

**Appendix F**  
**Wellhead Protection Program**

City of Tumwater

# Wellhead Protection Program

February 2010 Update

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## PURPOSE

The tendency for chemical contaminants to move between groundwater and surface water is a key consideration in managing water resources. An increasing emphasis is placed on reviewing watersheds as a unit for managing water quality. Coordination between watershed-management and groundwater-protection programs is essential to protect the quality of drinking water.

Most instances of aquifer contamination become known when trace levels of a contaminant are detected through routine monitoring. Drinking water systems that have completed a wellhead protection plan will have information on groundwater flow and aquifer hydraulic characteristics as well as a contaminant source inventory and thus will be in a good position to determine the best response to ensure the continued quality of the water supply.

The Wellhead Protection Area Program aims to identify, and then protect, land areas and aquifers that supply municipal wells. This process guards against potential sources of contamination and helps maintain a high-quality water supply. Using the Wellhead Protection Area Program, the City manages and controls the use of substances that could potentially contaminate the aquifers critical for production of municipal supply.

The intention of this report is to provide an update on the City's on-going Wellhead Protection program and status of modeled Wellhead Protection Areas (WHPAs). A comprehensive plan was completed in 1997, designed to meet the technical requirements for the wellhead protection plan for the City of Tumwater required by the federal Safe Drinking Water Act (SDWA). Since then, the City has aimed to be proactive in protecting groundwater quality and intertwine wellhead protection concepts and goals through the regular outreach and business conducted by the City.

A wellhead protection plan is designed to protect the groundwater used by the community from contamination. The original plan, developed in 1997, established protected areas overlying the aquifer supplying water to the City's production wells and extended upgradient a prescribed distance. The extent of the upgradient protection area was determined by modeling the aquifer(s) and projecting the wells' capture zone as determined for one, five, and ten year scenarios. This "special protection region" is regularly inventoried to identify potential contaminant sources. The City works with the businesses and residents to continually protect the health of the aquifers and ensure potential pollutants do not reach the City's production wells and many thousands of consumers every day.

## INTRODUCTION

### THE COMMUNITY

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Incorporated in 1869, historical Tumwater is located between Seattle and Portland on Interstate-5, serving the traveler with a central location for exploring Puget Sound and all its beauty, including Mt. Rainier, Mt. St. Helens, Pacific Ocean beaches, and the Olympic Peninsula and rain forest.

The first water system in the Tumwater area was built by the Olympia Brewing Company in 1885, serving a population of 410. Since then, the Tumwater area has grown to a population of 16,710 and has fully developed a water utility that manages more than 6,500 connections, the bulk of which serve residential and domestic needs.

## GEOLOGIC BACKGROUND

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The geology in and around Tumwater is primarily a result of glacial action that occurred more than 10,000 years ago. As glaciers advanced and retreated across the area, they gouged and scoured the land, scraping up large amounts of sediment. The layers of deposits left behind range from boulders, sand, and gravel to clay and silt.

Because the aquifers in Tumwater are found at shallow depths, these layers are highly susceptible to the effects of human activities and the contamination that may accompany them. Many of these layers are composed of loose sediments such as sand and gravel, which are less likely to filter out contaminants. Aquitards found in the area may not be thick enough or impermeable enough to provide adequate protection from contamination.

## SPECIAL PROTECTION AREAS

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Two types of area have been identified in the Tumwater Municipal Code (TMC) to receive special protection, as required by the 1986 amendments of the SDWA: Wellhead Protection Areas (WHPAs), TMC 16.26, and Aquifer Protection areas (AQPs), TMC 16.24. All development in Tumwater is regulated subject to these special requirements for protection of the groundwater serving the community.

A WHPA is a management area defined by modeled capture zones, specific surface and subsurface areas that contain potable water for production by the City's water utility, with an additional buffer area to address uncertainties in the models used to develop the capture zones. Within WHPAs, specific prohibitions and limitations apply to new, expanding, and existing development. WHPAs in Tumwater are defined for the purpose of water resource management and protection of the potable supply.

An AQP is a larger area naturally more vulnerable to contamination because of its geological and hydrological conditions. The current overlay area includes all lands within Tumwater, requiring all development to provide for the general protection of groundwater.

