Water Management and Conservation Plan Update

City of Sherwood

April 2018

BEFORE THE WATER RESOURCES DEPARTMENT
OF THE
STATE OF OREGON

In the Matter of the Proposed Water Management and Conservation Plan for City of Sherwood, Washington County	)))	FINAL ORDER APPROVING A WATER MANAGEMENT AND CONSERVATION PLAN

Authority

OAR Chapter 690, Division 086, establishes the process and criteria for approving water management and conservation plans required under the conditions of permits, permit extensions and other orders of the Department. An approved water management and conservation plan may authorize the diversion and use of water under a permit extended pursuant to OAR Chapter 690, Division 315.

Findings of Fact

1. The City of Sherwood submitted a Water Management and Conservation Plan (plan) to the Water Resources Department (Department) on June 14, 2018. The required statutory fee for review of the plan was received by the Department on July 3, 2018. The plan was required by a condition set forth under the City's previously approved plan (Sp. Or. Vol. 76, Pg. 869-871 issued on December 19, 2008.

2. The Department published notice of receipt of the plan on July 10, 2018, as required under OAR Chapter 690, Division 086. No comments were received.

3. The Department provided written comments on the plan to the City on September 11, 2018. In response, the City submitted a revised plan on November 21, 2018.

4. The Department reviewed the revised plan and finds that it contains all of the elements required under OAR 690-086-0125 and OAR 690-086-0130.

5. On December 19, 2008, the Department issued a final order approving the City's previous plan and authorizing diversion of up to 23.20 cfs (out of the total permitted 31.0 cfs) under Permit S-49240. The projections of future water needs in the City's 2018 plan demonstrate a need for a total of 9.04 cfs of water under Permit S-49240 to help meet overall projected 20 year demands. As stated in their 2018 plan, the City has diverted 6.34 cfs to date and are requesting an additional 2.7 cfs to help meet overall projected needs until the year 2037 for a total of 9.04 cfs. Therefore, the quantity authorized for diversion will be reduced accordingly. These projections are reasonable and consistent with the City's land use plan.

This is a final order in other than a contested case. This order is subject to judicial review under ORS 183.484. Any petition for judicial review must be filed within the 60-day time period specified by ORS 183.484(2). Pursuant to ORS 536.075 and OAR 137-004-0080, you may petition for judicial review or petition the Director for reconsideration of this order. A petition for reconsideration may be granted or denied by the Director, and if no action is taken within 60 days following the date the petition was filed, the petition shall be deemed denied.

6. The system is fully metered and the rate structure includes a base rate and volumetric charge. Unaccounted-for water is estimated at 5.18 percent for the year 2016.

7. The plan includes 5-year conservation benchmarks to: continue to perform annual water system audits; continue to install meters on all new connections; implement a meter accuracy pilot program for meters less than 2-inches in size; continue to sustain a leak detection and repair program that includes surveying 25% of the system annually; continue to bill customers based, in part, on the quantity of water metered at the service connection; continue to provide the public with free water conservation items; decide whether to expand the toilet rebate program; continue to look for ways to conserve water at City facilities and properties; continue to implement its public education program, which includes promoting water conservation in the City's newsletters, utility bills, and website and retaining membership in the Regional Water Providers Consortium.

8. The plan identifies groundwater and the Willamette River as the sources of the City's water rights and accurately and completely describes the upper Willamette River Chinook salmon, Upper Willamette River winter steelhead, Lower Columbia River Chinook salmon, Cutthroat salmon, Coho salmon, Columbia River Chum salmon, Western Brook lamprey, Pacific lamprey and Pacific eulachon as the affected listed species because portions of their migratory habitat are in source areas of Permit S-49240

9. The water curtailment element included in the plan satisfactorily promotes water curtailment practices and includes a list of four stages of alert with concurrent curtailment actions.

10. The diversion of water under Permit S-49240 will be increased during the next 20 years and is consistent with OAR 690-086-0130(7), as follows:

    a. The plan meets OAR 690-086-0130(7) (a) by continued implementation of conservation measures that provide water at a cost that is equal to or lower than the cost of other identified sources, and the supplier has provided sufficient justification for the factors used in selecting other sources for development;

    b. The plan meets OAR 690-086-0130(7) (b) as expanded use under this regional supply source is the most feasible and appropriate water supply alternative available to the supplier; and

    c. The plan meets OAR 690-086-0130(7) (c), because it contains documentation that no mitigation is required and the City also included the requirements of the settlement agreement as part of the planned conservation activities.

Conclusion of Law

The Water Management and Conservation Plan submitted by the City of Sherwood is consistent with the criteria in OAR Chapter 690, Division 086.

Now, therefore, it is ORDERED:

Duration of Plan Approval:

1. The City of Sherwood Water Management and Conservation Plan is approved and shall remain in effect until **December 11, 2028**, unless this approval is rescinded pursuant to OAR 690-086-0920.

Development Limitation:

2. The limitation of the diversion of water under Permit S-49240 established in the Final Order approving the City's previous WMCP issued on December 19, 2008 is now modified. Subject to other limitations or conditions of the permit, the City of Sherwood is now authorized to divert up to 9.04 cfs (*out of the total permitted 31.0 cfs*) of water under Permit S-49240.

Plan Update Schedule:

3. The City of Sherwood shall submit an updated plan meeting the requirements of OAR Chapter 690, Division 086 within **10 years** and no later than **July 11, 2028**.

Progress Report Schedule:

4. The City of Sherwood shall submit a progress report containing the information required under OAR 690-086-0120(4) by **December 11, 2023**.

Other Requirements for Plan Submittal:

5. The deadline established herein for the submittal of an updated Water Management and Conservation Plan (consistent with OAR Chapter 690, Division 086) shall not relieve the City of Sherwood from any existing or future requirement(s) for submittal of a Water Management and Conservation Plan at an earlier date as established through other final orders of the Department.

Dated at Salem, Oregon this 20th day of December, 2018.

Dwight French
Water Right Services Division Administrator, for
Thomas M. Byler, Director
Oregon Water Resources Department

Mailing date: DEC 21 2018

Notice Regarding Service Members: Active duty service members have a right to stay proceedings under the federal Service Members Civil Relief Act. 50 U.S.C. App. §§501-597b. You may contact the Oregon State Bar or the Oregon Military Department for more information. The toll-free telephone number for the Oregon State Bar is: 1 (800) 452-8260. The toll-free telephone number of the Oregon Military Department is: 1 (800) 452-7500. The Internet address for the United States Armed Forces Legal Assistance Legal Services Locator website is: http://legalassistance.law.af.mil

Water Management and Conservation Plan

City of Sherwood

April 2018

Murraysmith

888 SW 5th Avenue
Suite 1170
Portland, OR 97204

GSI Water Solutions, Inc.

1600 SW Western Boulevard
Suite 240
Corvallis, OR 97333

Table of Contents

3. Water Conservation Element

4. Water Curtailment Element

5. Water Supply Element

Figures

Tables

Appendices

Section **1**

Section 1

Introduction

1.1 Authorization

In July 2017, Murraysmith and GSI Water Solutions, Inc. were authorized by the City of Sherwood (City) to prepare this Water Management and Conservation Plan (WMCP).

1.2 Purpose

The purpose of this WMCP is to aid the City in documenting current water conservation programs, to identify potential future conservation measures, to review and update the City's water curtailment plan, to analyze future water needs and evaluate the City's long-term water supply plan, and to meet State of Oregon requirements for the WMCP.

1.3 Compliance

This plan complies with water management and conservation planning requirements established under Oregon Administrative Rules (OAR) for Public Water Systems, Chapter 690, Division 86 and applicable elements of Division 315. The City's previous WMCP was approved in February 2008 by the State of Oregon Water Resources Department. A copy of the approval letter and Approval Order are included in Appendix A of this report. Table 1-1 presents a summarized list of the information required under OAR 690-86 for the completion of this WMCP and the location of that information in this plan document.

The City anticipates submitting a 10-year update of this WMCP. As required under OAR 690-86, and a progress report will be submitted in five years.

1.4 Review by Affected Local Governments

Thirty days before submitting this WMCP to OWRD, the City provided a draft WMCP to the following affected local governments for review and comment relating to consistency with comprehensive land use planning. Received comments are included in Appendix B.

- City of Sherwood
- City of Wilsonville
- Washington County
- Metro

The City also provided a courtesy copy of the draft WMCP to the Tualatin Valley Water District, City of Tualatin, City of Tigard, City of Hillsboro, and City of Beaverton.

Table 1-1
Oregon Administrative Rule Requirements

Item	OAR Reference	Report Section
Water Supplier Description		
Description of Supplier's Source(s)	690-086-0140 (1)	2.6-2.8
Delineation of Current Service Area	690-086-0140 (2)	2.5, Figure 2.1
Assessment of Adequacy and Reliability of Existing Supplies	690-086-0140 (3)	2.10
Quantifications of Present and Historic Use	690-086-0140 (4)	2.4
Summary of Water Rights Held	690-086-0140 (5)	Table 2-6, 2.8
Description of Customers Served and Water Use Summary	690-086-0140 (6)	2.4
Identification of Interconnections with Other Suppliers	690-086-0140 (7)	2.6-2.8
System Schematic	690-086-0140 (8)	Figure 2-2
Quantification of System Leakage	690-086-0140 (9)	2.11
Water Conservation Element		
Full Metering of Systems	690-086-0150 (4)(b)	3.4.2
Meter Testing and Maintenance Program	690-086-0150 (4)(c)	3.4.3
Annual Water Audit	690-086-0150 (4)(a)	2.11, 3.4.1
Leak Detection Program	690-086-0150 (4)(e)	3.4.5
Leak Repair or Line Replacement Program	690-086-0150 (6)(a)	N/A
Rate Structure Based on Quantity of Water Metered	690-086-0150 (4)(d)	3.4.4
Rate Structure/Billing Practices that Encourage Conservation	690-086-0150 (6)(d)	3.6.4
Public Education Program	690-086-0150 (4)(f)	3.4.6
Technical and Financial Assistance Programs	690-086-0150 (6)(b)	3.6.2
Retrofit/Replacement of Inefficient Fixtures	690-086-0150 (6)(c)	3.6.3
Reuse, Recycling, Non-potable Opportunities	690-086-0150 (6)(e)	3.6.5
Other Measures, If Identified by Supplier	690-086-0150 (6)(f)	3.6.6
Progress Report on Previous WMCP	690-086-0150 (1)	Table 3-1
Documentation of Water Use Measurement and Reporting	690-086-0150 (2)	3.3
Measures Already Implemented or Required Under Contract	690-086-0150 (3)	3.6
Water Curtailment Element		
Assessing Water Supply	690-086-0160 (1)	4.4
Stages of Alert	690-086-0160 (2)	4.6
Triggers for Each Stage of Alert	690-086-0160 (3)	4.6
Curtailment Actions	690-086-0160 (4)	4.6
Water Supply Element		
Delineation of Current and Future Service Areas	690-086-0170 (1)	5.2
Population Projections for Service Area	690-086-0170 (1)	5.3, 5.4
Prepare Schedule to Fully Exercise Each Permit	690-086-0170 (2)	5.5
Prepare Demand Forecast	690-086-0170 (3)	5.4
Comparison of Projected Need and Available Sources	690-086-0170 (4)	Figure 5-1
Analysis of Alternative Sources	690-086-0170 (5)(8)	5.5.1
Quantification of Maximum Rate and Monthly Volume	690-086-0170 (6)	5.5.2
Mitigation Actions Under State and Federal Laws	690-086-0170 (7)	5.5.3
Other Items		
List of Affected Local Governments and Their Comments	690-086-0125 (5)	Appendix B
Date for Submittal of Next Update	690-086-0125 (6)	1.3
Additional Time Requested to Meet Previous Benchmarks	690-086-0125 (7)	N/A

1.5 Scope

The scope of work for this plan includes the following work tasks:

- *Data Gathering* -- Compilation and review of existing maps, drawings, data, plans, studies and reports related to all aspects of water management and conservation.

- *Water Supplier Description Element*

    - *Update Inventory of Existing Facilities* -- Preparation of a system inventory of existing wells, distribution and transmission facilities, storage reservoirs, telemetry, pump stations and other water system facilities. The facilities inventory will also include tabulation of the current status of the City's water rights.

    - *Describe the Current Population and Water Service Area --* Review information related to: service area, land use, and population distribution. Document historical population estimates for recent years and update the current water service area.

    - *Analyze Historical Water Demand and Metered Consumption* -- Analyze and describe historical water demands, including: annual demands, average daily demands, and peak seasonal and daily demands. Describe the estimated number of customers by customer category, analyze historical metered water consumption data, and compare consumption by customer class analyzed in this WMCP to consumption reported in the 2014 WMCP.

    - *Describe the City's Water Sources* -- Describe the City's water sources, water supply agreements and interconnections with other municipal water providers, provide a tabular list of the City's water rights, assess the adequacy and reliability of the City's existing water supply, identify any listings of water sources as water quality limited, and identify streamflow-dependent species listed by a state or federal agency as sensitive, threatened, or endangered that are present in the water sources.

    - *Evaluate Unaccounted-for Water* -- Unaccounted-for water includes all water which leaves the system unmetered or without proper record keeping. This can include such uses as firefighting, system flushing, line breaks and leaks, unmetered usage, improperly registering meters, and possible unauthorized or unrecorded connections to the system. As part of this task, historical water demand (i.e. production) and water consumption data and other water use records provided by the City will be evaluated and the system's level of unaccounted-for water will be estimated. Recommendations will be presented if these levels are found to exceed normally accepted levels.

- *Water Conservation Element* -- Provide a progress report on previous water conservation benchmarks, document the City's current water conservation program, and develop new

water conservation 5-year benchmarks in accordance with OAR Division 86. This work will consider the following water conservation activities:

- Source and customer metering
- Meter testing and maintenance
- Water system audits
- Leak detection and repair
- On-going water main replacement
- Water rate and billing practices
- Public education
- Technical and financial assistance
- Supplier-financed retrofit or replacement of inefficient water fixtures
- Reuse and recycling of water

- *Water Curtailment Element* --This task includes documenting, reviewing, and updating the City's current water curtailment plan, including curtailment stages, triggers, goals, and implementation measures. Related ordinances will also be reviewed.

- *Water Supply Evaluation* -- This task includes: delineation of current and future water service areas, reporting a schedule for putting water rights to full beneficial use, development, incorporation and presentation of updated population and water demand forecasts, a comparison of projected water supply needs with sources of water currently available to the City, discussion of State and Federal mitigation actions related to source development and water rights, and an analysis of alternative sources of water that could mitigate source development, such as water from interconnections and water savings from conservation measures.

- *Prepare Report Documents* -- Preparation of a water management and conservation plan that documents and describes the planning and analysis work tasks above. This document includes a description of the City's existing water system, a discussion of water conservation, a water curtailment plan and an evaluation of water supply.

murraysmith

Section **2**

Section 2

Water Supplier Description

2.1 General

This section describes the City of Sherwood (City) service area and water system and presents historical population and water demand estimates and use records. This section also includes an assessment of the City's supply sources, a review of existing distribution system water losses, and a water rights summary.

2.2 Service Area and Background

The City's current water service area includes all areas within the current City limits. The City provides potable water to approximately 19,145 people through approximately 5,558 residential, commercial, and multi-family service connections. The study area of this planning effort includes the current city limits, the Tonquin Employment Area (TEA), Brookman Annexation area, and the West Urban Reserve which are within the City's existing Urban Growth Boundary (UGB). The existing and future study area of this planning work is illustrated in Figure 2-1.

Currently, the City's primary water supply is from the Willamette River Water Treatment Plant (WRWTP). Water is supplied from the WRWTP to Sherwood's Sunset Reservoirs through approximately 6.3 miles of 63-inch and 48-inch diameter welded steel pipe. Some segments of the transmission main currently serve both Sherwood and Wilsonville customers with pipe oversizing to accommodate future WTP and service area expansion.

Sherwood operates three groundwater wells for back-up supply within the City's water service area. Wells 3, 5 and 6 have a combined operational capacity of approximately 2.58 mgd. Liquid sodium hypochlorite is added at each well for disinfection.

The City's water distribution system consists of three service zones supplied by three storage reservoirs and two pumping stations. One of the service zones is supplied through a continuous operation pump station. Pressure zone boundaries are defined by ground topography in order to maintain service pressures within an acceptable range for all customers in the zone. Figure 2-2 presents a water system map including major facilities and pressure zone boundaries.

2.3 Supply Sources

2.3.1 Wilsonville Supply Connection

The City has a 63-inch and a 48-inch diameter welded steel metered connection to the Willamette River Water Treatment Plant (WRWTP) in the City of Wilsonville through a 6-mile-long transmission line. The intake for the plant is located at Township, Range, Section: 3S1W22NE ¼ of SE ¼. As of 2015, this is the City of Sherwood's primary drinking water supply. There was a transition period away from the wells and the Tualatin intertie over the past 5 years. The WRWTP is operated and maintained under contract by Veolia Water, a private contractor.

2.3.2 Back-up Groundwater Wells

Three of the City's groundwater wells (Wells 3, 5, and 6) are currently used for emergency backup water supply. These three wells have an existing combined operational capacity of approximately 1,790 gallons per minute (gpm) (2.58 mgd). Well 5 production capacity is limited to 350 gpm due to foaming in the well caused by air entrainment at higher pumping rates. Well 4 is very low producing and high maintenance. The City intends to transfer the Well 4 water right to other City wells which may have additional capacity. For the purposes of this plan, Well 4 capacity is zero.

The groundwater supplies are disinfected through the addition of sodium hypochlorite at each well. Table 2-1 lists the location, pump type, horsepower, year constructed, approximate depth, approximate production capacity and casing diameter for each of the City's groundwater wells.

Table 2-1
Groundwater Well Summary

Well No.	Location	Pump Type	Hp	Year Constructed	Production Capacity (gpm)	Approx. Depth (feet)	Casing Dia. (inch)
1	Well Abandoned						
2	Well Abandoned						
3	Intersection of Pine and Willamette Street 2S,1W,32,SE,NW	Vertical Line Shaft Turbine	75	1946	890	319	12
4	17191 Smith Road 2S,1W,32, NW,NE	Vertical Line Shaft Turbine	60	1969	0[1]	458	14
5	16491 Sunset Boulevard 2S,1W,32, NW,SW	Vertical Line Shaft Turbine	150	1984	350	800	16
6	1830 Roy Street	Vertical Line Shaft Turbine	75	1997	550[2]	889	16
Total Production Capacity (gpm)[mgd)]					**(1,790)[2.58]**		

Notes:

[1] Well 4 is very low producing and high maintenance. The City plans to transfer the Well 4 water right to other wells.

[2] Production capacity is limited by available water rights.

2.3.3 Emergency Connections with City of Tualatin

Sherwood maintains the water supply piping with the City of Tualatin as an emergency connection. The transmission main, which is an approximately 4-mile long, 24-inch diameter ductile iron pipe owned by the City of Sherwood, begins at the Tualatin Community Park where the Tualatin-Portland supply main connects to the City of Tualatin's distribution system. A pressure reducing valve (PRV) at this connection reduces the hydraulic grade to approximately 385 feet of head for the City of Sherwood. The transmission main runs west along SW Tualatin Road and SW Herman Road and south on SW Cipole Road, SW Tualatin-Sherwood Road and SW Oregon Street to a connection to the City's distribution system at the intersection of SW Oregon Street and SW Murdock Street.

2.4 System Interties and Intergovernmental Agreements

The City of Sherwood has a supply connection with the City of Wilsonville near the Willamette River Water Treatment Plant. In addition, the City of Sherwood has the old supply connection with the City of Tualatin as well as two emergency interties at the western portion of the City of Tualatin's water system as previously discussed. The City of Sherwood has an intergovernmental agreement (IGA) with the City of Wilsonville pertaining to the primary supply source. The previous IGA amongst Sherwood, Wilsonville, Tualatin, and TVWD defines the capacity in each shared pipe segment that is available to each water provider within the Washington County Supply Line and related facilities, although this supply source is no longer in use.

2.5 System Summary

2.5.1 Land Use

Existing land use designations within the Urban Growth Boundary are primarily residential with some areas designated for industrial and office/commercial/retail purposes. The City also includes rights-of-way, schools, parks, open spaces and vacant land. Land use and zoning classifications for Sherwood's water system planning area are established under the City's Comprehensive Plan. Table 2-2 summarizes land uses and zoning classifications for the City's water system planning area in accordance with the Comprehensive Plan designations.

Table 2-2
Land Use Summary

Zone	Zoning Description	Area City of Sherwood UGB (acres)
VLDR	Very Low Density Residential	108
LDR	Low Density Residential	677
MDRL	Medium Density Residential – Low	182
MDRH	Medium Density Residential – High	200
HDR	High Density Residential	146
NC	Neighborhood Commercial	1
OC	Office Commercial	31
OS	Open Space	4
RC	Retail Commercial	101
GC	General Commercial	77
LI	Light Industrial	258
GI	General Industrial	250
IP	Institutional/Public	142
	UGB Expansion Area	818
	Existing Rights-of-Way	390
	Total	**3,385**

2.5.2 Water Treatment Plant

The Willamette River Water Treatment Plant (WRWTP) in the City of Wilsonville began operating in 2002 using conventional filtration to treat up to 15 million gallons per day (mgd) of Willamette River water for municipal consumption. The facility was developed and funded by Wilsonville and the Tualatin Valley Water District (TVWD). In 2006, Sherwood purchased 5 mgd of the WRWTP's capacity. The plant is currently operated and maintained under private contract by Veolia Water.

2.5.3 Pressure Zones, Reservoirs, and Pump Stations

The City's existing distribution system is divided into three major pressure zones. Pressure zone boundaries are defined by ground topography in order to maintain service pressures within an acceptable range for all customers in the zone. The hydraulic grade line (HGL) of a zone is designated by overflow elevations of water storage facilities, discharge pressure of pump stations, or outlet settings of pressure reducing valves (PRVs) serving the zone.

Sherwood's water system has three reservoirs with a total combined storage capacity of approximately 9.0 million gallons (MG) with all reservoirs full. The Sunset Reservoirs consist of a 2 MG and a 4 MG reservoir in Snyder Park. The Kruger Road Reservoir has a capacity of 3.0 MG.

Sherwood's water system includes two booster pump stations. The Sunset Pump Station has 5 pumps, totaling 260 hp, or 3,700 gpm. The Wyndham Ridge Pump Station has 4 pumps, totaling 120 hp or 1200 gpm.

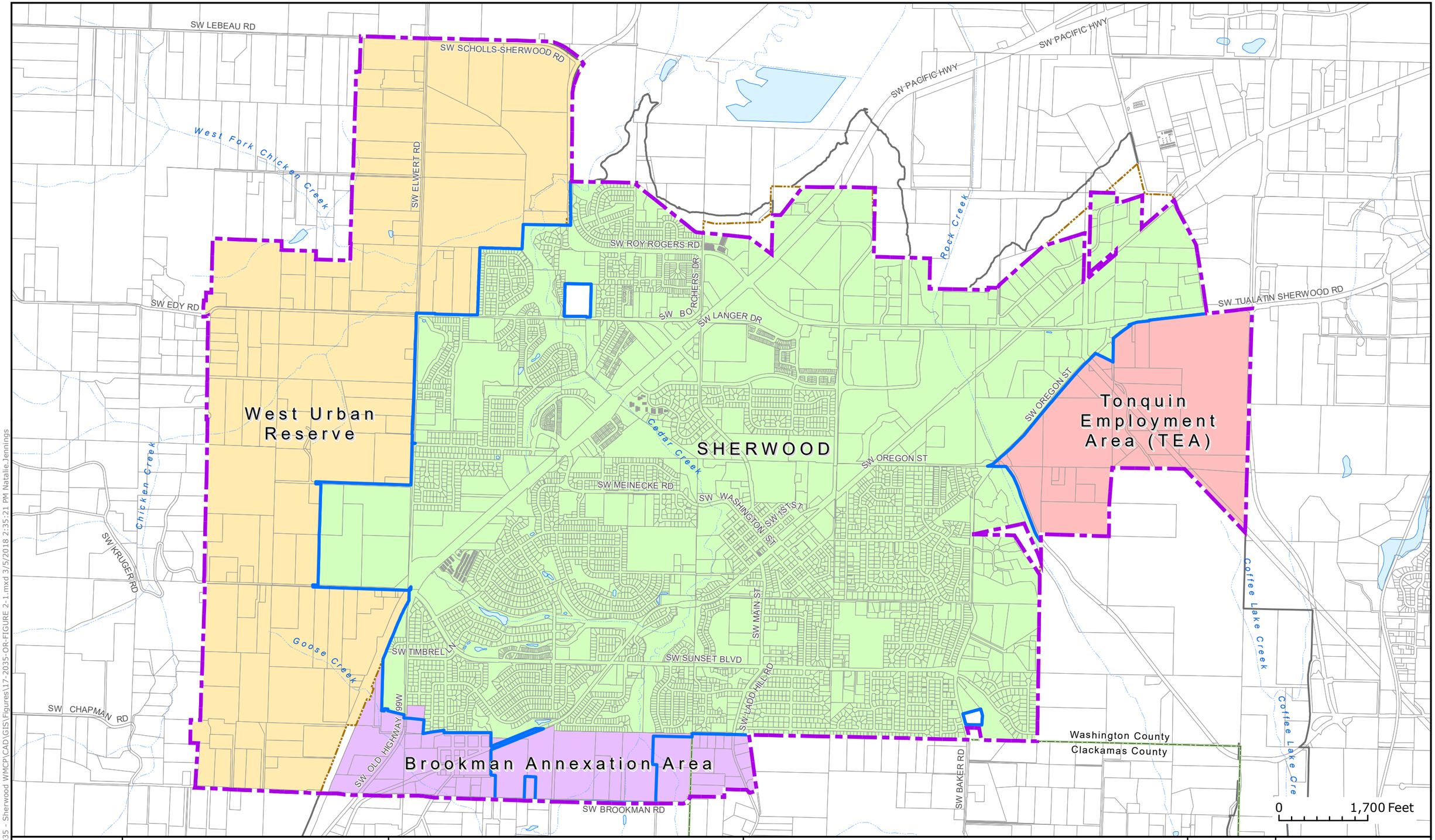
The majority of Sherwood customers are served from the 380 Pressure Zone which is supplied by gravity from the City's Sunset Reservoirs. The 380 Zone can also be served by gravity from the WRWTP, the City's groundwater wells and the Tualatin emergency supply connection. The 535 Pressure Zone, serving the area around the Sunset Reservoirs, is supplied constant pressure by the Sunset Pump Station. The Murdock sub-zone, with an HGL of 400 feet, is served through a PRV from the 535 Zone. The 455 Pressure Zone serves higher elevation customers on the western edge of the City. This zone is served by gravity from the Kruger Reservoir which is filled by pumping out of the 380 Zone at the Wyndham Ridge Pump Station.

2.5.4 Distribution Pipes

The City's distribution system is composed of various pipe materials in sizes shown in Table 2-3. The total length of piping in the service area is approximately 77.4 miles. Pipe materials include cast iron, ductile iron, PVC and copper. The majority of the system is ductile iron.

Table 2-3
Distribution System Pipe Summary

Pipe Diameter	4"	6"	8"	10"	12"	14"	16"	18"	24"	Total
Approximate Length (miles)	0.7	5.0	37.2	6.9	14.0	0.9	1.8	0.8	4.3	**77.4**



G:\PDX_Projects\17\2035 - Sherwood WMCP\CAD\GIS\Figures\17-2035-OR-FIGURE 2-1.mxd 3/5/2018 2:35:21 PM Natalie.Jennings

murraysmith

City of Sherwood Oregon

City of Sherwood Water Management and Conservation Plan

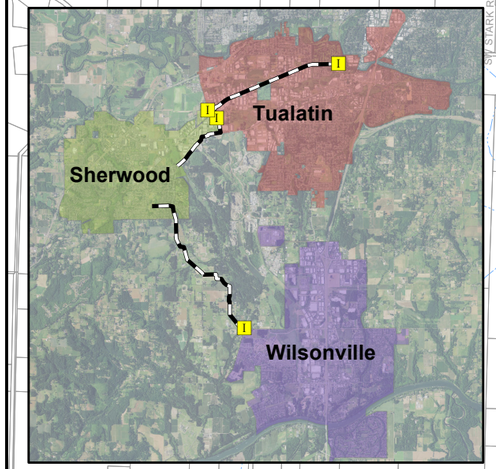
Legend

- City Limits and Existing Service Area
- Proposed 2034 Water Service Area
- Urban Growth Boundary
- Brookman Annexation Area
- Sherwood West Urban Reserve
- Tonquin Employment Area
- Stream
- County Boundary

N W E S

Figure 2-1 Study Area

March 2018 17-2035



To Intertie

Future 380 WEST Zone

Future 475 WEST Zone

Future 455 WEST Zone

Future 630 WEST Zone

Future 380 TEA Zone

Future 380 BROOKMAN Zone

Future 400 BROOKMAN Zone

380 Zone

400 Zone

455 Zone

535 Zone

Wyndham Ridge Pump Station

Kruger Reservoir

Well 5

Well 6

Sunset Pump Station

Sunset Reservoir 1

Oregon Street PRV

To Intertie

West Fork Chicken Creek

Chicken Creek

Rock Creek

Cedar Creek

Goose Creek

Coffee Lake Creek

SW SCHOLLS-SHERWOOD RD

SW ROY ROGERS RD

SW PACIFIC HWY

SW EDY RD

SW CONZELMANN RD

SW CENTURY DR

SW RINGER ST

SW CHAPMAN RD

SW KRUGER RD

SW BROOKMAN RD

0 1,700 Feet

G:\PDX_Projects\17\2035 - Sherwood WMCP\CAD\GIS\Figures\17-2035-OR-FIGURE 2-2.mxd 3/23/2018 9:48:39 AM Natalie.Jennings

murraysmith

City of Sherwood Oregon

City of Sherwood Water Management and Conservation Plan

Legend

- Existing Pump Station
- Existing Well
- Existing Reservoir
- Existing Pressure Reducing Valve
- Existing Transmission
- Existing Water Main
- City Limits
- Urban Growth Boundary (UGB)

Existing Pressure Zones:
380
400
455
535

Proposed Pressure Zones:
380 West
400 Brookman
455 West
475 West
630 West

N W E S

Figure 2-2 Existing and Future Study Area

March 2018 17-2035

2.6 Current Population Estimates

2.6.1 General

Estimates of the existing population and total number of dwelling units within the water system planning area were developed through a review of existing City planning data, previous water supply planning efforts, population forecast data developed by Metro for the region's water suppliers and Portland State University population forecasts.

2.6.2 Existing Population

The City currently supplies water to approximately 19,145 people in the water service area through approximately 5,558 service connections. Based on a review of U.S. Census data, the number of persons per dwelling unit is approximately 2.88. This results in approximately 6,650 existing dwelling units. The larger number of dwelling units relative to the number of service connections reflects single metered connections to multi-family dwelling units within the City's water service area. Table 2-4 summarizes historical and current populations within the City's water service area based on information available from Portland State University Population Research Center.

Table 2-4
Historical Population Summary

Year	Population
2006	16,115
2007	16,365
2008	16,420
2009	16,640
2010	18,205
2011	18,255
2012	18,265
2013	18,575
2014	18,955
2015	19,080
2016	19,145

2.7 Water Demand and Metered Consumption

2.7.1 General

Water demand refers to the quantity of finished water delivered to the water distribution system from the City's water sources, which have included Willamette River finished water from the Willamette River Water Treatment Plant (WRWTP) in the City of Wilsonville (metered at the point

where the finished water enters the City's transmission line), purchased water from City of Portland's Portland Water Bureau (PWB) (through the City of Tualatin's system), and groundwater from City wells. Water demand includes metered consumption, unmetered uses, and water lost to leakage. For the purposes of the WMCP, the terms demand and production are synonymous. Consumption refers to the portion of water demand that is metered. Demand and consumption are typically discussed as a rate in terms of million gallons per day (mgd), cubic feet per second (cfs), and gallons per minute (gpm)) and as a monthly or annual volume in terms of million gallons (MG). Water use per person (per capita use) is expressed in gallons per person (per capita) per day (gpcd).

2.7.2 Historical Water Demand

The City maintains records of historical demands. **Table 2-5** summarizes demand data for the years 2006 through 2016. **Figure 2-3** shows the total monthly demands for each of the years 2012-2016.

Table 2-5
Historical Water Demand Summary

Year	Annual Water Use (mg)	Peak Season Water Use [1] (mgd)	Average Day Demand (ADD)		Maximum Day Demand (MDD)		MDD:ADD
			mgd	gpcd	mgd	gpcd	
2006	741	3.5	2.0	126	Data Not Available		
2007	694	3.2	1.9	116			
2008	694	3.2	1.9	116			
2009	750	3.5	2.1	123			
2010	705	3.4	1.9	106			
2011	686	3.2	1.9	103			
2012	696	2.9	1.9	104	3.8	211	2.0
2013	685	2.9	1.9	101	3.8	206	2.0
2014	700	3.2	1.9	101	3.7	197	1.9
2015	708	3.5	1.9	101	4.1	214	2.1
2016	662	2.9	1.8	94	3.7	194	2.1
Average	**690**	**3.1**	**1.9**	**100**	**3.8**	**204**	**2.0**

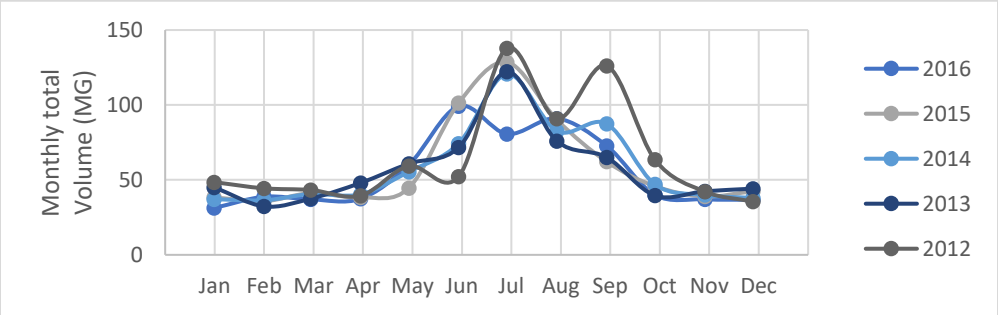
Note:
[1] Peak season water use is the cumulative volume of water use during the three highest consecutive water use months divided by the number of days in that period.

Based on the most recent historical water demand patterns and historical population, the water service area's average daily demand has primarily decreased over the last 5 years. This is likely due to conservation and unaccounted-for water reduction efforts that are becoming increasingly more effective, which are described later in this WMCP. The most recent year of data, 2016, the average day demand was approximately 1.8 mgd with an average day per capita consumption of approximately 94 gpcd. Recent maximum daily water demand usage has ranged from 1.9 times to

2.1 times the average day demand. This is equivalent to a maximum per capita usage ranging from 194 to 214 gpcd.

