.24-hour</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Hillsboro</td>
<td>PM$_{2.5}$ (µg/m$^3$)</td>
<td>Annual Mean</td>
<td>9.0</td>
<td>10.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Max.24-hour</td>
<td>31</td>
<td>38</td>
</tr>
<tr>
<td>Beaverton</td>
<td>PM$_{2.5}$ (µg/m$^3$)</td>
<td>Annual Mean</td>
<td>7.7</td>
<td>7.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Max.24-hour</td>
<td>24</td>
<td>28</td>
</tr>
<tr>
<td>Portland</td>
<td>CO (ppm)</td>
<td>Annual Mean</td>
<td>0.012</td>
<td>0.012</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Max.8-hour</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Portland</td>
<td>NO$_2$ (ppm)</td>
<td>Max.1-hour</td>
<td>6.4</td>
<td>5.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Max.8-hour</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Portland</td>
<td>O$_3$ (ppm)</td>
<td>Annual Mean</td>
<td>8.8</td>
<td>8.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Max.24-hour</td>
<td>25</td>
<td>28</td>
</tr>
<tr>
<td>Portland</td>
<td>PM$_{2.5}$ (µg/m$^3$)</td>
<td>Annual Mean</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Max.24-hour</td>
<td>44</td>
<td>67</td>
</tr>
<tr>
<td>Portland</td>
<td>Pb (µg/m$^3$)</td>
<td>Quarterly Mean</td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td>Portland</td>
<td>SO$_2$ (ppm)</td>
<td>Annual Mean</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Max.24-hour</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

ppm = parts per million  µg/m$^3$ = micrograms per cubic meter  
Source: MWH 2007
4.16.2 Environmental Consequences

4.16.2.1 Alternative 1 – No Action

4.16.2.1.1 Potential Impacts (direct, indirect)
The No Action Alternative would have no impact on air quality. Sources of pollutants in the project area would continue to be recreational uses around the reservoir, commercial logging, vehicle traffic, and dust from unimproved roads. Reservoir options would not change ambient air quality conditions.

4.16.2.1.2 Cumulative Impacts
Alternative 1 would not contribute to cumulative impacts on air quality.

4.16.2.2 Alternative 2 – Scoggins Dam 40-foot Raise

4.16.2.2.1 Potential Impacts (direct, indirect)

**Construction Impacts**
The temporary effects of construction activities can cause two types of emissions from primary sources: exhaust from heavy construction equipment and other vehicles, and particulate matter in the form of dust and other particles produced from disturbed soils during construction. Impacts on air quality are considered significant if project construction would result in a short-term or long-term violation of primary NAAQS and Oregon ambient air quality standards for the criteria pollutants outside of the construction site boundaries.

A typical pipeline construction site and dam construction site were simulated using the SCREEN3 model developed by EPA to represent the project construction activities. The model analysis was based on a number of conservative assumptions, which are detailed in the Human Environment Technical Report prepared for the project (MWH 2007). Among others, the assumptions include simultaneous operation of all of the equipment, with dam construction occurring 20 hours per day (two 10-hour shifts), six days per week, and road construction, pipeline construction, and cleanup and restoration occurring 10 hours per day, six days per week. The measured background pollutant concentrations are based on measurements taken in downtown Portland (NO2, SO2) and Hillsboro (PM10), which probably are higher than would occur in the rural area surrounding the dam and RWP alignment. Therefore, model results represent the projected maximum impact condition.

The construction sites were analyzed for total emission levels, which were used as model input data to determine impacts on ambient air quality. These resulting air quality conditions were then compared to the NAAQS to determine if there would be any significant impacts on air quality resulting from project construction activities. Table 4.16-2 summarizes the results of this analysis.

The highest total emission levels for CO, NO2, SO2, and PM10 could occur during rebuilding of the dam to the higher elevation and construction of the inlet channel. Construction dust PM10 emissions would occur from construction activities such as travel over unpaved surfaces, clearing, grading, loading of debris into trucks, dumping debris onto storage piles, burning slash, bulldozing, compacting, and wind erosion of temporary storage piles and cleared areas.
Standard construction procedures generally require that dust control measures will be implemented at construction sites. It was assumed that construction dust would be reduced 50 percent by watering when needed at all construction sites (EPA 1995). Other dust control measures, such as chemical stabilization, could be used in addition to watering. Blasting will be controlled to prevent escape of blast force and, therefore, dust emissions, and would not contribute measurably to airborne particulate matter.

Impacts from ozone are not analyzed because, unlike the other criteria pollutants, ozone is formed from precursor compounds (volatile organic compounds and nitrogen oxides) that are emitted from concentrated sources. A photochemical reaction occurs in the hours after the precursor compounds are emitted that creates ozone, which can form several hours downwind. No ozone modeling was performed because there would be no long-term concentrated sources resulting from the project, the short-term emission levels of nitrogen oxides and volatile organic compounds would be low, and the project area is not designated a non-attainment or maintenance area.

Table 4.16-2. Simulated Equipment Exhaust and Dust Emissions at Alternative 2 Construction Sites (Dam Raise, Reservoir Enlargement, and Road Relocation)

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Time</th>
<th>Modeled Peak Conc. Beyond Construction Site Boundary (µg/sec-m³)</th>
<th>Measured Background Concentration (µg/sec-m³)</th>
<th>Total Peak Concentration (µg/sec-m³)</th>
<th>NAAQS (µg/sec-m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>8-hour</td>
<td>273</td>
<td>4,531&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4,804</td>
<td>10,000</td>
</tr>
<tr>
<td></td>
<td>1-hour</td>
<td>273</td>
<td>6,866&lt;sup&gt;b&lt;/sup&gt;</td>
<td>7,139</td>
<td>40,000</td>
</tr>
<tr>
<td>NO₂</td>
<td>Annual</td>
<td>456</td>
<td>23&lt;sup&gt;c&lt;/sup&gt;</td>
<td>489</td>
<td>100</td>
</tr>
<tr>
<td>SO₂</td>
<td>Annual</td>
<td>44</td>
<td>5&lt;sup&gt;d&lt;/sup&gt;</td>
<td>49</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>24-hour</td>
<td>52</td>
<td>14&lt;sup&gt;e&lt;/sup&gt;</td>
<td>66</td>
<td>365</td>
</tr>
<tr>
<td>PM&lt;sub&gt;10&lt;/sub&gt;</td>
<td>Annual</td>
<td>176</td>
<td>13&lt;sup&gt;h&lt;/sup&gt;</td>
<td>189</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>24-hour</td>
<td>428&lt;sup&gt;g&lt;/sup&gt;</td>
<td>25&lt;sup&gt;i&lt;/sup&gt;</td>
<td>453</td>
<td>150</td>
</tr>
</tbody>
</table>

Notes:
µg/m³ = micrograms per cubic meter
<sup>a</sup> Portland 2001 through 2005
<sup>b</sup> Portland 2001 through 2005
<sup>c</sup> Portland 2001 through 2005
<sup>d</sup> Portland 2005
<sup>e</sup> Portland 2005
<sup>f</sup> Based on mean maximum 1-hour concentrations for each month at 651 meters downwind from construction site
<sup>g</sup> Based on August maximum 1-hour concentration at 651 meters downwind from construction site
<sup>h</sup> Hillsboro PM<sub>10</sub> 2005
<sup>i</sup> Hillsboro PM<sub>10</sub> 2005

Source: MWH 2007
Without mitigation, significant, temporary, air quality impacts would occur for NO$_2$ (annual average) and for PM$_{10}$ (annual and 24-hour averages) because the concentrations resulting from Alternative 2 dam raise, reservoir enlargement, and road relocation construction would exceed the NAAQS and Oregon Ambient Air Quality Standards. The Alternative 2 NO$_2$ annual average concentrations would be within the NAAQS NO$_2$ concentration beyond 855 meters downwind of the dam construction activity. The Alternative 2 PM$_{10}$ 24-hour average and annual average concentrations would be within the NAAQS PM$_{10}$ concentration beyond 8900 meters downwind of the pipeline construction activity. Within those distances, concentrations would exceed the standards. There would be minor to moderate short-term increases in CO and SO$_2$ concentrations resulting from Alternative 2 construction, primarily in the immediate vicinity of the project area, and the concentrations of these pollutants would diminish with increasing distance from the construction site.

RWP construction would have different impacts on air quality than the 40-foot dam raise, reservoir enlargement and road relocation because of the linear disturbance that would occur in segments during the total construction period. The highest total emission levels for CO, NO$_2$, SO$_2$, and PM$_{10}$ would occur during trench excavation.

Table 4.16-3 summarizes dispersion modeling results for equipment and dust emissions from RWP construction. The project construction activities would be located in a rural area, and construction would exceed 12 months.

**Table 4.16-3. Simulated Equipment Exhaust and Dust Emissions from Alternative 2, RWP Construction**

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Time</th>
<th>Modeled Peak Conc. Beyond Construction Site Boundary (µg/m$^3$)</th>
<th>Measured Background Concentration (µg/m$^3$)</th>
<th>Total Peak Concentration (µg/m$^3$)</th>
<th>NAAQS (µg/m$^3$)</th>
<th>Distance Downwind of Construction that Avg. Concentrations Occur (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>8-hour</td>
<td>6,206</td>
<td>4,531$^a$</td>
<td>10,737</td>
<td>10,000</td>
<td>78</td>
</tr>
<tr>
<td></td>
<td>1-hour</td>
<td>6,206</td>
<td>6,866$^b$</td>
<td>13,072</td>
<td>40,000</td>
<td>--</td>
</tr>
<tr>
<td>NO$_2$</td>
<td>Annual</td>
<td>9,607</td>
<td>23$^c$</td>
<td>9,630</td>
<td>100</td>
<td>423</td>
</tr>
<tr>
<td>SO$_2$</td>
<td>Annual</td>
<td>870</td>
<td>5$^d$</td>
<td>875</td>
<td>80</td>
<td>155</td>
</tr>
<tr>
<td></td>
<td>24-hour</td>
<td>1,015</td>
<td>14$^e$</td>
<td>1,029</td>
<td>365</td>
<td>155</td>
</tr>
<tr>
<td>PM$_{10}$</td>
<td>Annual</td>
<td>1,137$^f$</td>
<td>13$^h$</td>
<td>1,150</td>
<td>50</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>24-hour</td>
<td>1,440$^g$</td>
<td>25$^i$</td>
<td>1,465</td>
<td>150</td>
<td>260</td>
</tr>
</tbody>
</table>

Notes:

- $\mu$g/m$^3$ = micrograms per cubic meter
- $^a$ Portland 2001 through 2005
- $^b$ Portland 2001 through 2005
- $^c$ Portland 2001 through 2005
- $^d$ Portland 2005
- $^e$ Portland 2005
- $^f$ Based on mean maximum 1-hour concentrations for each month at 77 meters downwind from construction
- $^g$ Based on October maximum 1-hour concentration at 77 meters downwind from pipeline construction
- $^h$ Hillsboro PM$_{10}$ 2005
- $^i$ Hillsboro PM$_{10}$ 2005
Dispersion modeling indicates that the NAAQS would be exceeded for CO 8-hour and 1-hour averages), NO\textsubscript{2} (annual average), SO\textsubscript{2} (annual and 24-hour averages), and PM\textsubscript{10} (annual and 24-hour averages). Without mitigation, these would all be significant, temporary impacts on air quality.

The dispersion model results indicate that the maximum one-hour concentrations for CO, NO\textsubscript{2}, SO\textsubscript{2}, and PM\textsubscript{10} would occur 77 meters downwind of the pipeline construction area, with the pollutant sources consisting primarily of construction equipment emissions and a relatively small component of the PM\textsubscript{10} contributed as fugitive dust. These potential short-term air quality impacts would occur because the construction equipment would be operating within a relatively small area and emitting concentrated pollutants through engine exhaust systems. The model results are based on simultaneous operation of all of the equipment, which is a conservative assumption. The measured background pollutant concentrations are based on measurements taken in downtown Portland (NO\textsubscript{2}, SO\textsubscript{2}) and Hillsboro (PM\textsubscript{10}), which probably are higher than would occur in the rural area surrounding the pipeline alignment. The RWP construction would have significant impacts on air quality for CO, NO\textsubscript{2}, SO\textsubscript{2}, and PM\textsubscript{10} within the distances shown in the table.

Revegetation of disturbed areas following construction activities is a standard construction practice and would serve to control total suspended particulates over the long term following Alternative 2 construction.

**Operational Impacts**

Operation under Alternative 2 would not result in measurable impacts on air quality. Park visitation and motorized vehicle use of the lake are expected to increase with or without project construction. Therefore, the potential for more engine exhaust emissions during the recreation season would increase to a similar degree with the No Action and Action Alternatives. These impacts on air quality would not cause exceedance of the NAAQS and would not be significant.

4.16.2.2 Cumulative Impacts

No other construction projects have been identified that would occur simultaneously and in proximity to the project construction at Henry Hagg Lake. Cumulative impacts to air quality from project construction cannot, therefore, be identified. Both the No Action and Action Alternatives would contribute to air pollution over the long term as a result of increased park attendance and motorboat and personal watercraft use. Additional development in the Portland metropolitan region would also result in air quality impacts. These impacts would contribute to air quality problems in the region and could result in exceedance of the NAAQS and designation of non-attainment or additional maintenance areas.

4.16.2.3 Alternative 3 – Multiple Source Option

4.16.2.3.1 Potential Impacts (direct, indirect)

**Construction Impacts**
The air quality impacts of constructing the 25-foot dam raise under Alternative 3 would be the same as for Alternative 2, except that the length of construction time, and therefore the duration of construction emissions, would be shorter. Construction of the 25-foot dam raise, reservoir enlargement, and road relocation would cause increases in pollutant levels, and some of these impacts would exceed NAAQS and Oregon Ambient Air Quality Standards, notably for NO2 and PM10 emissions. Construction of the RWP, Willamette Pipeline, and water tanks would result in localized air quality impacts that could exceed NAAQS and Oregon Ambient Air Quality Standards for CO, NO2, SO2, and PM10 from construction equipment emissions. Any exceedances would be a significant, temporary impact on air quality and on the quality of the human environment.

Although no modeling was done for construction of the Willamette Pipeline or water tanks, impacts would be similar to those of the RWP. The diameter of the Willamette Pipeline and the construction methods used would be the same as for the RWP. The Willamette Pipeline would also create a linear disturbance and the highest emission levels would occur during trench excavation. Construction of the water tanks, although not a linear disturbance, would require similar excavation and construction equipment. The measured background pollutant concentrations used in the RWP modeling are based on measurements taken in downtown Portland and Hillsboro. It is estimated that, without mitigation, construction of the Willamette Pipeline would have temporary, significant impacts on air quality due to NAAQS exceedances for CO 8-hour and 1-hour averages), NO2 (annual average), SO2 (annual and 24-hour averages), and PM10 (annual and 24-hour averages). Willamette Pipeline and water tank construction also would have temporary, significant impacts on air quality for CO, NO2, SO2, and PM10 for similar distances as for the RWP.

**Operating Impacts**

Operation under Alternative 3 would not result in measurable impacts on air quality. Impacts from recreation activity at Henry Hagg Lake would be the same as under Alternatives 1 and 2. The RWP, Willamette Pipeline, and the water tanks would have no operational air quality impacts.

**4.16.2.3.2 Cumulative Impacts**

Cumulative impacts would be the same as under Alternative 2.

**4.16.3 Mitigation Measures**

**4.16.3.1 Alternative 1**

No mitigation is proposed.

**4.16.3.2 Alternatives 2 and 3**

The air quality impacts requiring mitigation involve construction equipment emissions of NO2 and PM10 during dam, roadway, pipeline, and other construction activities, and CO, NO2, SO2, and PM10 associated with construction. Implementing the following mitigation measures would reduce the construction equipment emissions to levels below the NAAQS and Oregon Ambient Air Quality Standards, so construction would not result in any significant impacts.
Route and schedule construction trucks and other equipment to reduce delays to vehicle traffic during peak travel times to reduce secondary air quality impacts.