## WELLHEAD PROTECTION AREAS (WHPAS)

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A WHPA is defined, according to TMC 16.26.020, as the "surface and subsurface area surrounding a municipal water well or wellfield through which contaminants are likely to move toward and reach such water well or wellfield within six months, one year, five years and ten years". In simpler terms, it is the area managed by the community to protect groundwater based drinking water supplies. As the distance from the pumping well is increased, the time-of-travel for a particle of water traveling in the aquifer to the well is lengthened. Protecting and monitoring this area:

- Decreases the possibility that the drinking water supply will be contaminated with pathogens or toxic substances.

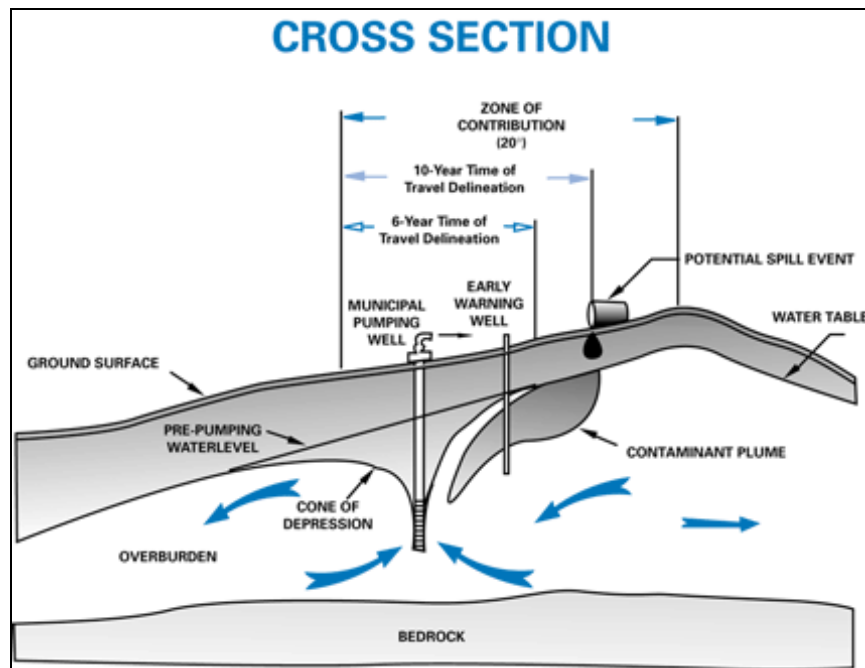
- Provides increased reaction time so Tumwater can respond to a potential loss of a well(s) due to contamination and determine if another source of water can be located or a treatment system should be installed.

Designing and implementing an effective Wellhead Protection Program involves the following steps, as required by the SDWA and guidance developed by the WA Department of Health (DOH) in 1995, which is discussed further in this text:

1. Delineating the area to be protected
2. Identifying potential sources of contamination
3. Managing the WHPA
4. Establishing and defining roles and responsibilities of participants
5. Groundwater monitoring
6. Contingency planning
7. Educating the public, elected officials, the business community, and others.

## DELINEATING A WELLHEAD PROTECTION AREA

As water is drawn into a well, the surrounding water table is lowered, creating a cone of depression. Within this cone of depression, groundwater flows more rapidly because of the slope of the groundwater surface caused by the pumping well. As water is drawn into the well, it is replaced by groundwater from further away.



Typical cross section showing time of travel zones and aquifer flow

The full recharge area is an area(s) that contributes water to the aquifer through infiltration of rainfall or other surface water. Recharge areas are also commonly referred to as a zone of contribution. Zones of contribution range in size, usually from tens of acres to several square miles or larger.

When defining management zones for wellhead protection, communities occasionally choose to protect only part of the zone of contribution. In other communities, where the entire zone of contribution is protected, different standards may be set for different areas. These areas are often defined by the time-of-travel (TOT) to the well or wellfield. TOT is the amount of time it would take for a contaminant within the aquifer to reach the well. The cross section graphic on the previous page shows an arbitrary six and ten-year TOT for an imaginary well. In the City of Tumwater, Wellhead Protection Areas are larger than the modeled TOT, or capture zones, to account for uncertainties in the model.