The estimated average daily and maximum daily demand per capita reported in the 2009 WMCP were 113 gpcd and 249 gpcd, respectively. In the past five years, average daily demand per capita has ranged between 94 gpcd and 104 gpcd while maximum day demand per capita has ranged between 194 gpcd and 214 gpcd, as shown in Table 2-5. Thus, average daily demand per capita has been below 113 gpcd four of the past five years and the maximum day demand per capita has been consistently lower than 249 gpcd.

Figure 2-3
Total Monthly Demand



2.7.3 Historical Water Consumption

2.7.3.1 Customer Description

The City has two finished water billing classes: residential/multi-family and commercial, but the tracks water in four categories, commercial, irrigation, multi-family, and residential. The City is primarily residential with little industrial development and limited commercial development. In addition, a significant portion of the water distribution system is used for irrigation of residential and non-residential properties. Figure 2-4 and Table 2-6 shows the average water consumption by customer class from 2012 through 2016 as a percentage. This data cannot be compared to the previous WMCP because the City did not track this information prior to that plan.

Figure 2-4
2012-2016 Total Water Consumption by Customer Class

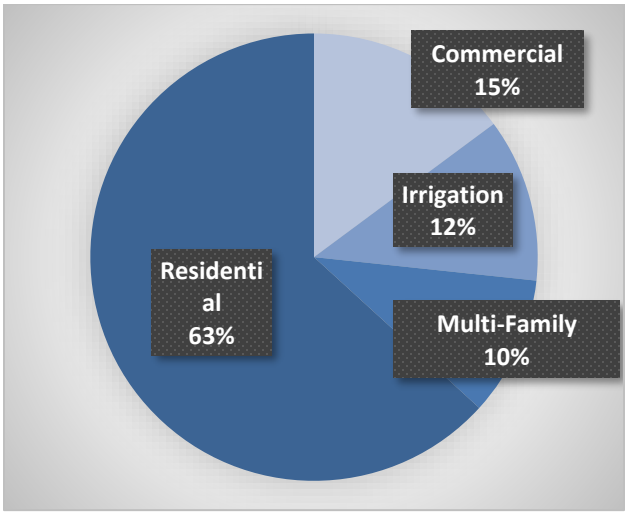


Table 2-6
2012-2016 Total Water Consumption by Customer Class

Usage (mgd)	2012	2013	2014	2015	2016	Total
Commercial	0.22	0.23	0.27	0.26	0.26	0.25
Irrigation	0.18	0.18	0.21	0.23	0.19	0.20
Multi-Family	0.16	0.16	0.17	0.18	0.17	0.17
Residential	1.02	1.02	1.07	1.12	1.08	1.06
Total	1.59	1.59	1.72	1.80	1.70	1.68

2.8 Water Rights Summary

The City holds surface water and groundwater rights, which are described below and in detail in Table 2-7. Copies of the City's water rights claims, permits, and certificates are included in Appendix C.

2.8.1 Surface water

The City is a member of the Willamette River Water Coalition (WRWC), which holds Permit S-49240 (modified by Transfer T-10477) for use of the Willamette River. Permit S-49240 authorizes the use of up to 202.0 cfs (130 mgd) from the Willamette River for municipal and industrial use and has a priority date of June 19, 1973. The WRWC First Restated Intergovernmental Cooperative Agreement states that the City of Sherwood is currently allocated 31 cfs (20 mgd) under Permit S-49240. The Final Order approving the City's first WMCP issued on December 19, 2008 by OWRD provided the City access to up to 23.20 cfs (10,412 gpm, 14.99 mgd) under Permit S-49240.

2.8.2 Groundwater

The City holds three groundwater certificates (Certificates 82857, 40967, and 82650), one groundwater permit (Permit G-12546), and three groundwater registrations (Groundwater Registration Claims GR-1161, GR-1160, and GR-1162) that authorize the use of water for municipal purposes. A groundwater registration is a claim to appropriate water from a groundwater well which was initiated prior to August 3, 1955. The registrations filed with OWRD entitle the City to a right to appropriate the groundwater and apply it to beneficial use as described in the registration. A registration is not a final determination and is subject to an adjudication process. A groundwater registration has a tentative priority from the date when the construction of the well was started.

The City's authorization for use of groundwater totals 6.42 cfs (4.14 mgd), which consists of the use of up to 1.99 cfs under the three groundwater registrations, 3.20 cfs under the three certificates, and 1.23 cfs under Permit G-12546. The City completed development of Permit G-12546 and filed a Claim of Beneficial Use (COBU) in June 2007 that demonstrated full beneficial use of the permit. The COBU is still pending at OWRD.

Table 2-7
Water Rights Summary

Source	Priority Date	Application	Permit	Certificate	Groundwater Registration (GR) Claim [GR Certificate]	Transfer	Entity Name on Water right	Type of Use[2]	Authorized Date of Completion	Authorized Rate[1] cfs(gpm)[mgd]	Maximum Rate of Withdrawl to Date		Average Daily Diversion (mgd)	Average Monthly Diversion (MG)		
											Instantaneous (cfs)	Annual (MG)	2016	5-year (2012-2016)	2016	5-year (2012-2016)
Ground Water																
Well 1	4/30/1922	–	–	–	(GR-1161) [GR-1707]	–	City of Sherwood	M, M&I	n/a	0.36(160)[0.23]	0.36	NA[5]	0	0	0	0
Well 2	5/12/1922	–	–	–	(GR-1160) [GR-1706]	–	City of Sherwood	D, M, M&I	n/a	0.49(220)[0.32]	0.49	69	0	0	0	0
Well 3	7/25/1946	–	–	–	(GR-1162) [GR-1708]	–	City of Sherwood	D, M, M&I	n/a	1.14(510)[0.73]	1.14	2694	0	0.024	0	0.694
Well 3	11/3/1980	G-9504	G-9491	82857	–	–	City of Sherwood	M	n/a	0.87(390)[0.56]	0.87	2694	0	0.024	0	0.694
Well 4	2/3/1969	G-4777	G-4500	40967	–	–	City of Sherwood	M	n/a	0.83(372)[0.54]	0.83	63	0	0.002	0	0.06
Well 5	2/13/1985	G-11347	G-10495	82650	–	–	City of Sherwood	M	n/a	1.50(673)[0.97]	1.5	118	0	0.01	0	0.26
Well 6	6/27/1990	G-12155	G-12546	–	–	–	City of Sherwood	M	10/1/1999	1.23(550)[0.79]	1.23	107	0	0.07	0	2.15
															Total	6.42(2875)[4.14]
Surface Water																
Willamette River[3]	6/19/1973	S-50693	S-49240	–	–	T-10477	Willamette River Water Coalition, to which Sherwood is a member	M, I	10/1/2047	202.0 cfs (31.0 cfs of which is the City of Sherwood's portion[3])	6.37	685	1.8	1.66	60.2	51553.4

Notes:

[1] Permit Rate shown is the instantaneous rate as documented in the water rights permit, certificate or claim. No limitations of total annual volume have been established for these rights.

[2] Types of beneficial use are M: Municipal, D: Domestic, I: Industrial, and M&I: Manufacturing and Industrial.

[3] Transfer T-10477 moved the point of diversion downstream approximately 900 feet. The WRWC First Restated Intergovernmental Cooperative Agreement states that the City of Sherwood is currently allocated 31 cfs (20 mgd) under Permit S- 49240. The Final Order approving the City's WMCP issued on December 19, 2008 by OWRD provided the City access to up to 23.20 cfs (10,412 gpm, 14.99 mgd) under Permit S-49240. This right can also be limited by streamflows. Details are discussed in section 2.8.

[4] Well 3 has two water rights that combine, so usage is reported together

[5] Well 1 was not a viable source of water, so it was abandoned, and no records exist of maximum annual usage.

2.9 Source Sensitive Species & Water Quality Impairments

OAR 690-086-140(5) requires municipal water suppliers to identify the following for each of its water sources: 1) any listing of the source as water quality limited (and the water quality parameters for which the source was listed); 2) any streamflow-dependent species listed by a state or federal agency as sensitive threatened or endangered that are present in the source; and 3) any designation of the source as being in a critical groundwater area.

2.9.1 Water Quality

The Willamette River has been a drinking water source for decades. The cities of Springfield, Corvallis, Adair Village, and Wilsonville, as well as Sherwood, provide safe drinking water from the Willamette River. The Willamette River has been a water source for the City of Corvallis since 1949. The Willamette River Water Treatment Plant in the City of Wilsonville, which treats the City of Sherwood's drinking water, has been operating since 2002 and has met or exceeded every safe drinking water quality standard. Environmental protection laws and restoration activities over the past few decades have improved water quality in the Willamette River and they support continued use of the Willamette River as a drinking water source.

The Oregon Department of Environmental Quality's (DEQ) is required to assess water quality and report to EPA on the condition of Oregon's waters every two years. In accordance with the Clean Water Act Section 303(d), DEQ is required to identify waters that do not meet water quality standards and need a Total Maximum Daily Load (TMDL) pollutant load limit developed. The Environmental Protection Agency defines a TMDL as "the calculation of the maximum amount of a pollutant allowed to enter a waterbody so that the waterbody will meet and continue to meet water quality standards for that particular pollutant. A TMDL determines a pollutant reduction target and allocates load reductions necessary to the source(s) of the pollutant." For more information about TMDLs, visit: https://www.epa.gov/tmdl/program-overview-total-maximum-daily-loads-tmdl.

The Willamette River at the City's point of diversion (POD), which is located at the Willamette River Water Treatment Plant in the City of Wilsonville at approximately River Mile 39, is included on the DEQ's 303 (d) list for: aldrin; biological criteria; DDE 4,4; DDT 4,4; dieldrin; iron; polychlorinated biphenyls (PCBs); chlorophyll a; lead; and mercury.

Water quality parameters may be removed from the 303(d) list under the following circumstances: 1) TMDLs or other control measures have been established that are expected to improve water quality, 2) data show water quality has improved, and 3) water quality standards are revised.

At the City's POD on the Willamette River, DEQ delisted *E. coli* in 2010, temperature in 2010, and dioxin (2,3,7,8-TCDD) in 1998 upon approval of a TMDL. The 303(d) listing information was obtained from: http://www.deq.state.or.us/wq/assessment/rpt2012/search.asp

2.9.2 Listed Streamflow-dependent Species

Table 2-8 shows the fish species with state or federal protections in the Willamette River within the reach of the City's point of diversion (~river mile 39).

Table 2-8
Listed Fish Species in the Willamette River (River Mile 39)

Listed Fish Species	Type of Listing		Evolutionarily Significant Unit (ESU) (i.e. Range of Federal/State Listing)
	Federal	State	
Fall Chinook	Threatened	Sensitive-Critical	Lower Columbia River
Spring Chinook	Threatened	Sensitive-Critical	Lower Columbia River, Upper Willamette River
Coastal Cutthroat		Sensitive-Vulnerable, below Willamette Falls	Lower Columbia River, including up to Willamette Falls; Coastal Cutthroat Trout Species Management Unit (SMU)
Coho Salmon	Threatened	Endangered	Lower Columbia River, including up to Willamette Falls
Winter Steelhead	Threatened	Sensitive-Critical	Lower Columbia River, Upper Willamette River
Chum Salmon	Threatened	Sensitive-Critical	Columbia River
Western Brook Lamprey		Sensitive-Vulnerable	Columbia River System
Pacific Lamprey	Petitioned for listing	Sensitive-Vulnerable	Columbia River System
Pacific Eulachon	Threatened	Sensitive-Vulnerable	Southern DPS, Northern Oregon and Washington

Sources:

- Federal ESA listed species (T&E), from NOAA Fisheries Office of Protected Resources: http://www.nmfs.noaa.gov/pr/species/esa/fish.htm
- Federal Sensitive species, from the Interagency Special Status/Sensitive Species Program for Oregon and Washington State: http://www.fs.fed.us/r6/sfpnw/issssp/agency-policy/
- Oregon State ESA listed species, from the Oregon Department of Fish & Wildlife: http://www.dfw.state.or.us/wildlife/diversity/species/threatened_endangered_candidate_list.asp
- Oregon State Sensitive Species, from the Oregon Department of Fish & Wildlife: http://www.dfw.state.or.us/wildlife/diversity/species/sensitive_species.asp
- Federal Species of Concern, from the U.S. Fish & Wildlife Service, Oregon Fish & Wildlife Office: http://www.fws.gov/oregonfwo/Species/Data/PacificLamprey/default.asp

2.9.3 Critical Groundwater Area

The City's groundwater rights are not located in a critical groundwater area. However, the water rights are located in the Sherwood-Wilsonville Groundwater Limited Area.

2.10 Source Assessment

2.10.1 General

Prior to 2011, the City of Sherwood used groundwater as the main supply source and augmented supply by obtaining PWB water through the connection with the City of Tualatin. In May 2011, the City of Sherwood started using water from the WRWTP. In March 2012, primary supply was switched to the Willamette River source, although some water was still obtained from the PWB source to meet contractual obligations. The City of Sherwood stopped purchasing water via the

City of Tualatin connection in June 2015. Consequently, the City of Sherwood water supply source is now exclusively the Willamette River. The City's groundwater wells are operated as emergency supply. An assessment of the adequacy and reliability the City's water supply sources is presented below.

2.10.2 The Willamette River Supply

As previously described, the City holds a 31 cfs portion of Permit S-49240, which authorizes the use of up to 202 cfs from the Willamette River. OWRD's Final Order approving the City's WMCP on December 19, 2008 provided the City access to up to 23.20 cfs. Water availability analyses, historical flow records, and the priority date of the permit are analyzed below as a means of assessing the reliability of the City's Willamette River water supply under Permit S-49240.

2.10.2.1 Water Availability and Historical Flow Records

Available streamflows in the Willamette River based on the OWRD database suggests that Permit S-49240 will be highly reliable. After considering all existing consumptive use and non-consumptive use water rights (including instream water rights), OWRD's online water availability database indicates that water is available for appropriation from the Willamette River at Salem gage (14191000). Specifically, up to 993 cfs of water is available for appropriation from the Willamette River at Salem in the month of August and more than that is available every other month of the year based on an 80 percent exceedance probability.

Average minimum streamflows in the Willamette River at the Salem gage from 2000 through 2016 range from 6,537 cfs in August to 24,759 cfs in January, which suggests that Permit S-49240 is a reliable source of water supply. However, as shown in Table 2-9 and described below, the City's Willamette River water supply reliability is affected by target flows for maintenance of fish populations included in permit extension conditions for Permit S-49240 and included in the Willamette Project Biological Opinion (BiOp).

Table 2-9 shows the permit extension target flows and the 2000-2016 average minimum 7-day rolling average flow for each month (e.g., for the month of July this would be the average of the lowest recorded 7-day rolling average flow during the month of July for each of the 17 years of July data included in the analysis), as well as the minimum 7-day rolling average flow recorded in 2015 to provide an example of dry year flows.

The target flows on the Willamette River shown in Table 2-9 stem from the process of securing an extension of time until October 1, 2047 to put Permit S-49240 to beneficial use, during which Oregon Department of Fish and Wildlife (ODFW) recommended to OWRD that the extension of time contain conditions intended to "maintain the persistence of listed fish." The target flows vary based on the time of year. If the target flows are not met, use of water under Permit S-49240 would be reduced in proportion to the amount by which the flow target is not met (based on a seven-day rolling average of mean daily flows). During the period from April 1 through June 30, the reduction in the amount that can legally be diverted will not exceed 20 percent. For some context, the U.S. Army Corps of Engineers (USACE) manages thirteen reservoirs within the

Willamette River Basin to meet to meet fish flow targets at the Willamette River at Salem gage (USGS Gage 14191000). The USACE's target flows differ slightly from the ones included in Final Order approving an extension of time for Permit S-49240, but both of the target flows are measured at the Salem gage (USGS 14191000).

Table 2-9
Fish Persistence Target Flows at the Willamette River at Salem Gage

Period	Target Flow[2](cfs)	2000-2016 Avg. Minimum Flow (cfs)	2015 Minimum Flow (cfs)
January	6,000	24,759	21,829
February	6,000	16,331	13,329
March	6,000	16,454	10,104
April	15,000	19,820	11,114
May	15,000	16,060	8,717
June 1 - 15	12,600	14,666	7,143
June 16 - 30	8,500	10,395	6,354
July	5,630	7,001	5,503
August	5,630	6,547	5,287
September	5,630	6,947	5,327
October	5,630	8,947	6,449
November	6,000	12,471	7,597
December	6,000	20,948	13,571

Notes:

[1] Flow targets may have been met intermittently between the dates shown, which are the earliest and latest dates flow targets were missed in each calendar year.

[2] Fish Persistence Target Flows at the Willamette River at Salem Gage (USGS Gage 14191000), monthly average minimum 7-day rolling average flows at the Salem gage from 2000-2016, and monthly minimum 7-day rolling average flows at Salem gage in 2015

Analysis of seven-day rolling average streamflow records for the Willamette River at the Salem gage (USGS 14191000) from January 2000 through December 2016 showed that target flows for Permit S-49240 were met on 94.9 percent of the days, and thereby missed 5.1 percent of the days. Table 2-10 presents annually the number of days from 2000 through 2016 that the seven-day rolling average flow did not meet the above-described target flow and the time periods during which those days with missed targets occurred, as well as the average deficit and maximum deficit of streamflows compared to target flows. The target flows were not met in 10 out of the 16 years, and in seven of the years the target flows were not met only in May and June. The 317 days in which the target flows were not met mostly occurred in April, May, and June, which to do not correspond to the City's time period of peak demands in July and August. The average percentage that target flows were missed was less than 10 percent in every year from 2000 through 2016, except 2015. The maximum percentage that target flows were missed was as high as 43.3 percent in 2015.

Thus, historical flow records indicate that permit extension conditions affect the reliability of Permit S-49240 a little less than 50 percent of years from one day to several months. However,

streamflow targets are most often missed outside of the peak season, thereby reducing the limitations that permit conditions may place on the City's ability to meet demands.

Table 2-10
Willamette River Flows Compared to Permit S-49240 Target Flows, 2000-2016

Year	Number of Days Flow Target Missed	Period Flow Targets Missed (Earliest-Latest)[1]	Average Deficit (cfs)	Average Deficit (%)	Max Deficit (cfs)	Max Deficit (%)
2000	1	June 12	29	0.2%	29	0.2%
2001	73	April 1-August 24	507	5.9%	2740	21.7%
2002	2	June 15-June 30	59	0.5%	86	0.7%
2003	13	May 28-June 30	718	8.3%	1353	15.9%
2004	18	April 1-May 29	308	2.1%	586	3.9%
2005	0					
2006	0					
2007	20	May 30-June 30	363	3.2%	1473	11.7%
2008	0					
2009	0					
2010	0					
2011	0					
2012	0					
2013	13	May 17-June 15	697	5.2%	1571	12.5%
2014	4	June 6-June 9	150	1.2%	243	1.9%
2015	142	April 6-September 16	2216	16.9%	6283	43.3%
2016	31	May 17-June 30	889	6.6%	2029	14.9%

Note:

[1] Flow targets may have been met intermittently between the dates shown, which are the earliest and latest dates flow targets were missed in each calendar year.

The recent gage data presented above in Table 2-9 indicate that the fish flow targets are met most years, however, this may not be the case during future low flow water years as a result of minimum stream flow targets adopted by the BiOp in 2008[1], which are measured on the Willamette River at Salem. The BiOp target flows are adjusted based on the volume of stored water in mid-May as follows:

1. During years considered "Adequate" or better, when at least 1.20 million acre-feet (MAF) are anticipated to be stored by mid-May, the USACE manages the reservoirs to meet Minimum Flow Objectives (see Table 2-11.)

[1] The minimum stream flow targets adopted by the Bi-Op are based on the minimum stream flow targets included in the 2007 USACE Biological Assessment.

2. During years when storage volumes are predicted to be lower, the USACE will manage the reservoirs to meet lower flow objectives using either "Insufficient Year" requirements or "Deficit Year" requirements.

    a. "Insufficient Year:" A year in which 0.90 to 1.19 MAF are anticipated to be stored in the reservoirs by mid-May. Under this scenario, the flow objectives are adjusted in proportion to where the projected storage volume falls in the scale between 0.90 and 1.20 MAF. As an example, **Table 2-11** shows "Insufficient Year" flow objectives during a year when total storage in mid-May is 0.95 MAF.

    b. "Deficit Year:" A year in which less than 0.90 MAF are anticipated to be stored in the reservoirs by mid-May. Under this scenario, flow objectives in April and May are equal to fish flow targets, 3,000 cfs (35 percent) lower than the fish flow targets during late June, and 630 cfs (11 percent) lower than the fish flow targets during July and August.

Table 2-11
Flow Objectives for the Willamette River at Salem

Time Period	Minimum Flow Objectives in at least Adequate Years (cfs)	Example "Insufficient Year" Flow Objectives based on 0.95 MAF (cfs)	"Deficit Year" Flow Objectives (cfs)
April 1 – 15	17,800	15,467	15,000
April 16 – 30	17,800	15,467	15,000
May 1 – 31	15,000	15,000	15,000
June 1 – 15	13,000	11,333	11,000
June 16 – 30	8,700	6,033	5,500
July 1 – 31	6,000	5,167	5,000
August 1 – 15	6,000	5,167	5,000
August 16 – 31	6,500	5,250	5,000
September 1 – 30	7,000	5,333	5,000
October 1 – 31	7,000	5,333	5,000

Note:
[1]The minimum stream flow targets adopted by the Bi-Op are based on the minimum stream flow targets included in the 2007 USACE Biological Assessment.

Therefore, the impacts of reduced flow objectives during "Insufficient" and "Deficit" years on the ability to meet fish flow targets at the Salem gage are expected to vary throughout the year, and during "Deficit Years," the likelihood of curtailment during at least some portions of the year is high. According to a USACE analysis, 10 years were designated as "deficit years" between 1936 and 1999 (64-year period).

2.10.3 Priority Date

The priority date of Permit S-49240 is June 19, 1973, which is junior to the June 22, 1964 priority date of the unconverted minimum perennial streamflow (MPSF) at Wilsonville. The unconverted MPSFs on the Willamette River have both natural flow and released stored water components. OWRD historically established minimum perennial streamflows for waters throughout the State of

Oregon. According to OAR 690-077-0054, all minimum perennial streamflows established before June 25, 1988 shall be converted to instream water rights. To date, there are several MPSFs that have not been converted to instream water rights. At Wilsonville, the natural flow component of the unconverted MPSF is 1,500 cfs and the released stored water component is up to 4,700 cfs. Since these flows are lower than the target flows for which the USACE is already managing the reservoirs, it appears that the MPSFs will not likely impact the reliability of the WRWC Permit S-49240. However, the City should continue to monitor activities associated with converting the MPSFs in the Willamette Basin, as well as the Willamette Basin Review (often called the "Reallocation Study") process, which will influence the extent to which stored water from USACE managed reservoirs in the Willamette River Basin is protected instream in the future.

2.10.4 Groundwater Wells

As part of the development of the City's Water System Master Plan and previous WMCP, a hydrogeological evaluation to assess the potential capacity and supply limitations of the City's groundwater supply source was completed. Historical groundwater production rates and water level trend data were compiled and analyzed for each of the City's groundwater wells to evaluate the hydraulic response of the Columbia River Basalt Group aquifer underlying the City relative to historical groundwater pumping rates. From this evaluation it was observed that a distinct overall declining trend in water levels is occurring when the wells are in use and increases in this rate of water level decline has occurred during periods of peak groundwater production by the City. From the analysis, it was determined that continued groundwater production at historic rates would have required capital investment to maintain current pumping rates and will likely result in significant loss of production capacity as groundwater levels continued to decline. Development of additional groundwater production facilities is feasible, but additional groundwater production will result in an increased rate of water level decline and the ultimate loss of production capacity will occur sooner than under historic conditions. The rate of decline is dependent upon actual groundwater production. A technical memorandum documenting the complete groundwater supply evaluation is included in this report as Appendix D

Based on the hydrogeological assessment and historic water demands, the City's groundwater supply is inadequate to meet existing and future water system supply needs. As the water level in the aquifer underlying the City further declines, it is anticipated that this supply will become less reliable to the City, so it has been replaced.

The City's groundwater rights are also located in the Sherwood-Dammasch-Wilsonville Groundwater Limited Area, which means no new groundwater rights will be issued in the area.

2.10.5 Tualatin Supply Connection

As discussed above, the City's other backup supply source is from the City of Portland Bull Run Watershed and Columbia South Shore Wellfield. This supply to the City is excess capacity in the Washington County Supply Line provided from the City of Portland through the TVWD's wholesale water supply agreement. In addition, this supply is dependent upon the City of Tualatin's ability and agreement to wheel water to the City of Sherwood. As such, the adequacy of this supply is

limited under current agreements to 3 mgd. In addition, the owners of the Washington County Supply Line could reduce this amount if it is determined that one or more of the owners requires this capacity for their own needs. Since the City does not currently have a wholesale supply agreement with the City of Portland or control of the facilities which deliver water to the City's supply system, the long-term reliability and availability of this source is uncertain.

2.11 Unaccounted-for Water

Water production and meter records were reviewed for the City's water system for the past 10 years. Table 2-12 summarizes the water production and unaccounted-for water losses for this period. The billing software was replaced around 2011, which may have affected unaccounted-for water that year. During the last five years, the unaccounted-for water percentage has been continually declining and has been below 10 percent for the last three years. The water works industry generally considers a level of unaccounted-for water of 15 percent or more to be excessive. In addition, Division 86 of the Oregon Administrative Rules requires water suppliers with leakage greater than 10 percent to put in place a leak detection program. As long as the unaccounted-for water remains below 10 percent, the City will not need to implement a leak detection program. Nevertheless, the City has a leak detection and repair program, as described in Section 3.

Table 2-12
Water Production and Losses Summary

Year	Volume Purchased and Produced[1] (mg)	Metered & Other Usage (mg)	Annual Unaccounted-for Water (mg)	Percent Unaccounted-for Water (%)
2006	741	671	70	9.4%
2007	694	621	74	10.6%
2008	694	607	87	12.6%
2009	750	665	85	11.3%
2010	705	613	92	13.0%
2011	686	665	21	3.1%
2012	696	587	196	15.60%
2013	685	586	88	14.44%
2014	700	645	55	7.87%
2015	708	662	45	6.41%
2016	662	628	34	5.18%

Note:

[1] This is the quantity of finished water delivered to the water distribution system from the City's water sources, which have included Willamette River finished water from the Willamette River Water Treatment Plant (WRWTP) in the City of Wilsonville (metered at the point where the finished water enters the City's transmission line), purchased water from City of Portland's Portland Water Bureau (PWB), and groundwater from City wells. Since 2015, the Willamette River has been the City's primary water supply source.

2.12 Summary

This section presented a summary of the City's existing water system, including the City's supply sources, system interties and water rights. Also included was a discussion of existing land uses estimates of existing population and water demands within the water system service area, an evaluation of the adequacy and reliability of the City's supply sources, and an evaluation of unaccounted for water.

murraysmith

Section **3**

Section 3

WATER CONSERVATION ELEMENT

3.1 General

This section describes the City's existing water conservation programs and new water conservation five-year benchmarks.

3.2 Progress Report and Current Conservation Measures

This WMCP is an update to the WMCP approved by OWRD in a final order dated December 19, 2008 (published by the City as the January 2009 WMCP). A progress report on benchmarks was required as a condition in that WMCP final order and is required as part of this WMCP. The progress report presented in Table 3-1 is intended to fulfill both requirements.

The City's current water management and conservation measures include:

- A fully metered system
- A meter testing and maintenance program
- A leak detection and repair program that includes surveying 25 percent of the system annually
- Residential and multifamily water rates with a two-tiered block rate structure
- Monthly billing
- Free water conservation items
- Toilet rebates
- City irrigation systems upgraded with web-based controllers that use evapotranspiration data to increase watering efficiency
- Water conservation promoted in the City's newsletters, utility bills, and website
- City membership in the Regional Water Providers Consortium, which implements water conservation programs targeting City customers.

3.3 Water Use Measurement and Reporting

The City complies fully with the annual reporting requirements of OAR Chapter 690, Division 85. The City submits the annual report for its groundwater sources and Veolia Water submits the annual report for the City's Willamette River water supply source to OWRD on behalf of the City.

Table 3-1
Progress Report on Conservation Measures

Section Requirement	Sub-section Requirement	2008 Benchmarks	2017 Benchmark Status
OAR 690-086-150 (4) A description of the specific activities, along with a schedule that establishes five-year benchmarks, for implementation of each of the following conservation measures that are required of all municipal water suppliers:	(a) An annual water audit that includes a systematic and documented methodology for estimating any un-metered authorized and unauthorized uses	The City will continue measuring and recording water usage data to note trends or abrupt changes. The City is considering a more detailed record keeping program and analysis, such as documenting: source meter data; customer meter usage classified by type (i.e. Residential or Commercial); estimated quantities of unmetered water use via main flushing, firefighting, street cleaning, and other similar uses; and water leakage as identified through a leak detection program. The City will implement a more thorough annual water audit using AWWA's Water Audit Software or a similar method for estimating un-metered authorized and unauthorized uses.	The City currently utilizes a maintenance management information system (MMIS) system to conduct annual water audits, which is a software package that maintains a database of maintenance/system operations. The MMIS system collects meter data from: groundwater and surface water sources, customers (classified within one of the following categories: residential, multi-family, commercial, and irrigation), and maintenance activities (e.g., uni-directional flushing, hydrant maintenance, on-line sampling, street sweeping, and construction) estimated primarily via metering devices (e.g., diffusers, pitots, etc.). Maintenance activities are treated as metered customer connections. The City has not yet explored using AWWA water audit software or a similar method for estimating unmetered authorized and unauthorized uses due to resources being focused on the City's change in water supplies.
	(b) If the system is not fully metered, a program to install meters on all un-metered water service connections.	No benchmark	The City has a fully metered water system. The City began installing advanced metering infrastructure (AMI) on all meters in May 2014 and this installation effort is 99 percent complete.
	(c) A meter testing and maintenance program	The City and TVWD are installing bypass piping on the remaining large diameter meters so that all meters 2-inches in diameter and larger will be included in the meter testing and replacement program.	Bypasses have been completed for 2-inch and larger water meters. Meters larger than 2-inches are tested annually. Meters are repaired to meet AWWA standards.
	(d) A rate structure under which customers' bills are based, at least in part, on the quantity of water metered at the service connections	No benchmark	The City's water rate structure consists of a monthly base rate, plus a two-tiered block rate structure volume charge for residential and multi-family customers. Commercial and irrigation customers have a volume charge that is not tiered.
	(e) If the annual water audit indicates that system leakage exceeds 10 percent, a regularly scheduled and systematic program to detect leaks in the transmission and distribution system using methods and technology appropriate to the size and capabilities of the municipal water supplier;	The City will continue to educate customers regarding detection and elimination of water leaks downstream of the meter, including the current practice of notifying customers of possible leaks when higher than normal meter readings occur. The City will also continue to monitor unaccounted for water and should the percentage rise above the threshold, a distribution system leak detection program will be developed and implemented. For future WMCP updates, the following leak detection results will be presented: Leaks identified and repaired since the previous WMCP with estimated leak rate; Leak detection activities over the past 10 years; and Description of planned approach to perform leak detection.	The City has continued to educate customers regarding detection and elimination of water leaks downstream of the meter and to monitor non-revenue water. In addition, the City recently installed an AMI system which monitors water meters on an hourly basis. Meters found to be flowing continuously for greater than 2 days are provided with a leak alert door hanger/notice. In 2012, the City began surveying a quarter of the water system each year using a private contractor, for a total system leak detection survey completed every four years. The surveys found a total of 29 leaks during the past five surveys that produced water losses totaling approximately 59.75 gpm (0.09 mgd). Estimated leakage rates: 2012 - 7 gpm, 2013 - 27 gpm, 2014 (2 surveys this year) - 23.75 gpm, 2016 - 2 gpm. Leaks have been associated with mains/services/hydrants/valve and customer side leaks.
	(f) A public education program to encourage efficient water use and the use of low water use landscaping that includes regular communication of the supplier's water conservation activities and schedule to customers	No benchmark	The City includes conservation information in the City's annual consumer confidence report, newsletter, and utility bills. The City is a member of the Regional Water Providers Consortium (RWPC) and shares combined resources to promote water conservation. Through the RWPC, the City participates in various water conservation shows geared toward children from kindergarten-5th grade. In addition to the children programs, the RWPC has a marketing campaign to promote conservation through TV, radio, billboards, and buses. The City also promotes water conservation at community events, such as the Clean Water Festival, City Community Service Fair, and Home and Garden Shows.

Section Requirement	Sub-section Requirement	2008 Benchmarks	2017 Benchmark Status
OAR 690-086-150 (6) If the supplier serves a population greater than 1,000 and proposes to expand or initiate diversion of water under an extended permit for which resource issues have been identified under OAR 690-086-0140(5)(i), or if the supplier serves a population greater than 7,500, description of the specific activities, along with a schedule that establishes five-year benchmarks, for implementation of each of the following measures; or documentation showing implementation of the measures is neither feasible nor appropriate for ensuring the efficient use of water and the prevention of waste	(a) A system-wide leak repair or line replacement program to reduce system leakage to 15 percent and if the reduction of system leakage to 15 percent is found to be feasible and appropriate, to reduce system leakage to 10 percent	No benchmark.	The City has been following recommendations from the Water Master Plan for its routine pipe replacement program to target galvanized service lines and mainlines, water lines over 100 years old, or water lines less than 100 years old located in planned street projects. One mainline project remains for replacement of galvanized mainline, which is scheduled for placement in Fiscal Year 2017-2018. The City annually budgets approximately $25,000 for emergency water line repairs and $50,000 for mainline and service line repairs and upgrades.
	(b) Technical and financial assistance programs to encourage and aid residential, commercial, and industrial customers in implementation of conservation measures;	No benchmark.	The City provides technical assistance through field service staff interactions with customers, the City's website, and the RWPC website. The City provides free water conservation items to customers, including bathroom faucet aerators, kitchen faucet aerators, showerheads, shower timers, toilet dye tablets, and toilet tank banks.
	(c) Supplier financed retrofitting or replacement of existing inefficient water using fixtures, including distribution of residential conservation kits and rebates for customer investments in water conservation;	No benchmark.	The City continues to offer a residential toilet rebate ($40 per toilet, maximum two toilets per household), which is currently the City's only rebate. From 2009 to present, $28,180 have been spent on this effort. The City discontinued the washing machine, dishwasher, and landscape rebates largely to mirror similar rebate programs of the Metro area for regional consistency and to focus its resources on other conservation programs. The City spent $25,885 on washing machine rebates from 2009-2014 (program discontinued in 2014). The City spent $580 on dishwasher rebates from 2009-2012 (program discontinued in 2012). The City spent $1,640 on landscape rebates from 2009-2012 (program discontinued in 2012).
	(d) Adoption of rate structures, billing schedules, and other associated programs that support and encourage water conservation;	It is anticipated that an update on the status of the rate evaluation and potential rate structure modifications will be included in the required WMCP progress report which will be submitted in 2011. The City is in the process of transitioning custom billing from TVWD back to the City over the next six months to one year. As part of this transition, the City is evaluating the feasibility of transitioning to monthly billing. An update on the City's selected billing cycle and the justification for the selection will be included in the WMCP progress report in five years.	Customers are billed monthly. The City uses a two-tiered block rate structure for residential and multifamily customer classes.
	(e) Water reuse, recycling, and non-potable water opportunities; and	Currently, Clean Water Services continues to explore opportunities for reuse of wastewater effluent. The City supports these efforts to develop new and innovative means of reducing potable water usage. The City is open to exploring the potential benefits of water reuse and recycling within the City and to the potential uses of non-potable water if opportunities arise and are appropriate.	Clean Water Services, which manages the City's wastewater, continues to explore opportunities for reuse of wastewater effluent. The City supports these efforts to develop new and innovative means of reducing potable water usage. The City is open to exploring the potential benefits of water reuse and recycling within the City and to the potential uses of non-potable water if opportunities arise and are appropriate.
	(f) Any other conservation measures identified by the water supplier that would improve water use efficiency.	No benchmark.	The City has been working to increase water conservation at City facilities/properties by upgrading existing irrigation on City streetscapes from battery operated to web-based. Over the past 8 years, the City has spent approximately $25,000 per year retrofitting irrigation controllers from battery operated to web-based in existing parks and facilities. This web-based system allows the City to use evapotranspiration values to more efficiently water. In 2016, the City began charging itself for water usage, which has caused the City to be more efficient with irrigation usage.