Require appropriate emission-control devices on all construction equipment powered by gasoline or diesel fuel to reduce CO, NO₂, SO₂, and PM₁₀ emissions. Use well-maintained construction equipment to reduce CO, NO₂, SO₂, and PM₁₀ emissions.

Avoid idling individual construction equipment when not being actively used in the pipeline construction activities.

Monitor the pipeline and water tanks construction site for CO, NO₂, SO₂, and PM₁₀ background concentrations and Alternative 2 concentrations to determine if NAAQS and Oregon Ambient Air Quality Standards are exceeded. If any standards are exceeded, take corrective actions as necessary to remain within the standards in the vicinity of the construction activities. Corrective actions may include temporarily turning off individual construction equipment, re-scheduling construction during hours when background concentrations are lower, reducing shifts, limiting use of certain construction equipment with higher emissions, upgrading emission control devices on construction equipment, and other similar actions.
4.16 Air Quality .................................................................................. 4.16-1

4.16.1 Affected Environment .............................................................. 4.16-1
4.16.2 Environmental Consequences ............................................. 4.16-3
4.16.3 Mitigation Measures ............................................................... 4.16-7

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Table 4.16-3. Simulated Equipment Exhaust and Dust Emissions from Alternative 2, RWP Construction .................................................................................. 4.16-5
4.17 Noise

4.17.1 Affected Environment
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).

The rural setting of Scoggins Valley Park, Henry Hagg Lake, and the largely agricultural lowlands that would be traversed by the proposed water pipeline is characterized by low ambient noise. Noise sources within that portion of the project area are primarily from motorized recreational activities on the reservoir, visitors at the various recreational areas, vehicular noise on nearby roadways, and local industry operations, such as wood product production. The Willamette Pipeline would traverse urban areas, which have higher ambient noise. The noise levels associated with these different sources vary significantly and depend on the particular locations, season, and time of day.

Table 4.17-1 shows typical day-night (Ldn) noise levels for different types of settings in the project area. Ldn represents the day-night average sound level, and is defined as the 24-hour A-weighted equivalent sound level with a 10 percent decibel reduction applied to nighttime levels to account for most receptor’s increased sensitivity to nighttime noises. Sound levels are measured in decibels (dB). A “weighted” scale that reflects human hearing is used to interpret sound levels since the human ear has a limited range of sensitivity to sound levels. This is better known as the “A-weighted” scale, and is denoted as dBA. The “A-weighted” scale is used in this analysis to measure projected sound levels resulting from construction and operation.

<table>
<thead>
<tr>
<th>Setting Description</th>
<th>Typical Range, Ldn (dBA)</th>
<th>Average Ldn (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Undeveloped</td>
<td>35 to 45</td>
<td>40</td>
</tr>
<tr>
<td>Rural Agricultural</td>
<td>40 to 50</td>
<td>45</td>
</tr>
<tr>
<td>Rural Residential</td>
<td>48 to 52</td>
<td>50</td>
</tr>
<tr>
<td>Urban Residential</td>
<td>51 to 68</td>
<td>60</td>
</tr>
<tr>
<td>Industrial</td>
<td>50 to 60</td>
<td>55</td>
</tr>
</tbody>
</table>

Source: EPA 1974
Sensitive noise receptors within the analysis area include scattered residential dwellings adjacent to Scoggins Valley Park; homes located along the proposed RWP and Willamette Pipeline corridors; schools, parks, and offices along the Willamette Pipeline corridor in the cities of Wilsonville, Beaverton, Sherwood, and Tigard; and workers at Stimson Mill. Along the RWP and rural parts of the Willamette Pipeline route, noise from vehicles and farm equipment are the primary noise generators, but as with noise in the park, noise levels are generally low. Within the urban areas along the Willamette Pipeline, traffic and commercial and industrial buildings/uses are the primary noise generators.

Within Scoggins Valley Park, motorized recreational activities on the reservoir during summer months and vehicular traffic on the interior park road are the most significant sources of noise within the area. Noise from personal watercraft and motorized boats is reflected off the surface of the water and, depending on wind and weather conditions, can be heard at locations far from the source. However, none of the noise sources within the dam and park area are known to be significantly disruptive to residents or workers. While weekends and holidays during summer months are noisier than at other times within Scoggins Valley Park, they usually remain within a reasonable level and occur during daytime hours. Scoggins Valley Park visitors are required to leave the reservoir each evening prior to dusk, which controls the noise on the reservoir and in the park during the nighttime hours. Recreational users are not classified as sensitive receptors because they may choose what parts of the park to use, unlike residents and workers who would not be able to leave areas affected by high noise levels.

Reclamation measured noise levels in Scoggins Valley Park over a two-day period in June 1993. Noise measurements were collected near two residences adjacent to the park to determine background noise levels from park activities, including boating, swimming, water skiing, and personal water-craft use. The study estimated and differentiated noise levels emitted by non-park sources from those emitted by sources within the park. The park noise generally increases by one or two dBA throughout the weekend and is highest on weekend days. The measured noise levels indicate that the park is a relatively quiet area, with noise levels ranging from 37 to 48 dBA.

### 4.17.2 Environmental Impacts

Construction noise was analyzed following the procedures for projects not yet under construction contained in Highway Construction Noise: Measurement, Prediction and Mitigation (FHWA 1977). The noise impact analysis identified the main construction phases for two typical construction sites (dam-raise, reservoir enlargement, and road location construction, and pipeline construction), the types of equipment required for each construction phase, and a representative noise emission level for each equipment type. The decibel noise levels at 50 feet for each piece of equipment were added together for each phase of construction.

The analysis made a conservatively high, worst-case assumption that all equipment associated with the construction phase would operate at the same time. It also assumed that vehicle speeds within the construction site would be 25 miles per hour and all blasting for rock removal would be in controlled, down-hole blasts with relatively small charges due to the proximity to the dam and to residences and businesses.
Impacts on noise levels are considered significant if project operation would result in a long-term increase in noise levels affecting human health (>85 dBA), interfere with normal human speech (>66 dBA), or result in substantially degrading the aesthetic qualities of residential living (>60 dBA).

4.17.2.1  Alternative 1 – No Action

4.17.2.1.1  Potential Impacts (direct, indirect)
Park visitation would expected to increase with or without project construction. Motorized boating, personal watercraft use, swimming, and other recreational activities would increase. Reclamation has estimated that noise levels in Scoggins Valley Park would increase by 2 dBA by 2010 from increased recreation use (Reclamation 1994), with resulting noise levels ranging from 39 to 51 dBA.

4.17.2.1.2  Cumulative Impacts
Alternative 1 would not contribute to noise impacts.

4.17.2.2  Alternative 2 – Scoggins Dam 40-foot Raise

4.17.2.2.1  Potential Impacts (direct, indirect)

Construction Impacts (short term)
Based on the noise analysis, The loudest hourly equivalent noise level expected from constructing the 40-foot dam raise, reservoir enlargement, and road relocation would occur during the clearing and grubbing phase and could be as high as 116 dBA. Other noise levels could range from 97 dBA for cleaning and restoration to 104 dBA for rebuilding the dam and inlet channel. For the RWP construction, the loudest hourly equivalent noise level would occur during clearing and grubbing and could be as high as 113 dBA. Clearing and grubbing of areas to be inundated and near the dam could last for 6 months. Clearing and grubbing for road relocation could last for a total of three to six weeks, but probably would occur in stages. Similarly, clearing and grubbing for new recreation and administrative facilities could last a total of about six weeks—one week at each site (Lambert 2007).

Other noise levels could range from 92 dBA for installing pipe and connecting to 104 dBA for trench excavation. The dam and RWP construction sites are assumed to act as a point source of noise, and noise levels would decrease by 6 dBA with each doubling of distance from the construction area.

Table 4.17-2 lists maximum expected hourly equivalent noise levels at varying distances from the dam and RWP construction sites.

Table 4.17-2. Maximum Expected Hourly Equivalent Noise Level at Varying Distances from the Dam and RWP Construction Sites, Alternative 2

<table>
<thead>
<tr>
<th>Distance From Construction Site (feet)</th>
<th>Maximum Expected Hourly Equivalent Noise Level Leq(h) (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dam area</td>
</tr>
<tr>
<td>50</td>
<td>116</td>
</tr>
<tr>
<td>100</td>
<td>110</td>
</tr>
<tr>
<td>200</td>
<td>104</td>
</tr>
</tbody>
</table>
Sensitive noise receptors (primarily residences) around the reservoir would receive short-term impacts from construction equipment noise under Alternative 2. Residences that would receive the most noise impact would be those within 1 mile of the clearing and grubbing activities around the reservoir perimeter and those closest to the RWP alignment. The noise levels at these residences close to the dam could range from over 74 to over 90 dBA during hours of construction activity, compared to the estimated daytime background levels ranging from 37 to 52 dBA. The noise levels at the closest residences along the RWP corridor could range from 60 to 100 dBA during the daylight hours, compared to the estimated daytime background levels ranging from 48 to 60 dBA. This would be a significant but short-term impact.

Receptors up to about 2.5 miles away from the construction areas would experience occasional noise levels in excess of 60 dBA. Noise resulting from construction activities would exceed the aesthetic residential living threshold of 60 dBA and the normal speech threshold of 66 dBA for some receptors, resulting in significant, short-term impacts.

**Operating Impacts (long term)**

Park visitation would expected to increase with or without project construction. Motorized boating, personal watercraft use, swimming, and other recreational activities would increase. As with the No Action Alternative, increased recreation under the Action Alternatives would increase noise levels in Scoggins Valley Park by about 2 dBA by 2010 (Reclamation 1994).

### 4.17.2.2 Cumulative Impacts

No other construction projects have been identified that would occur simultaneously and in proximity to the project construction at Henry Hagg Lake. Cumulative noise impacts from project construction cannot, therefore, be identified. Because development in the immediate vicinity of Hagg Lake would be limited by land use regulations, there would be very little to no cumulative impacts on noise levels in the project area.

### 4.17.2.3 Alternative 3 – Multiple Source Option

#### 4.17.2.3.1 Potential Impacts (direct, indirect)

**Construction Impacts (short term)**

The noise impacts of constructing the 25-foot dam raise, reservoir enlargement, road relocation, RWP, and Willamette Pipeline, water tanks, and related facilities under Alternative 3 would be about the same as described under Alternative 2. The time needed for construction near Henry Hagg Lake would be shorter than for Alternative 2—perhaps one year shorter—so the duration of noise impacts would be less. The noise impacts would exceed the aesthetic residential living threshold of 60 dBA, the normal
speech threshold of 66 dBA, and the human health threshold of 85 dBA. These would be significant but short-term impacts.

**Operating Impacts (long term)**
Operational impacts under Alternative 3 would be the same as described for Alternatives 1 and 2. The Willamette Pipeline and associated water tanks would have no operational noise impacts.

### 4.17.2.3.2 Cumulative Impacts
Cumulative impacts would be the same as for Alternative 2.

### 4.17.3 Mitigation Measures

#### 4.17.3.1 Alternative 1
No mitigation is proposed.

#### 4.17.3.2 Alternatives 2 and 3
The noise impacts requiring mitigation involve construction equipment producing point source noise levels during all construction phases in the reservoir and dam area and along the pipeline alignment. In most instances, the highest noise emissions would originate from equipment that would have relatively limited duration of use, specifically chain saws, and potentially, rock drills and pile drivers. The following mitigation measures would contribute to reducing short-term noise levels during construction activities.

- Provide additional muffling of high noise producing equipment such as chainsaws, dump trucks, and concrete trucks.
- Retain vegetation for screening and absorbing construction site noise, and then remove vegetation near the end of the project construction activities.
- Avoid idling construction equipment that is not being actively used.
- Provide sound barriers for pipeline construction between the construction areas and nearby residences.
- Restrict time of use of high noise emitting activities, such as chainsaws, rock drilling, pile driving, and blasting, to daylight hours.
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4.17.2 Environmental Impacts..................................................4.17-2
4.17.3 Mitigation Measures.....................................................4.17-5

Table 4.17-1. Typical Day-Night Noise Levels for Different Settings in Project Area
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
4.18 Public Health and Safety

Information in this section was summarized from the Human Environment Environmental Impacts Technical Report (MWH 2007). The greatest risk to public safety related to the TBWSP would be the catastrophic breach failure of Scoggins Dam. If dam failure were to occur, it probably would be a result of a seismic event that causes damage to dam structural integrity, or by some externally-induced failure of dam structural features, not because of high precipitation runoff which would be released downstream in accordance with dam design and operation practices.

4.18.1 Affected Environment

At present, all M&I water provided by the TBWSP Partners is treated to meet federal and state drinking water standards. Existing M&I water supplies utilized by the Partners include Henry Hagg Lake, Barney Reservoir, the City of Portland Bull Run system and Columbia South Shore well field, and, to a limited extent, groundwater.

Reclamation’s Dam Safety Program, in cooperation with the State of Oregon, provides for modifications to dams to address potential risks that may be identified during ongoing dam safety evaluations. At present, Reclamation is conducting studies to determine if and what modifications are needed at Scoggins Dam to reduce risk related to seismic activity.

The western Tualatin Valley below Scoggins Dam is used for residential, agricultural, industrial, and recreational purposes. Table 4.18-1 shows river miles downstream from the dam to towns, cities, and highway crossings on Scoggins Creek and the Tualatin River.

Table 4.18-1. Towns, Cities, and Bridge Crossings Downstream of Scoggins Dam

<table>
<thead>
<tr>
<th>Location</th>
<th>Distance downstream from Scoggins Dam (in river miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scoggins Dam</td>
<td>0.0</td>
</tr>
<tr>
<td>Stimson Mill</td>
<td>0.5</td>
</tr>
<tr>
<td>OR 47 at Seghers</td>
<td>3.4</td>
</tr>
<tr>
<td>Confluence with Tualatin River</td>
<td>4.7</td>
</tr>
<tr>
<td>Gaston</td>
<td>6.3 (Upstream (south) on Tualatin River)</td>
</tr>
<tr>
<td>Wapato</td>
<td>8.7 (South of Gaston on Wapato Creek)</td>
</tr>
<tr>
<td>Dilley</td>
<td>6.9</td>
</tr>
<tr>
<td>Carnation and Forest Grove</td>
<td>8.3</td>
</tr>
<tr>
<td>Cornelius</td>
<td>11.9</td>
</tr>
<tr>
<td>Near Hillsboro High School</td>
<td>21.2</td>
</tr>
<tr>
<td>OR 10 at Farmington</td>
<td>25.4</td>
</tr>
<tr>
<td>Scholls</td>
<td>30.6</td>
</tr>
<tr>
<td>OR 99W at King City</td>
<td>44.6</td>
</tr>
<tr>
<td>Durham</td>
<td>46.6</td>
</tr>
<tr>
<td>Town of Willamette</td>
<td>54.2</td>
</tr>
<tr>
<td>West Linn, confluence with Willamette River</td>
<td>55.2</td>
</tr>
</tbody>
</table>

Source: Reclamation 2005
Transportation into and out of the western Tualatin Valley is almost exclusively by automobile. The primary route downstream of Scoggins Dam is OR 47. OR 47 is a north-south highway that passes within a few miles downstream of Scoggins Dam near Gaston and intersects OR 8 northwest of Scoggins Dam at Forest Grove. OR-8 is an east-west highway that serves as a primary avenue of travel between the Tualatin Valley and the Portland metropolitan area to the east. It intersects OR 219 at Hillsboro, a north-south highway that intersects US 26 north of Hillsboro at North Plains. In the event of an evacuation emergency, these highways would be the primary avenues of escape.

Emergency services are provided by Washington County Emergency Medical Services and by Tualatin Valley Fire & Rescue. Section 5.19 provides more information on emergency services. Hospital services in western Tualatin Valley are provided by Forest Grove Community Hospital in Forest Grove and Tuality Hospital in Hillsboro. Large public emergency responses, such as natural disasters, are coordinated by Washington County Department of Health and Human Services and the Washington County Office of Consolidated Emergency Management.