## TUMWATER WELLHEAD PROTECTION AREAS

In 1997, the City of Tumwater completed an extensive review and computer analysis of the aquifer systems that provide water to the City's utility customers. Time-of-travel capture zones were modeled for each of the City's production wells using groundwater flow simulation software, QuickFlow. The simulation was calibrated to US Geological Survey (USGS) water level data. These modeled capture zones were then enhanced to include higher resolution water level data collected by the City and expended to account for model uncertainties and temporal changes in water production.

The final WHPAs that currently surround the City's production wells are shown in Figure 1. A comprehensive analysis will be conducted in 2011 to reflect changing conditions in water production and source acquisition and modification.

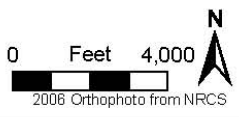
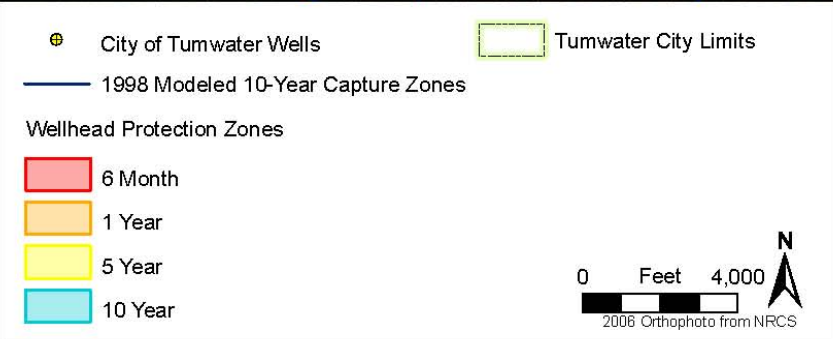
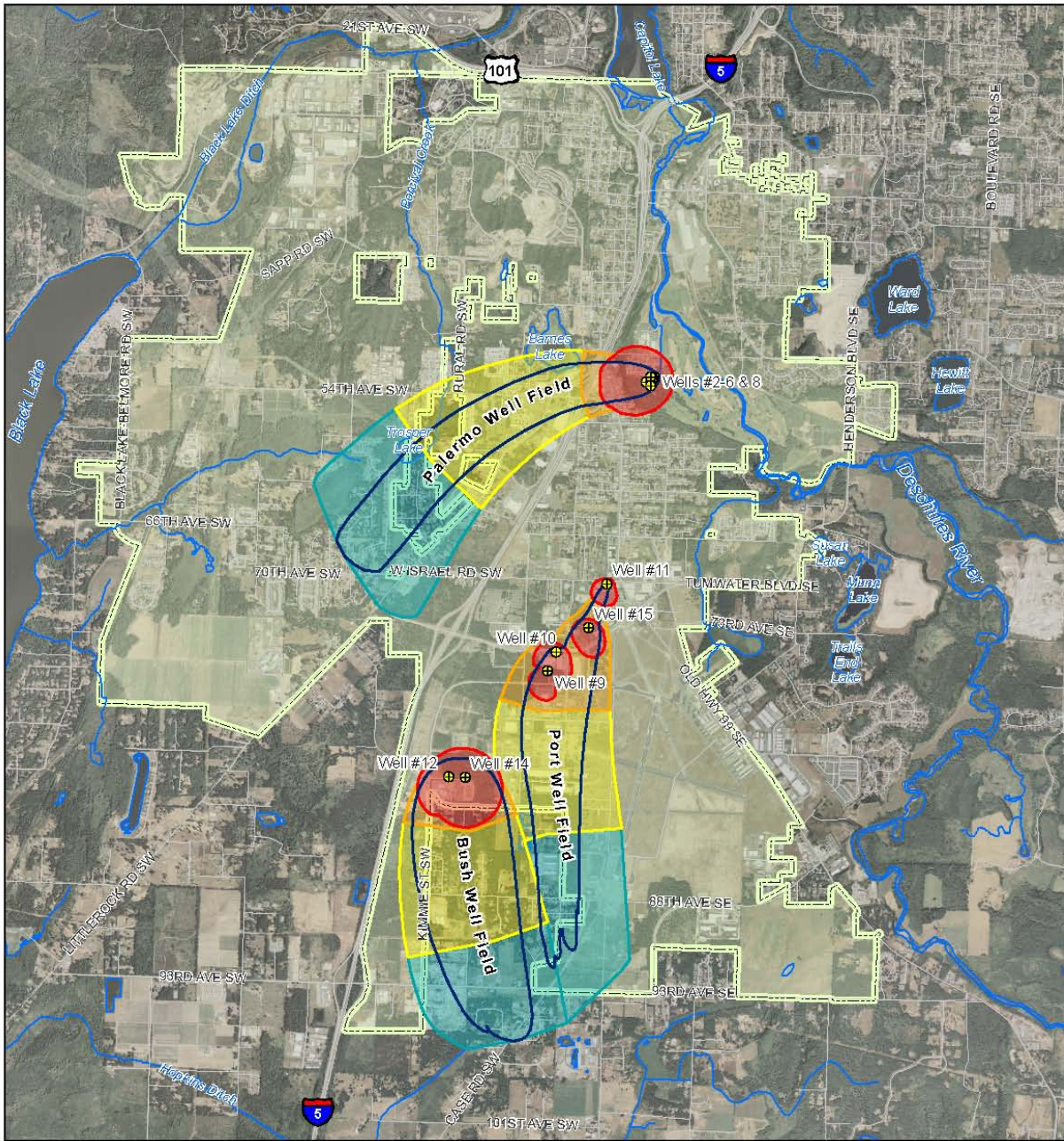
## ADEQUACY OF EXISTING WELLHEAD PROTECTION AREAS