3.4 Required Conservation Programs

OAR 690-086-150(4) requires that all water suppliers establish five-year benchmarks for implementing the following water management and conservation measures:

- Annual water audit
- System-wide metering
- Meter testing and maintenance
- Unit-based billing
- Leak detection and repair (if system leakage exceeds 10 percent)
- Public education

Five-Year Benchmarks for Required Conservation Measures: **During the next five years, the City plans to initiate, continue, or expand the following conservation measures that are required of all municipal water suppliers.**

3.4.1 Annual Water Audit

The City currently utilizes a maintenance management information system (MMIS) system to conduct annual water audits, which is a software package that maintains a database of maintenance/system operations. The MMIS system collects meter data from: groundwater and surface water sources, customers (classified within one of the following categories: residential, multi-family, and commercial), and maintenance activities (e.g., uni-directional flushing, hydrant maintenance, on-line sampling, street sweeping, and construction) estimated primarily via metering devices (e.g., diffusers, pitots, etc.). Maintenance activities can then be accounted-for. As shown in Section 2, the City's unaccounted-for water was 5.18 percent in 2016.

Five-year Benchmarks: The City will continue to conduct annual water audits. The City will continue to meter construction bulk water and to account for that water in its water audits.

3.4.2 System-wide Metering

The City has a fully metered water system. The City began installing advanced metering infrastructure (AMI) on all meters in May 2014 and this installation effort is 99 percent complete. The City anticipates completing installation of AMI on the entire system this fiscal year when it installs AMI on large meters for schools, apartment complexes, and mobile home complexes. All non-emergency sources of water are metered including all permanent connections to the City of Tualatin's water system and the City's groundwater wells. All customer service connections within the City's service area are also metered.

Five-year Benchmarks: The City will continue to install meters on all new connections. The City will complete installation of AMI on all meters in its system.

3.4.3 Meter Testing and Maintenance Program

The City's meter testing and replacement program consists of testing meters larger than 2-inches in diameter annually and testing 2-inch meters every three years. Residential customers have 5/8-inch meters are tested per customer request or when errors are suspected. Given that new AMI meters were just installed for all 2-inch meters, annually testing them is currently considered unnecessary. Larger meters will continue to be tested annually given that more water is consumed and could potentially be lost at these meters. Meters are repaired to meet AWWA standards or replaced as needed.

Five-year Benchmarks: In the next five years, the City will implement a meter accuracy pilot program for meters less than 2-inches in size, which will involve annually replacing 250 remaining retro-fit AMI meters that are greater than three years old from 2019 through 2026 (for a total of approximately 1,700 meters replaced in 7 years). The goal would be to replace remaining retro-fit AMI meters that are greater than 3 years old, to account for meter inaccuracy, and to make the metered system less than 10 years old with the exception of testable meters.

3.4.4 Water Rate Structure

The City's water rate structure consists of a monthly base rate, plus a two-tiered block rate structure volume charge for residential and multi-family customers. Commercial and irrigation customers have a volume charge that is not tiered. The base rate increases with the size of the water meter. The City's current water rates are shown in Table 3-2.

Table 3-2
Water Service Rates, as of July 1, 2017

Customer Class/Meter Size (inches)	Base Charge ($/Month)	Consumption Rate ($/100 Gal.) First 21,000 Gal.	Consumption Rate ($/100 Gal.) Over 21,000 Gal.
Residential, Multi-family			
5/8-3/4	$20.28	$0.56	$0.87
¾	$22.88		
1	$25.07		
1 ½	$44.56		
2	$64.80		
3	$130.38		
4	$222.76		
6	$462.44		
8	$855.96		
10	$1,236.09		
Commercial, Irrigation			
5/8-3/4	$20.28	$0.62 Commercial; $0.87 Irrigation	$0.62 Commercial; $0.87 Irrigation
¾	$22.88		
1	$25.07		
1 ½	$44.56		
2	$64.80		
3	$130.38		
4	$222.76		
6	$462.44		
8	$855.96		
10	$1,236.09		

The rates in Table 3-3 are applicable to all connections for automatic sprinklers and fire hydrant service for private fire protection regardless of customer type.

Table 3-3
Fire Protection Services Rates

Customer Class/Meter Size (inches)	Base Charge ($/Month)
4	$32.52
6	$54.35
8	$77.17
10	$106.16

Five-year Benchmarks: The City will continue to bill customers based, in part, on the quantity of water metered at the service connection.

3.4.5 Leak Detection and Repair

The City has a leak detection and repair program, which helped to reduce the City's unaccounted-for water to below 10 percent since 2013. In 2012, the City began surveying a quarter of the water system each year using a private contractor, for a total system leak detection survey completed every four years. The surveys found a total of 29 leaks during the past five surveys that produced water losses totaling approximately 59.75 gpm (0.09 mgd). The City recently installed an AMI system that monitors water meters on an hourly basis and flags meters found to be flowing continuously for more than two days. Customers with flagged meters receive a leak alert doorhanger/notice from the City. The City repaired the leaks following their discovery. The City has a waterline replacement program that provides for the routine replacement of leaking, damaged, and older water mains throughout the water system. In most cases, the existing water lines have adequate capacity and will be replaced with the same diameter water lines. The City annually budgets approximately $25,000 for emergency water line repairs and $50,000 for mainline and service line repairs and upgrades. The City has been following recommendations from its Water Master Plan for its routine pipe replacement program to target galvanized service lines and mainlines, water lines over 100 years old, or water lines less than 100 years old located in planned street projects. The City educates customers about leak detection and repair downstream of the meter and notifies customers of possible leaks when abnormal meter readings occur.

Five-year Benchmarks: The City will continue to educate customers about leak detection and repair downstream of the meter and to notify customers of possible leaks when meter readings are higher than normal. The City will continue to survey a quarter of the water system per year, for a total system leak detection survey completed every four years. In the next five years, the City will evaluate a pilot program to test a scaled acoustic leak monitoring system within the distribution and transmission system. The goal of the pilot program is to identify leaks in the distribution and transmission system. In the next year, the City will replace the remaining galvanized mainline in the galvanized mainline replacement project. In the next five years, the City will begin to replace water lines that do not meet the City's current standard specifications, such as a small portion of the system has thin wall PVC (schedule 200 and schedule 40) installed for service lines and small mainlines.

3.4.6 Public Education and Outreach

The City promotes water conservation through a variety of City public education and outreach efforts and regional conservation programs and activities.

The City promotes water conservation in its annual consumer confidence report, monthly billing statements, the City newsletter, and the City's website. Occasionally, conservation brochures are included with billing statements to provide tips for ways to reduce water usage. These tips, in

conjunction with the City's public education program, provide a clear link between water conservation and financial savings for the individual customer.

The City's website includes:

- A list of reasons to conserve water,
- A video link about how to install high-efficiency aerators,
- Indoor and outdoor water conservation tips,
- Free items offered by the City that help conserve water (e.g., faucet aerators, showerheads, shower timers, and toilet dye tablets, and toilet tank banks),
- Information about the Regional Water Providers Consortium and a link to its website, and
- Residential high-efficiency toilet rebates offered by the City.

The City's conservation education and outreach program also extends to local events and festivals. The City provides a booth with general water system information as well as conservation literature at events, such as the Community Services Day held in April, the Sherwood Robin Hood Festival held each July, the Clean Water Festival, and Home and Garden shows. Water-wise information is available for adults and a water-related activity for kids is provided.

As a member of the Regional Water Providers Consortium (RWPC), the City actively participates in regional water conservation program development and implementation. Composed of 20 water providers and Metro, the RWPC provides a forum for collaboration on water supply, resource management and conservation issues affecting the region. The RWPC was formed in 1996 by Intergovernmental Agreement to coordinate the implementation of the Regional Water Supply Plan for the Portland Metropolitan Area. The Regional Water Supply Plan is the region's water supply strategy and recognizes that water conservation plays a key role in meeting future water needs. The RWPC's conservation objectives are to:

- Plan and implement regional programs to reduce peak summer water use.
- Integrate consistent conservation messages into the daily lives of customers.
- Develop and implement effective monitoring and reporting techniques to verify program effectiveness.
- Invite stakeholder participation in conservation program development.
- Seek economies of scale by working together.
- Foster public awareness of the RWPC's collaborative efforts.

The RWPC's conservation plan includes a variety of programs and outreach opportunities which include:

- Summer marketing campaign
- Education programs
- Regional events
- Website (www.conserveh2o.org)
- Informational materials (brochures, kits and water saving devices)

Through the RWPC, the City participates in various water conservation shows geared toward children from kindergarten through 5th grade. In addition to the children programs, the RWPC has a marketing campaign to promote conservation through TV, radio, billboards, and buses. The RWPC also promotes use of its Weekly Watering Number, which allows customers to enter their zip code to determine how much water they should be using per week for irrigation.

Five-year Benchmarks: The City will continue to implement its multifaceted public education program. In the next five years, the City will develop additional information/materials promoting efficient irrigation and low water use landscaping.

3.5 Expanded Use under Extended Permits

Under OAR 690-086-0150(5), any municipal water supplier that proposes to expand or initiate the diversion of water under an *extended permit* for which resource issues have been identified shall include a description of activities and a five-year implementation schedule for a system-wide leak repair or line replacement program to reduce system leakage to no more than 15 percent.

The City proposes to expand diversion of water from the Willamette River under *extended permit* S-49240. Aquatic resource issues have been identified for the Willamette River; however, the City's unaccounted-for water was 5.18 percent in 2016. Although the City's unaccounted-for water, and thus system leakage, is well below 15 percent, the City continues to implement a leak detection and repair program as previously described.

3.6 Additional Conservation Measures

OAR 690-086-0150(6) requires municipal water suppliers that serve a population greater than 1,000 and propose to expand or initiate the diversion of water under an *extended permit* for which resource issues have been identified, or if the population served is greater than 7,500, to provide a description of the specific activities, along with a five-year schedule to implement several additional conservation measures. The City meets both of these criteria. The City is proposing to expand diversion of water under Permit S-49240 and the City's water service area population was 15,172 in 2016. Therefore, the City is required to address the following additional conservation measures.

3.6.1 Leak Repair and Line Replacement Program

Under this rule requirement, the City is required to implement a system-wide leak repair program or line replacement program to reduce system leakage to 15 percent, and if feasible to 10 percent. The City's unaccounted-for water was 5.18 percent in 2016. Although the City's unaccounted-for water, and thus system leakage, is well below 15 percent, the City continues to implement a leak detection and repair program.

As previously described, the City has a leak detection and repair program. The City surveys a quarter of the water system each year using a private contractor, for a total system leak detection survey completed every four years. The City recently installed an AMI system that monitors water meters on an hourly basis and flags meters found to be flowing continuously for more than two days. Customers with flagged meters receive a leak alert doorhanger/notice from the City. The City repaired leaks following their discovery. The City has a waterline replacement program that provides for the routine replacement of leaking, damaged, and older water mains throughout the water system. The City annually budgets approximately $25,000 for emergency water line repairs and $50,000 for mainline and service line repairs and upgrades. The City has been following recommendations from the Water Master Plan for its routine pipe replacement program to target galvanized service lines and mainlines, water lines over 100 years old, or water lines less than 100 years old located in planned street projects. One mainline project remains for replacement of galvanized mainline, which is scheduled for placement in Fiscal Year 2017-2018. The City also educates customers about leak detection and repair downstream of the meter and notifies customers of possible leaks when abnormal meter readings occur.

Five-year Benchmarks: The City will continue to educate customers about leak detection and repair downstream of the meter and to notify customers of possible leaks when meter readings are higher than normal. The City will continue to survey a quarter of the water system per year, for a total system leak detection survey completed every four years. In the next five years, the City will evaluate a pilot program to test a scaled acoustic leak monitoring system within the distribution and transmission system. The goal of the pilot program is to identify leaks in the distribution and transmission system. In the next year, the City will replace the remaining galvanized mainline in the galvanized mainline replacement project. In the next five years, the City will begin to replace water lines that do not meet the City's current standard specifications, such as a small portion of the system has thin wall PVC (schedule 200 and schedule 40) installed for service lines and small mainlines.

3.6.2 Technical and Financial Assistance Programs

Since 2009, the City has been offering customers free water conservation items, including bathroom faucet aerators, kitchen faucet aerators, showerheads, shower timers, toilet dye tablets, toilet tank banks, and rain gauges. The City offers two kits, the "High Water Bill Kit" and the "Leak Kit," to residential customers to help them reduce water usage and detect leaks. These free water conservation items and kits are distributed through Field Customer Service Representatives, Office Customer Service, Public Works facility, and upon request by mail or

delivery. Technical assistance is also provided on the City's website and the RWPC website, such as a video about how to install a faucet aerator.

Five-year Benchmarks: The City will continue to offer free water conservation items, two residential water conservation kits, and online technical assistance. The City will continue to track the number of free water conservation items and water conservation kits distributed.

3.6.3 Retrofit/Replacement of Inefficient Fixtures

The City currently offers one rebate, which is a residential toilet rebate (as shown in Appendix G). The rebate amount is $40 per toilet with a maximum of two toilets per household. The City has spent $28,180 on the toilet rebate program from 2009 to present. The City did offer other rebates (e.g., washing machine, dishwasher, and landscape) for several years, but decided to discontinue those rebates largely to mirror similar rebate programs of the Metro area for regional consistency and to focus those resources on other conservation programs. The City spent $25,885 on washing machine rebates from 2009-2014, $580 on dishwasher rebates from 2009-2012, and $1,640 on landscape rebates from 2009-2012.

Five-year Benchmarks: In the next five years, the City will decide whether to expand the toilet rebate program to commercial and multifamily customers and will begin to implement the program if the City decides to move forward with the expansion. In the next five years, the City will decide whether to implement an irrigation-related rebate program and will begin to implement the program if the City decides to move forward with it.

3.6.4 Rate Structure and Billing Practices that Encourage Conservation

The City currently bills customers on a monthly basis. The meter is read, the data is processed, and the bill arrives shortly after the reading. This ensures that customers receive bills relatively close to the time when the water was used, providing a connection for the customer between the volume of water used and the cost of water. The new AMI system enables customers to have information on hourly water consumption and patterns of water consumption. The City is using AMI data to conduct detailed analyses of consumption by customer category. As described under Public Education, the City includes conservation information in monthly billing statements. Occasionally, conservation brochures are included with the billing statements to provide tips for ways to reduce water usage.

Five-year Benchmarks: In the next five years, the City will analyze hourly meter data and use that information to identify potential new water conservation measures.

3.6.5 Water Reuse, Recycling and Non-potable Water Use Opportunities

The City's wastewater is conveyed to a regional treatment facility operated by Clean Water Services. The distance to the treatment plant makes water reuse and recycling economically

unfeasible at this time. Currently, Clean Water Services continues to explore opportunities for reuse of wastewater effluent. The City supports these efforts to develop new and innovative means of reducing potable water usage. The last two schools built in the City use irrigation water from existing wells on the property instead of treated potable water. The City is open to exploring the potential benefits of water reuse and recycling within the City and to the potential uses of non-potable water if opportunities arise and are appropriate.

Five-year Benchmarks: The City will continue to explore water reuse, recycling, and non-potable water use opportunities.

3.6.6 Other Conservation Measures

City Properties

The City has been working to increase water conservation at City facilities and properties by upgrading existing irrigation systems on City streetscapes from battery operated to web-based. Over the past 8 years, the City has spent approximately $25,000 per year retrofitting irrigation controllers from battery operated to web-based in existing parks and facilities. This web-based system provides evapotranspiration data that operators can use to adjust the amount of irrigation water applied, thereby increasing water use efficiency. In 2016, the City began charging itself for water usage, which has caused the City to be more efficient with irrigation usage.

Local Legislation

In 2004, the City adopted a resolution to establish a campaign for voluntary water conservation. This program focuses on water usage in the summer months and is mostly aimed at irrigation. A full copy of the resolution is found in Appendix E. Prior to the 2004 resolution, the City passed an ordinance in April of 1999 that created provisions for water restrictions and non-essential water use during drought or other emergencies. A copy of this ordinance is also included in Appendix F.

Five-year Benchmark: The City will continue to look for ways to conserve water at City facilities and properties.

3.7 Summary of Benchmarks

Table 3-4 presents a summary of the City's 5-year water conservation benchmarks.

Table 3-4
Summary of Water Conservation Benchmarks

Annual Water Audit	The City will continue to conduct annual water audits.
	The City will continue to meter construction bulk water, and to account for that water in its water audits.
System-wide Metering	The City will continue to install meters on all new connections.
	The City will complete installation of AMI on all meters in its system.
	The City will continue metering construction bulk water.
Meter Testing and Maintenance	In the next five years, the City will implement a meter accuracy pilot program for meters less than 2-inches in size, which will involve annually replacing 250 remaining retro-fit AMI meters that are greater than three years old from 2019 through 2026 (for a total of approximately 1,700 meters replaced in 7 years). The goal would be to replace remaining retro-fit AMI meters that are greater than 3 years old, to account for meter inaccuracy, and to make the metered system less than 10 years old with exception of testable meters.
Water Rate Structure and Billing Practices that Encourage Conservation	The City will continue to bill customers based, in part, on the quantity of water metered at the service connection.
	In the next five years, the City will analyze hourly meter data and use that information to identify potential new water conservation measures.
Leak Detection and Repair or Line Replacement	The City will continue to educate customers about leak detection and repair downstream of the meter and to notify customers of possible leaks when meter readings are higher than normal.
	The City will continue to survey a quarter of the water system per year, for a total system leak detection survey completed every four years.
	In the next five years, the City will evaluate a pilot program to test a scaled acoustic leak monitoring system within the distribution and transmission system. The goal of the pilot program is to identify leaks in the distribution and transmission system.
	In the next year, the City will replace the remaining galvanized mainline in the galvanized mainline replacement project.
	In the next five years, the City will begin to replace water lines that do not meet the City's current standard specifications, such as a small portion of the system has thin wall PVC (schedule 200 and schedule 40) installed for service lines and small mainlines.
Public Education	The City will continue to implement its multifaceted public education program.
	In the next five years, the City will develop additional information/materials promoting efficient irrigation and low water use landscaping.

Technical and Financial Assistance Programs	The City will continue to offer free water conservation items, two residential water conservation kits, and online technical assistance.
	The City will continue to track the number of free water conservation items and water conservation kits distributed.
Supplier Financed Retrofit or Replacement of Inefficient Fixtures	In the next five years, the City will decide whether to expand the toilet rebate program to commercial and multifamily customers and will begin to implement the program if the City decides to move forward with the expansion.
	In the next five years, the City will decide whether to implement an irrigation-related rebate program and will begin to implement the program if the City decides to move forward with it.
Water Reuse, Recycling, and Non-potable Opportunities	The City will continue to explore water reuse, recycling, and non-potable water use opportunities.
Other Conservation Measures	The City will continue to look for ways to conserve water at City facilities and properties.

3.8 Willamette River Fish Flows: Public Education and Voluntary Conservation

In the WMCP approved by OWRD in 2009, the City stated it would establish a public education program pursuant to the Settlement Agreement incorporated in the Final Order for the Extension of Time for Permit S-49240. The City stated that it would implement the public education program described below within the next five years of WMCP approval and prior to diversion of use of water under the permit.

The goal of the public education program is to disseminate a public education message to the City's customer that includes the following elements:

- Inform customers about the status of river flows in relation to the minimum fish flow needs in the Willamette River, measured at Salem and highlight the connection between City customer water use and flow in the river. Clearly identify the role of the Willamette River in supplying water to the City and also identifies the importance of river flows to fish. The message will include a description of fish resources and identify the presence of any listed fish.

- Provide a list of voluntary water conservation measures that are appropriate for the April 1 through May 31 time period that may be effective at reducing water use from the Willamette River. These voluntary water conservation measures, consistent with the program outlined in this WMCP, shall generally include but not be limited to, reduction in outdoor water usage, including car washing and lawn watering.

- Inform customers that while water conservation is important year-round, it is especially important when minimum fish flow needs in the Willamette River (measured at Salem) are not being met.

The public education message discussed above, along with the encouragement of the implementation of voluntary conservation measures and supply source management are effective means of reducing demand. Given the success of these measures as currently used, the City anticipates that similar results will be achieved to reduce demand on the Willamette River during times when minimum fish flows in the river are not being met.

The public education message discussed above will continue to be disseminated by placing the message on the City's website and by print communication in the form of a bill insert. The message will continue to be distributed annually on or before April 1 and continue to include the elements described above.

Should the seven-day rolling average of mean daily streamflows (measured at USGS Gage number 14191000) fall below the minimum fish flows needed at Salem by ten percent or more for 15 consecutive days at any time of the year (except for April 1 to May 31), a message stating this and restating the key points of the April 1 message will be placed on the City's website until the minimum fish flow needs at Salem are met.

Another message will be distributed through print communication (if the timing coincides with a billing cycle) or through the media, by means of the local Sherwood Gazette or other appropriate media outlet, for each period of 15 consecutive days that the seven-day rolling average of mean daily streamflows are below the minimum fish flow needs at Salem by ten percent or more.

The City started using Willamette River water in May 2011 and has implemented the required public education message since then. The public education message is located on the City's website (Visit https://www.sherwoodoregon.gov/utilitybilling/page/willamette-river-fish-and-you) and has been sent out to customers in the form of a bill insert before April 1 annually since 2011. The public education messages have focused on indoor water conservation due to the concern about meeting target flows from April 1 to May 31, before most water customers begin irrigating. However, the City's website provides a link to the Regional Water Providers Coalition website (www.conserveh2o.org), which contains indoor and outdoor water conservation information. Since the City began tracking streamflows in 2011, the seven-day rolling average of mean daily streamflows (measured at USGS Gage number 14191000) has fallen below the minimum fish flows needed at Salem by ten percent or more for 15 consecutive days only from June 1 through July 1 in 2015 (excluding April and May, as per the discussion above). The City disseminated additional water conservation messages on this occasion.

In addition, under item 4(d) of the Final Order Incorporating Settlement Agreement for the Extension of Time for Permit S-49240, the City is required to remind OWRD of OWRD's obligations described in term #3 of the Settlement Agreement concerning extension of time for Permit S-49240. The Final Order Incorporating Settlement Agreement and the Settlement Agreement are attached in Appendix C.

3.9 Summary

This section documented the City's current water conservation programs and evaluated various other water conservation measures that must be considered in the WMCP. As identified in this section, the City's current water conservation program addresses the required measures. During the planning horizon of this report, benchmarks have been set for more detailed evaluation and implementation of additional conservation measures. This section also includes the special section "Willamette River Fish Flows: Public Education and Voluntary Conservation."

murraysmith

Section **4**

Section 4

WATER CURTAILMENT ELEMENT

4.1 General

This section describes a program for the City to accomplish a reduction in water use during a water shortage or an emergency. This section also presents an assessment of the vulnerability of the City's water supply.

Three primary scenarios are considered that could result in the reduction or loss of water supply for the City: the first is a mechanical or structural failure of the infrastructure, the second is drought that reduces streamflows in the Willamette River, and the third is water supply contamination. These elements will be further developed and discussed later in this section along with the proposed response by the City. Any of these broad categories could be long or short-term in duration. Infrastructure failures tend to be immediate emergencies with little or no warning. Infrastructure failures can result from system failures (pump outage, pipe break, etc.) or can be induced by the forces of nature (earthquakes, storms, floods, landslides, etc.).

Drought conditions resulting in surface water shortages tend to be "foreseeable" because they are based on snow pack and rainfall and the data allow watershed managers to forecast available water supply. Drought could result in streamflows in the Willamette River declining enough to trigger fish persistence conditions, thereby reducing the City's access to water.

Reservoir or pipeline contamination are likely to be rapid onset events with relatively quick clean up assuming the contaminant can be readily removed. In contrast, groundwater contamination from long-term spills, dumping and leaks, or from persistent chemical application to land could take several years to reach a well and affect the water supply.

It is not practical to develop a plan that would cover any and all potential emergency scenarios. Rather, the goal of this curtailment plan is to project a series of possible water shortage events that could cause a range of water use curtailment and to develop the protocols for City action, leaving the details flexible. This document is being developed for "system wide" emergencies and water shortages while smaller distribution disruptions are considered as part of the City's Emergency Response Plan.

4.2 Historical Curtailment Efforts

The City has not needed to implement water curtailment measures in the past 10 years. The last events requiring the City to initiate curtailment measures occurred in 1996 and 1999 as the result of a lack of groundwater, which was the main source of supply at that time. These measures were

aimed at anticipated summer supplies being lower than normal. Because a significant portion of the peak demand is from irrigation, the curtailment plans were focused on this segment of water use. A temporary halt was ordered for outdoor water use by all non-residential customers. Through this measure and a general public awareness, the City was able to reduce water demand by approximately one-third.

4.3 Program Objectives

The City's objective of a curtailment program is to protect public health and safety and to minimize the impacts of water supply shortages. This is done by rapidly and accurately determining the type, magnitude and potential duration of the water system emergency, directing staff and users to the appropriate response, and monitoring demand and supply until the supply returns to normal conditions.

4.4 Water Supply Vulnerability Assessment

The City's primary water supply source is the Willamette River. This Willamette River water supply is treated at the WRWTP and conveyed to the City of Sherwood through an interconnection with the City of Wilsonville. The City can use up to 5 mgd of the plant's capacity, as long as it is meeting the instream requirements summarized in Table 2-9.

As discussed in Section 2, the City has groundwater wells that serve as a backup water supply, but the wells are rarely used due to an historic decline in the water level in the aquifers supplying the wells and the low production of several wells. Groundwater levels in the aquifer underlying the City continue to decline when the wells are in use, and the capacity of the City's groundwater production facilities will decline if efforts are not made to reduce the demand on the aquifer. As such, the nominal capacity of the City's backup groundwater sources to meet a water emergency is limited to approximately 2.58 mgd (3.98 cfs) for a short period, with a sustainable rate being 75 percent of full capacity (1.935 mgd (2.99 cfs)). In addition, this supply source faces risk from increased rates of water level decline, contamination and mechanical failure of well pumps.

The City's emergency supply from the City of Tualatin (originally from City of Portland Bull Run Watershed and Columbia South Shore Wellfield) is limited to a maximum capacity of 3 mgd due to capacity limitations of the transmission system supplying water to the City of Tualatin. In addition, the owners of the capacity in the Washington County Supply Line (WCSL) may further restrict the available supply to the City if the capacity is needed elsewhere. However, there is no certainty that this supply will be available in the event of a water emergency given that City does not currently have a wholesale supply agreement with the PWB or control of the facilities which deliver water to the City's supply system.

It is generally assumed that a water shortage event with one of the City's sources of supply will not occur simultaneously with an emergency in the other source. There is, however, a remote possibility that concurrent with a reduction in one source, a second source or an emergency

intertie will be out of service. Maintaining multiple water supplies is one of the strongest ways to limit the impact of a disruption of any one of the sources.

4.5 Tools Available to the City

The City has three tools available to reduce or eliminate the impact of a water shortage or emergency and to ensure adequate supply for its customers.

1. Existing storage within the City's distribution system amounts to 9 MG of available capacity if the reservoirs were full when the emergency occurred. Reservoir levels and available storage fluctuates during the day, so the assumed available usable storage capacity is 8 MG.

2. Existing emergency intertie with the City of Tualatin. If a water emergency associated with the supply from the PWB occurs, then the City of Tualatin will also likely experience a water emergency and these interties will not be available to address water supply issues for the City of Sherwood.

3. A water curtailment plan.

4.6 Curtailment Plan

The City's curtailment plan consists of four stages of alert that the City will implement in the event that a water supply shortage requires water curtailment. The curtailment stages are intended to be implemented in progressive steps and they include voluntary and mandatory curtailment measures, which depend upon the cause, severity, and expected duration of the water shortage. As described above, the primary triggers considered likely to result in the reduction or loss of water supply for the City are a mechanical or structural failure of the infrastructure, a drought, and contamination. Table 4-1 presents the City's four curtailment stages and their potential triggers (i.e., initiating conditions).

Table 4-1
Curtailment Plan

Curtailment Stages	Potential Initiating Conditions
Stage 1 - Water Shortage Advisory	▪ Metered demand from the WRWTP exceeds 95 percent of the City's share of the WRWTP capacity[1]. ▪ Power Outage ▪ Use of one well to meet demand.
Stage 2 - Moderate Water Supply Shortage Goal: Reduce daily demand by 10 percent.	▪ Metered demand from the WRWTP is 100 percent of the City's share of the WRWTP capacity[1]. ▪ Substantial damage to water system infrastructure resulting from a natural disaster, fire, or criminal act. ▪ Failure of a minor component of water system infrastructure. ▪ Use of two wells to meet demand.
Stage 3 - Severe Water Supply Shortage Goal: Reduce daily demand by 25 percent.	▪ Demand exceeds the City's share of the WRWTP capacity[1]. ▪ Significant and sustained reductions in water pressure are experienced in the distribution system ▪ Serious damage to water system infrastructure resulting from a natural disaster, fire, or criminal act. ▪ Failure of a significant component of water system infrastructure. ▪ Isolated or temporary contamination of the water supply. ▪ Severe drought. ▪ Use of all backup wells to meet demand.
Stage 4 - Critical Water Supply Shortage Goal: Reduce Daily demand by 50 percent.	▪ The City's WRWTP water supply is interrupted. ▪ City's primary supply source is physically cut off or becomes unavailable, such as from: ○ Infrastructure damage resulting from a natural disaster, fire, or criminal act, ○ Failure of critical water system infrastructure, and ○ Major water supply contamination.

Notes:

[1] Plant capacity may be further limited by fish persistence conditions under the extension of time Final Order for Permit S-49240 (dated June 26, 2007).

4.6.1 Stage 1 – Water Shortage Advisory

A water shortage advisory is intended to encourage customers to voluntarily conserve water that results in enough water savings to avoid more severe stages of curtailment.

4.6.1.1 Stage 1 - Triggers

Potential triggers activating Stage 1 curtailment are metered demand from the WRWTP exceeds 95 percent of the City's share of the WRWTP capacity, power outage, and use of one well to meet demand.

4.6.1.2 Stage 1 – Possible Actions

Following declaration of Stage 1 by the City manager, the City will:

- Stop hydrant flushing program until demands decrease.

- Reduce irrigation system water use at City parks and City facilities.
- Issue a press release to the local media requesting that customers voluntarily reduce indoor and outdoor water use, such as for the following:
    - Sprinkling, watering or irrigation of shrubbery, trees, lawns, grass, ground covers, plants, vines, gardens, vegetables, flowers or any other vegetation;
    - Washing automobiles, trucks, trailers, trailer houses, motorbikes, boats, or any other type of mobile equipment;
    - Washing sidewalks, driveways, parking lots, tennis courts, filling station aprons, porches and other hard surface area; and
    - Washing the outside of dwellings, washing the outside of office buildings.

4.6.2 Stage 2 – Moderate Water Supply Shortage

The goal of a moderate water supply shortage is to achieve a measurable reduction in City-wide daily water usage of 10 percent through voluntary water conservation actions.

4.6.2.1 Stage 2 – Triggers

Potential triggers activating Stage 2 curtailment include: metered demand from the WRWTP is 100 percent of the City's share of the WRWTP capacity; substantial damage to water system infrastructure resulting from a natural disaster, fire, or criminal act; and failure of a minor component of water system infrastructure; and use of two wells to meet demand.

4.6.2.2 Stage 2 – Possible Actions

Following declaration of Stage 2 by the City manager, the City will:

- Implement or continue to implement Stage 1 actions.
- Turn off automatic irrigation systems at City parks and City facilities.
- Postpone enforcement of landscaping elements of City development code to minimize irrigation needs associated with maintenance requirements.
- Issue a notice to the local media and send postcard notification to City customers requesting that customers voluntarily reduce water use, such as for the following (in addition to Stage 1):
    - Sprinkling, watering or irrigation of shrubbery, trees, lawns, grass, ground covers, plants, vines, gardens, vegetables, flowers or any other vegetation;

- Washing automobiles, trucks, trailers, trailer houses, motorbikes, boats, or any other type of mobile equipment;
- Washing sidewalks, driveways, parking lots, tennis courts, filling station aprons, porches and other hard surface area;
- Washing the outside of dwellings, washing the outside of office buildings;
- Washing and cleaning business or industrial equipment and machinery;
- Operating any ornamental fountain, scenic or recreational ponds and lakes or other structures making a similar use of water, except for the minimum necessary to support fish life;
- Use of water to fill, refill or add to any swimming and wading pools or jacuzzi not employing a filter and re-circulating system, and evaporation covers, or where the use of the pool is required by a doctor;
- Permitting the escape of water through defective plumbing;
- Use of water for construction projects;
- Water to serve customers in a restaurant unless requested; or
- Other restrictions requested by a supplier of water to the City as a condition in an agreement to supply water to the City.

4.6.3 Stage 3 – Severe Water Supply Shortage

The goal of a severe water supply shortage alert is to achieve an overall decrease in daily water demand of 25 percent. At this stage of alert, mandatory curtailment measures will be implemented.

4.6.3.1 Stage 3 - Triggers

Potential triggers activating Stage 3 curtailment include: demand exceeds the City's share of the WRWTP capacity; significant and sustained reductions in water pressure are experienced in the distribution system; serious damage to water system infrastructure resulting from a natural disaster, fire, or criminal act; failure of a significant component of water system infrastructure; isolated or temporary contamination of the water supply; severe drought; and use of all backup wells to meet demand.

4.6.3.2 Stage 3 – Possible Actions

Following declaration of Stage 3 by the City manager, the City will:

- Implement or continue to implement all Stage 1 and 2 actions.
- The City will impose mandatory reduction or cessation of customer water uses, such as for activities described under Stages 1 and 2.
- Implement enforcement provisions as authorized by the City's Water Conservation Ordinance.