### 4.18.2 Environmental Impacts

#### 4.18.2.1 Methodology

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. Catastrophic failure of Scoggins Dam under any of the alternatives could result in deaths or serious injuries resulting from flooding, collapse of buildings, and impacts with floodwater debris. These impacts do not reflect the current safe condition of the dam. Although dam failure could occur, it is unlikely. Reclamation continuously evaluates Scoggins Dam safety conditions and, when warranted by the evaluations, makes modifications to the dam to address safety issues.

Modeling of dam failure scenarios assumes a rapid breach of the dam from top to bottom when the dam is completely filled, during “sunny day” conditions (that is, no rain or snow to exacerbate flooding). 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. Some error in projections may result from the relatively coarse resolution of topography. In the event of catastrophic dam failure from breaching, the elevation of water surface, weather conditions, and rate and dimensions of dam breaching may be different from the conditions assumed. Most of the assumptions represent near-worst case conditions, except for the sunny-day condition. The resulting projected inundation impacts therefore probably are greater than would actually occur.

The estimated population residing or working in the inundation area from a sudden failure of Scoggins Dam with the reservoir at the top of active storage (elevation 303.5) is shown in Table 4.18-2. This population is also described as the “population at risk.” The population estimates are based on current development in the area that would be inundated.

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Population at Risk</th>
</tr>
</thead>
</table>

Table 4.18-2. Estimated Population at Risk, Scoggins Dam Failure, All Alternatives
<table>
<thead>
<tr>
<th>Alternative 1 (No Action)</th>
<th>4,400</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative 2 (40-foot raise)</td>
<td>8,000</td>
</tr>
<tr>
<td>Alternative 3 (25-foot raise)</td>
<td>7,400</td>
</tr>
</tbody>
</table>

Source: MWH 2007

4.18.2.2 Alternative 1 – No Action

4.18.2.2.1 Potential Impacts (direct, indirect)

The greatest public safety risks would occur to people living downstream of the dam who may not have sufficient time to evacuate to higher, safer locations. These would include occupants of Scoggins Valley from the dam down to Tualatin River (including workers at the Stimson Mill), and low-lying areas in the Tualatin Valley about one mile east and about three miles south of Gaston, and north to Forest Grove and Cornelius. Inundation depths up to 25 feet above stream bed would occur in the lower Scoggins Valley from the dam to the Tualatin River. Lower Scoggins Valley would be inundated in less than 45 minutes. Workers at Stimson Mill and surrounding residents and occupants in lower Scoggins Valley would be at greatest risk of death or serious injury. Water depths of 2 to 25 feet could extend in the Tualatin Valley as far as five miles south of Scoggins Creek and as far east as the confluence of the Tualatin River with the Willamette River, although the risk would decrease with distance from the dam (Reclamation 2005b). Anyone near the Tualatin River could be at risk if unable to evacuate quickly.

Flooding could inundate municipal wastewater treatment facilities at Forest Grove, Cornelius, Hillsboro, and possibly other communities. This could disrupt and probably shut down the use of these facilities, and may distribute untreated sewage in floodwaters downstream of the facilities. Water treatment facilities east of Dilley and water pumping stations on the Tualatin River throughout the valley could be affected and probably shut down by flooding, interrupting the supply of water for municipal use. This could leave thousands of people, most of whom would not live in the direct path of flooding, without water and sewer for extended periods. These people would be in need of emergency water and waste disposal until potable water treatment systems, pump stations, and wastewater treatment systems could be brought back into service. Depending on the extent of damage, this could be a period of weeks to several months.

OR 47, portions of OR 8 and OR 219, and many other streets and roadways could be inundated and unusable. Bridges all along the Tualatin River as far downstream as the Willamette River probably could be flooded and some would fail. This could limit evacuation options and disrupt access for emergency medical, fire, and police personnel and vehicles. This could exacerbate public safety problems by preventing or delaying emergency responses such as rescues, medical treatment, and firefighting, and could temporarily prevent control of looting and violence. For the most part, emergency response accessibility for cities and communities north of the Tualatin River (Forest Grove east to West Linn and the Willamette River) would remain essentially intact. Cities and occupants affected by floodwaters on the south side of the Tualatin River and in the west part of the Tualatin Valley near Scoggins Dam could be largely isolated from emergency responders in the immediate aftermath of the dam failure and ensuing flood. Emergency responders probably would have to mobilize from the McMinnville area via OR 47, approximately 35 to 45 minutes response time from McMinnville Medical Center to Gaston.

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Power and communication lines and transmitters, and possibly broadcast media facilities, would be inundated at various locations. This could interrupt electrical supply and communications for emergency services, for heating and cooling of homes (potentially life- or health-threatening in winter or midsummer, particularly to people with frail health) and could prevent emergency calls. Rapid public notification would be critical to successful evacuations; if communication systems and broadcast media were impaired, whether by a coinciding seismic event, facility damage from flooding, or other means, public safety would be at greater risk.

Some residential areas, particularly in the rural homes near Dilley and Gaston and in Carnation, southeast Forest Grove, south Cornelius, and south Hillsboro, could be inundated. This poses some risk to public safety, although the projected leading edge travel time from the dam to Forest Grove and locations further downstream would be greater than three hours and therefore occupants would have more time to evacuate. Those least able to evacuate quickly, including unassisted children, elderly people, disabled people, people without access to vehicles, and anyone who may have limited physical mobility, would be at greatest risk.

At least one school (Joseph Gale School) and possibly a hospital (Forest Grove Community Hospital) in Forest Grove would be at or near the edge of the inundated area. Neil Armstrong Middle School would be near the inundated area and might also be affected. Echo Shaw School in Cornelius also could be inundated, possibly at a depth of 10 feet or more. Gaston Elementary School and Gaston High School probably would not be inundated but would be near the floodwater edge. W.L. Henry School and Brookwood School in southeastern Hillsboro and other schools further downstream may also be at risk, but the floodwater travel times would be sufficient to allow evacuation (more than three hours). Inundation of schools and hospitals would pose relatively greater risks to life and health for the occupants because of age and mobility concerns. It is likely that school occupants would be evacuated within the three-hour travel time of the floodwaters from the dam to the Forest Grove area. Hospital patients may not be readily evacuated; however, the Forest Grove hospital is projected to be just outside the area of inundation, so if floodwaters reached the hospital, the depth of inundation probably would be very shallow. This would still disrupt hospital services at a time when emergency hospital needs would be great.

Low-lying areas along the Tualatin River could be flooded for an undefined period of time. As waters recede, pools of standing water, flooded basements and structures, and saturated sediments could remain for weeks or even months. These would provide environments for breeding of disease-carrying vectors and insects such as flies, ticks and mosquitoes. Epidemic outbreaks could result. This could be compounded by the distribution of untreated sewage from flooded municipal wastewater treatment facilities, especially in the Forest Grove and Cornelius areas.

Many people could be left homeless in the event of a catastrophic flood. Those most likely affected would be people in the western Tualatin Valley downstream of Scoggins Dam, and the residents of Carnation, southern Forest Grove, southern Cornelius, and southern Hillsboro. Until emergency responders could reach, locate, and transport such people to shelters, they could be at risk to exposure.

4.18-4
to the elements, food and potable water shortages, and protection from potential rioting and looting as commonly occurs in the aftermath of major catastrophes.

Underground fuel storage tanks could be inundated in the Gaston, Forest Grove, Cornelius, and Hillsboro areas and probably elsewhere, and this may result in releases of fuel into the floodwaters. This contamination probably would be minimal, unless the energy of the floodwaters is sufficient to scour the buried tanks out of the ground and cause rupturing. This is not likely because service stations and similar facilities are generally not located close to rivers where the greatest floodwater energy is likely to be concentrated. Above-ground fuel tanks and fuel tanks in vehicles caught in the floodwaters would be more likely to cause fuel releases because they are more abundant (vehicles) and are less well protected from rupture or leakage. Other large fuel or chemical storage facilities have not been identified in the anticipated area of inundation. Fuel and chemical contamination could cause primary health problems as a result of direct contact, as well as secondary problems associated with fumes in contaminated water and soil and long-term contamination of groundwater.

4.18.2.2 Cumulative Impacts
The risk of dam failure is very low; therefore Alternative 1 would not likely contribute to cumulative impacts on public health and safety.

4.18.2.3 Alternative 2 – Scoggins Dam 40-foot Raise

4.18.2.3.1 Potential Impacts (direct, indirect)

Construction Impacts
There would be an increased risk of failure during construction activities due to factors such as excavation activities at the toe of the dam, the upper part of the dam, and spillway removal. During construction, cofferdams would be used to enhance flood protection. In addition, construction timing would be designed to minimize risk by focusing on periods when reservoir levels are low. If a dam failure were to occur during construction as a result of a large seismic event or some other cause, impacts would be the same as described under “Operating Impacts,” below.

Operating Impacts
The risk of dam failure under Alternative 2 would be less than the No Action Alternative. Some of the measures that would lower the probability of failure include an internal filter, additional cutoff trenches, foundation treatment, increased freeboard, increased thickness of concrete and increased reinforcement in the concrete of the dam.

While the risk of dam failure would be lower, the consequences from a catastrophic failure would be greater due to the larger volume of water being released and the associated larger area of inundation. The types of impacts would be similar to those described for Alternative 1. The areas of inundation under Alternative 2 would be greater than under the No Action Alternative, but in most areas it would be only marginally greater. Exceptions include some flat, mostly agricultural areas that would be inundated with shallow floodwaters, such as the lower Patton Valley, a region southwest of Forest Grove, and the Onion Flat area northeast of Sherwood. Tributary drainages to the Tualatin River that would be flooded in the event of a dam failure under the No Action Alternative would be flooded farther.
upstream under Alternative 2, primarily in areas of limited development. Lake Oswego, which would not be affected in the event of dam failure under the No Action Alternative, would see an inflow of floodwaters that would raise the lake level by one to two feet and would cause some flooding of the lake outlet to the Willamette River. The population at risk under Alternative 2 would be 8,000.

Inundation of water and sewer treatment facilities would be similar to the No Action Alternative. Floodwater transport of untreated municipal wastewater may be greater because of greater depths and higher velocities, particularly in the Forest Grove and Cornelius areas.

Other infrastructure features, including power, water distribution systems, and roadways, generally would not be affected much more than under the No Action Alternative, although some additional impacts would occur. Notable impacts would include greater risk to bridges and power distribution systems. However, in the event of a catastrophic flood, it is assumed that all affected bridges, water supply distribution systems, and power grid components would be shut down until floodwaters had receded and the features could be inspected and repaired. The infrastructure components affected would be the same as, or similar to, the No Action Alternative.

More ponding and flooding in low-lying areas would occur than under Alternative 1, potentially resulting in greater risks of disease and infections spread by insects and vectors or by direct contact. However, because the inundated area is not substantially greater than the No Action Alternative in the more urban areas, the likelihood is low that diseases and infections would be higher under Alternative 2 than under the No Action Alternative.

In the event of a catastrophic dam failure, the travel time from the dam to Forest Grove would be less than two hours, compared to about three hours under the No Action Alternative. It is likely that more deaths and injuries would occur as a result of this rapid floodwater travel time than would occur under the No Action Alternative.

The likelihood of failure of the RWP is very low. The pipeline would be designed to meet seismic standards, have corrosion protection, and last more than 100 years. If failure occurs, the leak would be detected fairly quickly because water flow would be monitored. Water flow would be turned off until repairs could be made. Emergency, back-up water supply would be used until the RWP is repaired so there would be no interruption in water service to customers.

4.18.2.3.2 Cumulative Impacts
The risk of dam failure or RWP failure is very low; therefore Alternative 2 would not likely contribute to cumulative impacts on public health and safety.

4.18.2.4 Alternative 3 – Multiple Source Option

4.18.2.4.1 Potential Impacts (direct, indirect)
Construction Impacts
The risk of dam failure due to construction would be the same under Alternative 3 as Alternative 2.

Operating Impacts
Impacts would be similar to the impacts described in Alternative 2. The estimated population at risk would be 7,400.

Public safety impacts to infrastructure, including water supply, water and wastewater treatment, power, and other features would be greater under Alternative 3 than under Alternative 1 (No Action), but not substantially greater, and less than under Alternative 2. Similarly, property damages would be greater under Alternative 3 than under the No Action Alternative but would not pose substantially greater risks to public safety.

Dam failure would inundate a larger area under Alternative 3 than under the No Action Alternative. This would cause greater ponding and flooding of low-lying areas, and potentially result in greater risks of disease and infections spread by insects and vectors or by direct contact. An increase in insects also would result in more bites and stings. However, because the inundated area is not substantially greater than the No Action Alternative in the more densely populated areas, the likelihood is low that diseases, infections and bites or stings would be substantially greater under Alternative 3 than under the No Action Alternative.

Floodwater travel times would be faster than under the No Action Alternative, posing a potentially greater risk of deaths or injuries. This is true primarily in the lower Scoggins Valley and the western Tualatin Valley as far north as the Forest Grove area.

The risk of failure of the RWP would be very low, as described under Alternative 2. Similarly, it is unlikely that the Willamette Pipeline would fail. The Willamette Pipeline would be designed to meet seismic standards, would have corrosion protection, and is expected to last for at least 100 years. Water flow in the pipeline would be monitored to detect a leak. If the pipeline were to fail, water flow would be shut off near the leak until repairs could be made so service would not be disrupted to customers “upstream” of the shut-off point. Emergency, back-up water supply would be used to provide water to affected customers while pipeline repairs are made.

The risk of water tank failure is unlikely. The water tanks would be designed to meet seismic standards and would be partially buried, which would reduce flood damage. The water tanks system also would include on-site overflow and stormwater management including a retention basin on-site. The water tank sites would be fenced for security.

4.18.2.4.2 Cumulative Impacts
Under Alternative 3, the risk of failure of Scoggins Dam, the RWP, and the Willamette Pipeline and associated water tanks very low; therefore Alternative 2 would not likely contribute to cumulative impacts on public health and safety.

4.18.3 Mitigation Measures

4.18.3.1 Alternative 1
Reclamation would make improvements to Scoggins Dam to address seismic risk, if determined to be necessary. No mitigation measures are necessary.
4.18.3.2 Alternatives 2 and 3
Scoggin Dam and other project facilities would be designed to prevent failure. No mitigation measures are necessary.
4.18 PUBLIC HEALTH AND SAFETY ...................................................... 4.18-1
4.18.1 Affected Environment .................................................. 4.18-1
4.18.2 Environmental Impacts ................................................. 4.18-2
4.18.3 Mitigation Measures ...................................................... 4.18-7

Table 4.18-1. Towns, Cities, and Bridge Crossings Downstream of Scoggins Dam
Table 4.18-2. Estimated Population at Risk, Scoggins Dam Failure, All Alternatives
4.19  Public Services and Utilities

4.19.1  Affected Environment

4.19.1.1  Henry Hagg Lake and Vicinity

4.19.1.1.1  Public Services

The Washington County Sheriff’s Department provides law enforcement throughout the county, having jurisdiction in all of the county’s unincorporated areas. Response times vary depending on the location of the patrol officer at the time of the call. Typical disturbances within the Henry Hagg Lake project area that require law enforcement are vandalism, theft, domestic disturbances, and alcohol-related misconduct.

Security and safety patrols within Scoggins Valley Park are conducted by the Washington County Sheriff’s Office, Oregon State Police, and park rangers. In addition, a bicycle patrol officer is provided by the Sheriff’s Office on weekends from Memorial Day through Labor Day, and a mounted posse (usually three officers on horseback) is provided by volunteer officers on holiday weekends. Oregon State Police do occasional patrols through the park, largely to cite visitors for fish and wildlife violations and to respond to call-in reports on an as-needed basis.

On Henry Hagg Lake, the Washington County Sheriff has an annual contract with the State Marine Board to provide marine patrol services from Memorial Day to Labor Day. The Sheriff’s marine patrol has a building at the Recreation Area A Boat Ramp, from which the patrol operates. Their equipment includes an 18-foot boat, a flat bottom boat, and a zodiac boat. Potential activities include boat inspections, emergency response, righting capsized vessels in the water, and checking for fishing licenses.

Daily marine patrol is provided from Memorial Day through Labor Day and on weekends through September. No marine patrol is provided during other periods of the recreational season. Marine patrol facilities and equipment include one patrol boat and a boathouse adjacent to the Recreation Area A West boat ramp. The Sheriff’s Marine Patrol is augmented by the US Coast Guard Auxiliary Flotilla 712 and by a volunteer retired State Police program. The Coast Guard Auxiliary Flotilla maintains a booth at the park from which they perform safety checks and generally assist the public. Their primary role is to provide education and distribute printed materials to facilitate boater safety.

There are two full-time park rangers for Scoggins Valley Park. These rangers are authorized to cite visitors for any violation of the general rules and regulations set forth in the Washington County Code Park Ordinance (Chapter 11.08). Common violations for which visitors receive a citation include failure to purchase or display a park pass, unauthorized parking, off-road vehicle use, open fires, and unauthorized fishing or camping.

Both the Gaston Rural Fire District and the Oregon Department of Forestry (ODF) are responsible for fire protection in the area. Within Scoggins Valley Park, the Gaston Rural Fire District is generally responsible for the southern two-thirds of the park, while ODF is responsible for the northern third of the park. In the case of fire response, the Fire District and ODF are both first-alarm providers for the park area and respond to emergency calls, assisting each other during responses. However, ODF does not respond to...
emergency calls for medical or rescue situations. The Gaston Rural Fire District and ODF operate under a mutual aid agreement with each other, as well as with other fire protection providers in the area when additional services are required.

The Gaston Rural Fire District fire station is located in the community of Gaston southeast of the reservoir, approximately four miles from the park entrance. Response time to Scoggins Dam by the Fire District is less than five minutes, while areas on the opposite side of the reservoir generally take up to 20 minutes to reach. In 2004, the Fire District responded to 15 calls within the park area. Fire District equipment includes one rescue vehicle, three 1,000-gallon pumpers with the capacity to pump 250 gallons per minute, one 3,000-gallon water tender, one light brush rig, and two staff vehicles. As of May 2005, Gaston Rural Fire District personnel included one part-time chief, two full-time firefighters, and additional part-time assistance equaling three full-time positions. There are approximately 36 volunteer fire fighters who also work for the Fire District (Reclamation 2004a).

Emergency response time by ODF (Forest Grove Protection District) is about 12 to 15 minutes, depending on the location of personnel and equipment at the time of the call. In 2004, ODF responded to one call within the park area. ODF currently maintains a crew of 12 firefighters during the summer season, which typically begins around the end of June and ends with the coming of fall rains sometime in October. The Protection Unit Forester is one of two full-time positions supported throughout the year by ODF. ODF equipment for the Forest Grove Protection District includes three 500-gallon, three-crew fire engine brush-rigs and three 200-gallon, one-crew fire engine brush rigs (Reclamation 2004a).

Both the Gaston Rural Fire District and Metro-West Ambulance service respond to emergency calls within the area. When a 911 call is placed, the Washington County Consolidated Communication Agency (WACCCA) dispatch service determines which entities should respond to the call and contacts the appropriate dispatcher. The Gaston Rural Fire District responds to all fire and accident and emergency calls, while Metro-West typically responds only to emergency calls involving serious trauma, reports of chest pain, or drowning and water-related accidents. The Gaston Rural Fire District may request assistance from Metro-West at any time. Individuals requiring emergency medical facilities are transported to either Emanuel Hospital in northeast Portland or to Oregon Health Sciences University Hospital in southwest Portland. Lifeflight provides helicopter transport for critical cases to trauma centers at the same two hospitals. Response time for Metro-West is 11 minutes to the park entrance and up to 30 minutes once in the park. Response times vary depending on the location of the nearest ambulance.

4.19.1.1.2 Utilities
Most utilities within the project area are associated with recreation, O&M facilities at Scoggins Valley Park, and with private residences adjacent to the park. Utility infrastructure within the project area varies from limited facilities, such as the Scoggins Creek Picnic Area, to fully developed facilities that provide electricity, water, and wastewater disposal. Residences near the reservoir have independent septic systems and potable water wells. Electrical and phone service is provided via overhead lines along the roadway.
West Oregon Electric Co-op provides electrical services within the project area, including nearby residences. Electrical power is available to most recreation sites within the park, supplying light and power for restroom facilities and maintenance needs. Power is also supplied to the water service plant, which is adjacent to the Sain Creek Picnic Area. Within the park, site lighting is limited to surface-mounted fixtures at restrooms; no roadway lighting is provided.

Four separate water systems, two potable and two non-potable, supply water to various areas of Scoggins Valley Park. Potable water is supplied to the north side of the park by the Hillsboro Utility Water Commission. The 12-inch-diameter supply line, owned by Hillsboro Utility Water Commission, runs from a booster pump station below the dam to bathrooms and other facilities in Recreation Area A. The pumping facilities and 4-inch transmission line from the pumping station are owned and maintained by Washington County. Two deep wells provide potable water to the west side of the park (see Section 4.5.1). Well water is treated at a treatment plant near Sain Creek and distributed to bathrooms and other facilities at Area C and the Sain Creek Picnic Area. Non-potable water is supplied to Recreation Area C and the Sain Creek Picnic Area by Sain Creek surface flows, and at the Elks Picnic Area by an on-site water supply system owned and operated by Washington County. No water is provided at the Scoggins Creek Picnic Area.

Wastewater from permanent bathrooms at the park (Areas A and C) is routed to four septic tank and leach field disposal systems. Sewage from the restrooms at the Elks Picnic Area is collected in two holding tanks and pumped as needed.

There are several underground utilities within the RWP project area including finished and raw water, wastewater, irrigation water, telecommunications, and power transmission facilities. The most notable of these facilities is a large, 33-inch diameter, TVID irrigation main located along Fern Hill Road. Other large pipelines crossing the RWP corridor are the City of Hillsboro’s 18-inch water main in Scoggins Valley Road and the 8-inch Gaston sanitary sewer force main located along the east side of OR 47. Generally most existing utilities are buried between 2½ and 4 feet deep.

4.19.1.2 Willamette Pipeline Vicinity

4.19.1.2.1 Public Services

Tualatin Valley Fire & Rescue serves the portion of the project area where the proposed Willamette Pipeline would be located. Tualatin Valley Fire & Rescue has a 210-square-mile service area that includes the cities of Beaverton, Durham, King City, Rivergrove, Sherwood, Tigard, Tualatin, West Linn, and Wilsonville, as well as unincorporated areas in Clackamas, Multnomah, and Washington counties. It has 22 fire stations, an administration office, a training facility, and two division offices. Each division office includes a duty chief, fire prevention staff, a community liaison, and administrative personnel.

The North Division office serves the cities of Aloha, Beaverton, Tigard, Skyline, and areas of unincorporated northeast Washington and Multnomah County. The South Division office serves the cities of Durham, King City, Rivergrove, Sherwood, Tigard, Tualatin, West Linn, Wilsonville, and unincorporated portions of Washington and Clackamas County. A Tualatin Valley Fire & Rescue training center is located along the Willamette Pipeline alignment, south of SW Tonquin Road across from the Morse Bros. quarry.

4.19-3
Tualatin Valley Fire & Rescue contracts its emergency dispatch (“911”) services from WACCCA, a regional dispatch center for all fire and law enforcement agencies throughout Washington County. In addition, WACCCA also ensures that Tualatin Valley Fire & Rescue’s radio communications system is functioning properly. The Fire & Rescue staff is trained to respond to a variety of incidents including fire, medical, vehicle crashes, hazardous materials spills, technical and water rescue, and natural disasters. Because medical incidents constitute the highest percentage of emergency calls, firefighters are certified as emergency medical technicians or paramedics, with at least one paramedic on all first-responding engine and truck companies. Individuals requiring emergency medical facilities are transported to either Emanuel Hospital or Oregon Health Sciences University Hospital. Lifeflight provides helicopter transport for critical cases to trauma centers at the same two hospitals. The fire district also has incident management and specialty teams for emergencies requiring special skills and equipment, including hazardous materials, water rescue, and technical rescue.

Police service within the incorporated communities of Beaverton and Sherwood is provided by those cities. Wilsonville contracts with the Clackamas County Sheriff’s Department for its police service. A lieutenant serves as Wilsonville’s Chief of Police. The duties of the sheriff’s department include the enforcement of all state, county, and municipal laws and ordinances pertaining to public safety. Services that are available to Wilsonville at no additional cost include the detective division, the special investigations unit, the dive/rescue team, traffic teams, SWAT team, and the hazardous materials and bomb squad.

The Washington County Sheriff’s Department and Clackamas County Sheriff’s Department serve the unincorporated portions of the project area.

4.19.1.2.2 Utilities
Urban infrastructure, particularly public water and sewer facilities, is largely confined to portions of the project area within the UGB.

Wastewater Systems in the Vicinity of the Willamette Pipeline
Clean Water Services operates four wastewater treatment plants and coordinates with twelve member cities to build and maintain the public sanitary sewer system. Clean Water Services owns and operates the regional components of the system, including the treatment plants, interceptor lines and pump stations, while member cities such as Tualatin and Sherwood generally own and operate the smaller components of the wastewater collection system. Clean Water Services owns and operates the Durham Advanced Wastewater Treatment Facility, which provides wastewater treatment for the Cities of Tualatin, Sherwood, Beaverton, Tigard, Durham and King City, and portions of unincorporated Washington County land within the UGB and in the Tualatin River Basin. The City of Wilsonville owns and maintains a wastewater collection system and treatment facility that processes up to 3.4 million gallons per day. The Wilsonville Wastewater treatment plant currently operates at just over half of its hydraulic capacity (DEA 2006a).

Existing wastewater utilities along or crossing the proposed Willamette Pipeline alignment include:

4.19-4
8- to 18-inch diameter gravity storm drain in SW Willamette Way East, parallel to the Willamette Pipeline alignment
250 feet of 18-inch diameter sanitary sewer in Grahams Ferry Road, just south of SW Day Road
Large diameter sewer trunk in SW Allen Boulevard in Beaverton
30-inch diameter storm drain culvert west of SW Murdock Roundabout
18-inch diameter sanitary sewer entering SW Murdock Road in the roundabout area
Approximately 500 feet of 36-inch diameter storm sewer line along the west side of SW Scholls Ferry Road at SW 158th Avenue
60-inch and 42-inch diameter storm sewer line crossing SW 5th Avenue just west of OR 217
15- and 18-inch diameter sanitary sewer pipes crossing SW 5th Avenue under OR 217
Approximately 2,300 feet of 10- and 18-inch diameter sanitary sewer pipes along the centerline of SW 5th Street east to the SW Western Avenue intersection

**Water Facilities in the Vicinity of the Willamette Pipeline**
Following voter approval in 1999, a surface water treatment plant was built in Wilsonville on the Willamette River and was designed to provide up to 20 million gallons per day of capacity for the local system, with up to 50 additional million gallons per day available to be pumped to neighboring communities north of Wilsonville. TVWD is part owner of the Willamette River Water Treatment Plant.

The City of Sherwood is served primarily by groundwater that originates from wells within the city, although local aquifers are declining and the City buys water on a short-term contract with TVWD. Water purchased from TVWD originates from the City of Portland. In addition, TVWD provides operations and management support for Sherwood’s water system. The City of Sherwood has examined several long-term water supply options and determined that water from the City of Portland and Wilsonville’s Willamette River water treatment facility are the two best options. In the November 2005 election, Sherwood voters approved use of either or both water sources. The City of Sherwood is in the preliminary engineering phase of its Willamette Water Supply System project, which includes a 48-inch diameter water main along sections of SW Tooze Road and SW Baker Road from the Wilsonville Willamette River Water Treatment Plant. The construction would occur prior to construction of the Willamette Pipeline.

The Washington County Supply Line currently supplies water by gravity to TVWD, the Raleigh Water District and the city of Tualatin. The proposed Willamette Pipeline would tie into the Washington County Supply Line at approximately SW Western Avenue. Water from the Washington County Supply Line is also provided to Sherwood through Tualatin and to Tigard through the Metzger area of the TVWD.

Existing water lines along or crossing the Willamette Pipeline alignment are:

- 8-inch diameter water main along SW Willamette Way East and an 18-inch water main in SW Wilsonville Road
- 12- and 24-inch diameter water lines in the north and south corridor of the SW Oregon Street roundabout. The Willamette Pipeline would cross the roundabout, which is south of the SW Oregon Street/SW Tonquin Road intersection
• 24-inch diameter water mains entering SW Murdock Road in the roundabout area
• 16-inch diameter water line crossing SW Scholls Ferry Road at SW Barrows Road
• 10-inch diameter water line in an 18-inch diameter steel casing crossing the P&&W Railroad
• 12-inch diameter water line on the west side of SW Western Avenue

Other Utilities in the Vicinity of the Willamette Pipeline
Portland General Electric (PGE) and Northwest Natural provide electricity and natural gas service within the project area. PGE transmission lines in the alignment vicinity are routed on easements. Current guidelines prohibit any structure, obstruction or construction within 50 feet of a PGE transmission substructure. Most PGE easements in the Willamette Pipeline vicinity are not wide enough to accommodate the proposed pipeline, particularly when considering PGE’s need for future expansion capability. PGE would consider perpendicular crossing of its easements. A variety of telephone, cable/satellite, and high-speed internet providers also serve the area. Key providers include Verizon (telephone); Comcast Cable, Dish Network and DirecTV (cable/satellite); and Comcast, Earthlink DSL and DirecWay (high speed internet). All of service providers likely have above and/or underground utilities in the vicinity of the proposed Willamette Pipeline. Existing utilities along or crossing the proposed Willamette Pipeline are:

• BPA high-voltage electrical transmission lines in the Morey’s Landing green space. The proposed Willamette Pipeline also would cross the BPA transmission line corridor on Scholls Ferry Road east of SW 145th Avenue in Beaverton, on Grahams Ferry Road north of Day Road, and on Tonquin Road near the P&W Railroad crossing (south of Tualatin).
• Communications facilities in SW Wilsonville Road
• Kinder Morgan Energy 8-inch diameter high pressure petroleum pipeline crossing SW Grahams Ferry Road approximately 3,300 feet north of SW Tooze Road and crossing SW Tonquin Road just west of SW Morgan Road
• Level 3 fiber optic lines in Allen Boulevard in Beaverton
• 24-inch diameter high pressure gas line crossing SW Elwert Road just north of SW Edy road and running north in the east corridor of SW Elwert Road
• 10-inch diameter high pressure gas line along the west side of SW Elwert Road
• 12-inch diameter high pressure gas line along the east side of the corridor of SW Roy Rogers Road between SW Schools-Sherwood Road and SW Scholls Ferry Road
• 10- and 4-inch diameter gas lines located on the north side of SW Scholls Ferry Road from SW Roy Rogers Road to SW 125th Avenue
• 8-inch diameter high pressure petroleum pipeline crossing SW Scholls Ferry Road just west of SW 147th Street intersection
• 66-inch diameter corrugated steel pipeline crossing SW 125th Avenue in two locations between SW Scholls Ferry Road and SW Brockman Road
• Communication facilities potentially located in the SW Wilsonville Road right-of-way

4.19.2 Environmental Impacts
4.19.2.1 Alternative 1 – No Action

4.19.2.1.1 Potential Impacts (direct, indirect)

Public Services
The No Action Alternative would not affect public services. Service providers would not alter staffing or level of service as a direct result of this alternative.

Utilities
Some expansion of existing water facilities, such as the JWC Fern Hill Water Treatment Plant and Willamette River Water Treatment Plant, would occur as water providers fully utilize existing water rights and permits. The No Action Alternative would have no short-term impact on utilities because capacity of utility facilities would not be altered.

Within Scoggins Valley Park, the No Action Alternative would not affect existing utilities.