4.6.4 Stage 4 – Critical Water Supply Shortage

The goal of a critical water supply shortage alert is to achieve an overall decrease in daily water demand of 50 percent or more through mandatory water conservation measures.

4.6.4.1 Stage 4 – Triggers

Potential triggers activating Stage 4 curtailment include: the City's WRWTP water supply is interrupted; and the City's primary supply source is physically cut off or becomes unavailable, such as from infrastructure damage resulting from a natural or human-caused event (e.g., natural disaster, fire, or criminal act), failure of critical water system infrastructure, and major water supply contamination.

4.6.4.2 Stage 4 – Possible Actions

Following declaration of Stage 4 by the City Manager, the City will:

- Implement or continue to implement all Stage 1, 2 and 3 actions.
- Enforce the Water Curtailment Plan with warnings, fines and discontinuation of service if necessary.
- Conduct additional emergency actions, including:
    - Begin rationing water. This may include restricting indoor water use to only water uses essential for public health and safety and requiring all outdoor watering to cease.
    - Open emergency interconnection with the City of Tualatin (if supply is available).
    - Place a moratorium on all new water service connections and new water main extensions.

4.7 Authority to Declare Water Curtailment

The City manager has the authority to declare and to terminate each stage of water curtailment. City Code 13.20.060 states that "The declaration shall be made by posting notice in three (3) conspicuous public places in the city. Such announcement shall set out the nature of the situation

giving rise to the emergency, describe the action(s) to be taken by the City manager (including the time the declaration becomes effective) and shall specify the particular activity(ies) for which the use of water will be prohibited or restricted. The declaration shall be reviewed by the City council at its next meeting." The City manager also has the authority to impose civil penalties (e.g. monetary penalty) for violation of mandatory curtailment measures under City Code 13.20.120.

4.8 Drought Declaration

In the event that the Governor declares a drought in Washington County, the City will add a message to the City's website that informs customers of the drought declaration, describes the status of the City's water supply, and asks customers to voluntarily reduce their water consumption. The City may also issue a press release to local media with similar content as the website message. Declaration of any stage of curtailment will be based on the City's water supply, as per curtailment stage triggers.

murraysmith

Section **5**

Section 5

WATER SUPPLY ELEMENT

5.1 General

This section delineates the current and future City of Sherwood's service area, and presents population and water demands forecasts. This section also includes a comparison of the City's supply source capacity and water demands, an analysis of supply source alternatives and a timeline for the City to fully exercise each water right permit.

5.2 Current and Future Service Area

As described in Section 2 and shown in Figure 2-1, the City's current service area encompasses all the land within the City limits as well as scattered adjacent parcels within the Urban Growth Boundary (UGB). The City is located between Tigard and Newberg on Highway 99W, southwest of the City of Portland. The City's service area is adjacent to only one other water provider's service area, which is the City of Tualatin. Other land surrounding the City is rural and is not served by municipal water utilities or water districts. The future service area includes all land within the UGB and encompasses approximately 3,385 acres. The service area is entirely within Washington County.

5.3 Population and Demand Projections

Population and demand forecasts for the water system planning area have been developed for the recent water master plan and extended to the end of this planning period using the same methodology. These future demands are summarized in Tables 5-2 through 5-5.

The City's future water service area, illustrated on Figure 2-1, is comprised of four different planning areas:

1. Sherwood City limits
2. Tonquin Employment Area (TEA)
3. Brookman Annexation Area
4. West Urban Reserve

Each of these areas has its own land use characteristics, approximate development timelines and existing planning information. Estimates of future growth and related water demand are developed using the best available information for each area including Sherwood buildable lands geographic information system (GIS) data, population growth projections, development area concept plans and current water demand data. The

buildable lands GIS includes a calculated number of new units for each residentially zoned property and a net acreage for each non-residential property. Each of these values takes into account the property's current zoning and development restrictions such as floodplain overlays.

Water demand growth is projected at 2 years, 7 years, and 20 years. These time intervals correspond with expected growth rate changes. Expected demand at 10 years was interpolated and is presented as well. Future MDD is projected from estimated future ADD based on the current average ratio of MDD:ADD, also referred to as a peaking factor. From current water demand data shown in Table 2-4, the MDD:ADD peaking factor for the Sherwood system is approximately 2.0.

5.3.1 Sherwood City Limits

Residential services account for the majority of water demand in the City of Sherwood, thus, an estimated annual average population growth rate is used as an indicator of growth in water demand within the current City limits. The regional government Metro projects saturation development will occur within the existing Sherwood city limits in the next 10 years. According to annual population estimates developed for all Oregon cities by the Portland State University Population Research Center (PRC), recent population growth within the Sherwood City limits has occurred at an average rate of less than 0.3 percent annually.

Based on proposed subdivisions and planned unit developments (PUDs) approved by the City in 2012 and 2013, it is assumed that residential growth within the City limits will be slightly accelerated for the next 3 to 5 years as these housing developments are completed. For this analysis, future population growth within the City limits is estimated based on an annual average growth rate of approximately 1.25 percent through 2019 and 0.15 percent after 2019 to saturation development. For water supply planning purposes, the saturation development condition for the portion of the service area within the existing City limit is anticipated to occur within the 20-year planning window, as shown in Table 5-1.

Table 5-1
City Limits Population Forecast Summary

Year	Growth Rate	Population	ADD (mgd)
2016	--	18,145	1.81
2017	1.25%	18,372	1.83
2019	0.15%	18,427	1.84
2024	0.15%	18,566	1.85
2027	0.00%	18,566	1.85
2034	0.00%	18,566	1.85
2037	0.00%	18,566	1.85

5.3.2 Tonquin Employment Area (TEA)

Growth in the TEA is estimated based on the September 2010 Tonquin Employment Area Preferred Concept Plan Report Table IV-1: TEA 20-Year Employment Forecast. This table develops estimates of job density per acre for four sub-areas within the TEA. Development in the TEA is assumed to follow a linear growth pattern based on 20-year development percentages established in Table IV-1 of the TEA Concept Plan. For example, the 96.8 acres of light industrial buildable land in sub-area A is anticipated to be 70 percent developed in 20 years. Using a linear growth pattern, light industrial land in sub-area A will be 3.5 percent developed per year.

Future water demand projections in the TEA are based on water use per employee of 45 gallons per day (gpd) for mixed use commercial, office and light industrial development as presented in the TEA Concept Plan. This water demand estimate assumes there will be no process water uses in future TEA developments. Growth projections and future water demand estimates for the TEA are summarized in Table 5-2.

Table 5-2
Tonquin Employment Area Forecast Summary

Year	Total Acres Developed	Total Jobs	ADD (mgd)
2017	42	678	0.03
2019	55	872	0.04
2024	103	1,607	0.07
2027	125	1,49	0.09
2034	174	2,675	0.12
2037	195	2,962	0.13

5.3.3 Brookman Annexation Area

Growth projections in the Brookman Annexation Area are developed based on the 2009 Brookman Addition Concept Plan Final Report and the City's buildable lands GIS data. The concept plan identifies areas for residential, commercial, office and light industrial development within the Brookman Annexation Area. Table 1 Land Use Metrics from the Brookman Concept Plan presents an estimated density and total number of jobs within the Brookman Annexation Area at saturation development. The City's buildable lands GIS data for the Brookman area includes an estimated number of residential units at saturation development. Due to the small amount of developable residential land within the existing City limits and the exclusively non-residential, primarily industrial development anticipated within the TEA, it is assumed that the Brookman Annexation Area will reach saturation development within the 20-year planning horizon.

It is assumed that the Brookman Annexation Area will begin developing in by 2019 with an initial 80 households and 300 jobs. The initial number of households is based on existing

housing unit counts in the area from the 2010 Census and two new residential developments of 30 to 40 homes. Approximately eight acres of non-residential development would yield 300 jobs based on the density of 35.83 jobs/acre presented in the Brookman Concept Plan Table 1. Growth projections by 2024 are based on a linear growth pattern from initial development at five years to saturation at 2034.

Average daily water demands for future residential development are estimated based an ADD/RU of 213 gpd/RU. Commercial, office and light industrial average daily water demands within the Brookman Annexation Area are based on an average water use per employee of 45 gpd consistent with the TEA Concept Plan for these same land uses. Growth projections and future water demand estimates for the Brookman Annexation Area are summarized in Table 5-3.

Table 5-3
Brookman Annexation Area Forecast Summary

Growth Projection	Non-Residential Developed Acres	Total Jobs	Residential Units	ADD (mgd)
2019	8.4	300	80	0.04
2024	18.6	665	596	0.16
2027	21.6	774	751	0.20
2034	28.7	1,029	1,112	0.28
2037	28.7	1,029	1,112	0.28

5.3.4 West Urban Reserve

For the purposes of this analysis, future land use within the West Urban Reserve is assumed to mirror the proportion of land use types among developed properties within the current City limits. The proposed 630 West Zone within the West Urban Reserve, as shown on Figure 2-1, is not anticipated to have any industrial development. Percentages of future land use by type have been adjusted to exclude industrial development in this area. 20 percent of land within the West Urban Reserve is assumed to be dedicated to right-of-way, parks and open space with no future water demand.

Due to the small amount of developable residential land within the existing City limits, the exclusively non-residential development anticipated within the TEA, and the assumed build-out of the Brookman Annexation Area, it is assumed that the West Urban Reserve will be approximately 25 percent developed by 2034 and 29 percent developed within the 20-year planning horizon. It is assumed that the West Urban Reserve will begin developing by 2021 with an initial 20 acres of non-residential and 70 acres of institutional (High School) development and 150 residential units. Long term residential development in the West Urban Reserve is anticipated to occur at approximately 10 units per acre based on discussion with City planning staff.

Future water demand in the West Urban Reserve is based on 213 gpd/RU and 437 gpd/acre for non-residential land as developed previously in this section based on the Water Master Plan.

Since the master plan, the High School has been slated for replacement within this area. In addition to the projections from the master plan for this area, actual 2014 demands per acre for irrigation and indoor use per student were scaled based on existing school size to estimated future demands for the proposed institutional area.

Growth projections and future water demand estimates for the West Urban Reserve are summarized in Table 5-4.

Table 5-4
Western Urban Reserve Forecast Summary

Growth Projection	Percent Built	Residential Units	Non-Residential Developed Acres	High School (mgd)	ADD (mgd)
2024	2.0%	150	20.00	0.02	0.06
2027	8.9%	660	42.14	0.02	0.17
2034	25.0%	1,849	93.80	0.02	0.45
2037	28.8%	2,126	107.87	0.02	0.52

5.4 Water Demand Forecast

Estimates of future water demands were developed from the City's present per capita water usage data, population forecasts and water demand forecasts prepared for the City through previous work. As conservation plays an increasing role in water usage patterns, it is anticipated that Sherwood's average daily per capita usage can ultimately be reduced. Estimated maximum day water demands are developed by multiplying the estimated average day demand by the peaking factor of 2.0 for each year. To provide an estimate of peak hourly usage, a factor of approximately 1.5 was applied to estimated maximum day demands. This is consistent with water demand patterns of similar communities in the region. Population projections and anticipated water demand, through 2037 are summarized in Table 5-5. Populations for areas outside the City limits were estimated by multiplying the average people per household of 2.88 from the 2010 U.S. Census by the number of projected residential units.

Table 5-5
Population Forecasts and Estimated Water Demand Summary

Year	Service Area Population	Average Daily Demand (mgd)	Maximum Day Demand (mgd)	Peak Hour Demand (mgd)
2017	18,372	1.86	3.91	5.86
2019	18,657	1.92	4.02	6.03
2024	20,714	2.14	4.49	6.74
2027	22,628	2.31	4.85	7.27
2034	27,093	2.70	5.67	8.51
2037	27,891	2.78	5.84	8.75

Figure 5-1 is a graphical representation of the water demand forecast presented above. This chart illustrates the City's projected average day demand and maximum day demand through year 2037.

Figure 5-1
Estimated Water Demands and Available Supply

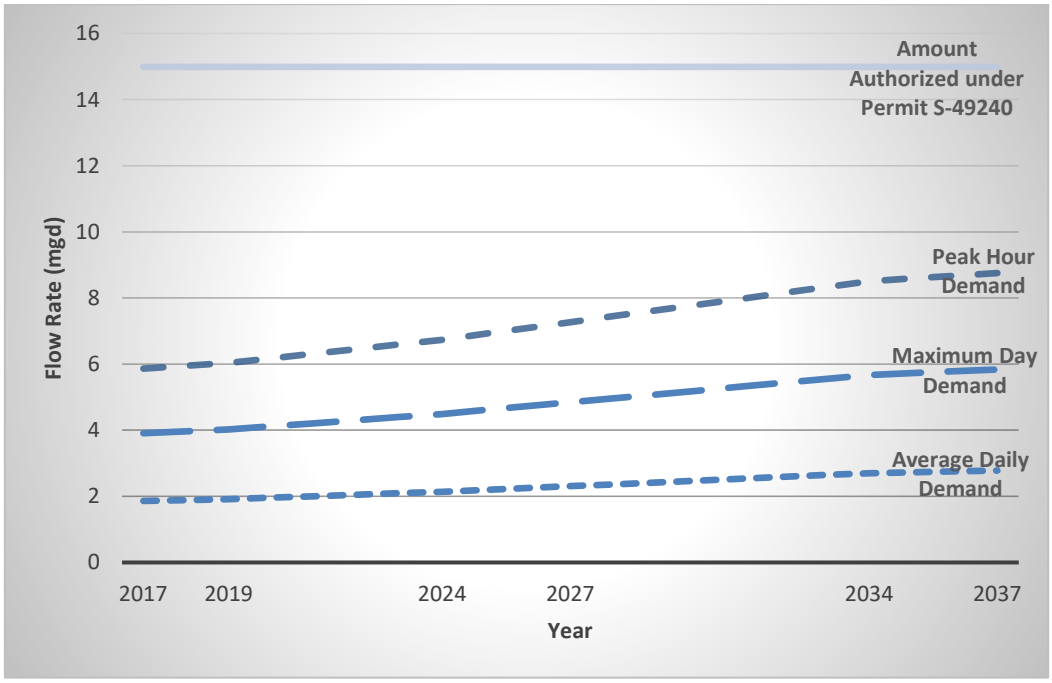
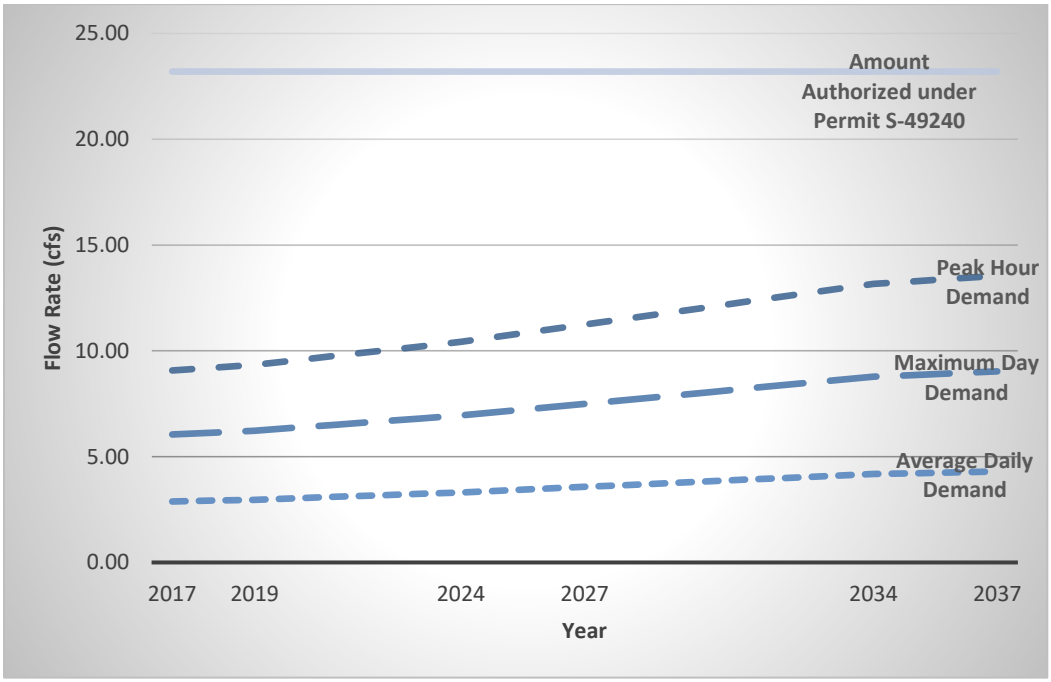


Figure 5-1 cont.
Estimated Water Demands and Available Supply



5.5 Water Rights Implementation Schedule / Quantification of Additional Supply Required

As described in Section 2, the City holds one surface water rights permit (Permit S-49240) for use of water from the Willamette River, three groundwater certificates (Certificates 82857, 40967, and 82650), one groundwater permit (Permit G-12546), and three groundwater registrations (Groundwater Registration Claims GR-1161, GR-1160, and GR-1162).

The City has used 6.34 cfs (4.1 mgd) under *extended permit* S-49240 to date. As shown in Table 5-5 and Figure 5-1, the City is projected to need 9.04 cfs (5.84 mgd) by 2037. Therefore, the City is requesting access to an additional 2.70 cfs (1.74 mgd) of "green light water" under *extended permit* S-49240 to meet its projected municipal water demands in 2037 beyond the developed portion (6.34 cfs) of the permit. The City completed the capacity expansion of the transmission line from the WRWTP to the City in January 2012, which expanded the capacity to 31 cfs (20 mgd), thereby enabling the City to convey the water needed to meet projected demands through 2037 and beyond.

The City is a member of the WRWC, which holds Permit S-49240. Water demands and water supply strategies of the WRWC members and the water providers in the area may change over the next 20 years, putting more demand on Permit S-49240. Given this likelihood, at this time the City will continue to anticipate that the WRWC will put extended

permit S-49240 to full beneficial use by October 1, 2047, as stated in the Final Order Incorporating Settlement Agreement Extension of Time for Permit S-49240. The City will revisit the date when the WRWC will likely put Permit S-49240 to full beneficial use in the City's next WMCP update.

As previously stated, the City has completed development of its groundwater rights, including Permit G-12546. The City filed a Claim of Beneficial Use (COBU) and the required supporting documentation for Permit G-12546 in June 2007, which demonstrated full beneficial use of the permit. The COBU is still pending at OWRD. The City is now using its groundwater rights and supply system as a backup water supply for emergencies given that groundwater is not a reliable long-term water supply source due to declining groundwater levels in the associated aquifer.

5.5.1 Alternative Sources

OAR 690-086-0170(5) requires an analysis of alternative sources of water if any expansion or initial diversion of water allocated under existing permits is necessary to meet future water demand. During the planning period of this WMCP, the City anticipates expanding diversion of water under Permit S-49240 to meet its future water demands as described above; therefore, this rule applies.

5.5.1.1 Conservation Measures

As described in Section 3, the City has an array of water conservation measures, and the City will continue to implement water conservation measures. Water savings generated by the City's water conservation measures in the past few years are integrated in historical demands, which the City used to develop its water demand projections. Implementation of new water conservation measures over the 20-year planning period of this WMCP would likely produce some water savings, but the extent of savings is likely to be a small percentage based on the findings of studies in other cities in Oregon. Studies of potential water conservation programs conducted by the Cities of Corvallis and Bend found that implementation of a water conservation program with a variety of measures would produce average annual percentage of conservation savings (approximately 4 percent and 6 percent respectively) and would cost $5 million over 20 years in the case of the City of Corvallis (City of Corvallis, Water Use and Water Conservation Project, 2010) and $3 million over 10 years in the case of the City of Bend (City of Bend WMCP, 2011). If the City of Sherwood achieved 2 percent water savings, assuming it would have a smaller budget than those two cities, the conservation savings would reduce demand by approximately 0.18 cfs, which would only delay the need for additional water under Permit S-49240 for a short amount of time. Conversely, climate change is expected to increase municipal and industrial peak season water demands in the Willamette Basin, according to the US Army Corps of Engineers' (in cooperation with OWRD) Willamette Basin Review Feasibility Study. For example, due to climate change and associated increased demands and reduced supplies, municipal and industrial demand for stored water from the Willamette Valley Project (i.e. the thirteen dams in the Willamette River basin along with the associated

reservoirs and infrastructure managed by the US Army Corps of Engineers) is projected to increase by 6.9 percent by 2030 and 17.0 percent by 2040 (Table 11 in Appendix K and pg. 63; Willamette Basin Review Feasibility Study 2017). Thus, increased demands resulting from climate change could outpace savings from water conservation measures implemented by the City. The City now depends on the Willamette River as its primary water source due to the reliability issues with the City's groundwater sources; therefore, having sufficient access to Permit S-49240 is imperative. Consequently, water savings from water conservation measures cannot eliminate the City's need for additional supply from the Willamette River. However, the City will continue to implement its current water conservation measures and to pursue additional measures.

5.5.1.2 Interconnections

Since 2015, the City's water supply has come exclusively from the Willamette River via the WRWTP, which was created to serve all members of the WRWC (TVWD and the cities of Tigard, Tualatin, and Sherwood) as well as the City of Wilsonville. The City also maintains the prior water supply piping with the City of Tualatin as an emergency connection, which enables the purchase of PWB water. However, as previously stated, a temporary pump must be installed to boost the hydraulic grade of the supply in order for the City of Tualatin to supply the City with water through this connection. Given that neighboring municipalities are currently relying on the same water source (the Willamette River) as the City or plan to rely on the same water source in the near future, additional interconnections will not provide the City within additional reliable water supply source.

5.5.1.3 Cost effectiveness

OAR 690-086-170(c) requires an assessment of whether the projected water needs can be satisfied through other conservation measures that would provide water at a cost that is equal or less than the cost of other identified sources.

As described above, water conservation measures alone, regardless of the cost, cannot meet the City's need to expand diversions under Permit S-49240.

5.5.2 Quantification of Projected Maximum Rate and Monthly Volume

OAR 690-086-0170(6)

OAR 690-086-0170(6) requires a quantification of the maximum rate of withdrawal and maximum monthly use if any expansion or initial diversion of water allocated under an existing permit is necessary to meet demands in the 20-year planning horizon. Within the next 20 years, the City is planning to need up to 9.04 cfs (5.84 mgd) under the Permit S-49240 to help meet its projected water demands in 2037. Assuming that the water right is used at 5.84 mgd, 24 hours per day for 31 days during the peak demand month (likely July or August), the maximum monthly volume for the water right would be approximately 181.04 MG.

5.5.3 Mitigation Actions under State and Federal Law

Under OAR 690-086-0170(7), for expanded or initial diversion of water under an existing permit, the water supplier is to describe mitigation actions it is taking to comply with legal requirements of the Endangered Species Act, Clean Water Act, and other applicable state or federal environmental regulations. The City does propose to expand diversion of water allocated under extended permit S-49240 during the planning period of the WMCP. The final order on the City's extension application for Permit S-49240, included "fish persistence" conditions, which are described in Section 2.10.2.1. In addition, the City is required to implement a public education and voluntary conservation program under the Settlement Agreement incorporated in the Final Order for Extension of Time for Permit S-49240, as described in Section 3. A copy of the Final Order is included in Appendix C. The City is not required to take any other mitigation actions under state or federal law.

5.5.4 New Water Rights

Under OAR 690-086-0170(8), if a municipal water supplier finds it necessary to acquire new water rights within the next 20 years in order to meet its projected demand, an analysis of alternative sources of the additional water is required. As shown in the above, the City's water rights are sufficient to meet projected demands during the next 20 years. Consequently, the City currently does not plan to acquire additional water rights within that timeframe.

5.6 Summary

This section presented future population projections and water demands for the City's service area. This section also presents a comparison of the availability of the City's existing supply source with future water demands. An assessment of supply source alternatives to meet the City's future water demands was presented, as was a discussion of the City's schedule for full use of its existing water rights were included in this section.

BEFORE THE WATER RESOURCES DEPARTMENT
OF THE
STATE OF OREGON

In the Matter of the Proposed Water Management and Conservation Plan for City of Sherwood, Washington County	)))	FINAL ORDER APPROVING WATER MANAGEMENT AND CONSERVATION PLAN

Authority

OAR Chapter 690, Division 086, establishes the process and criteria for approving water management and conservation plans required under the conditions of permits, permit extensions and other orders of the Department. An approved water management plan may authorize the diversion and use of water under a permit extended pursuant to OAR Chapter 690, Division 315.

Background

On September 5, 2006, the City of Sherwood submitted a draft Water Management and Conservation Plan (WMCP) for review under OAR Chapter 690, Division 086 (November 2002). Submittal of the plan was required as an update of the previous WMCP under Permit G 12546. The City of Sherwood is also required to submit a WMCP consistent with a settlement agreement in order to gain access to water under an extension of Permit S 49240. Sherwood is one of the cities identified to develop water under this Permit S 49240 through the settlement agreement.

The Department published notice of receipt of the plan on September 12, 2006. No public comments were received. The Department provided written comments on the plan to the City on March 5, 2007. In response, the City submitted a revised plan on January 22, 2008 and supplemental materials on October 8, 2008.

Findings of Fact

1. The City of Sherwood Water Management and Conservation Plan contains all of the plan elements required under OAR 690-086-0125.

2. The projections of future water needs in the plan demonstrate a need for over 23.20 cfs of water available under permit S 49240 to meet demands for the population anticipated in 20 years. These projections are reasonable and consistent with the City's land use plan.

This final order is subject to judicial review by the Court of Appeals under ORS 183.482. Any petition for judicial review must be filed within the 60-day time period specified by ORS 183.482(1). Pursuant to ORS 536.075 and OAR 137-003-0675, you may petition for judicial review or petition the Director for reconsideration of this order. A petition for reconsideration may be granted or denied by the Director, and if no action is taken within 60 days following the date the petition was filed, the petition shall be deemed denied.

3. The plan includes continued implementation of conservation activities such as: an annual water audit; a two-tiered water rate system with an updated rate study; annual testing of 2" and larger meters; joint public education materials with the Regional Water Providers Consortium and Tualatin Valley Water District (including a web link from the City web site); bi-monthly educational inserts in billing materials; and an annual "Sherwood Conservation News" direct mailing. The system is fully metered and the rate structure includes a base rate and volumetric charge. System leakage is estimated at 6.4 percent.

4. The plan shows implementation of required conservation activities under OAR 690-86-150(6) and includes 5-year benchmarks for evaluation of existing conservation activities and an updated rate study.

5. The plan identifies ground water, water service contracts and the Willamette River as the sources of the City's water rights. The plan accurately and completely describes Upper Willamette River Chinook salmon and Upper Willamette River steelhead as the affected listed species because portions of their migratory habitat are in source areas of permit S 49240.

6. The water curtailment element included in the plan satisfactorily promotes water curtailment practices and includes a list of four stages of alert with concurrent curtailment actions.

7. The diversion of water under permit S 49240 will be initiated during the next 20 years and consistent with OAR 690-086-0130(7):

    a. The plan meets OAR 690-086-0130(7)(a) by continued implementation of conservation measures that provide water at a cost that is equal to or lower than the cost of other identified sources, and the supplier has provided sufficient justification for the factors used in selecting other sources for development;

    b. The plan meets OAR 690-086-0130(7) (b) as initiation of use under this regional supply source is the most feasible and appropriate water supply alternative available to the supplier; and

    c. The plan meets OAR 690-086-0130(7) (c), because it contains documentation that, at this time, no mitigation is required and reflects a willingness by the City to perform mitigation if required in the future. The City also included the requirements of the settlement agreement as part of the planned conservation activities.

Conclusion of Law

The water management and conservation plan submitted by the City of Sherwood is consistent with the criteria in OAR Chapter 690, Division 086.

Now, therefore, it is ORDERED:

1. The City of Sherwood Water Management and Conservation Plan is approved and shall remain in effect until January 22, 2018, unless this approval is rescinded pursuant to OAR 690-086-0920.

2. The limitation of the diversion of water under Permit S 49240 established by the extension of time approved on June 26, 2007 is removed and, subject to other limitations or conditions of the permit, the City of Sherwood is authorized to divert up to 23.20 cfs under Permit S 49240.

3. The City of Sherwood shall submit an updated plan within ten years and no later than January 22, 2018 and shall submit progress reports containing the information required under OAR 690-086-0120(4) by January 22, 2013.

Dated at Salem, Oregon this 19th day of December, 2008.

Phillip C. Ward, Director

Appeals should be addressed to the attention of: Bill Fujii

Appeals deadline: 2-27-09
Minimum of 60 days from issuance of FO

December 19, 2008

Craig Sheldon, Public Works Director
City of Sherwood
22560 SW Pine Street
Sherwood, Oregon 97140

Subject: Water Management and Conservation Plan

Dear Mr. Sheldon:

Thank you for asking Brian Ginter to review the proposed final order on your water management and conservation plan. He asked me to generate the final order.

We appreciate your cooperation in this effort. Please do not hesitate to contact us if we can provide any guidance or information on your bench mark report due on January 22, 2013 or as you update your plan.

We appreciate your cooperation in this effort. Please do not hesitate to call me at 503-986-0887 if you have any questions.

Sincerely,

Bill Fujii, NRS III
Field Services Division

Enclosure

C Brian Gintner, MSA
Todd Heidgerken, TVWD
Darrell Hedin
Mike McCord

Appendix B: Local Jurisdiction comments

The following local jurisdictions were provided copies to provide comments, but none were received.

1. Washington County
2. Metro
3. City of Wilsonville
4. Tualatin Valley Water District
5. City of Tualatin
6. City of Tigard
7. City of Hillsboro
8. City of Beaverton

Registration No. GR - 1161 0

Certificate No. GR 1707

Registration Statement

OF CLAIMANT OF RIGHT TO APPROPRIATE GROUND WATER

TO THE STATE ENGINEER OF OREGON:

I, F. C. Albert, Recorder for the City of Sherwood

of Sherwood, Oregon (Mailing address) County of Washington

State of Oregon, do hereby make application for a certificate of registration as evidence of a right to appropriate ground water.

1. Source from which water is withdrawn is Pump Well # 1 (Flowing well, pump well, infiltration branch, or tunnel)

2. Location is: within the corporate limits of Sherwood, Oregon (Approximate distance and direction from nearest city or town) 1620 ft. E & 1650 ft. S Mon

and is more particularly described as follows: 21'-6" from Railroad Right-of-way and 20'-6" from line between lots 6 and 7 of Block 1 of Epler's Addition to the City of Sherwood, according to the plat thereof on file in Washington County, Oregon

(a) being within SE¼ of the NW¼ (Smallest legal subdivision) of Sec. 32, Twp. 2 S (N. or S.), Rge. 1 W (E. or W.)

or (b) within limits of recorded platted property, town or city Sherwood, Oregon

in Lot Six (6), Block One (1) of Epler's Addition to the City of (Name of plat or addition)

Sherwood (If within city or town, give name) County of Washington

3. Construction Work was begun on Before Jan., 1922 (Date); was completed on Indefinite, no records available (Date)

and the ground water claimed was first used for the purposes set out below on Before Jan. 1, 1922 (Date),

since which time the water has been used continuously (Continuously or intermittently)

from (Date) to Present (Date) February 10, 1958

4. Quantity of water claimed and used is 100 gallons per minute; acre feet per year.

5. Purpose or Purposes for which water is used Municipal, Manufacturing and Industrial (Domestic, irrigation, municipal, manufacturing, industrial, etc.)

6. Description of Well: Depth 160 feet. Type Drilled (Dug or drilled)

diameter Six (6) inches. Elevation of ground at well site approximately 130 (As near as known) feet, mean sea level.

Depth to water table 32' to 40' feet.

7. Capacity of Well: 130 g.p.m. with None feet drawdown.

g.p.m. with feet drawdown.

Date of test Began the Date Indefinite

If Flowing Well: Measured discharge g.p.m. on (Date)

Shut-in pressure at ground surface lbs. per sq. in. on (Date)

Water is controlled by (Cap, valve, etc.)

4M—4-57

BEFORE THE WATER RESOURCES DEPARTMENT
OF THE
STATE OF OREGON

In the Matter of Permit Amendment T-10477, Clackamas, Multnomah and Washington Counties	)))	FINAL ORDER APPROVING A CHANGE IN POINT OF DIVERSION

Authority

ORS 537.211 establishes the process in which a water right permit holder may submit a request to change the point of diversion and/or place of use authorized under an existing water right permit.

Applicant
WILLAMETTE RIVER WATER COALITION
ATTN: AMANDA RICH
PO BOX 745
BEAVERTON, OR 97075

Agent
GSI WATER SOLUTIONS, INC.
ATTN: ADAM SUSSMAN
1600 SW WESTERN BLVD., STE. 240
CORVALLIS, OR 97333

Findings of Fact

1. On October 24, 2007, the Willamette River Water Coalition filed an application to amend the point of diversion under Permit S-49240. The Department assigned the application number T-10477.

2. The permit to be amended is as follows:

Permit: S-49240 (Application S-50693), in the name of WILLAMETTE RIVER WATER COALITION, *as assigned on May 22, 2007*
Use: MUNICIPAL and INDUSTRIAL
Priority Date: JUNE 19, 1973
Quantity: 202.0 CUBIC FEET PER SECOND (CFS)
Source: WILLAMETTE RIVER, a tributary of Columbia River
Date for Completion of Construction and Complete Application of Water: October 1, 2047

Authorized Point of Diversion:

Twp	Rng	Mer	Sec	¼ ¼	Location
3 S	1 W	WM	22	NE SE	3350 feet South and 400 feet West from the NE corner of Section 22

This is a final order in other than a contested case. This order is subject to judicial review under ORS 183.484. Any petition for judicial review must be filed within the 60-day time period specified by ORS 183.484(2). Pursuant to ORS 536.075 and OAR 137-004-0080, you may petition for judicial review or petition the Director for reconsideration of this order. A petition for reconsideration may be granted or denied by the Director, and if no action is taken within 60 days following the date the petition was filed, the petition shall be deemed denied.

Authorized Place of Use:

Twp	Rng	Mer	Sec	¼ ¼
1 N	1 W	WM	4	All
1 N	1W	WM	5	All
1 N	1W	WM	6	All
1 N	1W	WM	7	All
1 N	1W	WM	8	All
1 N	1W	WM	9	All
1 N	1W	WM	10	All
1 N	1W	WM	15	All
1 N	1W	WM	16	All
1 N	1W	WM	17	All
1 N	1W	WM	18	All
1 N	1W	WM	19	All
1 N	1W	WM	20	All
1 N	1W	WM	21	All
1 N	1W	WM	22	All
1 N	1W	WM	23	All
1 N	1W	WM	25	All
1 N	1W	WM	26	All
1 N	1W	WM	27	All
1 N	1W	WM	28	All
1 N	1W	WM	29	All
1 N	1W	WM	30	All
1 N	1W	WM	31	All
1 N	1W	WM	32	All
1 N	1W	WM	33	All
1 N	1W	WM	34	All
1 N	1W	WM	35	All
1 N	1W	WM	36	All
1 N	2 W	WM	1	All
1 N	2 W	WM	2	All
1 N	2 W	WM	3	All
1 N	2 W	WM	10	All
1 N	2 W	WM	11	All
1 N	2 W	WM	12	All
1 N	2 W	WM	13	All

Twp	Rng	Mer	Sec	¼ ¼
1 N	2 W	WM	14	All
1 N	2 W	WM	15	All
1 N	2 W	WM	22	All
1 N	2 W	WM	23	All
1 N	2 W	WM	24	All
1 N	2 W	WM	25	All
1 N	2 W	WM	26	All
1 N	2 W	WM	27	All
1 N	2 W	WM	34	All
1 N	2 W	WM	35	All
1 N	2 W	WM	36	All
1N	1 E	WM	31	All
2 N	1 W	WM	31	All
2 N	1 W	WM	32	All
1 S	1 W	WM	1	All
1 S	1 W	WM	2	All
1 S	1 W	WM	3	All
1 S	1 W	WM	4	All
1 S	1 W	WM	5	All
1 S	1 W	WM	6	All
1 S	1 W	WM	7	All
1 S	1 W	WM	8	All
1 S	1 W	WM	9	All
1 S	1 W	WM	10	All
1 S	1 W	WM	11	All
1 S	1 W	WM	12	All
1 S	1 W	WM	13	All
1 S	1 W	WM	14	All
1 S	1 W	WM	15	All
1 S	1 W	WM	16	All
1 S	1 W	WM	17	All
1 S	1 W	WM	18	All
1 S	1 W	WM	19	All
1 S	1 W	WM	20	All
1 S	1 W	WM	21	All
1 S	1 W	WM	22	All
1 S	1 W	WM	23	All

Twp	Rng	Mer	Sec	¼ ¼
1 S	1 W	WM	24	All
1 S	1 W	WM	25	All
1 S	1 W	WM	26	All
1 S	1 W	WM	27	All
1 S	1 W	WM	28	All
1 S	1 W	WM	29	All
1 S	1 W	WM	30	All
1 S	1 W	WM	31	All
1 S	1 W	WM	32	All
1 S	1 W	WM	33	All
1 S	1 W	WM	34	All
1 S	1 W	WM	35	All
1 S	1 W	WM	36	All
1 S	2 W	WM	1	All
1 S	2 W	WM	2	All
1 S	2 W	WM	3	All
1 S	2 W	WM	10	All
1 S	2 W	WM	11	All
1 S	2 W	WM	12	All
1 S	2 W	WM	13	All
1 S	2 W	WM	14	All
1 S	2 W	WM	15	All
1 S	2 W	WM	22	All
1 S	2 W	WM	23	All
1 S	2 W	WM	24	All
1 S	2 W	WM	25	All
1 S	2 W	WM	26	All
1 S	2 W	WM	27	All
1 S	2 W	WM	34	All
1 S	2 W	WM	35	All
1 S	2 W	WM	36	All
1 S	1 E	WM	6	All
1 S	1 E	WM	7	All
1 S	1 E	WM	18	All
1 S	1 E	WM	19	All
1 S	1 E	WM	30	All
1 S	1 E	WM	31	All

Twp	Rng	Mer	Sec	¼ ¼
2 S	1 W	WM	1	All
2 S	1 W	WM	2	All
2 S	1 W	WM	3	All
2 S	1 W	WM	4	All
2 S	1 W	WM	5	All
2 S	1 W	WM	6	All
2 S	1 W	WM	7	All
2 S	1 W	WM	8	All
2 S	1 W	WM	9	All
2 S	1 W	WM	10	All
2 S	1 W	WM	11	All
2 S	1 W	WM	12	All
2 S	1 W	WM	13	All
2 S	1 W	WM	14	All
2 S	1 W	WM	15	All
2 S	1 W	WM	16	All
2 S	1 W	WM	17	All
2 S	1 W	WM	18	All
2 S	1 W	WM	19	All
2 S	1 W	WM	20	All
2 S	1 W	WM	21	All
2 S	1 W	WM	22	All
2 S	1 W	WM	23	All
2 S	1 W	WM	24	All
2 S	1 W	WM	25	All
2 S	1 W	WM	26	All
2 S	1 W	WM	27	All
2 S	1 W	WM	28	All
2 S	1 W	WM	29	All
2 S	1 W	WM	30	All
2 S	1 W	WM	31	All
2 S	1 W	WM	32	All
2 S	1 W	WM	33	All
2 S	1 W	WM	34	All
2 S	1 W	WM	35	All
2 S	1 W	WM	36	All
2 S	2 W	WM	1	All

Twp	Rng	Mer	Sec	¼ ¼
2 S	2 W	WM	2	All
2 S	2 W	WM	3	All
2 S	2 W	WM	10	All
2 S	2 W	WM	11	All
2 S	2 W	WM	12	All
2 S	1 E	WM	6	All
2 S	1 E	WM	7	All
2 S	1 E	WM	18	All
2 S	1 E	WM	19	All
2 S	1 E	WM	30	All
2 S	1 E	WM	31	All
3 S	1 W	WM	4	All
3 S	1 W	WM	10	NE NW
3 S	1 W	WM	10	NW NW
3 S	1 W	WM	10	SW NW
3 S	1 W	WM	10	SE NW
3 S	1 W	WM	10	NE SW
3 S	1 W	WM	10	NW SW
3 S	1 W	WM	10	SW SW
3 S	1 W	WM	10	SE SW
3 S	1 W	WM	15	NE NW
3 S	1 W	WM	15	NW NW
3 S	1 W	WM	15	SW NW
3 S	1 W	WM	15	SE NW
3 S	1 W	WM	15	NE SW
3 S	1 W	WM	15	NW SW
3 S	1 W	WM	15	SW SW
3 S	1 W	WM	15	SE SW
3 S	1 W	WM	22	NE NW
3 S	1 W	WM	22	NW NW
3 S	1 W	WM	22	SW NW
3 S	1 W	WM	22	SE NW
3 S	1 W	WM	22	NE SW
3 S	1 W	WM	22	NW SW
3 S	1 W	WM	22	SW SW
3 S	1 W	WM	22	SE SW
3 S	1 W	WM	25	NE SW

Twp	Rng	Mer	Sec	¼ ¼
3 S	1 W	WM	25	NW SW
3 S	1 W	WM	25	SW SW
3 S	1 W	WM	25	SE SW
3 S	1 W	WM	25	NE SE
3 S	1 W	WM	25	NW SE
3 S	1 W	WM	25	SW SE
3 S	1 W	WM	25	SE SE
3 S	1 W	WM	26	NE SW
3 S	1 W	WM	26	NW SW
3 S	1 W	WM	26	SW SW
3 S	1 W	WM	26	SE SW
3 S	1 W	WM	26	NE SE
3 S	1 W	WM	26	NW SE
3 S	1 W	WM	26	SW SE
3 S	1 W	WM	26	SE SE
3 S	1 W	WM	27	NE SW
3 S	1 W	WM	27	NW SW
3 S	1 W	WM	27	SW SW
3 S	1 W	WM	27	SE SW
3 S	1 W	WM	27	NE SE
3 S	1 W	WM	27	NW SE
3 S	1 W	WM	27	SW SE
3 S	1 W	WM	27	SE SE
3 S	1 E	WM	6	All
3 S	1 E	WM	7	All
3 S	1 E	WM	18	NE NE
3 S	1 E	WM	18	NW NE
3 S	1 E	WM	18	SW NE
3 S	1 E	WM	18	SE NE
3 S	1 E	WM	18	NE NW
3 S	1 E	WM	18	SE NW
3 S	1 E	WM	18	NE SW
3 S	1 E	WM	18	SE SW
3 S	1 E	WM	18	NE SE
3 S	1 E	WM	18	NW SE
3 S	1 E	WM	18	SW SE
3 S	1 E	WM	18	SE SE

Twp	Rng	Mer	Sec	¼ ¼
3 S	1 E	WM	19	NE NE
3 S	1 E	WM	19	NW NE
3 S	1 E	WM	19	SW NE
3 S	1 E	WM	19	SE NE
3 S	1 E	WM	19	NE NW
3 S	1 E	WM	19	SE NW
3 S	1 E	WM	19	NE SW
3 S	1 E	WM	19	SE SW
3 S	1 E	WM	19	NE SE
3 S	1 E	WM	19	NW SE
3 S	1 E	WM	19	SW SE
3 S	1 E	WM	19	SE SE
3 S	1 E	WM	30	NE NE
3 S	1 E	WM	30	NW NE
3 S	1 E	WM	30	SW NE
3 S	1 E	WM	30	SE NE
3 S	1 E	WM	30	NE NW
3 S	1 E	WM	30	SE NW
3 S	1 E	WM	30	NE SW
3 S	1 E	WM	30	SE SW
3 S	1 E	WM	30	NE SE
3 S	1 E	WM	30	NW SE
3 S	1 E	WM	30	SW SE
3 S	1 E	WM	30	SE SE

3. Application T-10477 proposes to move the point of diversion of the permit downstream approximately 900 feet to:

Twp	Rng	Mer	Sec	¼ ¼	Location
3 S	1 W	WM	23	NW SW	3391.36 feet South and 495.26 feet East from the NW corner of Section 23

4. Notice of the application for the permit amendment was published in the Department's weekly notice on October 30, 2007, pursuant to ORS 540.520(5). No comments were filed in response to the notice.

5. The Oregon Department of Fish and Wildlife (ODFW) has determined that a fish screening and/or by-pass device is necessary at the new point of diversion to prevent fish from entering the diversion and/or safely transport fish back to the body of water from which the fish were

diverted and that the diversion is currently equipped with an appropriate fish screening and/or by-pass device.

6. The change would not result in injury to other water rights.

7. The change does not enlarge the permit.

8. The change does not alter any other terms of the permit.

Conclusion of Law

The change in point of diversion proposed by Permit Amendment Application T-10477 is consistent with the requirements of ORS 537.211.

Now, therefore, it is ORDERED:

The change and subsequent use of water shall be subject to the following conditions:

1. The quantity of water diverted at the new point of diversion shall not exceed the quantity of water lawfully available at the original point of diversion.

2. Prior to diverting water, the water user shall install an in-line flow meter, weir, or other suitable device for measuring and recording the quantity of water diverted. The type and plans of the measuring device must be approved by the Department prior to beginning construction and shall be installed under the general supervision of the Department. The water user shall maintain and operate the measuring device as required by the Department.

3. Water shall be acquired from the same surface water source as the original point of diversion.

4. The water user shall maintain and operate a fish screening and/or by-pass device, as appropriate, at the new point of diversion consistent with the Oregon Department of Fish and Wildlife's operational and maintenance standards.

5. All other terms and conditions of Permit S-49240 remain the same.

6. Permit S-49240, in the name of the Willamette River Water Coalition, is amended as described herein.

Dated at Salem, Oregon this 25th day of June, 2008.

for Phillip C. Ward, Director

Mailing Date: JUN 27 2008

690-10-PS2-v

STATE OF OREGON

County of CLACKAMAS

PERMIT TO APPROPRIATE THE PUBLIC WATERS

This is to certify that I have examined APPLICATION 50693 and do hereby grant the same SUBJECT TO EXISTING RIGHTS INCLUDING THE APPROPRIATE MINIMUM FLOW POLICIES ESTABLISHED BY THE WATER POLICY REVIEW BOARD and the following limitations and conditions:

This permit is issued to Wolf Creek Highway Water District of PO Box 745, 1850 SW 170th Avenue, Beaverton, Oregon 97075, phone 642-1511, for the use of the waters of Willamette River, a tributary of Columbia River,
for the PURPOSE of municipal and industrial

that the PRIORITY OF THE RIGHT dates from June 19, 1973

and is limited to the amount of water which can be applied to beneficial use and shall not exceed 202 cubic foot per second

The POINT OF DIVERSION is to be LOCATED: 3350 feet South and 400 feet West from the Northeast Corner of Section 22, being within the NE 1/4 SE 1/4 of Section 22, Township 3 South, Range 1 West, WM, in the County of Clackamas.

A description of the PLACE OF USE under the permit, and to which such right is appurtenant, is as follows:

SEE NEXT PAGE

Township 2 North,	Range 1 West,	WM	Sections 31 and 32	Municipal and industrial
Township 1 North,	Range 1 West,	WM	Sections 4 through 10 15 through 23 and 25 through 36	
Township 1 South,	Range 1 West,	WM	Sections 1 through 36	
Township 2 South,	Range 1 West,	WM	Sections 1 through 36	
Township 3 South,	Range 1 West,	WM	Section 4 W 1/2 of 10 W 1/2 of 15 W 1/2 of 22 S 1/2 of 25, and 26, 27	
Township 1 North,	Range 2 West,	WM	Sections 1 through 3, 10 through 15 22 through 27 34 through 36	
Township 1 South,	Range 2 West,	WM	Sections 1 through 3, 10 through 15 22 through 27 34 through 36	
Township 2 South,	Range 2 West,	WM	Sections 1 through 3 and 10 through 12	
Township 1 North,	Range 1 East,	WM	Section 31	
Township 1 South,	Range 1 East,	WM	Sections 6, 7, 18, 19, 30, 31	
Township 2 South,	Range 1 East,	WM	Sections 6, 7, 18, 19, 30, 31	
Township 3 South,	Range 1 East,	WM	Sections 6, 7 E 3/4 of 18, and 19, and 30	

Actual construction work shall begin on or before April 8, 1986 , and shall thereafter be prosecuted with reasonable diligence and be completed on or before October 1, 1987 .

Complete application of the water to the proposed use shall be made on or before October 1, 1988 .

Witness my hand this 8th day of April , 1985 .

/s/ WILLIAM H. YOUNG

WATER RESOURCES DIRECTOR

This permit, when issued, is for the beneficial use of water. By law, the land use associated with this water use must be in compliance with statewide land-use goals and any local acknowledged land-use plan. It is possible that the land use you propose may not be allowed if it is not in keeping with the goals and the acknowledged plan. Your city or county planning agency can advise you about the land-use plan in your area.

APPLICATION 50693

PERMIT **49240**

RECEIVED
FEB 12 1958
STATE ENGINEER
SALEM, OREGON

Registration No. GR - 1160

Certificate No. GR 1706

Registration Statement

OF CLAIMANT OF RIGHT TO APPROPRIATE GROUND WATER

TO THE STATE ENGINEER OF OREGON:

I, H. G. Albert, Recorder for the City of Sherwood,

of Sherwood, Oregon (Mailing address) County of Washington

State of Oregon, do hereby make application for a certificate of registration as evidence of a right to appropriate ground water.

1. **Source** from which water is withdrawn is Pump Well # 2 (Flowing well, pump well, infiltration trench, or tunnel)

2. **Location** is: Within the Corporate limits of Sherwood, Oregon (Approximate distance and direction from nearest city or town) 1680 ft. S - 1610 ft. E. NW cor. 32

and is more particularly described as follows: 29'-6" from Railroad High-of-way and 33'-6" from line between lots 6 and 7 of Block 1 of Epler's Addition to the City

(a) of Sherwood, according to the plat thereof on file in the Recorder's office in Washington County, Oregon (Give distance and bearing to corner of section or other legal subdivision)

being within SE¼ of NW¼ (Smallest legal subdivision) of Sec. 32, Twp. 2 S (N. or S.), Rge. 1 W. (E. or W.)

or (b) within limits of recorded platted property, town or city: Sherwood, Oregon

in Lot Six (6), Block One (1) of Epler's Addition to the City of (Name of plat or addition)

Sherwood (If within city or town, give name) County of Washington Indefinite.

3. **Construction Work** was begun on before May 1922 (Date); was completed on No records available (Date)

and the ground water claimed was first used for the purposes set out below on before May 10, 1922 (Date),

since which time the water has been used continuously (Continuously or intermittently)

from 1922 (Date) to present time, Feb. 10, 1958. (Date)

4. **Quantity** of water claimed and used is 220 gallons per minute; ..... acre feet per year.

5. **Purpose or Purposes** for which water is used Municipal, manufacturing and industrial (Domestic, irrigation, municipal, manufacturing, industrial, etc.)

6. **Description of Well:** Depth 180 feet. Type Drilled (Dug or drilled)

diameter Six (6") inches. Elevation of ground at well site 193 (As near as known) feet, mean sea level.

Depth to water table 32 to 40 feet.

7. **Capacity of Well:** 220 g.p.m. with none feet drawdown.

..... g.p.m. with ..... feet drawdown.

Date of test recently, date indefinite.

If Flowing Well: Measured discharge ..... g.p.m. on ..... (Date)

Shut-in pressure at ground surface ..... lbs. per sq. in. on ..... (Date)

Water is controlled by ..... (Cap, valve, etc.)

4M—4-57

8. **Casing:** (Give diameter, commercial specifications and depth below ground surface of each casing size.)

Six (6") inch diameter All way to bottom from 0 to 180 feet

..... inch diameter ..... from ..... to ..... feet

..... inch diameter ..... from ..... to ..... feet

..... inch diameter ..... from ..... to ..... feet

Describe and show depth of shoe, plug, adapter, liner or other details: .....

9. **Perforated Casings or Screens:**

No records available from ..... to .....
(Number per foot and size of perforations, or describe screen)

..... from ..... to .....

..... from ..... to .....

..... from ..... to .....

10. **Log of Well:** (Describe each stratum or formation clearly, indicate if water bearing, and give thickness and depth as indicated.)

MATERIAL	Thickness (Feet)	Depth to Bottom (Feet)
No Log of well obtainable.		
Note: The two wells located in Lot Six (6), Block One (1),		
Epler's Addition to Sherwood were drilled many years ago for		
Tualatin Valley Electric Company, which Company supplied		
water for the City of Sherwood until it sold its holdings		
to the City of Sherwood on May 15, 1922. Since then,		
the City of Sherwood has operated its own Water System.		

GR 1706

If log of well is not available, give name and address of driller. Jack Norback (deceased)

deepened both wells in Lot six and Block 1 or Epler's Addition during the early 1920s.

11. **Infiltration Trench:** Covered or open .....

Dimensions: Length ..... ft. Minimum depth ..... ft. Maximum depth ..... ft.

Bottom width ..... ft. Discharge ..... g.p.m. Date of test .....

12. **Tunnel:** Type of lining .....

Dimensions: ..... (Length, course, and cross sectional size)

Position of water bearing stratum with reference to portal of tunnel .....

Log of tunnel: (Preceding table for log of well may be used, if desired. Give footage from portal and character of materials, as pertinent.)

13. **Pumping Equipment:**

(a) Pump Rotary pump with booster (Make, type and size) Capacity 220 g.p.m.

(b) Motor 10 H. P. US Motor and 10 H. P. Booster (Type and horsepower)

14. Location of area irrigated or to be irrigated, or place of use if for purposes other than irrigation.

Township North or South	Range E. or W. of Willamette Meridian	Section	Forty-acre Tract	Number Acres To Be Irrigated	Date of Reclamation
Twp. 2 S	Rge. 1W	32	SE¼ of NW¼	Municipal	1922
"	"	"	NE¼ of NW¼	"	"
"	"	"	NW¼ of NW¼	"	"
"	"	"	SW¼ of NW¼	"	"
"	"	"	NW¼ of SE¼	"	"
"	"	"	SW¼ of SE¼	"	"
"	"	"	NE¼ of NE¼	"	"
"	"	"	NW¼ of NE¼	"	"
"	"	"	SW¼ of NE¼	"	"
"	"	"	SE¼ of NE¼	"	"
"	"	"	NE¼ of SW¼	"	"
"	"	"	NW¼ of SW¼	"	"
"	"	"	SW¼ of SW¼	"	"
"	"	"	SE¼ of SW¼	"	"

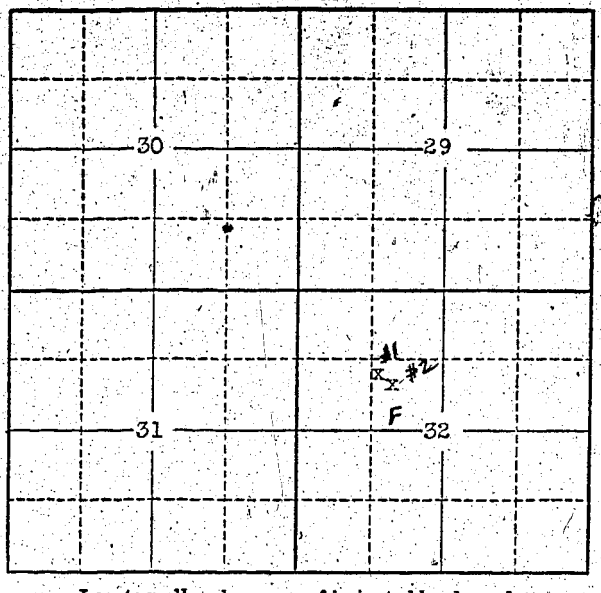
15. If the ground water supply is supplemental to an existing water supply, identification of any application for a permit, permit, certificate or adjudicated right to appropriate water made or held by the registrant.

.....

.....

Township 2 S. Range 1 W, W.M.

North



These two wells are about 20 ft. apart and housed in the same building

Locate well and acreage of irrigated land on plat.

Scale: 2" = 1 Mile

STATE OF OREGON
County of Washington } ss.

I, H. G. Albert, City Recorder, being first duly sworn, do hereby certify that I have read the foregoing Registration Statement and that all of the items therein contained are true to the best of my knowledge and belief.

H. G. Albert City Recorder
(Signature of Registrant)

Subscribed and sworn to before me this 22 day of February, 1958

My commission expires July 17, 1958 Walter E. Karb
(Notary Public)

(SEAL)

CERTIFICATE OF REGISTRATION

STATE OF OREGON
County of Marion } ss.

This is to certify that the foregoing Registration Statement was received in the office of the State Engineer on the 11 day of March, 1958, at 8:00 o'clock A. M. and has been duly recorded in said office in Book No. 8 of Registration Statements on page GR-1706

Witness my hand this 7th day of January, 1959

Edward A. Stanley
(State Engineer)

$20.00

By
(Deputy)

GR-1706

8. **Casing:** (Give diameter, commercial specifications and depth below ground surface of each casing size.)

Six (6") inch diameter All way to bottom from ____ to ____ feet

____ inch diameter from ____ to ____ feet

____ inch diameter from ____ to ____ feet

____ inch diameter from ____ to ____ feet

Describe and show depth of shoe, plug, adapter, liner or other details: ____

9. **Perforated Casings or Screens:**

No records available from ____ to ____
(Number per foot and size of perforations, or describe screen)

____ from ____ to ____

____ from ____ to ____

____ from ____ to ____

10. **Log of Well:** (Describe each stratum or formation clearly, indicate if water bearing, and give thickness and depth as indicated.)

MATERIAL	Thickness (Feet)	Depth to Bottom (Feet)
No log obtainable.		
The two wells located in Block One (1); Lot Six (6)		
were drilled many years ago for Tualatin Valley		
Electric Company which Company supplied water for		
the City of Sherwood until it sold its holdings to		
the City of Sherwood on May 15, 1922. Since then,		
the City of Sherwood has operated its own water		
system.		

GR 1707

If log of well is not available, give name and address of driller. Jack Horback (deceased)

deepened both wells in the early 1920s

11. **Infiltration Trench:** Covered or open _____

Dimensions: Length _____ ft. Minimum depth _____ ft. Maximum depth _____ ft.

Bottom width _____ ft. Discharge _____ g.p.m. Date of test _____

12. **Tunnel:** Type of lining _____

Dimensions: _____
(Length, course, and cross sectional size)

Position of water bearing stratum with reference to portal of tunnel _____

Log of tunnel: (Preceding table for log of well may be used, if desired. Give footage from portal and character of materials, as pertinent.)

13. **Pumping Equipment:**

(a) Pump Rotary (Make, type and size) Capacity 100 g.p.m.

(b) Motor US Electric Motors (Type and horsepower) 10 H. P.

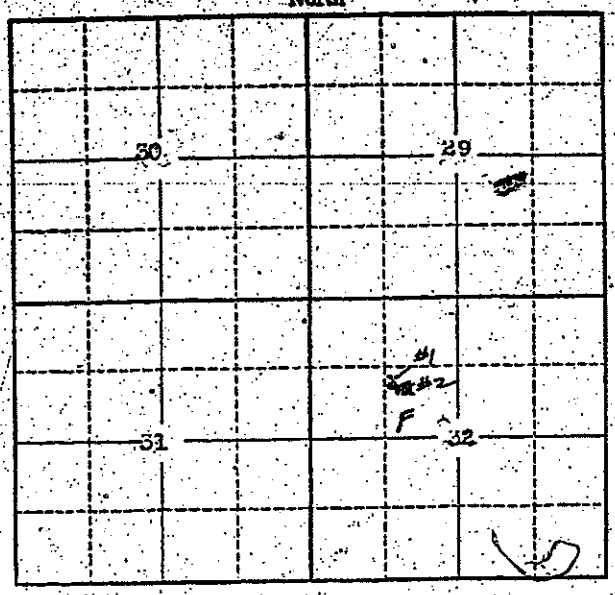
14. Location of area irrigated or to be irrigated, or place of use if for purposes other than irrigation.

Township North or South	Range E. or W. of Willamette Meridian	Section	Forty-acre Tract	Number Acres To Be Irrigated	Date of Reclamation
Twp. 4 S	Rge. 1W	32	SE¼ of NW¼	Municipal	1922
"	"	"	NE¼ of NW¼	"	"
"	"	"	NW¼ of NW¼	"	"
"	"	"	SW¼ of NW¼	"	"
"	"	"	NW¼ of SE¼	"	"
"	"	"	SW¼ of SE¼	"	"
"	"	"	NE¼ of NE¼	"	"
"	"	"	NW¼ of NE¼	"	"
"	"	"	SW¼ of NE¼	"	"
"	"	"	SE¼ of NE¼	"	"
"	"	"	NE¼ of SW¼	"	"
"	"	"	NW¼ of SW¼	"	"
"	"	"	SW¼ of SW¼	"	"
"	"	"	SE¼ of SW¼	"	"

15. If the ground water supply is supplemental to an existing water supply, identification of any application for a permit, permit, certificate or adjudicated right to appropriate water made or held by the registrant.

GR 1707

Township 2 S Range 1 W, W.M.



These two wells are about 20 ft. apart and housed in the same building

Locate well and acreage of irrigated land on plat.

Scale: 2" = 1 Mile

STATE OF OREGON }
County of Washington } ss.

I, H. G. Albert, City Recorder, being first duly sworn, do hereby certify that I have read the foregoing Registration Statement and that all of the items therein contained are true to the best of my knowledge and belief.

H. G. Albert City Recorder
(Signature of Registrant)

Subscribed and sworn to before me this 22 day of February, 1958

My commission expires July 17, 1960 Walter E. Worth
(Notary Public)

(SEAL)

CERTIFICATE OF REGISTRATION

STATE OF OREGON }
County of Marion } ss.

This is to certify that the foregoing Registration Statement was received in the office of the State Engineer on the 11 day of March, 19 58, at 8:00 o'clock A M. and has been duly recorded in said office in Book No. 8 of Registration Statements on page GR-1707

Witness my hand this 7th day of January, 19 59.

Lewis A. Stanley
(State Engineer)

$20.00

By
(Deputy)

GR-1707

RECEIVED
STATE ENGINEER

Registration No. GR - 1162

Certificate No. GR 1708

Registration Statement

OF CLAIMANT OF RIGHT TO APPROPRIATE GROUND WATER

TO THE STATE ENGINEER OF OREGON:

I, H. G. Albert, Recorder for the City of Sherwood

of Sherwood, Oregon (Mailing address) County of Washington

State of Oregon, do hereby make application for a certificate of registration as evidence of a right to appropriate ground water.

1. Source from which water is withdrawn is Pump Well #2 (Flowing well, pump well, infiltration trench, or tunnel)

2. Location is: Within the corporate limits of Sherwood, Oregon (Approximate distance and direction from nearest city or town);

and is more particularly described as follows:

(a) APPROX - 750 feet No. & 600 feet West from Center of Section 32. (Give distance and bearing to corner of section or other legal subdivision)

being within SE¼ of NW¼ (Smallest legal subdivision) of Sec. 32, Twp. 2 S (N. or S.), Rge. 1 W (E. or W.)

or (b) within limits of recorded platted property, town or city: Metes and Bounds description

in Lot ____, Block ____ of ____ (Name of plat or addition)

____ (If within city or town, give name) County of ____

3. Construction Work was begun on June 10, 1946 (Date); was completed on Jul. 17, 1946 (Date)

and the ground water claimed was first used for the purposes set out below on July 20, 1946 (Date),

since which time the water has been used continuously (Continuously or intermittently)

from 1946 (Date) to present date, Feb. 10, 1956 (Date)

4. Quantity of water claimed and used is 510 gallons per minute; ____ acre feet per year.

5. Purpose or Purposes for which water is used Domestic, municipal, manufacturing and industrial (Domestic, irrigation, municipal, manufacturing, industrial, etc.)

6. Description of Well: Depth 200 feet. Type ____ G (Dug or drilled)

diameter 12" inches. Elevation of ground at well site about 190' (As near as known) feet, mean sea level.

Depth to water table 20 feet.

7. Capacity of Well: 510 g.p.m. with 44 feet drawdown.

____ g.p.m. with ____ feet drawdown.

Date of test Recently Date indefinite

If Flowing Well: Measured discharge ____ g.p.m. on ____ (Date)

Shut-in pressure at ground surface ____ lbs. per sq. in. on ____ (Date)

Water is controlled by ____ (Cap, valve, etc.)

SM—4-57

8. **Casing:** (Give diameter, commercial specifications and depth below ground surface of each casing size.)

16" inch diameter from 0' to 38' feet

12" inch diameter from 35' to 132' feet

____ inch diameter from ____ to ____ feet

____ inch diameter from ____ to ____ feet

Describe and show depth of shoe, plug, adapter, liner or other details: ____

9. **Perforated Casings or Screens:**

____ from ____ to ____
(Number per foot and size of perforations, or describe screen).

____ from ____ to ____

____ from ____ to ____

____ from ____ to ____

10. **Log of Well:** (Describe each stratum or formation clearly, indicate if water bearing, and give thickness and depth as indicated.)

MATERIAL	Thickness (Feet)	Depth to Bottom (Feet)
clay	0'	20'
quick sand & blue clay	20'	36'
sand rock	36'	137'
lava rock	137'	175'
rock	175'	183'
cemented gravel	183'	206'
lava rock	206'	254'
cemented gravel	254'	269'
lava rock	269'	275'
cemented gravel	275'	298'
broken rock	298'	339'

Beginning at a point 43 deg. 24' West 963.42 feet from a stone marked with X set for center of Section 32, in Township 2, South of Range 1 West of the Willamette Meridian, and running thence north 43 deg. 24' west 50 feet along the border of Pine Street; thence north 47 deg. 15' East and parallel with the Portland and Willamette Valley Railroad Company's right-of-way 50 feet; thence south 43 deg. 24' east 50 feet and parallel with Pine Street; thence south 47 deg. 15' west 50 feet along the border of Willamette Street to the place of beginning. Said City Well is situated within the confines of the above described tract of land, specifically, 20 feet from the boundary of Pine Street and 33 feet from the boundary of Willamette Street. Said well is, for the purpose of this application, designated "Well No. 3" City of Sherwood.

Above described land is situated within the boundary of the corporate limits of the City of Sherwood, according to the official plat thereof on file in the office of the County Recorder of Washington County, Oregon.

GR 1708

If log of well is not available, give name and address of driller. _____

11. Infiltration Trench: Covered or open _____

Dimensions: Length _____ ft. Minimum depth _____ ft. Maximum depth _____ ft.

Bottom width _____ ft. Discharge _____ g.p.m. Date of test _____

12. Tunnel: Type of lining _____

Dimensions: _____ (Length, course, and cross sectional size)

Position of water bearing stratum with reference to portal of tunnel _____

Log of tunnel: (Preceding table for log of well may be used, if desired. Give footage from portal and character of materials, as pertinent.)

13. Pumping Equipment:

(a) Pump Rotary (Make, type and size) Capacity 510 g.p.m.

(b) Motor 60 H. P. (Type and horsepower)

14. Location of area irrigated or to be irrigated, or place of use if for purposes other than irrigation.

Township North or South	Range E. or W. of Willamette Meridian	Section	Forty-acre Tract	Number Acres To Be Irrigated	Date of Reclamation
Twp. 2 S	Rge. 1W	32.	SE¼ of NW¼	Municipal	1922
"	"	"	NE¼ of NW¼	"	"
"	"	"	NW¼ of NW¼	"	"
"	"	"	SW¼ of NW¼	"	"
"	"	"	NW¼ of SE¼	"	"
"	"	"	SW¼ of SE¼	"	"
"	"	"	NE¼ of NE¼	"	"
"	"	"	NW¼ of NE¼	"	"
"	"	"	SW¼ of NE¼	"	"
"	"	"	SE¼ of NE¼	"	"
"	"	"	NE¼ of SW¼	"	"
"	"	"	NW¼ of SW¼	"	"
"	"	"	SW¼ of SW¼	"	"
"	"	"	SE¼ of SW¼	"	"

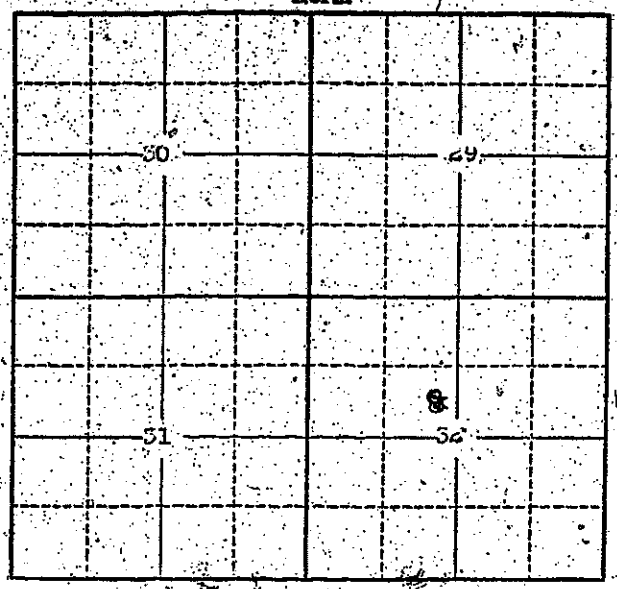
15. If the ground water supply is supplemental to an existing water supply, identification of any application for a permit, permit, certificate or adjudicated right to appropriate water made or held by the registrant.

_____

_____

GR 1708

Township 2S Range 1 W, W.M.



Locate well and acreage of irrigated land on plat.

Scale: 2" = 1 Mile

STATE OF OREGON }
County of Washington } ss.

I, E. C. Albert, being first duly sworn, do hereby certify that I have read the foregoing Registration Statement and that all of the items therein contained are true to the best of my knowledge and belief.

E. C. Albert City Recorder
(Signature of Registrant)

Subscribed and sworn to before me this 22 day of February, 1958

My commission expires July 17, 1961 Walter E. York
(Notary Public)

(SEAL)

CERTIFICATE OF REGISTRATION.