4.19.2.1.2 Cumulative Impacts
Alternative 1 would not contribute to cumulative effects on public services and utilities.

4.19.2.2 Alternative 2 – Scoggins Dam 40-foot Raise

4.19.2.2.1 Public Services
No long-term adverse impacts are anticipated to occur under Alternative 2. Increasing the height of the dam would increase the size of the lake that would be patrolled by Washington County and volunteer marine patrols. Additional recreation use in Scoggins Valley Park, which would occur regardless of which alternative is implemented may generate a need for increased staff or services to patrol the park and reservoir. The RWP would have no effect on public services.

Relocating portions of the perimeter road would be completed prior to increasing the water level of the reservoir. While road construction may cause short (up to 20-minute) delays for police, fire, and emergency services, access would be maintained at all times. Also, construction contractors would expedite their procedures, if possible, to minimize delays of police, fire, or emergency vehicles (Girard, 2006). When road reconstruction is complete, response times would be expected to be similar to today’s. Constructing the RWP could cause some short traffic delays where the pipeline would cross Old Highway 47, Scoggins Valley Road, OR 47, SW Seghers Road, and Spring Hill Road. These delays are expected to be minimal; trenchless crossings would be made at all of the roads except Seghers and Spring Hill, which carry relatively low levels of traffic. Delays would more likely be caused by heavy equipment entering and leaving the construction area. No additional police or emergency personnel would be required by Alternative 2.

Prior to construction, safety plans would be developed to protect construction workers and to identify procedures for responding to accidents that could occur. Fire and ambulance providers would be the first responders if an accident were to occur during project construction. In the event of an accident, individuals needing medical attention would be transported to one of several regional hospitals via ambulance or Lifeflight helicopter. In the event of a large-scale accident with multiple injuries, emergency service providers from neighboring jurisdictions may be needed. Considering the size of the Portland metropolitan area and the large number of emergency service providers in the area, adequate
capacity for emergency service providers and area hospitals is anticipated to be available if a large-scale accident were to occur.

During construction, flaggers, detour signs, and hazards (such as trucks and other equipment entering roads, and unfilled excavated areas) created during construction of Alternative 2 would be signed to alert motorists, bicyclists, and local residents to reduce the potential for injuries, or to identify areas to avoid until construction is complete.

4.19.2.2 Utilities
Increasing the height of the dam would require relocating utilities that are in or along the perimeter road, as well as utilities that would be inundated by the rise in reservoir level. These include water, electrical and telephone lines. In areas where the perimeter road would be relocated, utilities would also be moved to remain outside of the inundation line. Likewise, utility relocation would not occur where the perimeter road would remain in place.

A 4-inch water transmission line, which runs from the pumping station below the dam and provides service within the park, is located in the Scoggins Valley Road right-of-way and would likely be relocated along with portions of Scoggins Valley Road. From the 4-inch line, a 1½-inch metered water line supplying the ranger station and maintenance yard and two ¾-inch water lines supplying potable water to Recreation Area A–West and Recreation Area A–East would be relocated when the road and recreation areas are reconstructed. Other utilities, including septic systems within the park boundaries, would be removed and relocated when the associated recreation facilities are moved to new locations. The two wells providing potable water to Recreation Area C and Sain Creek Picnic area would be inundated, requiring a new source of potable water for those recreation areas. This could include new wells or an extension of Hillsboro Utility Water Commission service across the new dam to provide water service to facilities on the west side of reservoir.

Residences near the reservoir have independent septic systems and potable water wells. Impacts to private septic systems and wells from either road relocation or increased reservoir levels would be resolved either at the time of acquisition, or through a claim process following construction. See also Section 4.5.2.2.

Outside of the park boundaries, underground utilities would also be relocated as necessary to construct the RWP. The RWP would cross the 33-inch TVID irrigation pipeline north of Fern Hill Road. To avoid impacts, the RWP would be bored underneath the TVID pipeline. The RWP would not cross the 18-inch Hillsboro water line in Scoggins Valley Road. The proposed RWP would not affect the 8-inch Gaston sewer force main; the sewer main is located within existing OR 47 right-of-way and the proposed RWP would be bored underneath the highway and sewer main.

Temporary construction-related impacts to local utilities could include short-term utility disruptions, although to reduce potential for utility disruptions, affected utilities would be relocated prior to construction of the RWP or relocated during low demand seasons, such as during the winter when irrigation demands are minimal and relocating/reconstructing any waterlines would cause the least disruption to nearby landowners. Electrical lines would be relocated, if needed, but loss of power to users would be short-term, essentially only when new lines would be connected to existing service. No
long-term impacts to existing utilities are expected because the depth of the proposed RWP is anticipated to be between 6.5 and 8 feet below the surface. Most existing utilities would be unaffected because they are not buried deeper than 4 feet.

4.19.2.2.3 **Cumulative Impacts**
Alternative 2 would have no long-term negative effects to public services or utilities and, therefore, would not contribute to cumulative impacts.

4.19.2.3 **Alternative 3 - Multiple Source Option**

4.19.2.3.1 **Public Services**
Temporary construction-related impacts to public services from increasing the height of the dam and associated improvements would be similar to Alternative 2. No long-term impacts would occur in the vicinity of the reservoir. During construction of the Willamette Pipeline, construction-related traffic delays could occur. Section 4.21.2.3 describes the potential impacts within public rights-of-way.

As with Alternative 2, if a construction-related accident were to occur, it is expected that existing emergency response facilities would have the capacity to handle the situation.

No long-term adverse impacts would occur because street rights-of-way would be restored to preconstruction conditions, and pipeline operation would not require additional safety or emergency personnel.

4.19.2.3.2 **Utilities**
Alternative 3 would have similar impacts to utilities in the vicinity of the reservoir and RWP as Alternative 2.

Constructing the Willamette Pipeline would entail similar impacts as the RWP. Both trenched and trenchless construction techniques would be used for the Willamette Pipeline, depending on location along the proposed alignment. Trenchless construction would be used to avoid impacts to major underground transmission lines. However, project construction would likely require relocation of several underground utilities along the project corridor. Constructing the pipeline along public rights-of-way would temporarily disrupt traffic flow. Where utilities would be relocated, short-term interruptions in sewer, water, and electrical services could occur, although any interruptions would be minimized to the greatest extent practicable.

The water tanks associated with the Willamette Pipeline would be sited to avoid sanitary, water, electrical transmission, and telecommunication mains and to avoid service lines as much as possible. Where not feasible to avoid existing service lines, the lines would be relocated and service disruption minimized.

4.19.2.3.3 **Cumulative Impacts**
Alternative e would have no long-term negative effects to public services or utilities and, therefore, would not contribute to cumulative impacts.

4.19.3 **Mitigation Measures**
4.19.3.1 Alternative 1
No mitigation measures are necessary.

4.19.3.2 Alternatives 2 and 3

Public Services
No mitigation measures are necessary. However, local service providers should be updated on temporary detours and other construction-related impacts that could affect emergency services.

Utilities
Utility service would be maintained during construction. Any utilities affected by construction would be replaced or relocated, as appropriate. Impacts to private septic systems and wells would be resolved either at the time of land acquisition, or through a claim process following construction. No additional mitigation measures are necessary.
4.19 PUBLIC SERVICES AND UTILITIES ................................................. 4.19-1

4.19.1 Affected Environment.....................................................4.19-1
4.19.2 Environmental Impacts...................................................4.19-6
4.19.3 Mitigation Measures.......................................................4.19-9
4.20 Energy
As project alternatives were being developed, an option to produce hydropower at Scoggins Dam was considered. The option was not carried forward, primarily because analysis showed it would not be economically feasible (MWH 2005). See Section 3.7.10 for more information.

4.20.1 Affected Environment
Electrical service supplied to area residents and park facilities is described in Section 4.19.1 (Public Services and Utilities).

Electrical energy is used within a water system to operate pumps to place the water where it is needed within the system and to operate treatment facilities where the water enters the drinking system. Portland General Electric provides the electricity used to operate the pump stations and treatment system.

Maintaining the water system requires fossil fuels for operating equipment necessary to complete repairs and maintain the system.

4.20.2 Environmental Impacts

4.20.2.1 Alternative 1 – No Action

4.20.2.1.1 Potential Impacts (direct, indirect)
The No Action Alternative would not construct any new facilities at the dam or Spring Hill Pumping Plant that would require any additional energy resources, although increased future demand for water from the existing system could require additional electricity for pumping and treatment. As water demand increases, the JWC Fern Hill Water Treatment Plant and Willamette River Water Treatment Plant would be expanded to fully utilize existing water rights, requiring additional energy for construction and operation.

Because water availability under the No Action Alternative would not meet anticipated future demand, growth in the region would be less than anticipated, which would require less energy to serve future development than under the Action Alternatives.

4.20.2.1.2 Cumulative Impacts
The No Action Alternative would not contribute to additional demand for energy.

4.20.2.2 Alternative 2 – Scoggins Dam 40-foot Raise

4.20.2.2.1 Potential Impacts (direct, indirect)
Constructing Alternative 2 would require the use of fossil fuels to power construction equipment and trucks that would be used for construction of the dam raise and related facilities, RWP, new road segments, replacement recreation facilities, and improvements to the Spring Hill Pumping Plant. Electricity would be required to operate construction lighting, which could also be provided with diesel or gasoline generators on site. Gasoline and diesel needed to operate equipment would likely be
purchased locally and would not be anticipated to have an adverse impact on local supplies. Fossil fuels would also be used in asphalt pavement for the new segments of road around Henry Hagg Lake.

Additional electric power would be used at the Spring Hill Pumping Plant when pump-back is in operation.

At this time, the additional energy use and the difference in energy use between the alternatives cannot be quantified. However, it is anticipated that no expansion of the electrical transmission system would be necessary for either Action Alternative.

4.20.2.2 Cumulative Impacts
Cumulative impacts of Alternative 2 include the use of fossil fuels and energy during construction, as well as energy used at the Spring Hill Pumping Plant, combined with additional use of energy and fossil fuels to support existing and future growth in the Portland metropolitan region.

4.20.2.3 Alternative 3 - Multiple Source Option
4.20.2.3.1 Potential Impacts (direct, indirect)
The types of impacts to energy resources would be the same as Alternative 2 for construction and pump-back operations. However, use of electricity and fossil fuels during construction at the reservoir would be less than Alternative 2, primarily because of the lesser increase in dam height and shorter construction period. Electricity use at the Spring Hill Pumping Plant would be less than Alternative 2 because less water would be pumped to Henry Hagg Lake.

Unlike Alternative 2, Alternative 3 would require energy for construction of the Willamette Pipeline, associated water tanks, connections to local supply lines, and expansion of the Willamette River Water Treatment Plant in Wilsonville. Additional electrical power would be used at the Willamette River Water Treatment Plant to pump the additional water from the Willamette River, treat it, and move it through the new water transmission system. However, expansion of the Willamette River Water Treatment Plant may also occur under Alternative 1.

At this time, the additional energy use and the difference in energy use between the alternatives cannot be quantified. However, it is anticipated that no expansion of the electrical transmission system would be necessary for either Action Alternative.

4.20.2.3.2 Cumulative Impacts
Cumulative effects would be similar to those described for Alternative 2, with the addition of energy and fossil fuel use for construction of the Willamette Pipeline and related facilities.

4.20.3 Mitigation Measures
4.20.3.1 Alternative 1
No mitigation is necessary or proposed.

4.20.3.2 Alternatives 2 and 3
No mitigation is necessary or proposed.
4.20 ENERGY 4.20-1

4.20.1 Affected Environment ..................................................... 4.20-1
4.20.2 Environmental Impacts .................................................... 4.20-1
4.20.3 Mitigation Measures ....................................................... 4.20-2
4.21 Transportation and Access

4.21.1 Affected Environment
Figure 4.21-1 shows the major roads in the transportation network for the entire project area.

Figure 4.21-1. Major Roadways in the Project Area (File Name: Fig 4.21-1 Hagg Transportation.pdf)

4.21.1.1 Transportation System in the Vicinity Henry Hagg Lake
The primary road serving Henry Hagg Lake and Scoggins Dam is Scoggins Valley Road, which provides access to the reservoir and recreation areas and a series of unimproved forest access roads. Scoggins Valley Road links to the regional transportation system at OR 47 southeast of the reservoir, approximately 3½ miles from the park entrance. The road enters the park from the southeast, runs along the north and east perimeter of Henry Hagg Lake, and then continues outside of the park boundaries. West Shore Road continues the loop of the reservoir on the south and west shores and then crosses the dam and intersects with Scoggins Valley Road northeast of the dam.

The perimeter road is a 10.5-mile-long, paved, two-lane road with 6- to 8-foot-wide paved shoulders. Washington County owns and maintains the perimeter road, which is functionally classified as a collector in the Washington County Transportation Plan. Generally, the perimeter road meets current design standards and has adequate capacity for existing traffic. Maintenance requirements center on fixing problems resulting from unstable underlying soils. There are no traffic signals along the perimeter road; traffic control is limited to a single stop sign at the dam near the park entrance. Posted speed within the park is 45 mph, although near the park entrance the speed limit is reduced to 35 mph. There are 20 turnouts located along the perimeter road with the majority located on the lake side and providing view access. Some turnouts provide access and parking for trailheads. Trails in the vicinity of Henry Hagg Lake are described in Section 4.14.

In addition to recreational traffic, residential traffic, utility vehicles, and log trucks also use the perimeter road. Because of its high recreational value, the perimeter road gets peak usage on weekends and holidays during summer months.

Washington County maintains the local access roads that intersect with the perimeter road. These include Tanner Creek, Stepien, Sain Creek, Lee, Herr, Nelson, Scott Hill, and Hankins roads. All roads are 18 to 22 feet wide, and most have stop signs at their junction with the perimeter road. Log trucks use Tanner Creek, Stepien, Sain Creek, and Lee roads. Herr Nelson, Scott Hill, and Hankins roads primarily serve residential traffic.

There are approximately twelve other roads that intersect with the perimeter road, which are maintained by Washington County. They are primarily for fire access and are single-lane, gravel roads, 12 to 14 feet wide, and generally do not have stop signs at the junctions with the perimeter road.

4.21.1.2 Transportation System in the Vicinity of the Raw Water Pipeline
Outside of the park boundary, the primary roads in the vicinity of the RWP are Scoggins Valley Road, Old Highway 47, OR 47, Seghers Road, Fern Hill Road, and Spring Hill Road. Both Fern Hill and Spring Hill
roads are collectors on the east side of OR 47. Other roads in the vicinity of the RWP are local roads. A P&W Railroad line is parallel and east of OR 47.

4.21.1.3 Transportation System in the Vicinity of the Willamette Pipeline
The proposed 22-mile Willamette Pipeline alignment begins at the Willamette River Water Treatment Plant in Wilsonville and ends at Beaverton-Hillsdale Highway in Beaverton. The alignment is described in Section 3.4.3.7 and shown on various figures in this document. The alignment would lie primarily with public road rights-of-way and would cross numerous transportation facilities.

4.21.1.4 Current Traffic Conditions
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 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. Synchro is a macroscopic model similar to the Highway Capacity Software and, like Highway Capacity Software, 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). A summary of the study results are shown in Table 4.21-1.

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Traffic Control</th>
<th>Movement</th>
<th>V/C Ratio</th>
<th>Average Delay</th>
<th>Queue</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR 6 ramp @ OR 47</td>
<td>STOP Sign</td>
<td>Westbound Left</td>
<td>0.07</td>
<td>30 sec.</td>
<td>25 feet</td>
</tr>
<tr>
<td>OR 8 @ OR 47</td>
<td>Signal</td>
<td>Overall Intersection</td>
<td>0.83</td>
<td>43 sec.</td>
<td>--</td>
</tr>
</tbody>
</table>

As shown in Table 4.21-1, both intersections currently meet the ODOT operational standards. The stopped westbound left-turn movement at the intersection of OR 6 at OR 47 currently operates with about 30 seconds of stopped delay but with a low v/c ratio. The intersection of OR 8 at OR 47 currently operates with a v/c ratio of 0.83 and an average stopped delay of 43 seconds.

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.