STATE OF OREGON }
County of Marion } ss.

This is to certify that the foregoing Registration Statement was received in the office of the State Engineer on the 11 day of March, 1958, at 8:00 o'clock A. M. and has been duly recorded in said office in Book No. G of Registration Statements on page GR-1708

Witness my hand this 7th day of January, 1959

$22.00

Edwin A. Stanley
(State Engineer)

By _____
(Deputy)

GR-1708

STATE OF OREGON

COUNTY OF WASHINGTON

CERTIFICATE OF WATER RIGHT

This Is to Certify, That CITY OF SHERWOOD

of City Hall, Sherwood, State of Oregon 97140, has made proof to the satisfaction of the STATE ENGINEER of Oregon, of a right to the use of the waters of a well

a tributary of Cedar Creek for the purpose of municipal

under Permit No. G-4500 of the State Engineer, and that said right to the use of said waters has been perfected in accordance with the laws of Oregon; that the priority of the right hereby confirmed dates from February 3, 1969

that the amount of water to which such right is entitled and hereby confirmed, for the purposes aforesaid, is limited to an amount actually beneficially used for said purposes, and shall not exceed 0.83 cubic foot per second

or its equivalent in case of rotation, measured at the point of diversion from the stream. The point of diversion is located in the NW¼ NE¼, Section 31, T. 2 S., R. 1 W., W. M., 100 feet South and 1767.7 feet West from NE Corner, Section 31.

The amount of water used for irrigation, together with the amount secured under any other right existing for the same lands, shall be limited to _____ of one cubic foot per second per acre, and shall conform to such reasonable rotation system as may be ordered by the proper state officer.

A description of the place of use under the right hereby confirmed, and to which such right is appurtenant, is as follows:

	N½ NE¼
SW¼ NW¼	NE¼ NW¼
W½ SW¼	NE¼ SE¼
SW¼ SE¼	S½ SE¼
Section 29	Section 31
W½ NE¼	N½ NE¼
SE¼ NE¼	SW¼ NE¼
NE¼ NW¼	W½
SE¼	W½ SE¼
Section 30	Section 32

T. 2 S., R. 1 W., W. M.

The right to the use of the water for the purposes aforesaid is restricted to the lands or place of use herein described.

WITNESS the signature of the State Engineer, affixed this date. September 19, 1974

Chris L. Wheeler
State Engineer

Recorded in State Record of Water Right Certificates, Volume 33, page 40967

STATE OF OREGON

COUNTY OF WASHINGTON

CERTIFICATE OF WATER RIGHT

THIS CERTIFICATE ISSUED TO

CITY OF SHERWOOD
CITY HALL 90 NW PARK ST
SHERWOOD OR 97140

confirms the right to use the waters of A WELL (WELL 3) for MUNICIPAL USE.

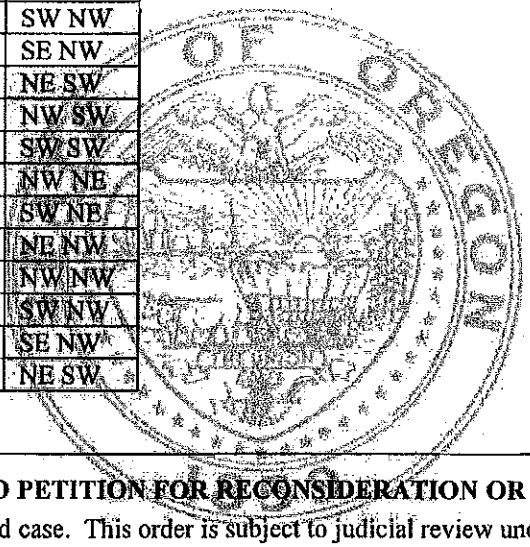
This right was perfected under Permit G-9491. The date of priority is NOVEMBER 3, 1980. The amount of water to which this right is entitled is limited to an amount actually used beneficially, and shall not exceed 0.87 CUBIC FEET PER SECOND or its equivalent in case of rotation, measured at the well.

The well is located as follows:

Twp	Rng	Mer	Sec	Q-Q	Survey Coordinates
2 S	1 W	WM	32	SE NW	750 FEET NORTH AND 600 FEET WEST FROM CENTER 1/4 CORNER, SECTION 32

A description of the place of use to which this right is appurtenant is as follows:

Twp	Rng	Mer	Sec	Q-Q
2 S	1 W	WM	28	NW NE
2 S	1 W	WM	28	SW NE
2 S	1 W	WM	28	SW NW
2 S	1 W	WM	28	SE NW
2 S	1 W	WM	28	NE SW
2 S	1 W	WM	28	NW SW
2 S	1 W	WM	28	SW SW
2 S	1 W	WM	29	NW NE
2 S	1 W	WM	29	SW NE
2 S	1 W	WM	29	NE NW
2 S	1 W	WM	29	NW NW
2 S	1 W	WM	29	SW NW
2 S	1 W	WM	29	SE NW
2 S	1 W	WM	29	NE SW



NOTICE OF RIGHT TO PETITION FOR RECONSIDERATION OR JUDICIAL REVIEW

This is an order in other than a contested case. This order is subject to judicial review under ORS 183.484. Any petition for judicial review must be filed within the 60 day time period specified by ORS 183.484(2). Pursuant to ORS 536.075 and OAR 137-004-0080, you may either petition for judicial review or petition the Director for reconsideration of this order. A petition for reconsideration may be granted or denied by the Director, and if no action is taken within 60 days following the date the petition was filed, the petition shall be deemed denied. In addition, under ORS 537.260 any person with an application, permit or water right certificate subsequent in priority may jointly or severally contest the issuance of the certificate at any time before it has issued, and after the time has expired for the completion of the appropriation under the permit, or within three months after issuance of the certificate.

Twp	Rng	Mer	Sec	Q-Q
2 S	1 W	WM	29	NW SW
2 S	1 W	WM	29	SW SW
2 S	1 W	WM	29	SE SW
2 S	1 W	WM	29	NE SE
2 S	1 W	WM	29	NW SE
2 S	1 W	WM	29	SW SE
2 S	1 W	WM	29	SE SE
2 S	1 W	WM	30	NE NE
2 S	1 W	WM	30	NW NE
2 S	1 W	WM	30	SW NE
2 S	1 W	WM	30	SE NE
2 S	1 W	WM	30	SE NW
2 S	1 W	WM	30	NE SW
2 S	1 W	WM	30	SW SW
2 S	1 W	WM	30	SE SW
2 S	1 W	WM	30	NE SE
2 S	1 W	WM	30	NW SE
2 S	1 W	WM	30	SW SE
2 S	1 W	WM	30	SE SE
2 S	1 W	WM	31	NE NE
2 S	1 W	WM	31	NW NE
2 S	1 W	WM	31	SW NE
2 S	1 W	WM	31	SE NE
2 S	1 W	WM	31	NE NW
2 S	1 W	WM	31	NW NW
2 S	1 W	WM	31	SW NW
2 S	1 W	WM	31	SE NW
2 S	1 W	WM	31	NE SW
2 S	1 W	WM	31	NW SW
2 S	1 W	WM	31	SW SW
2 S	1 W	WM	31	SE SW
2 S	1 W	WM	31	NE SE
2 S	1 W	WM	31	NW SE
2 S	1 W	WM	31	SW SE
2 S	1 W	WM	31	SE SE
2 S	1 W	WM	32	NE NE
2 S	1 W	WM	32	NW NE
2 S	1 W	WM	32	SW NE
2 S	1 W	WM	32	SE NE
2 S	1 W	WM	32	NE NW
2 S	1 W	WM	32	NW NW
2 S	1 W	WM	32	SW NW
2 S	1 W	WM	32	SE NW
2 S	1 W	WM	32	NE SW
2 S	1 W	WM	32	NW SW
2 S	1 W	WM	32	SW SW
2 S	1 W	WM	32	SE SW
2 S	1 W	WM	32	NE SE
2 S	1 W	WM	32	NW SE
2 S	1 W	WM	32	SW SE
2 S	1 W	WM	32	SE SE

Twp	Rng	Mer	Sec	Q-Q
2 S	1 W	WM	33	NW NW
2 S	1 W	WM	33	SW NW
2 S	1 W	WM	33	NW SW
2 S	1 W	WM	33	SW SW

The well shall be maintained in accordance with the General Standards for the Construction and Maintenance of Water Wells in Oregon.

The water user shall install and maintain a weir, meter, or other suitable measuring device and keep a complete record of the amount of ground water withdrawn.

The use of water shall be limited when it interferes with any prior surface or ground water rights.

WITNESS the signature of the Water Resources Director, affixed DEC 0 6 2006

Phillip C. Ward, Director

 Recorded in State Record of Water Right Certificates numbered 82857.

STATE OF OREGON

COUNTY OF WASHINGTON

CERTIFICATE OF WATER RIGHT

THIS CERTIFICATE ISSUED TO

CITY OF SHERWOOD
90 NW PARK
SHERWOOD OR 97140

confirms the right to use the waters of A WELL for MUNICIPAL USE.

This right was perfected under Permit G-10495. The date of priority is FEBRUARY 13, 1985. The amount of water to which this right is entitled is limited to an amount actually used beneficially, and shall not exceed 1.5 CUBIC FEET PER SECOND or its equivalent in case of rotation, measured at the well.

The well is located as follows:

Twp	Rng	Mer	Sec	Q-Q	Survey Coordinates
2 S	1 W	WM	32	NW SW	1440 FEET NORTH AND 50 FEET EAST FROM SW CORNER, SECTION 32

A description of the place of use to which this right is appurtenant is as follows:

Twp	Rng	Mer	Sec	Q-Q
2 S	1 W	WM	28	NW NE
2 S	1 W	WM	28	SW NE
2 S	1 W	WM	28	NE NW
2 S	1 W	WM	28	NW NW
2 S	1 W	WM	28	SW NW
2 S	1 W	WM	28	SE NW
2 S	1 W	WM	28	NE SW
2 S	1 W	WM	28	NW SW
2 S	1 W	WM	28	SW SW
2 S	1 W	WM	28	SE SW
2 S	1 W	WM	29	NW NE
2 S	1 W	WM	29	SW NE
2 S	1 W	WM	29	NE NW
2 S	1 W	WM	29	NW NW
2 S	1 W	WM	29	SW NW

NOTICE OF RIGHT TO PETITION FOR RECONSIDERATION OR JUDICIAL REVIEW

This is an order in other than a contested case. This order is subject to judicial review under ORS 183.484. Any petition for judicial review must be filed within the 60 day time period specified by ORS 183.484(2). Pursuant to ORS 536.075 and OAR 137-004-0080, you may either petition for judicial review or petition the Director for reconsideration of this order. A petition for reconsideration may be granted or denied by the Director, and if no action is taken within 60 days following the date the petition was filed, the petition shall be deemed denied. In addition, under ORS 537.260 any person with an application, permit or water right certificate subsequent in priority may jointly or severally contest the issuance of the certificate at any time before it has issued, and after the time has expired for the completion of the appropriation under the permit, or within three months after issuance of the certificate.

Twp	Rng	Mer	Sec	Q-Q
2 S	1 W	WM	29	SE NW
2 S	1 W	WM	29	NE SW
2 S	1 W	WM	29	NW SW
2 S	1 W	WM	29	SW SW
2 S	1 W	WM	29	SE SW
2 S	1 W	WM	29	NE SE
2 S	1 W	WM	29	NW SE
2 S	1 W	WM	29	SW SE
2 S	1 W	WM	29	SE SE
2 S	1 W	WM	30	NE NE
2 S	1 W	WM	30	NW NE
2 S	1 W	WM	30	SW NE
2 S	1 W	WM	30	SE NE
2 S	1 W	WM	30	SE NW
2 S	1 W	WM	30	NE SW
2 S	1 W	WM	30	SW SW
2 S	1 W	WM	30	SE SW
2 S	1 W	WM	30	NE SE
2 S	1 W	WM	30	NW SE
2 S	1 W	WM	30	SW SE
2 S	1 W	WM	30	SE SE
2 S	1 W	WM	31	NE NE
2 S	1 W	WM	31	NW NE
2 S	1 W	WM	31	SW NE
2 S	1 W	WM	31	SE NE
2 S	1 W	WM	31	NE NW
2 S	1 W	WM	31	NW NW
2 S	1 W	WM	31	SW NW
2 S	1 W	WM	31	SE NW
2 S	1 W	WM	31	NE SW
2 S	1 W	WM	31	NW SW
2 S	1 W	WM	31	SW SW
2 S	1 W	WM	31	SE SW
2 S	1 W	WM	31	NE SE
2 S	1 W	WM	31	NW SE
2 S	1 W	WM	31	SW SE
2 S	1 W	WM	31	SE SE
2 S	1 W	WM	32	NE NE
2 S	1 W	WM	32	NW NE
2 S	1 W	WM	32	SW NE
2 S	1 W	WM	32	SE NE
2 S	1 W	WM	32	NE NW
2 S	1 W	WM	32	NW NW
2 S	1 W	WM	32	SW NW
2 S	1 W	WM	32	SE NW
2 S	1 W	WM	32	NE SW
2 S	1 W	WM	32	NW SW
2 S	1 W	WM	32	SW SW
2 S	1 W	WM	32	SE SW
2 S	1 W	WM	32	NE SE
2 S	1 W	WM	32	NW SE

Twp	Rng	Mer	Sec	Q-Q
2 S	1 W	WM	32	SW SE
2 S	1 W	WM	32	SE SE
2 S	1 W	WM	33	NW NW
2 S	1 W	WM	33	SW NW
2 S	1 W	WM	33	NW SW
2 S	1 W	WM	33	SW SW

The well shall be maintained in accordance with the General Standards for the Construction and Maintenance of Water Wells in Oregon.

The water user shall install and maintain a weir, meter, or other suitable measuring device and keep a complete record of the amount of ground water withdrawn.

The use of water shall be limited when it interferes with any prior surface or ground water rights.

WITNESS the signature of the Water Resources Director, affixed NOV 17 2006

Phillip C. Ward, Director
Water Resources Department

 Recorded in State Record of Water Right Certificates numbered 82650.

STATE OF OREGON

COUNTY OF WASHINGTON

PERMIT TO APPROPRIATE THE PUBLIC WATERS

THIS PERMIT IS HEREBY ISSUED TO

CITY OF SHERWOOD
90 NW PARK ST (503)625-5522
SHERWOOD, OREGON 97140

The specific limits for the use are listed below along with conditions of use.

APPLICATION FILE NUMBER: G-12155

SOURCE OF WATER: ONE WELL IN THE CEDAR CREEK BASIN

PURPOSE OR USE: MUNICIPAL USE

MAXIMUM RATE: 550 GALLONS PER MINUTE

PERIOD OF USE: YEAR ROUND

DATE OF PRIORITY: June 27, 1990

POINT OF DIVERSION LOCATION: SE 1/4 NE 1/4, SECTION 32, T2S, R1W, W.M.; 100 FEET NORTH & 150 FEET WEST FROM E 1/4 CORNER, SECTION 32

THE PLACE OF USE IS LOCATED AS FOLLOWS:

WITHIN THE CITY OF SHERWOOD SERVICE AREA

SPECIAL CONDITIONS

1. The period of appropriation and use under this permit is year-round.

2. The amount of use allowed is 550 gpm.

3. Construction of the well shall begin within one year of permit issuance. Construction shall be complete by October 1, 1998. Water shall have been completely applied to the beneficial use herein allowed by October 1, 1999.

4. The well shall be constructed in accordance with the General Standards for Construction and Maintenance of Water Wells in Oregon. The works shall be equipped with a usable access port, and may also include an air line and pressure gauge adequate to determine water level elevation in the well at all times.

5. Measurement, recording and reporting:

A) Before water use may begin under this permit, the permittee shall install a totalizing meter at the point of diversion and shall require a meter to be installed at each residence served by water from this diversion, using meters approved by the Director. The permittee shall maintain the point of diversion meter in good working order, shall keep a complete record of the amount, nature and place of water used each month and shall submit a report which includes the recorded water use measurements to the Department on a quarterly basis or more frequently as may be required by the Director.

B) The permittee shall allow the Watermaster access to the meter; provided, however, where the meter or measuring device is located within a private structure, the Watermaster shall request access upon reasonable notice.

6. Prior to receiving a permit and again before receiving a certificate of water right, the permittee shall submit to the Department the results of a pump test meeting the Department's standards. The Director may require water level or pump test results every two years thereafter.

7. The permittee understands and accepts that sole long-term reliance on groundwater obtained under this permit is not acceptable and that within two years of permit issuance, the City shall submit a water management plan which complies with Oregon Administrative Rules (OAR) Division 86, and which includes, at a minimum, an analysis of the means of creating efficiency in existing City water use, the measures which the City will implement to ensure that inefficiency does not occur in the city's future uses, a cost and availability analysis pursuant to OAR 690-86-140(4)(c), and a plan for obtaining a long-term water supply that does not rely on ground water as its sole source.

8. The well shall be constructed, included proper casing and sealing, to allow groundwater production from no shallower than 300 feet below land surface at the proposed location of the well.

9. The permittee shall obtain and submit to the Department a static water level measurement before any use of water may commence at the well.

10. The permittee shall obtain a static water level measurement for the well during March of each year and report the measurement to the Department within 30 days. The measurement shall be made by a certified water rights examiner, registered geologist, licensed land surveyor, pump installer licensed by the Construction Contractors Board, or by the permittee/appropriator. Water levels shall be reported as depth-to-water below ground level and shall be accompanied by supporting calculations. Reports and calculations shall be provided to the Department on forms provided by the Department and shall be certified as to their accuracy by the individual making the measurements.

11. Use of water from the well shall be controlled or shut off if the well displays:

A) A total static water level decline of 15 or more feet in any five consecutive years, as compared to the reference level;

B) A total static water level decline of 25 or more feet over any period of years, as compared to the reference level; or

C) A hydraulic interference decline of 25 or more feet in any neighboring well with senior priority which provides water for any authorized use.

If the well displays any one or more of the conditions above, the permittee shall reduce the rate or volume of withdrawal or shall discontinue use from the well as determined by the Watermaster or Director. Such action shall be taken until the water level recovers to above the observed decline level or until such time as the Department may determine, based on the data and analysis available and in the possession of the Department, that no further action is necessary because the aquifer in question can sustain the reduced observed declines without adversely affecting the resource or senior water rights.

For purposes of implementing this condition, between the date the well is drilled and the following March, the measurement taken pursuant to condition 9 shall be considered the reference level. Thereafter, the first March static water level measurement taken shall be considered the reference level for water level declines. The permittee shall in no instance allow excessive decline to occur within the aquifer as a result of use under this permit.

12. The permittee agrees that it shall submit, within five years of permit issuance, an update of the water management plan specified in Condition 7.

13. If the Watermaster and/or Department finds that municipal use under this permit has resulted in demonstrable interference with any senior ground or surface water right(s) or permit(s), the City shall make a reasonable and prudent effort to connect such senior right/permit holder(s) to the municipal water system for the uses of water stated in the senior right(s) or permit(s), subject to the following:

A) Approval by the appropriate Boundary Commission and/or such other governmental agencies having jurisdiction;

B) The water right(s) or permit(s) holder shall obtain all appropriate land use approvals for installation of such connection(s).

C) The water right(s) or permit(s) holder shall pay any reasonable system development charge or cost for making the connection(s) to the City's system and all applicable user fees.

Alternatively, if connection of the senior user has not been achieved, then the City shall make all reasonable and prudent efforts to restore the flow and/or aquifer to a condition that meets the needs of such senior user(s). The Director shall determine what constitutes a reasonable and prudent effort.

14. The City shall not sell or supply water outside of the Urban Growth Boundary except:

A) To supply water to property owned by a governmental agency, district or political subdivision and used for governmental purposes;

B) Pursuant to condition #13 or

C) Pursuant to ORS 222.840 *et seq* or ORS 431.705 *et seq*.

15. This permit is for the beneficial use of water without waste. The permittee is advised that new regulations may require the use of best practical technologies or conservation practices to achieve this end.

16. Use shall conform to such reasonable rotation system as may be ordered by the proper state officer.

17. Failure to comply with any of the provisions of the permit may result in action including, but not limited to, restrictions on the use, penalties, or cancellation of the permit.

SPECIAL CONDITIONS

The use shall conform to such reasonable rotation system as may be ordered by the proper state officer.

By law, the land use associated with this water use must be in compliance with statewide land-use goals and any local acknowledged land-use plan.

The Director finds that the proposed use(s) of water described by this permit, as conditioned, will not impair or be detrimental to the public interest.

Issued June 12, 1996

for Martha O. Pagel, Director
Water Resources Department

Oregon Water Resources Department
Water Rights Division

Water Rights Application S-50693
Permit S-49240

Final Order Incorporating Settlement Agreement
Extension of Time for Permit S-49240

Appeal Rights

This is a final order in other than contested case. This order is subject to judicial review under ORS 183.484. Any petition for judicial review must be filed within the 60 day time period specified by ORS 183.484(2). Pursuant to ORS 536.075 and OAR 137-004-0080 you may either petition for judicial review or petition the Director for reconsideration of this order. A petition for reconsideration may be granted or denied by the Director, and if no action is taken within 60 days following the date the petition was filed, the petition shall be deemed denied.

Application History

The Department issued Permit S-49240 on April 8, 1985. The permit called for completion of construction by October 1, 1987, and complete application of water to beneficial use by October 1, 1988. On January 18, 2005, Tualatin Valley Water District (TVWD) submitted an application to the Department for an extension of time for Permit S-49240. In accordance with OAR 690-315-0050(2), on February 20, 2007, the Department issued a Proposed Final Order (PFO) proposing to extend the time to complete construction and the time to fully apply water to beneficial use to October 1, 2047, and to make the extension subject to certain conditions. The protest period closed on April 6, 2007, in accordance with OAR 690-315-0060(1). On April 6, 2007, WaterWatch of Oregon filed a protest against the PFO. On June 7, 2007, the permit was assigned from Tualatin Valley Water District to the Willamette River Water Coalition (WRWC).

In the PFO, the Department concluded that, based on the factors demonstrated by TVWD, the permit may be extended subject to certain conditions. On June 21, 2007, a Settlement Agreement was entered into between OWRD, the WRWC, and WaterWatch of Oregon. The Settlement Agreement is incorporated into this Final Order and is attached hereto. Pursuant to the Settlement Agreement, the following permit extension conditions have been agreed to:

Conditions

Development Limitations

1. The first diversion by each municipal water supplier of any water under permit S-49240 shall only be authorized after a period of 60 days from the date of issuance of a final order pursuant to OAR Chapter 690, Division 86 approving a Water Management and Conservation Plan (WMCP). For each subsequent WMCP filed by each municipal water supplier requesting diversion of water under permit S-49240, diversion of any amount of water by that municipal water supplier greater than the amount of water authorized for diversion by the previous WMCP shall only be authorized after a period of 60 days from the date of issuance of a final order pursuant to OAR Chapter 690, Division 86

approving that subsequent WMCP. For example, if in the year 2008 the initial WMCP final order authorizes use of 5.0 cfs under extended permit S-49240, and the subsequent WMCP final order in the year 2012 authorizes use of a total of 10.0 cfs under extended permit S-49240, the subject municipal water supplier shall not divert or use the additional 5.0 cfs under the year 2012 WMCP final order for 60 days after the final order is issued. Initial WMCPs shall be submitted to the Department by the municipal water suppliers that are authorized to use water under this permit as of the date of this Final Order, within 3 years from the date of this Final Order. Use of water under permit S-49240 shall be consistent with the applicable approved WMCP.

2. The deadline established in this Final Order for submittal of a WMCP shall not relieve a permit holder of any existing or future requirement for submittal of a WMCP at an earlier date as established through other orders of the Department. The Department may determine that a WMCP submitted to meet the requirements of this order also meets the WMCP submittal requirements of other Department orders.

3. Additional future municipal water suppliers that serve more than 1,000 individual residential or business end-user customer accounts, and that are authorized to use water under this permit pursuant to any contract or Intergovernmental Agreement (excluding short-term or emergency arrangements), shall submit a new or revised WMCP that also meets the requirements of items (4) and (5) below. Any such contract or Intergovernmental Agreement (excluding short-term or emergency arrangements) that allows municipal water suppliers that serve more than 1,000 individual residential or end-user business customer accounts to use water under Permit S-49240 shall include a provision that provides notice of the provisions of this extension Final Order, and in particular conditions #1 and #3 of this Final Order. For the purposes of this condition "short-term" means an Intergovernmental Agreement or contract that does not exceed one continuous period of two calendar years. For the purposes of this condition "emergency arrangement" means an Intergovernmental Agreement or contract to provide water to an entity in the event the entity loses its water supply due to unforeseen circumstances, for a period not to exceed one continuous period of one calendar year.

4. In addition to the requirements of OAR Chapter 690, Division 86, before using water under permit S-49240, each municipal water supplier authorized to divert or use water under this permit, and which is required to submit a WMCP pursuant to this extension Final Order, shall submit a WMCP that includes a section titled "Willamette River Fish Flows: Public Education and Voluntary Conservation" and receive a final order approving the WMCP pursuant to OAR Chapter 690, Division 86. Each subsequent WMCP submitted by these municipal water suppliers will also include such a section. WMCP section "Willamette River Fish Flows: Public Education and Voluntary Conservation" will include the following elements:

    a. Implementation steps for initiating and disseminating a public education message (as further specified below) to its water use customers, reasonably calculated to inform the customers of the municipal water supplier. Such education message shall be disseminated by placing such message on the water supplier's website and by either (1) media, or (2) print or electronic communications delivered to the customers (e.g. bill inserts or e-mail communications), or both.

An annual April 1 public education message will be provided. The April 1 public education message covers instances where streamflows fall below the minimum fish flow needs at Salem identified in this Final Order on extension of permit S-49240 (minimum fish flow needs at Salem) during the entire April 1 to May 31 time period.

An additional public education message will be provided upon the seven-day rolling average of mean daily streamflows (measured on the Willamette River at Salem, USGS Gage number 14191000) falling below the minimum fish flow needs at Salem by 10 percent or more for 15 consecutive days, at any time of the year (except for April 1 to May 31). Such message will be placed on the water supplier's website until the minimum fish flow needs at Salem are met.

Another message will be distributed through the media, or by print or electronic communication for each period of 15 consecutive days that the seven-day rolling average of mean daily streamflows are below the minimum fish flow needs at Salem by 10 percent or more.

b. Description of the content of the public education message:

   i. Inform customers: about the status of river flows in relation to the minimum fish flow needs in the Willamette River, measured at Salem and the connection between their water use and Willamette River flows; that Willamette River flows are important to fish (including a description of fish resources and the presence of any listed fish); and that the Willamette River is part of the entity's source of supply.

   ii. Provide a list of voluntary water conservation measures that are commonly accepted as effective, consistent with the municipal water supplier's WMCP, varying by season as appropriate. Such list must include, but shall not be limited to, avoidance of outdoor watering, avoidance of outdoor car washing, and avoidance of washing outdoor surfaces.

   iii. Inform water use customers that while water conservation is important year-round, it is especially important when minimum fish flow needs in the Willamette River, measured at Salem, are not being met.

c. A discussion of the public education message distribution and the recommended voluntary conservation measures and why they are reasonably expected to reduce water use.

d. A reminder to OWRD staff concerning OWRD's obligation described in Term 3 of the Settlement Agreement concerning extension of time for Permit S-49240.

Conditions to Maintain the Persistence of Listed Fish

5. The maximum total amount of water that can legally be diverted shall be reduced in proportion to the amount by which the flows shown in Table 1 are not met based on a seven day rolling average of mean daily flows measured on the Willamette River at Salem (USGS Gage Number 14191000), as illustrated in the examples below. During April, May and June, the reduction in the amount that can be legally diverted will not exceed 20 percent.

Example 1:

On July 15, the last seven mean daily flows were 7000, 6500, 6000, 5500, 5250, 5000 and 4750 cfs. The seven day rolling average is 5714 cfs. The maximum total amount of water that can legally be diverted under this permit would not be reduced because the 7 day average of mean daily flows is greater than the 5,630 target flow for July 15.

Example 2:

If on July 15 the average of the last seven mean daily flows was 5,011 cfs, then the target flows would be missed by 11 percent (100 - (5010/5630)*100). If the applicable WMCP indicates that the maximum total amount of water that can be legally diverted under the permit is 10 cfs, then the maximum total amount of water that could be legally diverted under this permit would be reduced by 11 percent.

TABLE 1

MINIMUM FISH FLOW NEEDS AT SALEM

July - October	5,630
November - March	6,200
April - May	15,000
June 1 - 15	12,600
June 16 - 30	8,500

Based on comments on the PFO from TVWD, OWRD's continuing evaluation reveals that certain other changes should be made to the PFO. The two following sections supersede the corresponding original sections from the PFO.

Findings of Fact

48. In accordance with OAR 690-315-0090(3), and as specified under Item 1 (Development Limitations) of the "Conditions" section of this PFO, the Department has determined that this extension shall be conditioned to provide that the diversion of any water under Permit S-49240 shall only be authorized under a final order issued pursuant to OAR Chapter 690, Division 86 approving a WMCP(s).

Conclusions of Law

7. In accordance with OAR 690-315-0090(3), and as described in Finding 48 above, the Department has established, as specified under Item 1 of the "Conditions" section of this Proposed Final Order for an Extension of Time, that the diversion of any water under Permit S-49240 shall only be authorized under a final order

issued pursuant to OAR Chapter 690, Division 86 approving a WMCP(s), except that diversion of any amount of water authorized for the first time by any WMCP shall not occur until 60 days after issuance of the final order, as specified in Development Limitation 1.

The applicant has demonstrated good cause for the permit extension pursuant to ORS 537.230, 539.010(5) and OAR 690-315-0080(3).

Order

The extension of time for Application S-50693, Permit S-49240, therefore, is approved subject to conditions contained herein. The deadlines for complete construction and the time to fully apply water to beneficial use are extended to October 1, 2047.

DATED: June 26, 2007

Dwight French, Administrator
Water Rights and Adjudications Division
for
Phillip C. Ward, Director

If you have any questions about statements contained in this document, please contact Ann L. Reece at (503) 986-0808.

If you have other questions about the Department or any of its programs, please contact our Water Resources Customer Service Group at (503) 986-0900

NOTE: Include a copy of the "Important Notice" document along with the original copy of the Final Order being sent to the permit holder.

Mailing List for Extension FO Copies

Application S-50693 **FO Date: June 26, 2007**
Permit S-49240

Original mailed to permit holder:

Willamette River Water Coalition
Attn: General Manager, Tualatin Valley Water Dist.
PO Box 745
Beaverton, OR 97075

Copies Mailed

By:
(SUPPORT STAFF)

on:
(DATE)

Copies sent to:

1. WRD - Appl. File S- 50693 / Permit S-49240
2. WRD – Dwight French, Administrator – Water Rights and Adjudications Division
3. WRD – Debbie Colbert, Senior Policy Coordinator
4. WRD – Bill Fujii
5. ODFW – North Willamette District 3, Danette Ehlers, Clackamas
6. DEQ – NW Region, Andy Schaedel, Portland
7. Golder Associates, Inc., 9 Monroe Parkway, Suite 270, Lake Oswego, OR 97035
8. Adam Sussman, GSI Water Solutions, 1600 Western Blvd., Suite 240, Corvallis, OR 97333
9. Clark Balfour, Cable Huston Benedict Haagensen & Lloyd LLP, Suite 2000, 1001 SW Fifth Ave., Portland, OR 97204-1136

Fee paid as specified under ORS 536.050 to receive copy:

10. None

Receiving via e-mail (10 AM Tuesday of signature date)

11. PFO: WRD – Watermaster District 16 – Mike McCord, Salem
*Done by*_____*Date*_____

CASEWORKER: ALR

BEFORE THE OREGON WATER RESOURCES DEPARTMENT

In the Matter of Extension of Time for Application S-50693, Permit S-49240 in the name of the Willamette River Water Coalition, *Applicant,*	)	**SETTLEMENT AGREEMENT**
WaterWatch of Oregon, Inc., *Protestant*	)	

The Oregon Water Resources Department ("OWRD"), the Willamette River Water Coalition ("WRWC"), and WaterWatch of Oregon, Inc. ("Protestant"), referred to collectively as "the Parties" and each individually a "Party," do hereby stipulate and agree in this "Settlement Agreement" as follows:

Stipulations

I. On January 18, 2005, Tualatin Valley Water District ("TVWD") submitted a $250 application fee and an "Application for Extension of Time," consistent with municipal and quasi-municipal water use permit extension rules OAR 690-315-0070 through 690-315-0100, requesting the time to complete construction of the water system and to apply water to full beneficial use be extended from October 1, 1997 to October 1, 2047.

II. On February 20, 2007, OWRD issued a Proposed Final Order ("PFO") recommending approval of the request for an extension of time with certain conditions.

III. On April 6, 2007, the Protestant submitted a $250 protest fee and a protest regarding the PFO on extension of time for Permit S-49240, Application S-50693.

IV. On June 7, 2007, OWRD approved an assignment of Permit S-49240 from Tualatin Valley Water District to the WRWC. The WRWC now holds Permit S-49240.

V. The Parties agree to resolve Protestant's pending administrative protest to the February 20, 2007 PFO on application for extension of time for Permit S-49240, Application S-50693 on the following terms.

Terms of Agreement

1. Effective immediately upon signature of this Settlement Agreement by all Parties, the WRWC withdraws its application for an extension of time for Permit S-49240 pursuant to Oregon Administrative Rule (OAR) Chapter 690 Division 320. The WRWC expressly retains its application for an extension of time for Permit S-49240 pursuant to OAR Chapter 690 Division 315.

2. Regarding the application for extension of time for Permit S-49240, Application S-50693, dated January 18, 2005, WRWC and Protestant hereby expressly waive all right and opportunity to request a contested case hearing, request for reconsideration, exceptions, or to

seek judicial review of the Final Order if substantively consistent with this Settlement Agreement and the attached Draft Final Order, in addition to waiving any right and opportunity to challenge this Settlement Agreement, including the attached Draft Final Order which is part of the Settlement Agreement. The Parties expressly retain the right to take whatever lawful action is necessary to remedy a breach or ensure performance of this Settlement Agreement and Final Order by any entity or party required to perform pursuant to it. Nothing in this Settlement Agreement affects the rights of any party to challenge other orders pertaining to the use of water under this permit, including orders regarding associated Water Management and Conservation Plans.

3. In reviewing Water Management and Conservation Plans (WMCP) of municipal water suppliers authorized to use water under Permit S-49240 and which are required to submit WMCP(s) pursuant to the Final Order on extension of time for permit S-49240, OWRD will make a finding regarding whether the WMCP section "Willamette River Fish Flows: Public Education and Voluntary Conservation" includes the elements set forth in Development Limitation Condition 4 of the Final Order on extension of time for Permit S-49240. In the event that OWRD inadvertently fails to make such a finding, OWRD shall have an opportunity to correct the omission in a timely manner once the omission is discovered.

4. After WRWC and Protestant sign this Settlement Agreement, they will mail the complete signed original documents back to the Oregon Water Resources Department, ATTN: Mike Reynolds, 725 Summer St. NE, Suite A, Salem, OR 97301-1266.

5. Within 30 days after OWRD receives the original Settlement Agreement signed by WRWC and Protestant, OWRD will issue a Final Order consistent with this Settlement Agreement and substantively consistent with the Draft Final Order attached to this Settlement Agreement. The Final Order will incorporate this Settlement Agreement by reference and as an attachment.

6. Each Party to this Settlement Agreement represents, warrants, and agrees that the person who executes this Agreement on its behalf has the full right and authority to enter into this Agreement on behalf of that Party and bind that Party to the terms of this Settlement Agreement.

7. Each Party to this Settlement Agreement certifies that it has had a reasonable opportunity to review and request changes to the Settlement Agreement, and that it has signed this Settlement Agreement of its own free will and accord. Each Party to this Settlement Agreement also certifies that it has read and understands the entire Settlement Agreement and Draft Final Order.

8. This Settlement Agreement may be signed in counterparts, each of which will be deemed an original, and all of which together shall constitute one and the same Settlement Agreement. This Settlement Agreement is only effective after all Parties have signed the Settlement Agreement.

SIGNATURE PAGE FOR SETTLEMENT AGREEMENT
ON EXTENSION OF TIME FOR APPLICATION S-50693, PERMIT S-49240

Dwight French, Administrator,
Water Rights and Adjudications Division
for
Phillip C. Ward, Director
Oregon Water Resources Department

June 15, 2007
Date

Print name: _____
for
Willamette River Water Coalition

Date

John DeVoe
for
WaterWatch of Oregon, Protestant

Jun 21, 2007
Date

SIGNATURE PAGE FOR SETTLEMENT AGREEMENT
ON EXTENSION OF TIME FOR APPLICATION S-50693, PERMIT S-49240

Dwight French, Administrator,
Water Rights and Adjudications Division
for
Phillip C. Ward, Director
Oregon Water Resources Department

June 15, 2007
Date

Print name: Richard P. Burke
for
Willamette River Water Coalition

6-18-07
Date

John DeVoe
for
WaterWatch of Oregon, Protestant

Date

Groundwater Solutions, Inc.
55 SW Yamhill Street, Suite 400 Portland, Oregon 97204
ph: 503.239.8799 fx: 503.239.8940 e: groundwatersolutions.com

TECHNICAL MEMORANDUM

City of Sherwood Groundwater Supply Evaluation

PREPARED FOR: Chris Uber, PE – Murray, Smith, & Associates

PREPARED BY: Brian Ginter, PE – Murray, Smith, & Associates
Ted Ressler – Groundwater Solutions, Inc.
Walter Burt, RG – Groundwater Solutions, Inc.

DATE: February 15, 2005

REGISTERED PROFESSIONAL GEOLOGIST OREGON WALTER C BURT G1402 Expires 06/31/05

Introduction

This memorandum presents Groundwater Solutions, Inc.'s (GSI) hydrogeologic evaluation of the City of Sherwood's (City) municipal well field and an assessment of the role of groundwater sources in meeting projected future water supply demands of the City. It is our understanding that the City is evaluating its current water system and production well field capacity to meet anticipated water supply needs.

The primary municipal water supply source for the City is groundwater produced from the aquifer hosted by basalt lava flows of the Columbia River Basalt Group (CRBG) using four production wells, Wells 3, 4, 5 and 6 (Figure 1). The overall short-term capacity of the City's well field is approximately 2,240 gallons per minute (gpm). The City holds approximately 596 gpm of undeveloped capacity on existing groundwater right permits. The City also utilizes Bull Run source water from the City of Portland via the City of Tualatin connection as a backup source. The City recently has purchased up to 3 MGD from the supply source to supplement groundwater supplies during peak demand periods. The need to augment the City's supply with an outside water source is increased in part due to constraints on how the City can operate Well 5 and Well 6. The operational rate of Well 5 recently has been reduced from approximately 550 gpm to 450 gpm because of the presence of gas exsolving from water produced in the well when pumped at rates greater than about 500 gpm. The gas has tentatively been identified as carbon dioxide. Even though the well and aquifer are capable of producing much higher rates, the operating rate of Well 6 is 550 gpm because Oregon Water Resources imposed a rate limitation on the groundwater right permit for the well since the CRBG aquifer in the area encompassing the City was designated a Groundwater Limited Area. In addition, the well produces water with high total dissolved solids (TDS), which limits the duration the City can pump the well without receiving complaints from customers.

Peak demands experienced by the City exceed the current capacity of the groundwater system, and demand is projected to continue to grow due to extensive development within the service area. Thus, the long-term goal of the City is to develop sufficient source capacity of good quality to reliably meet current and future anticipated demands. In doing so, the City also has a vested interested in fully developing unused capacity on existing water rights permits to retain the water rights into the future while utilizing the well field in a sustainable manner to ensure long-term viability of the groundwater supply.

The evaluation summarized in this memorandum is an element of an overall water master plan being completed on behalf of the City by MSA. The purpose of this evaluation is to assess the potential capacity and limitations of the City's groundwater source, and thus map out options for

the role groundwater will play in the overall long-term water supply picture for the City. The objectives include the following:

1. Assess peak and long-term limitations to the capacity of the City's well field due to long-term sustainable yield constraints in the CRBG aquifer.
2. Identify options for increasing the capacity of the well field and identify advantages and disadvantages of the options.
3. Identify options for fully utilizing undeveloped capacity on existing groundwater right permits to protect the full extent of these rights in the future.

This evaluation included the following work elements:

1. Review of the hydrogeologic setting of the City's well field;
2. Pumping test of Well 5 to evaluate aquifer continuity and boundary conditions;
3. Analysis of recent and historical water level trends and groundwater withdrawals;
4. Assessment of well improvement options for increasing or maintaining the capacity of individual production wells.
5. Development of general options available to the City for future groundwater usage.

These work elements are summarized in the following sections.

Hydrogeologic Setting

The following discussion of the regional geology and hydrogeology of the area is based on information from a detailed geologic and hydrogeologic study of the region surrounding the city completed by the Oregon Water Resources Department (OWRD) (Miller et al., 1994) and previous well field and hydrogeologic assessments completed on behalf of the City (Squier, 1999 and MSA, 2001).

The City is located within the Tualatin River Valley, approximately 20 miles southwest of the Portland metropolitan area (Figure 1). The general geologic section in the vicinity of the City consists of unconsolidated alluvial sediments overlying Tertiary volcanic and marine sedimentary rocks. The unconsolidated alluvial sediments, consisting of sand, silt, clay, and gravel, increase in thickness toward the center of the valley near the Tualatin River, and may be as thick as 200 feet. The thickness of the alluvial sediments increases to as much as 700 feet towards the east, in the vicinity of the city of Tualatin. Underlying the unconsolidated alluvial sediments is a thick sequence of basalt lava flows known as the Columbia River Basalt Group (CRBG). The CRBG consist of a series of basalt flows that erupted from now inactive vents near the Oregon-Idaho border. In the vicinity of the City, the CRBG is at least 950 feet thick (based on the lithologic log from Sherwood Well 6). The individual flows of basalt comprising the CRBG have lithologic and hydraulic differences in regards to groundwater occurrence and productivity. Table 1 presents a summary of the individual units making up CRBG present in the City's well field. Each unit may consist of one or more individual flows.

Underlying the CRBG are consolidated marine sedimentary rocks consisting of siltstone, sandstone, and claystone. The marine sedimentary rocks were encountered at a depth of 1,014 feet in City Well 6. Thin sequences of alluvial sediments representing paleodrainage features that predate the CRBG are locally present on the surface of the marine sediments. These features influenced emplacement of the early basalt flows of the CRBG and the water-bearing characteristics of the flows.

Table 1
Flow units of the Columbia River Basalt Group
City of Sherwood

Flow Unit (Formation)	*CRBG Units Penetrated by City Production Wells*			
	Well 3	*Well 4*	*Well 5*	*Well 6*
Gingko Unit (Wanapum Fm)	✓			
Sentinel Bluffs (Grande Ronde Fm)	✓			✓
Winter Water (Grande Ronde Fm)	✓	✓	✓	✓
Ortley (Grande Ronde Fm)		✓	✓	✓
Umtanum (Grande Ronde Fm)		✓	✓	✓
Grouse Creek (Grande Ronde Fm)		✓	✓	✓
Wapshilla Ridge (Grande Ronde Fm)			✓	✓
Downey Gulch/Mt. Horrible (Grande Ronde Fm)				✓

The primary groundwater resource in the vicinity of the City is the CRBG. Well 3 also is open to approximately 15 feet of sandstone overlying the CRBG; however, the relative contribution of water from these sediments is unknown. Groundwater within the CRBG is most abundant in the interflow zones between the individual basalt flows. The interflow zones are the relict flow tops of the individual basalt flows that tend to be vesicular, fractured, and broken because of relatively rapid cooling compared with the interior basalt of the flow (i.e., the flow interior or intraflow). Further, if the flowing lava came into contact with water, cooling was even more rapid, resulting in formation of pillow lava structures within a shattered glassy matrix. These pillow zones tend to be highly permeable, and in some cases substantially thicker than typical flow tops. The base of the Wapshilla Ridge in the vicinity of Well 6 consists of a thick, permeable pillow zone. This feature also has been encountered in City of Tigard and City of Tualatin exploratory wells.

The individual basalt flows of the CRBG were originally deposited as near horizontal sheets; however, subsequent tectonic stresses tilted and faulted the CRBG, resulting in numerous separate fault blocks, each of which may be displaced differently relative to the other. Geologic structures have an important influence on groundwater flow in basalts. Faults and folds influence groundwater flow by promoting and/or impeding both lateral and vertical flow. The City's well field is located in a fault-bounded basin bordered by highlands comprised of CRBG. A number of faults have been mapped in the vicinity of the well field (Figure 2). Faults may limit lateral transmission of water in the basalts that can effectively create "compartments". They also may promote preferential vertical flow of water, bringing deeper water up into shallower aquifers or transmitting of water into deeper aquifers. They also may create large zones of fracturing that can enhance the transmission and storage capabilities of the basalt. The character of faults in the CRBG depends on the degree of offset, as well as healing by secondary minerals such as clays. The significance of the faults on the hydraulic characteristics of the basalts in the Sherwood area is not known with certainty at present, although evidence of hydraulic boundaries in the basalts has been observed in an aquifer test of Sherwood Well No. 6.

Groundwater Withdrawals and Water Levels

We compiled and analyzed overall groundwater production rates and historical water level trends in the City's well field to compare hydraulic responses of the CRBG aquifer to historical and current pumping stresses. This information was used to assess the sustainability of current groundwater usage, as well as to identify and assess potential future groundwater supply options for the City to consider. Sources of information included the City, Tualatin Valley Water District (TVWD), OWRD, and past consultant reports completed on behalf of the City (Bookman-Edmonsten, 1999; Squier, 1999; and MSA, 2001).

The water level (static and pumping) for each City production well and the total yearly well field production volume for the period of 1988 to 2004 are shown on Figure 3. The short periodic oscillations in the water levels are likely the results of seasonal fluctuations in the aquifer water levels, with higher water levels occurring during winter months when groundwater withdrawals are less and rainfall is providing recharge to the aquifer. Several general observations were derived from the overall water level trends and cumulative annual withdrawals shown in Figure 3, as well as the hydrographs for individual wells provided in Appendix A:

- Approximate water level elevations in Wells 5 and 6 appear to be lower than in Wells 3 and 4 (Figure 3).
- There is a distinct overall declining trend in the water levels over time
- Increases in the rate of water level decline in City production wells occur at several times during the period of record of groundwater usage by the City (Figure 3).

A possible explanation for higher water levels in Wells 3 and 4 relative to Wells 5 and 6 is that the hydraulic head in the CRBG aquifer decreases with increasing depth, suggesting a downward component to vertical flow, or recharging conditions. Since Wells 5 and 6 are open to deeper parts of the CRBG section, the hydraulic head is lower. This is consistent with observations during drilling of Sherwood 6 and with the City of Tualatin ASR exploratory well EW-1 (MSA and GSI, 2002). An implication of this observation is that deepening the shallower wells (Wells 3 and 4) could result in somewhat lower initial pumping heads.

A linear trend fit to the static water levels of each well indicates a long-term water level decline of 2 to 3 feet per year (Table 2). The observed decline in aquifer levels is likely not the result of groundwater production from any one individual well, but a result of cumulative pumping of the aquifer by all wells completed in the CRBG, and accompanying change in storage in the aquifer.

Table 2
Decline in aquifer level measured at City groundwater production wells
City of Sherwood

Well	*Water Level at Construction*		*Water Level at Present*		*Overall Water Level Trend (ft/yr)*
	DTW, bgs	*Measured on*	*DTW, bgs*	*Measured on*	
3	26	1/1/1946	106.3	11/30/2004	1.8
4	44	4/28/1969	102	9/18/2003	2.7
5	48	10/25/1984	90	11/24/2004	2.2
6	131	2/7/1997	152.3	11/30/2004	2.7

Notes:
DTW = depth to water
bgs = below ground surface

Increases in the rate of water level declines in the aquifer correlate with installation of Well 4 and Well 6, and are probably due to increased pumping at the time of or after installation of those wells. The annual rate of water level decline in the aquifer since 1998 is approximately 4.2 feet per year. This increased rate of decline correlates with increases in groundwater withdrawals from between 200 and 250 million gallons (MG) per year from 1995 to 1997, to over 400 MG pumped in 2002 and 2003. Groundwater withdrawals by the City in 2004 exceeded 500 MG.

The volume of groundwater in the CRBG aquifer, and thus water levels, represents a dynamic balance between the water entering the aquifer (recharge) less the water removed from the aquifer (discharge). The volume of groundwater in the aquifer does naturally fluctuate to some extent due to season variations in precipitation and longer-term variations in climate (e.g. drought cycles). However, groundwater withdrawals from wells represent additional discharges from the aquifer, and if the cumulative groundwater discharge from an aquifer exceeds the recharge, then the aquifer will be essentially be 'mined' of groundwater and aquifer levels will decline over the long term unless natural discharges are captured or recharge is enhanced. The timing and

magnitude of water level declines in the aquifer will vary spatially depending on the location and magnitude of withdrawals relative to location of recharge and discharge areas. Past trends suggest further increases in the rate of water level declines should be expected if the recent rate of withdrawal is maintained or increased.

Because of declining water levels in the Sherwood-Wilsonville area, the OWRD has designated this region as the Sherwood-Dammasch-Wilsonville Groundwater Limited Area. Groundwater limited areas are regions where OWRD has determined that groundwater in an aquifer is over appropriated or that aquifer water levels have declined excessively, which essentially 'closes' the aquifer to additional development of new groundwater rights. The groundwater limited area designation does not immediately impact current water right holders, however, the OWRD may still intervene and request a reduction in groundwater production if OWRD determines that aquifer level declines are too severe and threaten the sustainability of the aquifer.

Well 5 Evaluation

The evaluation of Well 5 consisted of (1) conducting a pumping test of Well 5 to assess aquifer and well productivity and boundary conditions, and (2) assessing options for restoring the capacity of the well to a rate of 550 gpm, and (3) further increasing the capacity of the well.

Well 5 Pumping Test

The test consisted of pumping the well at an average rate of 450 gpm for approximately 24 hours. The recently installed SCADA systems at the City's production wells were used to collect water level measurements and flow data during the test. Representative water level data were not able to be recovered from the Well 4 SCADA system. The data indicate that the antecedent trends in water levels from all of the wells show the effects of recovery from pumping several of the production wells prior to the test. The antecedent trend obscures the responses to pumping in the observation wells, including Wells 3, 5 and 6. However, a definitive response to pumping of Well 5 was observed in the data from Well 3 after the data were corrected for the antecedent rising water level trend observed in the antecedent trend (Figure 4). A transmissivity of between 70,000 and 90,000 gallons per day per foot (gpd/ft) was calculated from the corrected data. This transmissivity is consistent with prior estimates by Squier (1999) and indicates that the portion of the basalt aquifer penetrated by Well 3 is more transmissive than the vicinity of Wells 4, 5 and even 6. It is unknown whether a portion of the relatively high calculated transmissivity could be due to water derived from approximately 15 feet of sediments overlying the basalt aquifer that are exposed in the well. The storativity calculated from the corrected data is 7×10^{-5}. The storativity value is typical of highly confined basalt aquifers.

A response in Well 6 to pumping in Well 5 could not be discerned in the corrected data; however, the lack of observable response may be a result of the resolution of the corrected data, rather than an actual lack of hydraulic connection between the two wells. Long-term water level trends in the aquifer since installation of Well 6 suggest a connection between the two wells (MSA, 2001).

Well 5 Improvement Evaluation

The current operational rate of Well 5 is limited to 450 gpm because of apparent production of carbon dioxide at higher pumping rates. Options for increasing the pumping rate in Well 5 include deepening the well to attempt to tap the pillow zone present at the base of the Wapshilla Ridge unit, and thereby either dilute it sufficiently to be acceptable or prevent production of carbon dioxide by maintaining higher pumping levels in the well. Another option is to attempt to restore the unused capacity of the well by identifying the source of the carbon dioxide and sealing it. Deepening the well to increase the capacity will entail demolishing the existing well house to access the well with a drilling rig, and carries the attendant risks that (1) the increase in capacity

will not meet expectations and (2) water produced from the well will be of lower quality, as experienced in Well 6. Sealing off the source of carbon dioxide to restore the operational pumping rate to 550 gpm will require a program of zonal testing and sampling, and then overreaming and sealing of the affected zone. This likely also will entail demolition of the well house and carries the attendant risk that the source cannot be definitively identified and so an effective repair cannot be implemented. Costs for this work are discussed in the following sections.

Groundwater Supply Options

Based on our understanding of the City's historical groundwater production, and aquifer water level trends, the status of existing wells, and regulatory considerations, we have identified three general options for the City to consider when planning the future role that groundwater will have in the City's overall water supply system. These options include:

1. Continue to operate the existing wells at current production capacities
2. Increase groundwater production
3. Implement aquifer storage and recovery

For each of the three options, we evaluated the potential benefits, costs and risks, including the long-term sustainability of option. The three options are discussed below and are summarized in Table 3.

Option 1 – Continue to Use Existing Wells at Current Production Rates

In Option 1, the City would continue to use their existing groundwater production wells at the current production rates. There are several assumptions implicit in this option including that the City would perform all well maintenance and/or well modifications necessary for maintaining the current production capacity (e.g., well redevelopment, pump maintenance, pump replacement, and lowering of pump intakes).

In order to retain current capacity, available information indicates that the City will need to evaluate and implement lowering the pump in Well 3 in the near future. Available well construction records indicate that the intake depth for Well 3 is 130 ft below ground surface (bgs), which is within uncased borehole below the production casing. Recent water level measurements indicate that drawdown in Well 3 during peak production during the late summer is close to the assumed location of the pump intake. If the current rate of water level declines continues and the intake is set at 130 feet in Well 3, the City may be forced to either reduce the pumping rate in the well or lower the pump within the next 1 to 2 years. Our preliminary analysis suggests that if the pump intake in Well 3 were lowered approximately 50 feet, to a level just above the first assumed basalt interflow zone (Squier, 1999), the amount of time the current rate of groundwater production could be sustained under Option 1 is approximately 10 years. This estimate assumes that the rate of water level decline remains at the current rate of 4.2 feet per year, a minimum intake submergence of 10 feet is desirable and that little of the current production in Well 3 would be lost by drawing the water level in the well down below the Ginkgo unit of the CRBG or the uncased portion of the overlying sandstone. These assumptions would need to be verified prior to implementation of this option. Available information indicates that interflows likely would not be exposed in other wells by the additional 40 to 50 feet of water level decline that lowering the pump in Well 3 would allow. The cost to implement this option is approximately $30,000, which includes the cost for assessing the feasibility of lowering the pump in Well 3 and then lowering it approximately 50 feet.

The implications of Option 1 for the City include:

- The option would entail minor upfront capital expenditures and no major modifications of the well field.

- The maximum rate the well field can produce during peak demand periods will limited to current pumping rates, including the reduced rate due to water quality concerns at Well 5.
- Any increases in peak demands will need to be met with purchased water.
- Aquifer levels will continue to decline at a rate of up to 4 feet per year. The City will eventually begin to lose production capacity as a result of water level declines, regardless of the maintenance measures described above, because productive interflows in the aquifer will become exposed and eventually dewatered; thus individual wells will eventually lose capacity.
- OWRD could potentially intervene and object to the continued rate of groundwater production by the City because of excessive declines in aquifer levels, as occurred in the City of Wilsonville in the 1990s.

Option 2 – Increase Groundwater Production

Option 2 entails developing groundwater production capacity to meet as much of the demand peak as possible. This option would include deepening of existing wells and/or drilling of new wells to make full use of existing water rights and any purchased rights so that the City could maximize production rates.

This option assumes that the City will perform all well maintenance and/or well modifications necessary for maintaining the production capacity (e.g., well redevelopment, pump maintenance, pump replacement, and lowering of pump intake) and will fully appropriate remaining unused capacity on their existing water rights and possibly purchase additional rights. The City would deepen existing wells and/or drill new wells under this option. The City has approximately 600 gpm of undeveloped water rights on its existing permits. In addition, the operational capacity of Well 5 has been reduced from 550 to 450 gpm because of water quality issues. Consequently, the City has 700 gpm or approximately 1 million gallons per day (MGD) of unutilized capacity, 600 gpm of which has not been developed.

The City also has been exploring the purchase of a water right (Certificate No. 61886) associated with Spada Well. The water right certificate rate is 400 gpm for agricultural use and is limited to the growing season. The rate on this water right represents additional potential capacity above what the City holds on its existing permits, but this additional capacity likely would be limited to the irrigation season, which includes the peak demand months of June through September.

We have identified several options for capturing unused capacity on existing water rights and integrating the capacity on the Spada Well water right. The options, approximate costs and risks/uncertainties are listed below.

Table 3
Options for Increasing Groundwater Supply Capacity
City of Sherwood

Option	Action	Risks and Uncertainties	Approximate Project Cost
1. **Repair Well 5**	Seal off source of carbon dioxide to restore the 100 gpm of unused capacity. Other options for restoring capacity include above-ground treatment or possibly dilution from increased capacity associated with well deepening. Four to 6 months to complete, including public bidding process.	Source of carbon dioxide is not known; feasibility and efficacy of this option depends on a single localized source of the carbon dioxide being identified.	**$48,000 - $55,000** Does not include demolition and reconstruction of well house or any pump system modifications
2. **Deepen Well 5**	Increase capacity of the well by deepening the lower borehole by 50 to 100 feet to tap the lower pillow zone complex identified in Well 6. Four to 6 months to complete, including public bidding process	The pillow complex present in Well 6 may not be present or as productive at the location of Well 5. In addition, there is a high probability that the water present in the pillow zone will be of poorer quality than is currently produced in the well.	**$65,000 - $70,000** Does not include demolition and reconstruction of well house or any pump system modifications
3. **Additional New Production Well**	Drill a new production well (400 to 700 gpm) and add as a point of appropriation on all existing water right permits held by the City to develop unutilized capacity available on the permits. At least 1 year to complete, including design and completion of wellhead facilities and public bidding process.	The capacity of a new well would depend on the location and depth of the well. While the capacity of a deep well (900') would likely be greater than a shallower (<800') well, the tradeoff for increased capacity would likely be poorer water quality. Additional withdrawals from the CRBG aquifer represented by developing unutilized capacity on the permits would likely increase the rate of water level declines in the CRBG aquifer.	**$900,000 to $1M** Estimate range assumes an 800 to 900-feet deep well, wellhead and well house improvements. Does not include distribution system improvements or property acquisition.
4. **Spada Well Water Right and New Well**	This option includes purchasing the Spada Well water right certificate, transferring the place and type of use and replacing the Spada Well with a new production well drilled and constructed to municipal supply specifications. This option would add up to 400 gpm of capacity during the peak demand season. Between 1 and 2 years to implement including water right transfer process (assumes expedited process), public bidding process, drilling new well and design and completion of wellhead facilities.	There is some uncertainty associated with transferring the place of use and type of use from agricultural to municipal. The time of use likely would be limited to the summer season. The risks and uncertainties associated with installing a new well are the same as described above in the previous option. The water produced by the Spada Well has a relatively high total dissolved solids (TDS) concentration. Additional withdrawals from the CRBG aquifer represented by regular use of the rate of the Spada Well right may increase the rate of aquifer water level declines.	**$900,000 to $1.10M** Assumes water right transfer, abandonment of old Spada Well and installation of 800 to 900-feet deep well, wellhead and well house improvements. Does not include distribution system improvements or property acquisition.

The implications for the City of implementing various permutations of Option 2 described include:

- Increased production will likely accelerate the rate of water level declines in the CRBG aquifer to greater than the current rate of approximately 4.2 feet per year;
- There is a risk that deepening existing wells will not result in sufficient increases in production capacity; however, existing data do suggest the presence of a highly productive pillow zone in the deep Wapshilla Ridge unit that could be exploited.

- Water from deeper interflow zones of the CRBG aquifer tends to be of poorer water quality (e.g. Well 6); consequently, increasing production by deepening wells or drilling new deep wells will likely come at the expense of reduced water quality.
- The City will eventually begin to lose production capacity because of the limitations of existing wells and the exposure and ultimate dewatering of shallower interflow zones.
- OWRD may intervene and object to the increased rate of groundwater production by the City because of excessive declines in aquifer levels, as occurred in the City of Wilsonville.

Option 3 –Aquifer Storage and Recovery (ASR)

This option entails implementing ASR to increase capacity during peak demand periods in the summer. Implementation of ASR would entail obtaining water from another drinking water source during the winter months, injecting the water into the CRBG aquifer and recovering the water in the summer during peak demand periods. The City has completed an initial ASR feasibility study (MSA, 2001). The study identified Well 6 as being suitable for development for ASR operations and recommended initiation of a pilot testing program. The City's Well 6 appears to be capable of pumping rates of approximately 2,100 gpm, or 3 MGD. However, the current operational rate of the well is limited to 550 gpm because of conditions of the water right permit. Water from Well 6 also contains high iron, manganese and total dissolved solids (TDS) concentrations.

ASR would allow the City to utilize Well 6 at its full capacity potential while improving the quality of water produced from the well. Successful implementation of ASR at Well 6 could potentially provide the City with an additional 2 MGD of additional capacity above the current pumping capacity of the groundwater system during the peak demand season. The steps outlined by MSA (2001) for implementation of ASR at Well 6 include:

- Permitting – ASR Limited License, UIC permit and discharge permits.
- Evaluation and Retrofit of Well 6 wellhead and other infrastructure improvements
- Installation of a monitoring well
- Pilot testing

Approximate planning level costs for ASR pilot testing at Well 6, including one year of injection and recovery of 150 MG of water are provided in Table 4.

Table 3
Well 6 ASR Implementation
City of Sherwood

Description	*Unit Capital Cost*	*Unit Engineering Cost*	*Total Incremental Cost*	*Notes*
Permitting	NA	$30,000 – $35,000	$30,000 – $35,000	For first site including ASR limited license for any other sites.
Evaluation and Retrofit of Well 6	$350,000 - $450,000	$80,000 - $110,000	$430,000 – $560,000	Based on 3 MGD pumping capacity. Assumes new pump, motor and downhole control valve, and piping, valves, controls, and disinfection system modifications. Cost will depend on modifications necessary for upsizing piping and other infrastructure improvements to handle increased capacity and pump-to-waste. Does not include any distribution system improvements necessary.

Description	*Unit Capital Cost*	*Unit Engineering Cost*	*Total Incremental Cost*	*Notes*
Installation of Monitoring Well	$65,000 - $85,000	$12,000 - $15,000	$77,000 - $100,000	Assumes 900 foot deep monitoring well.
Pilot Testing of Well 6	NA	$130,000- $160,000	$130,000– $160,000	Pilot test of Well 6. Includes monitoring, WQ testing, geochemical compatibility analysis, well testing and analysis. Does not include labor or equipment on the part of the City or TVWD.
Rounded Totals	$475,000 - $595,000	$252,000 - $320,000	**$727,000 - $915,000**	

Source water costs are not including in the above estimates; the actual operational and maintenance costs for implementing ASR will depend greatly on source water costs. The ultimate project cost will depend on whether or not the City elects to proceed with expansion of the ASR system to include other existing wells or new wells, or just operates Well 6 as an ASR well while looking to other long-term water sources.

Development of a wellhead protection plan, though optional, also is recommended. A wellhead protection plan would cost between $30,000 and $50,000, depending on the scope.

Water Rights Strategy

Regardless of the course the City elects to follow with regard to the role groundwater supply plays in the City's overall water supply, we recommend that the City take steps to fully develop and exercise the full amount of the capacity allowed under existing water rights permits. There are several strategies for achieving this goal including:

- Add other wells as a point of appropriation to each water right permit to maximize operational flexibility and fully utilize each permitted right (Option 1).
- Modify existing wells to increase capacity and develop the remaining unutilized rights on each permit where feasible (Option 2)
- Drill an additional well or wells and add as points of appropriation on permits with unutilized capacity (Option 2)

The only method to accomplish this if the City chooses Option 1 is to add each well as a point of appropriation on other permits. This also is the simplest method for the other options.

References

Bookman-Edmonsten Engineering, Inc., 1998. City of Sherwood Water System Master Plan Update. Prepared for the City of Sherwood.

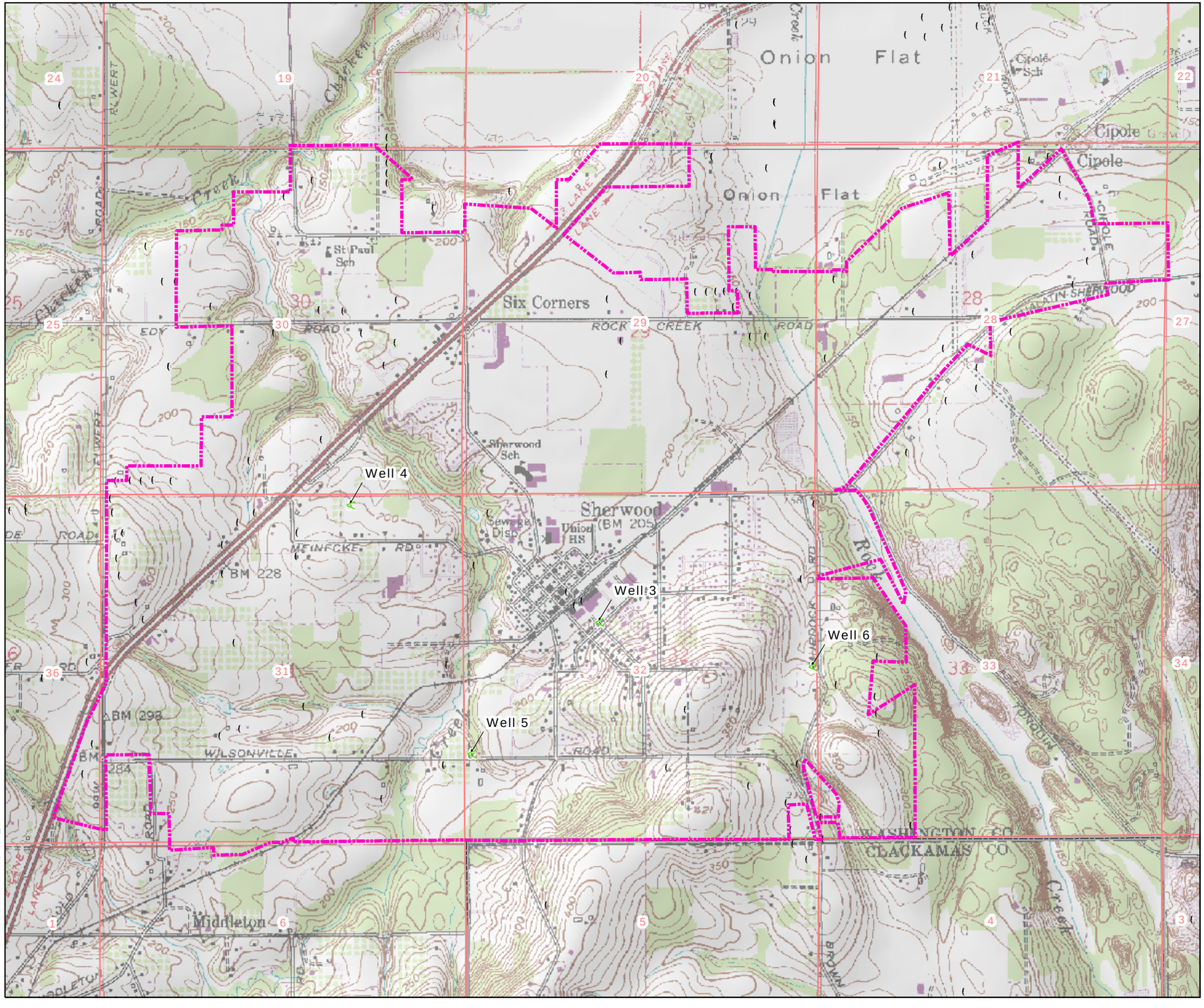
Squier and Associates, Inc., 1999. Municipal Well Field Hydrogeological Evaluation. Prepared for the City of Sherwood.

Miller, D. et al., 1994. Ground Water Conditions of Basalt Aquifers, Parrett Mountain, Northern Willamette Valley, Oregon. Oregon Water Resources Department Ground Water Report No. 40.

Murray Smith & Associates, Inc., 2001. Aquifer Storage and Recovery (ASR) Phase 1 – Program Evaluation and Development. Draft document prepared in association with Golder Associates for the City of Sherwood and Tualatin Valley Water District.

Murray Smith & Associates, Inc. and Groundwater Solutions, Inc., 2002. Aquifer Storage and Recovery (ASR) Exploratory Well Testing and Evaluation. Report prepared for the City of Tualatin, Oregon.

Figures



P:\124 - Sherwood (MSA)\GIS\Figure-1_Site Location.mxd

LEGEND

- < City of Sherwood Production Wells
- (Other Water Wells
- Sherwood City Limit

Current City Limits not shown. See Figure 2-1 of Water Management and Conservation Report for current City Limits and Urban Growth Boundary.

Map Notes:

Map projection - Universal Transverse Mercator Zone 10. North American Datum of 1927

0

Scale
1:18,000

0 2000 4000

Feet

Figure 1

Site Location Map

City of Sherwood

Map Date: January 24, 2005

Groundwater Solutions Inc.

Current City Limits not shown. See Figure 2-1 of Water Management and Conservation Report for current City Limits and Urban Growth Boundary.