4.21.2 Environmental Impacts
4.21.2.1 Alternative 1 – No Action

4.21.2.1.1 Potential Impacts (direct, indirect)
Alternative 1 would have no direct effects to transportation facilities or access.

Under the No Action Alternative, traffic is expected to increase in the project vicinity as a result of additional recreation use. This would occur under any of the alternatives. Because Alternative 1 would affect water availability and therefore could slow or reduce development in areas served by the Partners, the amount of additional traffic generated by development in those areas under Alternative 1 would be less than that generated under Alternatives 2 and 3.

4.21.2.1.2 Cumulative Impacts
Alternative 1 would not contribute to negative cumulative impacts.

4.21.2.2 Alternative 2 – Scoggins Dam 40-foot Raise

4.21.2.2.1 Potential Impacts (direct, indirect)
Alternative 2 would result in short-term traffic impacts associated with construction at Henry Hagg Lake (dam raise, recreation facilities, and road relocation) and with the installation of the RWP between Scoggins Dam and JWC Water Treatment Plant. Over the long term, Alternative 2 would not affect traffic or transportation facilities in the area. Traffic would increase as a result of future development, with or without construction of the project. Alternative 2 would not draw additional traffic to the project area or alter local traffic patterns, except during the project’s construction.

Henry Hagg Lake/Scoggins Valley Park
Raising the dam would require relocating portions of the perimeter road and twelve vehicle turnouts where the increased level of the reservoir would inundate the existing roadway or where dam construction would remove the existing road. Under the Action Alternatives, the perimeter road would be relocated as shown on Figures 3-3 and 3-6. Turnouts would be reconstructed along the new road segments, as shown on Figures 4.15-2 through 4.15-7. Road and turnout reconstruction would occur prior to removal of the existing perimeter road, preserving access until the road relocation is complete. Reconstruction of the perimeter road would be a positive effect because the new road would be constructed to meet current Washington County design standards. While some temporary construction-related detours are anticipated, no long-term adverse impacts to the transportation system would occur. However, the new location of the roads may provide attractive access to the lake bed for illegal off-highway vehicle use.

Access to residential and recreation areas would be preserved during construction of the project, although some detours could occur during construction. The perimeter road would be relocated prior to increasing the level of the reservoir. Short-term construction-related impacts would likely consist of temporary road closures, traffic delays, and potentially detours. During construction, a reduction in the number of visitors that would normally use the area for recreation could occur because the increased noise and potential conflicts with heavy equipment on the road system.
Trips for construction at the dam reflect a combination of construction workers traveling to and from the job site and truck traffic generated from delivery of materials and equipment. Traffic data on some of the major travel routes to the site was collected and evaluated with the addition of construction-generated traffic.

**Trip Generation/Distribution**

Dam construction would generate traffic from construction workers commuting to and from the site and from trucks moving fill/borrow needed to raise the dam. Although the truck traffic is not expected to have a measurable impact on the roadway system, the commuting construction workers would have some impact.

To estimate the impact of the traffic commuting to/from the site during construction, an estimate of trips generated by the workers and the routes they might take to the site was developed. During the three- to five-year construction phase, the average number of construction workers on the job site would be approximately 115, with a maximum of approximately 140 during the second year (Reclamation 2006a). Vehicle occupancy is conservatively estimated at 1.0 worker per vehicle (single occupancy), which yields maximum afternoon (PM) peak trip activity of approximately 140 passenger vehicle trips per day. Most construction activities are planned to occur between 6 a.m. and 4:30 p.m. During construction of the new intake tunnel, a second construction shift would be added between 4 p.m. and 2:30 a.m. With this shift schedule, the workers leaving at 4:30 p.m. would be the only trip generation that would coincide with a “peak hour” (morning: 7 to 9 a.m. or afternoon: 4 to 6 p.m.).

The trip distribution for the workers that leave during the PM peak was estimated based on the population of the nearby cities in the Portland area. Travel was assumed to occur north of the project area on some or all of the major roadways of OR 6, OR 8, and OR 47. Those roadways were assumed to carry 5 percent of the traffic to/from the north and west (Banks, Vernonia, and coastal communities), 25 percent to/from Hillsboro and communities to the east, and the remaining 70 percent to/from the greater Portland metropolitan area.

**Operations Analysis Results**

Two intersections in the study area were evaluated: the signalized intersection at OR 8 and OR 47 and the unsignalized intersection at OR 6 and OR 47. A summary of the study results is shown in Table 4.21-2.

**Table 4.21-2. Comparison of Traffic Operations. Existing and During Alternative 2 Dam Construction**

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Traffic Control</th>
<th>Movement</th>
<th>V/C Ratio</th>
<th>Average Delay</th>
<th>Queue</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR 6 ramp at OR 47: Existing</td>
<td>Stop Sign</td>
<td>Westbound Left</td>
<td>0.07</td>
<td>30 seconds</td>
<td>25 feet</td>
</tr>
<tr>
<td>OR 6 ramp at OR 47: During construction</td>
<td>Stop Sign</td>
<td>Westbound Left</td>
<td>0.07</td>
<td>34 seconds</td>
<td>25 feet</td>
</tr>
<tr>
<td>OR 8 at OR 47: Existing</td>
<td>Signal</td>
<td>Overall</td>
<td>0.83</td>
<td>43 seconds</td>
<td>--</td>
</tr>
</tbody>
</table>

4.21-4
<table>
<thead>
<tr>
<th>During construction</th>
<th>Signal</th>
<th>Intersection Overall</th>
<th>0.93</th>
<th>48 seconds</th>
<th>--</th>
</tr>
</thead>
</table>

As shown in Table 4.21-2 the unsignalized intersection of OR 6 at OR 47 would continue to operate adequately with the westbound left-turn movement experiencing an increase of about 4 seconds of delay due to the additional construction traffic.

With the assumed traffic distribution described above, the intersection of OR 8 at OR 47 would operate with a v/c ratio of 0.93 with an average delay of 48 seconds, an increase of 5 seconds over existing conditions. These results do not meet the ODOT standard of v/c ratio maximum of 0.85 but do not indicate a condition where extensive delays would prevail. This analysis was conducted based on the worst case scenario (maximum number of workers on site, single vehicle occupancy, and all vehicles parking on the construction site). The operations at the intersection OR 8 and OR 47 could operate adequately when the maximum number of workers are not needed on site (years 1, 3, 4, and 5) or could be improved by implementing:

- Carpooling to the site
- Staggered departure times
- Off-site parking

**Raw Water Pipeline**

Constructing the RWP would affect local and ODOT roadways, and the P&W Railroad. The Raw Water Pipeline Preliminary Design Report (MSA 2005) identifies five road crossings and two railroad crossings.

Road crossings would include:

- Old Highway 47 (Washington County)
- Scoggins Valley Road (Washington County)
- OR 47 (ODOT)
- SW Seghers Road (Washington County)
- Spring Hill Road (Washington County)

Impacts to roads as a result of the RWP would depend on the proposed construction method. Two pipeline construction options are available at the roadway and railroad crossings: trenchless technology, where construction would occur underground by tunneling with minimal impact to the surface facility, and open-trench technology, where the construction would occur above ground with impacts to the surface facilities.

All crossings except for SW Seghers Road, a two-lane east-west residential access road between Old Highway 47 and OR 47, and Spring Hill Road, a north-south road that connects OR 47 to Fern Hill Road and serves several residential properties, would use trenchless construction that would not disrupt traffic. The railroad crossings would also use trenchless construction to avoid impacts to rail traffic.
The preferred construction technique for the crossings at SW Seghers Road and Spring Hill Road is an open trench construction method, which would require temporary road closures and cause delays for vehicles using those roads. Such impacts would be temporary and construction-related. During construction of the Seghers Road crossing, traffic impacts may be minimal because some of the local traffic could be rerouted to Old Highway 47 or Scoggins Valley Road. Impacts to traffic on Spring Hill Road would be greater since the alternate route options, Fern Hill Road or Gaston Road, could require greater out-of-direction travel. If viable, at least one lane of traffic on Spring Hill Road would remain open during construction to minimize impacts. Property access would be maintained during construction. When construction is complete, the roadways would be reconstructed to meet Washington County design standards. Aside from where the RWP would cross the roads and railroad line, construction would occur outside of existing rights-of-way.

4.21.2.2 Cumulative Impacts
Alternative 2 would have no long-term impacts on the transportation system and would not contribute to cumulative effects. No other construction projects have been identified in the project area that would compound short-term construction impacts.

4.21.2.3 Alternative 3 – Multiple Source Option

4.21.2.3.1 Potential Impacts (direct, indirect)
Alternative 3 would have no long-term impacts on the transportation system. Alternative 3 would result in traffic impacts associated with construction at Henry Hagg Lake (dam raise, recreation facilities, and road relocation), with RWP installation, and with construction of the Willamette Pipeline and related facilities.

Henry Hagg Lake/Scoggins Valley Park
The impacts of construction at Henry Hagg Lake would be similar to those described above for Alternative 2. The main difference between Alternative 2 and 3 for the construction is the duration of the project. Alternative 3 assumes a four-year duration (the maximum number of workers on site would still occur during the second year of construction) as opposed to the four to five years assumed for Alternative 2.

Raw Water Pipeline
The impacts from RWP installation for Alternative 3 would be the same as those described above for Alternative 2.

Willamette Pipeline Corridor
Construction of the Willamette Pipeline from Wilsonville to Beaverton would result in traffic impacts that would not occur with Alternatives 1 and 2. The proposed pipeline corridor would parallel 10 arterial and 8 collector roadways and would cross 5 arterial and 13 collector roadways. The corridor would also cross the P&W Railroad line at three locations. Table 4.21-3 shows the transportation facilities that would be affected by Willamette Pipeline construction.
Open trench construction of roadway crossings over corridors that carry large volumes of traffic (15,000 vehicles per day or greater) are likely to greatly impact traffic flow. With open trench construction, it is likely that one or more travel lanes would need to be shut down at a time. Impacts to roads with two through lanes would be greater than those with four through lanes, where travel in both directions could be maintained.

For example, Highway 99W is an arterial roadway that carries traffic volumes in excess of 40,000 vehicles per day. This roadway is five lanes wide in the vicinity of the proposed pipeline crossing. Disruptions to traffic flow on Highway 99W would be significant and would result in long delays and extensive queuing. Traffic is likely to shift to other parallel routes where increased delays and queuing are also likely to occur. Because the impacts of lane closures on Highway 99W would be substantial, trenchless construction would be used at this location to reduce impacts to traffic operations. With trenchless construction, lane closures are less likely and the resulting disruptions to Highway 99W and other parallel routes would be much less than with the open trench construction.

On the other hand, along lower volume corridors such as Elwert Road, an arterial roadway that carries traffic volumes of approximately 5,000 vehicles per day, the impact of trench construction is not expected to be as severe. Closing a lane of traffic on Elwert Road would create delays and queuing, particularly during peak hours, but lower volumes would lessen the impact. Parallel roadways would still experience somewhat higher volumes as traffic is diverted.

The P&W Railroad line is the planned route of a future Washington County commuter rail service between Beaverton and Wilsonville, which is under final design and could open in 2008. As planned, both existing freight service and self-propelled, diesel-powered commuter trains would travel the rail alignment. To avoid disruption of rail service, all Willamette Pipeline crossings of the P&W line would be trenchless.

No impacts have been identified specific to the water tanks associated with the Willamette Pipeline. Traffic impacts would occur during construction in the vicinity of the water tanks, but no long-term impacts would occur.