Well 4
Well 3
Well 6
Well 5

North Ladd Hill Basalt Block

Pleasant Hill Basalt Block

Onion Flat
Six Corners
Sherwood
Middleton
Cipole
Tonquin
Mulloy
Roodview

Qal
Qls
Tfg
Tmsb
Tmww
Tmwr
Tmogc
Tmu

LEGEND

- City of Sherwood Production Wells
- Sherwood City Limit

Geologic Units

- Alluvium (Qal)
- Landslide (Qls)
- Ginko Basalt Flow (Tfg)
- Sentinel Bluffs Basalt Flow (Tmsb)
- Winter Water Basalt Flow (Tmww)
- Umtanum Basalt Flow (Tmu)
- Ortley-Grouse Creek Basalt Flow (Tmogc)
- Wapshilla Ridge Basalt Flow (Tmwr)
- Marine Sedimentary Rocks (Tos)
- Faults
- Inferred Faults

Map Notes:

Map projection - Universal Transverse Mercator Zone 10. North American Datum of 1927

Geology from Oregon Water Resources Department Groundwater Report No. 40 (Miller et. al., 1994).

Scale
1:24,000

0 2000 4000
Feet

Figure 2
Geologic Map
City of Sherwood

Map Date: January 24, 2005

Groundwater Solutions Inc.

P:\124 - Sherwood (MSA)\GIS\Figure-2_Geology.mxd

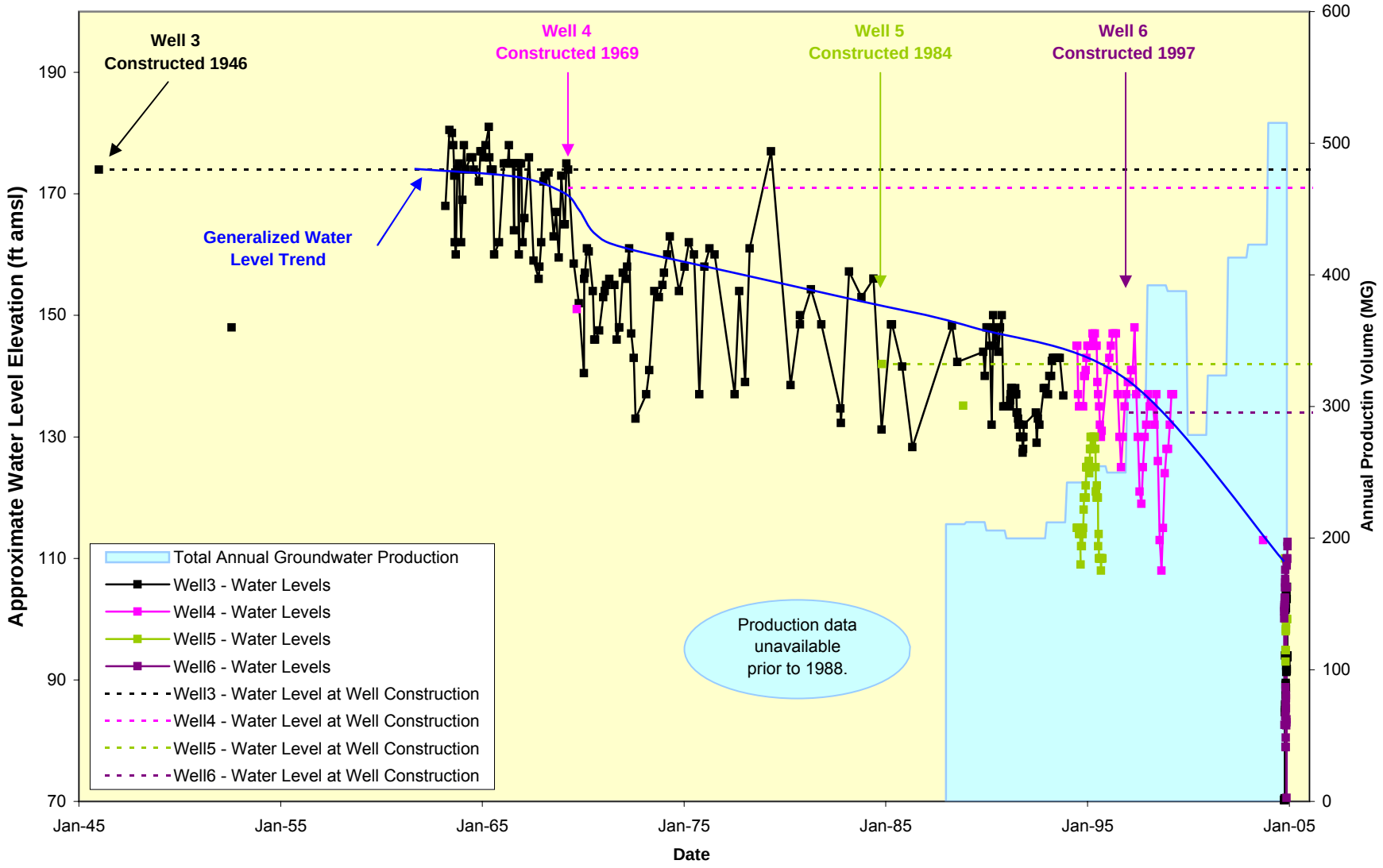
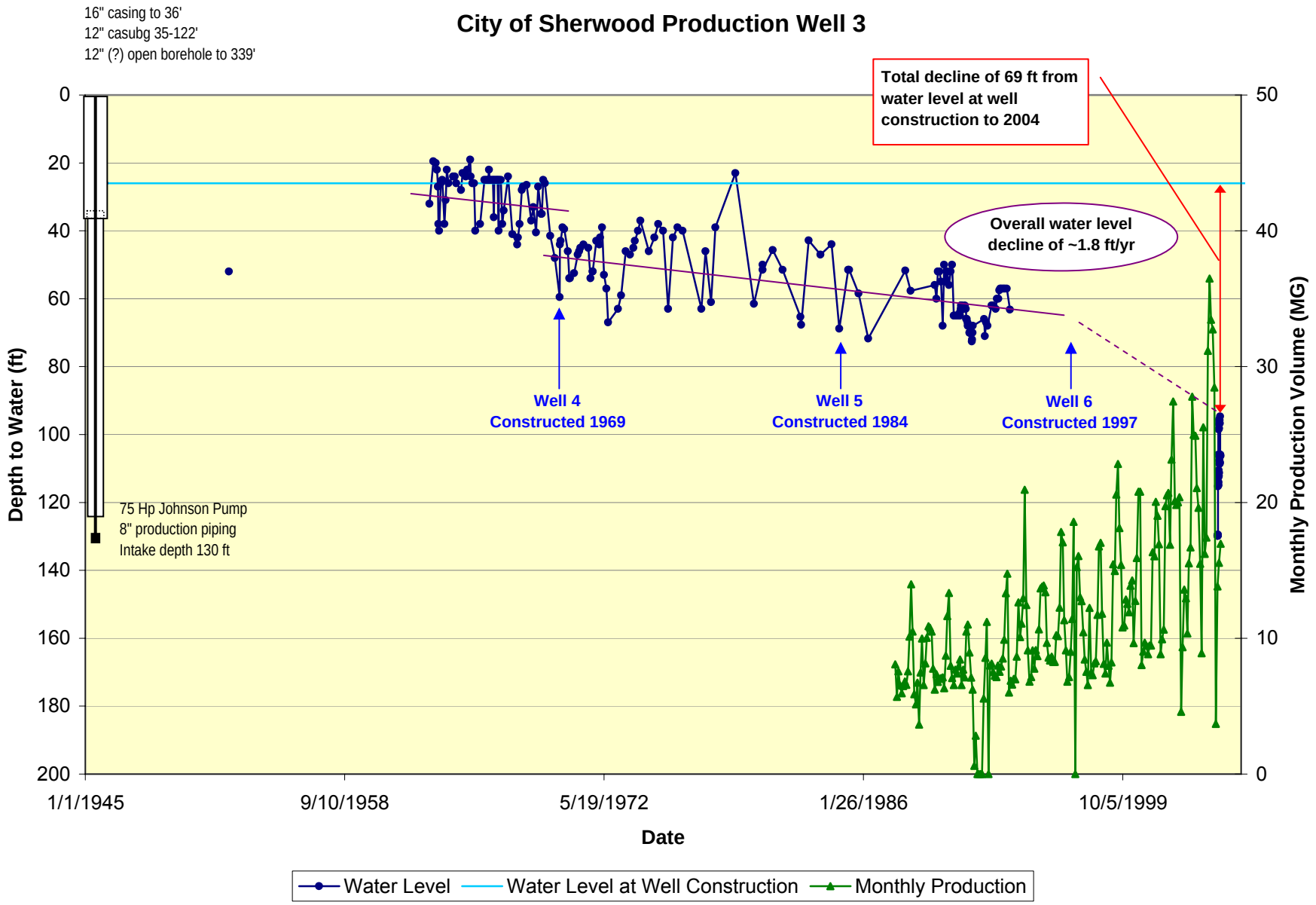


Figure 3
Well Hydrographs and Well Field Production
City of Sherwood
P:\124 - Sherwood (MSA)\003 - Well #5\Well evaluation\Q-Anual_Totals.xls

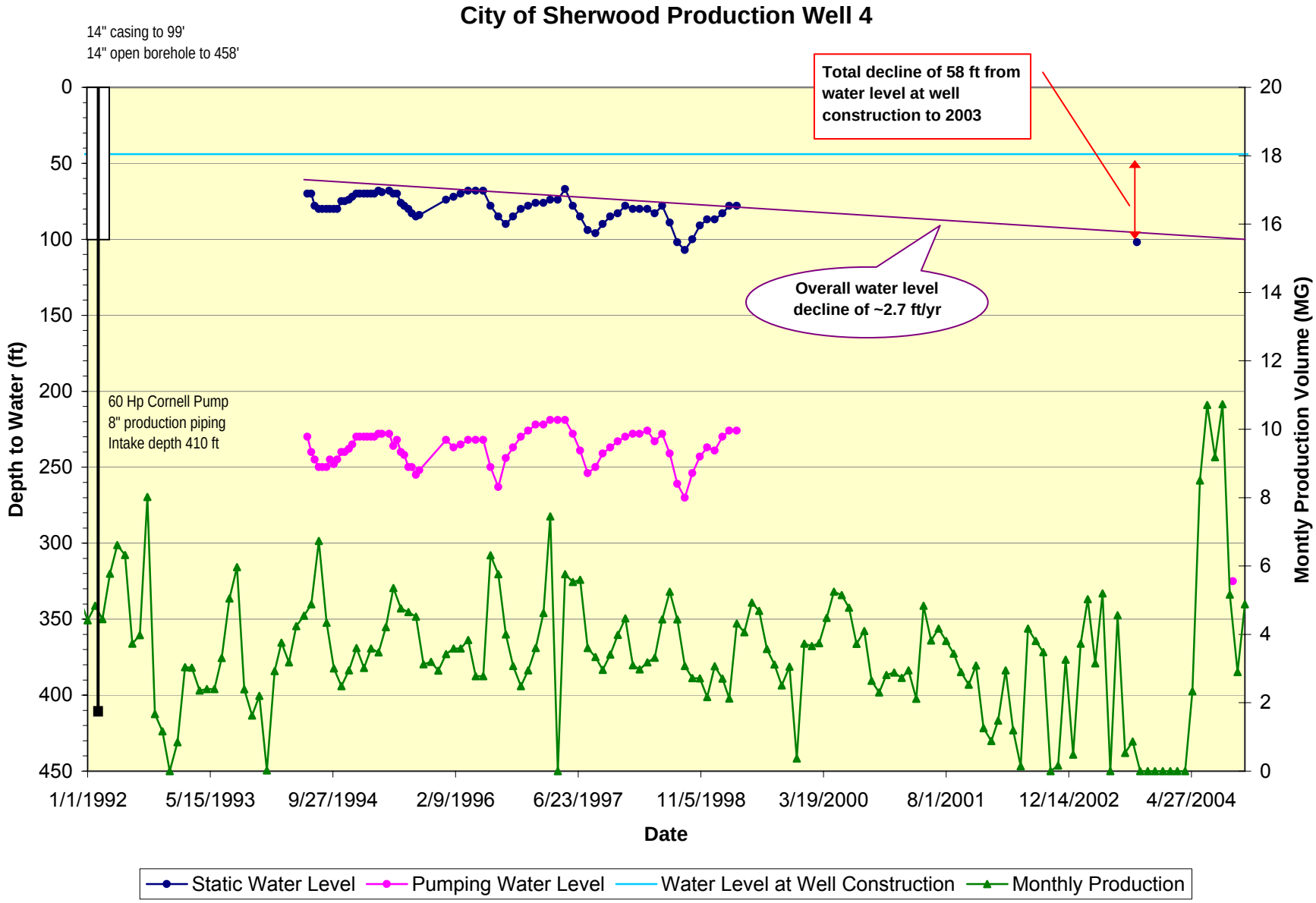
Groundwater Solutions Inc.



Groundwater Solutions Inc.

Appendix A - Production Well Hydrographs

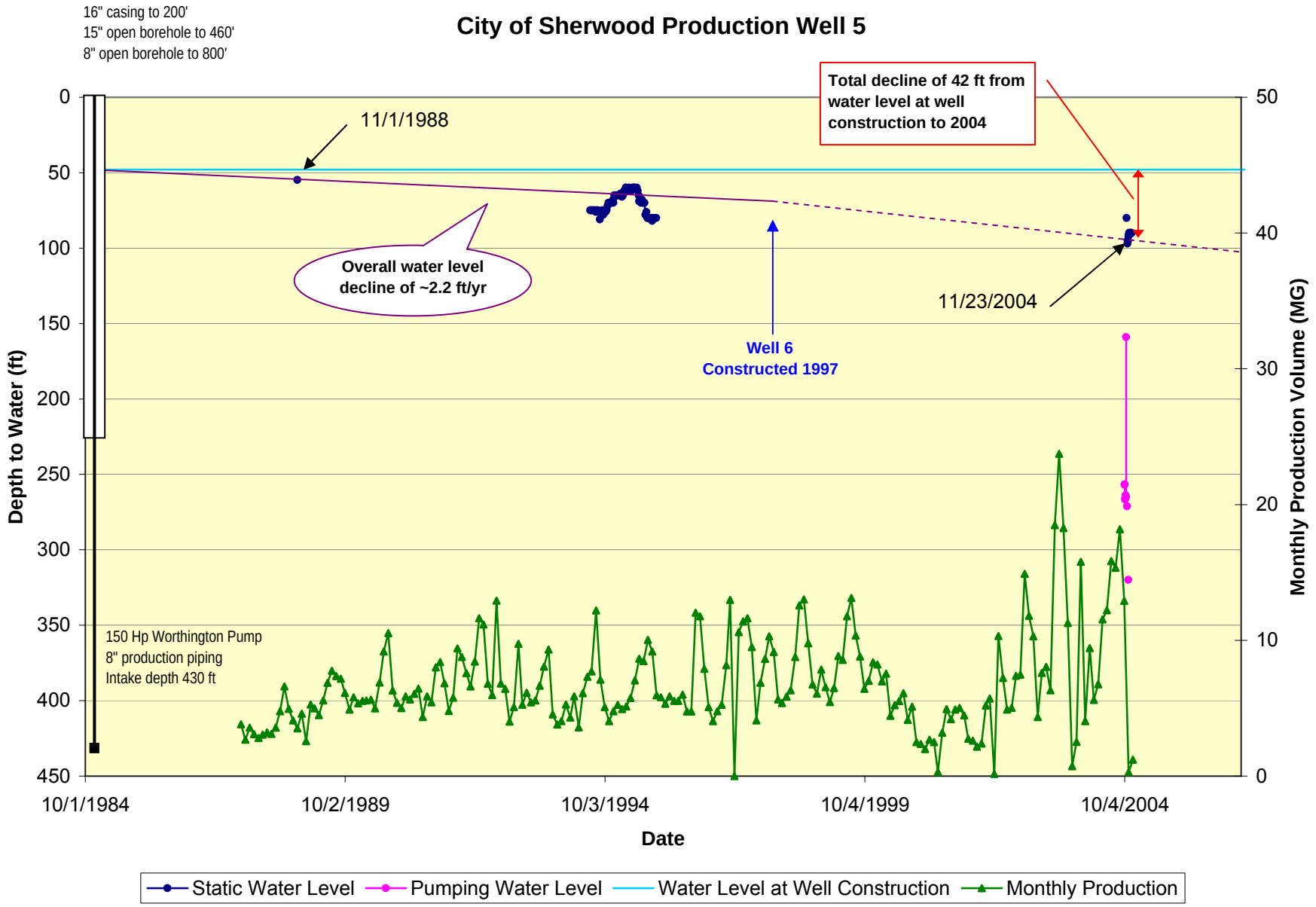
P:\124 - Sherwood (MSA)\003 - Well #5\Well evaluation\well 3 data.xls



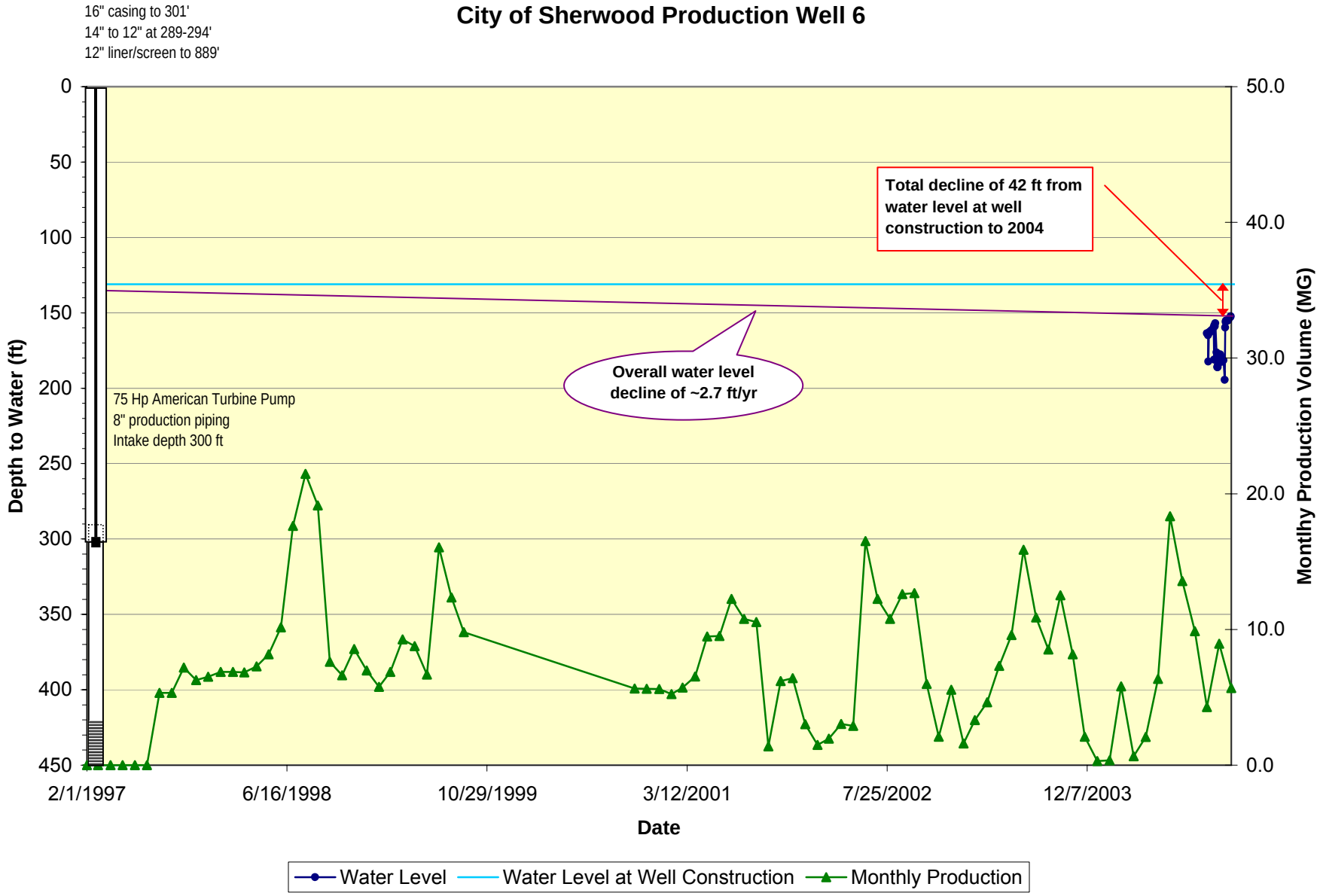
Groundwater Solutions Inc.

Appendix A - Production Well Hydrographs

P:\124 - Sherwood (MSA)\003 - Well #5\Well evaluation\well 4 data.xls



Appendix A - Production Well Hydrographs



Groundwater Solutions Inc.

Appendix A - Production Well Hydrographs

P:\124 - Sherwood (MSA)\003 - Well #5\Well evaluation\well 6 data.xls

City of Sherwood Oregon

Resolution 2004- 036

A RESOLUTION ESTABLISHING A VOLUNTARY WATER CONSERVATION CAMPAIGN

WHEREAS, The City of Sherwood recognizes that water usage increases during the summer months; and,

WHEREAS, the City of Sherwood recognizes that the cost of Bull Run water is steadily rising; and,

WHEREAS, the City of Sherwood recognizes that the cost of services provided by Tualatin Valley Water District has increased; and,

WHEREAS, the City of Sherwood wishes to promote a voluntary water conservation campaign to reduce usage and to reduce costs to the city; and,

WHEREAS, the City of Sherwood will work with Tualatin Valley Water District to develop water conservation messages and a voluntary water conservation campaign.

NOW, THEREFORE, THE CITY RESOLVES AS FOLLOWS:

Section 1. The City Manager is directed to implement a voluntary water conservation campaign during the summer months.

Duly passed by the City Council this 11th day of May 2004.

Mark O. Cottle, Mayor

ATTEST:

C.L. Wiley, City Recorder

ORDINANCE NO. 99-1076

AN ORDINANCE CREATING PROVISIONS FOR WATER RESTRICTIONS AND PROHIBITING NON-ESSENTIAL WATER USE DURING CRITICAL DROUGHT OR IN OTHER TIMES OF EMERGENCY WHEN THERE MAY BE INSUFFICIENT WATER, AND DECLARING AN EMERGENCY.

WHEREAS, the City implemented water conservation measures during the Summer of 1996 to preserve water supplies during the dry season as interim steps; and,

WHEREAS, the City Council at its January 26, 1999 meeting, directed the City Staff to prepare water restrictions for conservation in advance of Summer 1999; and,

WHEREAS, the City Council requested and received the report of the status of water supply resources, and the testing, now completed, of the Cipole 12-inch Intertie from the City of Tualatin; and,

WHEREAS, the Completion of necessary repairs to the Bull Run (Regional Supply) Line is projected to be completed by Summer; and,

WHEREAS, the City is a member of the Regional Water Providers (RWP) Consortium, which is implementing the Regional Water Supply Plan and its Conservation Provisions; and,

WHEREAS, the contractual requirements that accompany water supply from outside the City, Bull Run Water, for example, specify that if water restrictions are necessary for the supplier, they shall be passed on to water customers in what is basically a "share the shortage" concept; and,

WHEREAS, the City is completing its Water System Master Plan, and its Water Management & Conservation Plan, which include upgrading and expanding the wells and storage capacity of the water system and providing for conservation; and,

WHEREAS, the growth in demand is expected to result in Water Consumption for the Summer Peak that is approximately nine percent (9%) higher than the previous years; and,

WHEREAS, the City needs additional flexibility between a voluntary plan and mandatory controls because of the possibilities of a critical drought, an emergency situation, a reduction in pumping or in other times of emergency; and,

WHEREAS, an ongoing program of water conservation will help protect our water resources, now and in the future; and,

WHEREAS, the City desires to inform water users of these restrictions and prohibitions; and,

WHEREAS, the City needs to ensure that water is available for fire protection and other essential uses.

NOW, THEREFORE, THE CITY OF SHERWOOD ORDAINS AS FOLLOWS:

ARTICLE I
ONGOING WATER CONSERVATION PROGRAM

Section 1. The purpose of this Article is to restrict nonessential water use in order to protect the City's water resources without creating an undue hardship for water users.

Section 2. The City of Sherwood hereby establishes a water conservation program to include the following ongoing provisions:

A. Landscape sprinkling for each landscaped area (e.g. sprinkler zone) shall be limited to 20 minutes per day.
B. No landscape watering shall be allowed between 10:00 a.m. and 5:00 p.m. ~~from May 1st to October 15th~~.
C. All watering with a hose held by hand and constantly monitored is exempt from restrictions.
D. Exemptions may be granted by the Public Works Director.

Section 3. New landscaping shall be subject to any and all water restrictions imposed, and shall not receive any preference or exemptions until after the placement in service of the Bull Run (Regional Supply) Line.

ARTICLE II
WATER RESTRICTIONS

Section 1. The purpose of this article is to restrict water use to ensure fire flow and essential requirements. This Article includes the requirements of Article I.

Section 2. The City of Sherwood may restrict landscape sprinkling from May 1st to October 15th on an alternate day basis (e.g. even numbered addresses may water on even numbered days and odd numbered addresses on odd numbered days) under the following conditions:

A. The Public Works Director shall inform the City Manager when water consumption exceeds production and available water storage is approaching the minimum the City requires to meet fire protection and other essential requirements.

B. Upon notification, the City Manager shall impose the landscape water restrictions effective immediately upon posting notices in three (3) conspicuous places in the City.

C. The restrictions shall stay in effect until such time as the City Manager finds that the conditions which gave rise to the restrictions no longer exist. The City Manager may declare the prohibition terminated in whole or in part effective immediately upon announcement.

D. Restrictions imposed shall be reviewed by the City Council at its next subsequent meeting.

E. Water for construction and water for the purpose of dust control may be limited or restricted entirely depending upon the availability of water at such time as water restrictions are imposed.

F. The City reserves the right to establish separate rules to clarify and expand water restrictions and applications to meet the water demand.

ARTICLE III
EMERGENCY WATER RESTRICTIONS

Section 1. The purpose of this article is to restrict water use to essential services during times of critical water shortages due to severe drought, reduction in pumping capability or other emergency situations wherein there may be an insufficient water supply. This Article includes the requirements of Articles I and II.

Section 2. The City Manager shall declare a critical water supply emergency by means of posting notice in three (3) public and conspicuous places in the City. Such announcement shall prescribe the action taken by the City Manager, including the time it became or will become effective, and shall specify the particular activities for which the use of water will be prohibited. The declaration shall be reviewed by the City Council at its next subsequent meeting.

Section 3. When a declaration of emergency is announced and notice has been given, the use and withdrawal of city provided water by any person may be limited, including prohibiting the following:

A. Sprinkling, watering or irrigation of shrubbery, trees, lawns, grass, ground covers, plants, vines, gardens, vegetables, flowers or any other vegetation.

B. Washing automobiles, trucks, trailers, trailer houses, motorbikes, boats, or any other type of mobile equipment.

C. Washing sidewalks, driveways, parking lots, tennis courts, filing station aprons, porches and other hard surface area.

D. Washing the outside of dwellings, washing the outside of office buildings.

E. Washing and cleaning business or industrial equipment and machinery.

F. Operating any ornamental fountain, scenic or recreational ponds and lakes or other structures making a similar use of water, except for the minimum necessary to support fish life.

G. Use of water to fill, refill or add to any swimming and wading pools or jacuzzi not employing a filter and re-circulating system, and evaporation covers, or where the use of the pool is required by a doctor.

H. Permitting the escape of water through defective plumbing.

I. Use of water for construction projects.

J. Water to serve customers in a restaurant unless requested.

K. Such other prohibitions on use, or restrictions on use practices, conservation measures, or as may be imposed or requested by a supplier of water to the City, pursuant to supply agreement or contract, as a condition to supplying water to the City of Sherwood.

Section 4. Whenever the City Manager shall find that the conditions which gave rise to the water prohibition no longer exists, the City Manager may declare the prohibition terminated in whole or in part, effective immediately upon announcement.

Section 5. The City Manager shall make or cause to be made a record of each time and date when any emergency declaration is announced to the public and this includes the notice of termination, both in whole or in part.

ARTICLE IV
ENFORCEMENT

Section 1. Major Irrigators: Major irrigators with two-inch (2") or greater City water meter shall comply with the terms of the following:

A. Notice: Major irrigators using two-inch (2") or greater City water meters shall be prohibited from irrigating once an emergency is declared and the City shall provide them immediate notice of such declaration and a copy of this notice. Failure to comply with City's "no irrigating" provision shall result in the immediate shut off of nonessential water usage by the City Public Works personnel.

B. Other Users: In respect to other users, water restrictions and enforcement shall be as follows:

1) Letter of Warning. A Letter of Warning shall be in writing, shall specify the violation, may require compliance measures, and shall be served upon the Customer either personally, by office or substitute service, by first class mail, or by posting in a conspicuous place on the building, place or premises where the violation occurred.

2) Notice of Violation. For violation of each prohibition, the Customer will receive one Letter of Warning prior to receiving a Notice of

Violation. A Notice of Violation shall be in writing, shall specify the violation, may require compliance measures, may assess a civil penalty, and shall be served upon the Customer either personally, by office or substitute service, by first class mail, or by posting in a conspicuous place on the building, place or premises where the violation occurred.

Section 2. Penalties

A. Schedule of Penalties. In addition to any liability, duty, or other penalty provided by law, the City Manager may assess a civil penalty for any violation of requirements after a Customer has previously received a letter of warning for a violation. A civil fine may be assessed in the following manner and amounts:

First notice of violation	$100
Second notice of violation	$300
Third notice and subsequent violations(s)	$500

1) Penalties Assessed in a Notice of Violation. A penalty is due and payable upon receipt of the notice of assessment, and may be added to the total amount due on water bills. Procedures for collection of past due penalties shall be the same as for past due water bills, resulting in shut-off of water if payment is not received after notice and appeal rights have been exhausted.

B. Settlement of Penalty. Upon receipt of a notice of assessment of an enforcement action, a Customer may request a conference with the designee of the City Manager, who may settle any unpaid penalty where deemed appropriate.

C. Appeal of Assessment of Penalty. Upon receipt of a notice of assessment, a Customer may appeal the assessment to the City Manager. The appeal is required to be in writing and with sufficient proof to argue the assessment. The written appeal must be received in the City of Sherwood, 20 NW Washington, Sherwood, OR 97140, within seven (7) days of the date of issuance of the assessment.

Upon receipt of the notice, a time and place will be set for the hearing within seven (7) days. At the hearing, the appellant may present oral and documentary evidence relevant to the charge of violation. After hearing the evidence, the City Manager or his or her designee, will make a determination within fifteen (15) days, which determination shall be final.

ARTICLE V
VALIDITY

Section 1. The invalidity of any section clause, sentence or provision of this ordinance shall not affect the validity or any other part or section of this ordinance which can be given effect without such invalid part(s).

Section 2. Repealer. The existing provisions of Section 7A of Ordinance No. 514, codified as Section 13.04.070 "Use Restrictions in Periodic Water Shortage" are hereby repealed.

Section 3. Inasmuch as it is necessary for the public health, peace and safety of the City of Sherwood that water restrictions be created with the least possible delay, an emergency is hereby declared to exist; and this ordinance shall be in full force and effect after passage by the City Council and of the Mayor.

Duly passed by the City Council this 27th day of April 1999.

Approved

Walter Hitchcock, Mayor

Attest

Chris Wiley, Deputy City Recorder

	Aye	Nay
Cottle	absent	
Krause	✓	
Franklin	✓	
Hitchcock	✓	
5th seat vacant		

Residential High-Efficiency Toilet (HET) Rebate Application

"WaterSense" 1.28 gpf High Efficiency Toilets

Residential Rebate Eligibility Requirements

- Applicants must live in a single-family residence within the City of Sherwood service area, with a single meter.
- The applicant must have a current City of Sherwood water account in good standing.
- Applications must include a copy of a proof of purchase receipt from a retailer or plumbing company that specifies the purchase date, purchase price, manufacturer and model number.
- The application must be received **within 60 days of purchase date**.
- Prior to approval, an on-site inspection may be required. The total rebate per item will not exceed the receipt amount. Rebates will be applied to your utility account.
- Rebates are for new products only. Pre-existing products are not eligible.
- Please allow 2-4 weeks for processing.
- Rebates are distributed on a first-come, first-serve basis.

1.28 gpf High-Efficiency Toilet (HET) Rebate

Apply for a $40 rebate when you replace your old water-wasting toilet with an EPA WaterSense labeled 1.28 gpf High-Efficiency Toilet (HET). For a list of qualified WaterSense models, visit www.epa.gov/watersense. **Limit: 2 HET** rebates per household.

How to Apply

After purchasing and installing your new 1.28 gpf HET per the eligibility requirements outlined above, complete the Residential Rebate Application form and attach a copy of the receipt. Use the check list below to ensure you meet all of the program requirements and to expedite the processing of your request. The rebate will be credited to your City of Sherwood Utility account.

Recycling Your Old Toilet

If you would like to recycle your old toilets, contact the nearest recycling center for hours and costs:

S&H Landscape Supplies & Recycling
20200 SW Stafford Rd, Tualatin
503-638-1011

S&H Landscape Supplies & Recycling
1748 NE 25th Ave, Hillsboro
503-846-0881

Environmentally Conscious Recycling
12409 NE San Rafael, Portland
503-253-0867

Check List

◊ Toilet was installed in a single family residence with a single meter.
◊ Applicant is listed on water account.
◊ Receipt is attached and includes the 1.28 gpf HET toilet manufacturer, model name and model number, as well as purchase date and proof of payment.
◊ Toilets are EPA certified HET 1.28 gpf toilets.
◊ I have not previously received a rebate for which I am now applying for at this address.
◊ Water account is not past due.

Mail completed rebate application and proof of purchase within 60 days of purchase to:
City of Sherwood Utilities
Attn: Rebates
PO Box 638
Sherwood, OR 97140

Residential High-Efficiency Toilet (HET) Rebate Application

City of Sherwood Utility Account #:_____

First Name:_____ Last Name:_____

Address: _____

Home#:_____ Cell#:_____

REBATE	PURCHASE DATE	PURCHASE PRICE	MANUFACTURER	MODEL NAME	MODEL NUMBER	GALLONS PER FLUSH (gpf)
1.28 gpf **HET #1** $40 (2 max)						
1.28 gpf **HET #2** $40 (2 max)						

I certify the information I have provided is correct and I have purchased the goods and/or services for use at the location indicated. I grant permission to the City of Sherwood, with notification, to enter upon the property to inspect the installation of rebate goods to assure program requirements are met. I understand rebates are distributed on a first-come first-serve basis until funds are distributed.

_____ _____

Signature Date

Please mail this completed application and copy of proof of purchase to: City of Sherwood Utility Billing Dept., PO Box 638, Sherwood, OR 97140. Please call 503-925-2315 or visit our website at www.sherwoodoregon.gov for more information.

This application must be received within 60 days of purchase date. Please allow 2-4 weeks for processing.

Toilets must have the EPA WaterSense label. Please see the other side for complete eligibility requirements. For a list of qualified WaterSense models, visit www.epa.gov/watersense.

Office Use Only
Date Received:
Date Approved:
Date Denied:

Effective 07/01/2014

888 SW 5TH AVENUE, SUITE #1170

PORTLAND, OR 97204

www.murraysmith.us