4.21.2.3.2 Cumulative Impacts
Alternative 3 would have no long-term impacts on the transportation system and would not contribute to cumulative effects. No other construction projects have been identified in the project area that would compound short-term construction impacts.
<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Transportation Facility</th>
<th>Classification</th>
<th>Nearest Crossing(s)</th>
<th>Parallel/Crossing</th>
<th>No. of Lanes/Tracks</th>
<th>Existing ADT</th>
<th>ADT Count Location</th>
<th>ADT Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wilsonville</td>
<td>Wilsonville Rd</td>
<td>Minor Arterial</td>
<td>Willamette Way E</td>
<td>Both</td>
<td>3</td>
<td>4,400</td>
<td>West of Willamette Way W</td>
<td>DEA 2007a</td>
</tr>
<tr>
<td>Wilsonville</td>
<td>P&amp;W Railroad</td>
<td>Railroad</td>
<td>Grahams Ferry Rd.</td>
<td>Crossing</td>
<td>1</td>
<td>NA</td>
<td>NA</td>
<td>DEA 2007a</td>
</tr>
<tr>
<td>Wilsonville</td>
<td>Clutter St.</td>
<td>Major Collector</td>
<td>Grahams Ferry Rd.</td>
<td>Crossing</td>
<td>2</td>
<td>2,200</td>
<td>West of Grahams Ferry Rd.</td>
<td>Washington TSP</td>
</tr>
<tr>
<td>Wilsonville</td>
<td>Day Rd.</td>
<td>Major Collector</td>
<td>Grahams Ferry Rd.</td>
<td>Crossing</td>
<td>3</td>
<td>5,000</td>
<td>East of Grahams Ferry Rd.</td>
<td>Wilsonville TSP</td>
</tr>
<tr>
<td>Washington County</td>
<td>Tonquin Rd</td>
<td>Arterial</td>
<td>Morgan Rd.</td>
<td>Parallel</td>
<td>2</td>
<td>7,150, 6,092</td>
<td>Coffee Lake Creek South of Oregon St.</td>
<td>DEA 2007a, Washington County 2006 Counts</td>
</tr>
<tr>
<td>Washington County</td>
<td>P&amp;W Railroad</td>
<td>Railroad</td>
<td>Tonquin Rd.</td>
<td>Crossing</td>
<td>1-2</td>
<td>NA</td>
<td>South of Tualatin-Sherwood Rd.</td>
<td>DEA 2007a</td>
</tr>
<tr>
<td>Sherwood</td>
<td>Oregon St.</td>
<td>Collector</td>
<td>Tonquin Rd. to Adams Ave.</td>
<td>Parallel</td>
<td>2</td>
<td>11,100</td>
<td>South of Oregon St.</td>
<td>DEA 2007a</td>
</tr>
<tr>
<td>Sherwood</td>
<td>Adams Ave.</td>
<td>Collector</td>
<td>Oregon St. to Century Dr.</td>
<td>Parallel</td>
<td>2</td>
<td>NA</td>
<td>North of Oregon St.</td>
<td>DEA 2007a</td>
</tr>
<tr>
<td>Sherwood</td>
<td>Century Dr.</td>
<td>Collector</td>
<td>Adams Ave. to Sherwood Blvd.</td>
<td>Parallel</td>
<td>3</td>
<td>NA</td>
<td>East of Century Dr.</td>
<td>DEA 2007a</td>
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<td>Sherwood</td>
<td>Sherwood Blvd.</td>
<td>Arterial</td>
<td>Century Dr. to Highway 99W</td>
<td>Parallel</td>
<td>3</td>
<td>42,800</td>
<td>South of Crossing</td>
<td>DEA 2007a</td>
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<td>Sherwood</td>
<td>Highway 99W</td>
<td>Principal Arterial</td>
<td>Sherwood Blvd/Edy Rd.</td>
<td>Crossing</td>
<td>7</td>
<td>42,800</td>
<td>South of Crossing</td>
<td>DEA 2007a</td>
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<td>Jurisdiction</td>
<td>Transportation Facility</td>
<td>Classification</td>
<td>Nearest Crossing(s)</td>
<td>No. of Lanes/Tracks</td>
<td>Existing ADT</td>
<td>ADT Count Location</td>
<td>ADT Source</td>
<td></td>
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<tr>
<td>----------------------</td>
<td>--------------------------</td>
<td>----------------</td>
<td>----------------------------------------------------------</td>
<td>---------------------</td>
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<td>-----------------------------------------------</td>
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<tr>
<td>Sherwood</td>
<td>Edy Rd.</td>
<td>Collector</td>
<td>Highway 99W to Elwert Rd</td>
<td>Parallel 2-3</td>
<td>4,011</td>
<td>West of Tariapin Dr. East of Elwert Rd.</td>
<td>Washington County 2006 Counts</td>
<td></td>
</tr>
<tr>
<td>Sherwood</td>
<td>Borchers Dr.</td>
<td>Collector</td>
<td>Edy Rd. Edy Rd. to Scholls-Sherwood Rd</td>
<td>Crossing 2</td>
<td>Unavailable</td>
<td>NA South of Lebeau Rd.</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Beaverton</td>
<td>Scholls Ferry Rd.</td>
<td>Arterial</td>
<td>Roy Rogers Rd. to 125th Ave.</td>
<td>Parallel 2-5</td>
<td>East of Roy Rogers Rd. West of Murray Blvd.</td>
<td>Washington County 2006 Counts</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Barrows Rd. (West End)</td>
<td>Collector</td>
<td>Scholls Ferry Rd.</td>
<td>Crossing 3</td>
<td>6,677</td>
<td>East of Murray Blvd. West of Merganser Ln.</td>
<td>City of Beaverton 2006 Counts</td>
<td></td>
</tr>
<tr>
<td>Beaverton</td>
<td>Murray Blvd</td>
<td>Arterial</td>
<td>Scholls Ferry Rd.</td>
<td>Crossing 6</td>
<td>22,798</td>
<td>North of Scholls Ferry Rd.</td>
<td>Washington County 2006 Counts</td>
<td></td>
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<td>Jurisdiction</td>
<td>Transportation Facility</td>
<td>Classification</td>
<td>Nearest Crossing(s)</td>
<td>Parallel/ Crossing</td>
<td>No. of Lanes/ Tracks</td>
<td>Existing ADT</td>
<td>ADT Count Location</td>
<td>ADT Source</td>
</tr>
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<td>-------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Beaverton</td>
<td>Davies Rd.</td>
<td>Collector</td>
<td>Scholls Ferry Rd.</td>
<td>Crossing</td>
<td>3</td>
<td>2,918</td>
<td>North of Otter Ln.</td>
<td>City of Beaverton 2003 Counts</td>
</tr>
<tr>
<td>Beaverton</td>
<td>Barrow Rd. (East End)</td>
<td>Collector</td>
<td>Scholls Ferry Rd.</td>
<td>Crossing</td>
<td>2</td>
<td>10,273</td>
<td>South of Scholls Ferry Rd.</td>
<td>City of Beaverton 2005 Counts</td>
</tr>
<tr>
<td>Beaverton</td>
<td>130th Ave.</td>
<td>Collector</td>
<td>Scholls Ferry Rd.</td>
<td>Crossing</td>
<td>2</td>
<td>2,183</td>
<td>North of Cottontail Ln.</td>
<td>City of Beaverton 2006 Counts</td>
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<tr>
<td>Beaverton</td>
<td>125th Ave.</td>
<td>Arterial</td>
<td>Scholls Ferry Rd. to Brockman St.</td>
<td>Parallel</td>
<td>2-3</td>
<td>9,700</td>
<td>South of Brockman St.</td>
<td>City of Beaverton 2006 Counts</td>
</tr>
<tr>
<td>Beaverton</td>
<td>Conestoga Dr.</td>
<td>Collector</td>
<td>125th Ave.</td>
<td>Crossing</td>
<td>2</td>
<td>2,191</td>
<td>East of 125th Ave.</td>
<td>City of Beaverton 2006 Counts</td>
</tr>
<tr>
<td>Beaverton</td>
<td>Brockman St.</td>
<td>Arterial</td>
<td>125th Ave.</td>
<td>Crossing</td>
<td>3</td>
<td>7,506</td>
<td>East of Surranto Rd.</td>
<td>City of Beaverton 2007 Counts</td>
</tr>
<tr>
<td>Beaverton</td>
<td>125th Ave.</td>
<td>Proposed Arterial (Not Built)</td>
<td>Brockman St. to Hall Blvd.</td>
<td>Parallel</td>
<td>NA</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beaverton</td>
<td>Hall Blvd.</td>
<td>Arterial</td>
<td>Proposed 125th Ave. to Denney Rd.</td>
<td>Parallel</td>
<td>5</td>
<td>26,400</td>
<td>South of Denney Rd.</td>
<td>City of Beaverton 2005 Counts</td>
</tr>
<tr>
<td>Beaverton</td>
<td>Hart Rd.</td>
<td>Collector</td>
<td>Hall Blvd.</td>
<td>Crossing</td>
<td>2</td>
<td>8,753</td>
<td>West of Hall Blvd.</td>
<td>City of Beaverton 2005 Counts</td>
</tr>
<tr>
<td>Beaverton</td>
<td>Denney Rd.</td>
<td>Collector</td>
<td>Hall Blvd. to Lombard Ave.</td>
<td>Parallel</td>
<td>2-3</td>
<td>13,100</td>
<td>West of Lombard Ave.</td>
<td>City of Beaverton 2005 Counts</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>Transportation Facility</td>
<td>Classification</td>
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<td>Parallel/ Crossing</td>
<td>No. of Lanes/ Tracks</td>
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<td>ADT Source</td>
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<td>Parallel</td>
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ADT = average daily traffic; ODOT = Oregon Department of Transportation; TSP = transportation system plan
Sources: DEA 2007a, Washington County 2006, Kosho 2007 (City of Beaverton), Middleton 2007 (City of Beaverton), Entranco 2003 (Wilsonville TSP)
4.21.3 Mitigation Measures

4.21.3.1 Alternative 1
No mitigation is necessary or proposed.

4.21.3.2 Alternatives 2 and 3
For both Alternatives 2 and 3, the operations at the intersection OR 8 and OR 47 could be improved during construction by implementing the following mitigation measures, if needed.

- Encouraging or requiring workers to carpool to the job site.
- Staggering departure times at the end of the daytime shift.
- Providing off-site parking and a shuttle or other means to transport workers to the job site.

To mitigate traffic impacts of the Willamette Pipeline construction (Alternative 3), crossings of railroad lines and roadways with high traffic volumes (that is, over 15,000 vehicles per day) would use trenchless construction methods.

In addition, with all Willamette Pipeline roadway crossings, impacts could be lessened by limiting lane closures during peak commuting hours to minimize disruptions to traffic flow.

Also, physical modifications or barriers will be installed along the road to prevent off-highway vehicle access to lake bed.
4.21 TRANSPORTATION AND ACCESS .................................................. 4.21-1

4.21.1 Affected Environment................................................................. 4.21-1
4.21.2 Environmental Impacts............................................................... 4.21-2
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Figure 4.21-1. Major Roadways in the Project Area (File Name: Fig 4.21-1 Hagg Transportation.pdf) ................................................................. 4.21-1

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
4.22 Visual Resources

4.22.1 Affected Environment

4.22.1.1 Henry Hagg Lake and Vicinity

Scoggins Valley Park and Henry Hagg Lake are in the foothills on the east side of Oregon’s Coast Range. Much of the land surrounding the reservoir is hilly with slopes of 20 percent or greater (Reclamation 1994). Elevations within the park range between 180 and 450 feet but adjacent features extend to above 1,000 feet.

The recreation season at Henry Hagg Lake/Scoggins Valley Park is from early March through late November. Park facilities are only available for day use activities. Public use of the park during the winter months is limited. The park has no roadway lighting, and site lighting is limited to surface-mounted fixtures at the restrooms.

The landscape is characterized by rolling hills of coniferous forest interspersed with patches of grassland. Forested areas account for more than 70 percent of the upland habitat. Forest in and around Scoggins Valley Park is dominated by second growth conifers including Douglas-fir, western hemlock, and western red cedar. A deciduous overstory component is often evident in forested stands near the shores of Henry Hagg Lake. Grassland areas include a mixture of elk meadows and unmaintained native grasses interspersed with Oregon oak, big-leaf maple, and red alder. Wetland and riparian communities are generally located along the shores of Henry Hagg Lake at the mouth of tributaries of Scoggins and Tanner creeks. As such, the visual environment at the reservoir is composed primarily of natural-appearing rural landscapes of both closed and open canopy forest, meadow, and riparian woodland (Figure 4.22-1 and Figure 4.22-2).
Figure 4.22-1. Looking northwest from dam with a water surface elevation of 252 (November 1999).

Figure 4.22-2. Looking West from Scoggins Valley Road south of Tanner Creek (October 2005).
Per Reclamation Comment #300 (see Comment Log) – Photo 4.23-2 (above) should be replaced with a photo that better represents the scenic qualities of the area. CWS agrees to provide scenic photo of high pool.

The most prominent visual features at Scoggins Valley Park are Henry Hagg Lake, the surrounding forested hills, and the open meadows. Human presence is evident within the landscape but generally does not detract from the scenic quality available at the park. The perimeter road and many of the recreation sites offer a panoramic view of a largely pastoral setting, within a relatively short drive from a large metropolitan area.

The highest quality views of the reservoir exist from spring to early summer when the reservoir level is at its highest and the meadows are green with newly emerging growth. These views can be compromised during drawdown and periods of low precipitation when the shoreline is dominated by extensive unvegetated banks and mudflats. Views are also compromised by previous timber harvest in the Scoggins Creek watershed. Past timber harvesting is evident by differentiated tree height and massing, causing breaks in visual continuity.

Numerous private residences are visible from the reservoir and also have views of the reservoir. Most residences are not visible from the perimeter road, due to topography and vegetation.

### 4.22.1.2 Raw Water Pipeline

The affected environment of the RWP corridor generally includes agricultural areas, the industrial area at Stimson Mill, and road rights-of-way.

### 4.22.1.3 Willamette Pipeline

The Willamette Pipeline would cross through urban and rural residential areas, and other urbanized areas. It would follow public rights-of-way for much of its alignment and would be underground. Proposed TVWD water tanks would be constructed on the southern slopes of Cooper Mountain, at an elevation of approximately 445 feet. Each water tank would probably hold 20 MG, be 40 feet deep and partially below grade (buried). They would likely be built of concrete. Sites currently being considered for the TVWD water tanks are partially forested or farmed. Some of the sites are adjacent to large-lot residential parcels, and some are adjacent to single-family residential, urban neighborhoods.

The City of Tualatin water tank would be smaller, holding perhaps 5 MG, and located within Tualatin near SW Oregon Street and SW Tualatin-Sherwood Road. No additional information is available about the Tualatin water tank at this time.

### 4.22.2 Methodology

#### 4.22.2.1 Viewing Areas

For this visual resource analysis, 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 viewing areas were evaluated based on land use, public access, and significance. October is outside of the prime recreation and viewing season at the park; however,
photographs were taken at that time for use in the visual simulations. Water levels in October are representative of average reservoir drawdown.

4.22.2.2 Visual Simulations
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.

4.22.2.3 Proposed Actions and Management Requirements
Relevant and available documents were reviewed. Of special value were the Henry Hagg Lake Resource Management Plan (Reclamation 2004) and the Washington County Comprehensive Plan. These documents contain policies and objectives for managing scenic values. DEA used the visual simulations to compare project alternatives to the existing landscape character as viewed from key observation points. This method relies primarily on professional judgment because there are no quantifiable interval measurements that can be used as thresholds.

4.22.3 Applicable Plans and Policies

4.22.3.1 Henry Hagg Lake Resource Management Plan
The Resource Management Plan was adopted in May 2004. It describes existing conditions and the goals, objectives, and management actions that will guide park management and development until 2014. The Resource Management Plan was prepared under contract for Reclamation. Because Henry Hagg Lake is a Reclamation project on Reclamation lands, the Resource Management Plan is the planning framework that applies to the area.

The following goal, objective, and management actions address the scenic quality of Henry Hagg Lake and the surrounding environment.

Goal LMI 1
Allow for expanded recreation opportunities and other uses while balancing the need for the preservation of natural and cultural resources, and open space and scenic values.

Objective LMI 1.1
Ensure that siting and design of all new facilities on Reclamation lands maximize compatibility and integration with the open, rural environment of the reservoir and surrounding area.

Management Actions:
- LMI 1.1.1: Design new facilities to be compatible with scenic values.
- LMI 1.1.2: To the maximum extent possible, preserve existing [plants] and use native plants for landscaping. Facilities shall incorporate sustainable development elements as much as possible and be designed and positioned in a manner that is least intrusive to the area’s scenic qualities.
4.22.3.2 Statewide Planning Goals
Oregon’s Statewide Planning Goals are implemented through acknowledged local comprehensive plans. (See Section 4.13, Land Use and Planning, for more information.) Washington County has an acknowledged comprehensive plan, as noted below. Statewide Planning Goal 5, “Open Spaces, Scenic and Historic Areas, and Natural Resources” directs local land use policies regarding scenic resources.

4.22.3.3 Washington County Comprehensive Plan
The plan applicable to the project area is the County’s Rural/Natural Resource Plan Element, Volume III, which contains policies and strategies for the rural areas of Washington County. The Henry Hagg Lake perimeter road is identified as a Scenic Route on the Significant Natural Resources Area map. Policy 13 specifically addresses Scenic Resources in the project area.

Policy 13: It is the policy of Washington County to protect and enhance its outstanding Scenic Views, Routes, and Features.

Implementing Strategies of importance to the Henry Hagg Lake Scenic Route include:

- Implement procedures in the County’s Community Development Code whereby development in the Rural and Natural Resource Areas which may conflict with outstanding scenic resources will be reviewed with the intent of mitigating adverse impacts.
- Allow activities customarily conducted with commercial farm or forest practices in areas designated as Scenic Resources.
- Work to improve the availability of scenic resources to the general public.
- Encourage scenic easements or other means of providing public access to sites with outstanding views.

4.22.4 Key Viewing Areas
Key viewing areas are locations from which the public has significant opportunity to view the landscape. Two types of key viewing areas, recreation areas and roads and trails, offer prominent views of Henry Hagg Lake and are described below. Residences on private properties adjacent to the park also have views of the reservoir. Key viewing areas were not identified for the RWP or the Willamette Pipeline associated with Alternatives 2 and 3, primarily because impacts would be temporary, that is, they would occur during and shortly after construction.

4.22.4.1 Recreation Areas
Four recreation areas within the park offer prominent views of Henry Hagg Lake. The recreation areas are generally located below the road elevation between the road and the reservoir. Most of the day use areas, such as the Elks Picnic Area, Sain Creek Picnic Area, Recreation Area A West, and Recreation Area C, can be seen from the reservoir or from across the reservoir. Scoggins Creek Picnic Area cannot be seen from the reservoir or from across the reservoir due to dense shoreline vegetation—views are primarily of the area itself, which includes a portion of Scoggins Creek. Recreation Area A East was closed to the public in 1989 and does not provide a viewing area at this time.

4.22.4.2 Road/Trails
The entire perimeter road is designated as a “scenic route” by the Washington County Comprehensive Plan Rural/Natural Resource Plan Element. Scenic routes are identified as those being “excellent” scenic roads or “good” scenic roads with views of the Tualatin Valley or the Cascade Mountains. Henry Hagg Lake can be seen from a number of turnouts along the perimeter road. There are twenty turnouts, each with an associated viewpoint and trail access. The dam crest also offers views of the lake and of the Scoggins Creek valley downstream of the dam. With the exception of the Sain Creek Recreation Area and Recreation Area C, none of the recreation areas can be seen from the perimeter road due to vegetative buffers and topographic differences between day use areas and the road.

The Master Trail extends along the reservoir between the shoreline and the perimeter road. The Master Trail joins the perimeter road where the perimeter road bridges three creeks feeding the lake. The trail offers many opportunities for viewing the lake and the surrounding area.

A 10.5-mile multi-use trail runs along the reservoir on the shoulder of the perimeter road. The 6-to-8 foot-wide paved lanes are located on both sides of the road and are used by bicyclists and joggers. The lanes also provide additional parking, particularly for anglers in the Sain Creek Area (Reclamation 2004).

4.22.5 Environmental Impacts

4.22.5.1 Alternative 1 - No Action

4.22.5.1.1 Potential Impacts (direct, indirect)
As described in Section 3, the water level at full pool would be the same as at present (303.5 feet). However, the additional water demands (all contractors demanding full contract amounts each year) would mean that the reservoir would be drawn down to lower elevations than under current conditions. The lowest water level in Henry Hagg Lake during the 2001 dry year was about approximately 245 feet. With the No Action Alternative, minimum water levels in Henry Hagg Lake would be lower than 245 feet in about 90 percent of the years. The minimum operating level of Henry Hagg Lake is the top of inactive storage at elevation 235.3 feet.

The No Action Alternative would have no immediate effects on the visual resources because there would be no changes to facilities or the landscape within the study area. In the long term, additional water use in response to greater demand would result in the reservoir being drawn down to lower levels. The extent and duration of reservoir drawdown would increase the area of mudflats exposed during most years, and the mudflats would be exposed for longer periods of time, particularly during late summer and fall. (The area of mudflats at low pool, 668 acres, would not change, but low-pool conditions would occur more often and last longer.)

4.22.5.1.2 Cumulative Impacts
No other projects have been identified in the vicinity of Henry Hagg Lake that would contribute to visual impacts. It is expected that future timber harvest on lands surrounding the lake could compound the visual impacts of Alternative 1.

4.22.5.2 Alternative 2 – Scoggins Dam 40-Foot Raise
4.22.5.2.1 Potential Impacts (direct, indirect)

*Henry Hagg Lake*

Figure 4.22-3 is a photograph representing existing visual conditions and is presented in this section for ease of comparison with visual simulations of projected future conditions. For purposes of this analysis, the photograph was taken during October 2005, typically the month when reservoir levels are lowest. The reservoir was not drawn down to low pool in 2005; the water surface elevation in the photograph is 268. For contextual purposes, Figure 4.22-4 illustrates the same general view circa 1999 with a water surface elevation of 252.

Direct impacts of Alternative 2 to visual resources associated with Henry Hagg Lake would include higher pool elevations in the spring (Figure 4.22-5 - Figure 4.22-8), increased mudflat areas in the late summer and fall (Figure 4.22-3), decreased perimeter vegetation, a narrower horizon of surrounding forest, and a higher dam structure (Figure 4.22-4). The area of exposed mudflat or unvegetated shoreline at low pool (elevation 235.3 feet) would go from approximately 668 acres to approximately 1,038 acres of surface area. While the views in spring and early summer may appear similar to current or No Action conditions to the casual observer (that is, a full lake with vegetation near the shoreline), differences in late summer and fall views would be more visually evident because of the greater areas of exposed, unvegetated shoreline and remnant submerged vegetation visible at low water levels.

There would also be temporary impacts along the shore due to construction-related activities. During construction, the pool elevation would be maintained at an elevation no higher than 280 feet (versus a full pool elevation of 303.5 feet), resulting in a minimum of approximately 860 acres of exposed, denuded lake bottom. For the approximately one and a half year construction period, the area of exposed mudflat and unvegetated shoreline would be higher than under current or No Action conditions.

Trees would be cleared from much of the area to be inundated. As proposed, many trees would remain in place, particularly in the tributary “arms” of the reservoir, as well as in the “no wake” zone in the northern portion of the reservoir. Remaining trees would die with the higher water levels; therefore, the dead trees would be new visual elements introduced with Alternative 2. Tops of the trees likely would be visible during periods of high water, and the entire trees (or stumps as the trees decay) would be visible at low pool.
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.

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.
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

Figure 4.22-6. Photo simulation – low water level with 40-foot and 25-foot dam raise (looking south)
Figure 4.22-7. Photo of existing crest of dam (from south side looking northwest)

Figure 4.22-8. Photo simulation – crest of dam with 40-foot dam raise

Recreation Areas
Under Alternative 2, recreation facilities in the park would be inundated and relocated, as described in Section 4.14.2.2. Views to and from the relocated recreation facilities would be altered by differences in site design, elevations, and site characteristics. Because the recreational facilities would generally be at higher elevations than at present, they would likely be more visible, particularly from the lake and from viewpoints across the lake. At low water, recreation area users would view the lake over larger areas of unvegetated shoreline (or mudflats). The Scoggins Creek Picnic Area would remain visually secluded from the reservoir, although the picnic area would be moved upslope and farther upstream along Scoggins Creek.

**Road/Trails**

Twelve of the twenty turnouts and associated viewpoints would be relocated along with portions of the perimeter road. **Viewsheds**, or viewing corridors, from the road and the turnouts would be altered slightly with the relocated facilities, but the reservoir, vegetation, and shorelines would still be visible. During periods of low water in the reservoir, views from the road and turnouts would include larger expanses of exposed, unvegetated shoreline, previously inundated vegetation, and remnant recreation facilities. Views from the dam would be similarly affected. From Scoggins Valley Road, observers would likely notice the increase in dam height and, especially during and shortly after construction, some of the new dam facilities, such as the new spillway. The wetland mitigation area below the dam would also be new visual elements, visible from Scoggins Valley Road and the dam crest, introduced with Alternative 2.

The entire Master Trail along the lake perimeter would be rebuilt. The replaced trail would maintain a similar experience and view corridors at high water pool as current conditions and Alternative 1. However, during low pool there would be more distance between the trail and the lake including an expanded mudflat surface area.

**Private Residences**

Views from private residences around the lake would be negatively affected during periods of low water when residents would view the lake over larger areas of unvegetated shoreline (or mudflats). In general, this impact would not be as great as altered views from the recreation areas because the residences are generally farther from the lake and vegetation would screen many views of the shoreline. Some residences currently without views of the lake may have views of the lake during spring and early summer months, when the water level would be higher than under Alternative 1 conditions—this may be considered a positive effect.

**Raw Water Pipeline**

Direct impacts of the RWP would be temporary and related to construction. Trenching and other activities would be visible from Scoggins Valley Road east of the dam, from the dam crest, from Highway 47, and from other properties along the RWP corridor. Following the construction, parts of the pipeline alignment would be visible in the short term until vegetation becomes re-established.

**Light and Glare**
No additional lighting is proposed within the park, along Scoggins Valley Road, at the dam, or along the RWP. Lighting at existing recreation facilities would be replaced in kind. Alternative 2 would result in no increase in light emissions.

**Applicable Plans and Policies**
There is no specific plan direction that defines visual resources goals or management objectives for this project. Regarding the relocation of recreational areas and the visual experiences created by looking toward and from those facilities, it is assumed that all new facilities would be sited and designed so as to be compatible with applicable planning goals and objectives and would therefore likely result in minimal, if any, impacts on the visual environment. The alignment of the scenic route along the perimeter of Henry Hagg Lake would change slightly, but much of the scenic nature of the road would be maintained.

### 4.22.5.2.2 Cumulative Impacts
Cumulative impacts would be the same as for Alternative 1.

### 4.22.5.3 Alternative 3 – Multiple Source Option

#### 4.22.5.3.1 Potential Impacts (direct, indirect)

**Henry Hagg Lake**
Figure 4.22-3 and Figure 4.22-12 are the same as Figure 4.22-9 and Figure 4.22-7 respectively, repeated in this section for ease of comparison with photo simulations of projected future conditions under Alternative 3. Types of impacts to visual resources resulting from Alternative 3 would be similar to Alternative 2 and include higher pool elevations in the spring (Figure 4.22-10), increased mudflat areas in the late summer and fall (Figure 4.22-11), decreased perimeter vegetation, a narrower horizon of surrounding forest, and a higher dam structure (Figure 4.22-13). While the types of visual impacts would be similar as under Alternative 2, the levels of impact would be lower. The area of exposed mudflat at low pool (elevation 235.3 feet) would go from approximately 668 acres (No Action) to approximately 903 acres (Alternative 3), compared with 1,038 acres (Alternative 2).

**Recreation Areas**
Impacts would be of the same type as described for Alternative 2. The only notable difference would be that the area of exposed unvegetated shoreline, previously inundated vegetation, and remnant recreation facilities would be less under Alternative 3 than under Alternative 2.

**Road/Trails**
Impacts would be of the same type as described for Alternative 2. The only notable difference would be that the area of exposed unvegetated shoreline, previously inundated vegetation, and remnant recreation facilities would be less under Alternative 3 than under Alternative 2.
Figure 4.22-9. Existing Conditions (October 2005) looking south from Scoggins Valley Road east of Scoggins Creek Picnic Area

Figure 4.22-10. Photo simulation: High water level with 25-foot dam raise (looking south)
Figure 4.22-11. Photo simulation: Low water level with 40-foot and 25-foot dam raise (looking south)

Figure 4.22-12. Existing Crest of Dam (from south side looking northwest)
Private Residences
Views from private residences around the lake would be negatively affected during periods of low water when residents would view the lake over larger areas of unvegetated shoreline (or mudflats). In general, this impact would not be as great as altered views from the recreation areas because the residences are generally farther from the lake and vegetation would screen many views of the shoreline. Some residences currently without views of the lake may have views of the lake during spring and early summer months, when the water level would be higher than under Alternative 1 conditions—this may be considered a positive effect. Visual impacts to residences would be less than under Alternative 2 because of the lower high pool elevation with Alternative 3.

Raw Water Pipeline
Impacts would be the same as for Alternative 2.

Willamette Pipeline
Direct impacts of the Willamette Pipeline itself would be temporary and related to construction. Trenching and other activities would be visible from roads and properties along the construction corridor. Following the construction, parts of the pipeline alignment would be visible in the short term until vegetation becomes re-established.

Improvements at the Willamette River Water Treatment Plant would be contained within the existing site boundaries and would not be apparent to the casual observer.
Water tanks with Alternative 3 would be visible from surrounding properties, as would water tank construction activities. Water tank locations being considered are near urban areas, but most of the areas are not yet densely developed. All of the potential locations are at least partially forested or farmed. Because the water tanks need to be placed at higher elevations (that is, on hills or on elevated structures) than the areas they would serve (for gravity flow), they may be visible from some distance away, depending upon final design.

**Light and Glare**
No additional lighting is proposed within the park, along Scoggins Valley Road, at the dam, along the RWP, or along the Willamette Pipeline. Lighting at existing recreation facilities would be replaced in kind. Water tank sites may have some lighting for night-time security, but such lighting would be kept to the minimum necessary and would be directed downward and toward the facilities to minimize effects on nearby properties and views. Alternative 3 could result in a slight increase in light emissions at the water tank sites only.

**Applicable Plans and Policies**
There is no specific plan direction that defines visual resources goals or management objectives for this project. Regarding the relocation of recreational areas and the visual experiences created by looking toward and from those facilities, it is assumed that all new facilities would be sited and designed so as to be compatible with applicable planning goals and objectives and would therefore likely result in minimal, if any, impacts on the visual environment. The alignment of the scenic route along the perimeter of Henry Hagg Lake would change slightly, but much of the scenic nature of the road would be maintained. Prior to being built, the water tanks associated with the Willamette Pipeline would need to comply with local land use regulations related to scenic resources.

**4.22.5.3.2 Cumulative Impacts**
Cumulative effects of Alternative 3 in the vicinity of Henry Hagg Lake and the RWP would be the same as described for Alternatives 1 and 2. The only elements of the Willamette Pipeline that would contribute to cumulative effects are the water tanks. Combined with future development that would be expected in their vicinity, the visual character would be changed from rural to urban.

**4.22.6 Mitigation Measures**
For any of the alternatives, the extent of exposed mudflats cannot be mitigated, though it is assumed that users are conditioned to the drawdown effect seen at lower pool elevations. Views of the shoreline from the perimeter road, recreation areas, and other viewpoints could be screened by planting additional vegetation, but that action would also block views of the lake, which would not be desirable. Off-road vehicle access would be restricted with design features.

**4.22.6.1 Alternative 1**
No mitigation is proposed.

**4.22.6.2 Alternatives 2 and 3**
Alternatives 2 and 3 would alter the visual character of Henry Hagg Lake, particularly during periods of low water, and of Scoggins Dam, though less mudflat would be visible under Alternative 3. The
increased area of mudflat that would be visible at lower reservoir levels cannot be fully mitigated.
However, some visual effects of Alternatives 2 and 3 would be mitigated by implementing the following measures.

- Provide visual buffering of the relocated road with native plantings along the road, except where views from the road (that is, at turnouts) are desired.
- Use natural colors and textures in replacement recreation facilities.
- Remove structures of the replaced (old) recreation facilities, except those facilities that may be used after periods of inundation (e.g., Recreation Area “C” boat ramp).
- Plant native vegetation, where appropriate, at recreation areas.
- Block illegal off-road vehicle use and prevent “mudbogging” by incorporating design features such as boulders, guard rails, and ditches.

Also, for Alternative 3, the water tanks associated with the Willamette Pipeline may be visible, depending on their final design. The water tanks could be screened with plantings of native vegetation and painted to better blend with their surroundings.
4.22 Visual Resources

4.22.1 Affected Environment .............................................................. 4.22-1
4.22.2 Methodology ........................................................................ 4.22-3
4.22.3 Applicable Plans and Policies ............................................... 4.22-4
4.22.4 Key Viewing Areas ............................................................... 4.22-5
4.22.5 Environmental Impacts .......................................................... 4.22-6
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Figure 4.22-1. Looking northwest from dam with a water surface elevation of 252 (November 1999). ......................................................... 4.22-2
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4.23 Environmental Justice
(to be provided by Reclamation)
4.24 Summary of Unavoidable Adverse Impacts

Under the Action Alternatives, the increased area of inundation at Henry Hagg Lake would saturate soils above the existing reservoir level and would increase risk of slope instability and failure along the shoreline. The impacts would be short-term (that is, during the first few years after the reservoir is raised), and the long-term impacts would not be significant.

The Action Alternatives would convert forest, pasture, recreation, and residential land around Henry Hagg Lake to reservoir use (370 acres under Alternative 2 and 235 acres under Alternative 3). A minor amount of land would be converted to transportation use with relocation of portions of the perimeter road. Land would be acquired from private property owners and converted to Federal ownership. Under Alternative 2, 17 properties would be partially acquired and one would be fully acquired and the residents relocated; under Alternative 3, 17 properties would be partially acquired and no residents relocated. Pipeline easements acquired for the RWP and Willamette Pipeline (Alternative 3) would limit land uses within the easements. Water tanks associated with the Willamette Pipeline would also result in acquisition and conversion of private property to a public use; because a specific site(s) has not been identified, the specific impact is not yet known. The TVWD water tanks would each occupy between 6.5 and 11 acres; however, the amount of property acquired may exceed that, depending upon existing parcel sizes and negotiations with property owners. It is expected that the City of Tualatin water tank would be located on publicly owned property.

Recreation facilities in Scoggins Valley Park would be inundated by the dam raise under the Action Alternatives. Facilities would be replaced at higher elevations. Although the recreation mitigation plan (Section 4.14.2 and 4.14.3 of this document) has been developed to address not only physical loss of facilities but also changes in recreation experience (or level of service) and O&M, some of those changes cannot be wholly mitigated. Views of and from the lake would be altered, and some of the recreation areas may be on steeper slopes than at present. The fishing pier would be relocated from Recreation Area C to the Elks Picnic Area, and the 18-hole disc golf course would be replaced by a 9-hole course.

Under the No Action Alternative, the extent and duration of reservoir drawdown would increase the area of mudflats exposed during most years, and the mudflats would be exposed for longer periods of time, particularly during late summer and fall. (The area of mudflats at low pool, 668 acres, would not change, but low-pool conditions would occur more often and last longer.) Under the Action Alternatives, the area of mudflats exposed at low pool would increase to approximately 1,038 acres (Alternative 2) or 903 acres (Alternative 3).

The consequences of a catastrophic failure of Scoggins Dam would be greater under the Action Alternatives because of the larger volume of water that would be released; however, the probability of dam failure would be reduced because of design features that would be incorporated into the dam. The potential for dam failure is very low under all of the alternatives.

Short-term adverse impacts of construction of the Action Alternatives include increased noise and dust in the construction area, utility relocations, traffic disruptions and delays, and access disruption for
properties along the project corridor (including businesses along the Willamette Pipeline [Alternative 3 only]). Such impacts cannot be wholly mitigated, but they would be of relatively short duration and would not be significant.