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For the 2010 Comprehensive Water System Plan update, Pacific Groundwater Group (PGG) prepared a memo to communicate findings and recommendations regarding the adequacy of the City's existing WHPAs. The existing WHPAs are documented in the City's wellhead protection ordinance O97-028 of 1998 and were established based on modeling work originally conducted by PGG in 1997.

PGG's effort for the 2010 update included a review of the wellhead capture zones relative to WHPAs, and to compare actual pumping rates from 2006 to 2008 with projected future pumping rates and with pumping rates assumed during the 1998 modeling of the capture zones.

The following discussion distinguishes *capture zones* from *wellhead protection areas*. Capture zones are the areas of contribution to a well, predicted by a model. The City of Tumwater's WHPAs are the legal areas referenced in the ordinance, and are larger than the modeled capture zones to accommodate model and operational uncertainty.



**Figure 1**  
Existing Wellhead Protection Areas for Currently Pumped Wells

City of Tumwater

Figure 1: 2010 City of Tumwater Wellhead Protection Zones

## SUMMARY OF FINDINGS AND RECOMMENDATIONS

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The existing WHPA for the Bush Middle School (BMS) well field has a small safety buffer which will likely be exceeded by 2012 or sooner. If future demands include those from a potential fish hatchery and a large industrial user, the well field capture zone of BMS will exceed or nearly exceed (depending on assumed pumping scenarios) its WHPA, while other WHPAs will have minimal safety buffers. Therefore re-delineation of the existing WHPAs is recommended for the near future to include an “all water demand” scenarios examination.

If WHPAs are re-delineated, the following approach is recommended. WHPAs should assume the maximum allowable production given existing water rights, which will probably cause substantial enlargement of the existing WHPAs. Re-delineation could be performed using a simplified two-dimensional model of aquifer flow, as was done for previous WHPA delineation. Additionally, modeled groundwater elevations and local geology should be reviewed during WHPA re-delineation to verify that they reflect the most current data. Finally, the Trails End WHPA should be deleted as its water rights have been transferred to BMS.

## CONCEPTUAL AND QUANTITATIVE MODELS OF THE AQUIFER

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The 1998 capture zone model was a simplified, two-dimensional, steady-state, homogeneous representation of a more complex groundwater regime. New data generated since 1998 include recent geologic mapping by the Department of Natural Resources and a 2008 report for COT by Golder Associates. These reports refined deep stratigraphic units and boundaries and updated surface geology maps. However, as virtually all existing COT wells are in shallow glacial or alluvial sediments, the geologic understanding of the local well areas have generally changed little. A proposed large-scale infiltration facility could potentially affect local aquifer flow, but as this facility is still under review and has unknown infiltration rates its potential effects cannot be examined. Therefore, the aquifer characterization within the model remains approximate but valid for delineation of capture zones for the existing sources. When WHPA re-delineation occurs in 2011, a complete review of recent geologic data shall be incorporated.

## REVIEW OF EXISTING WHPAS

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Existing WHPAs, which were delineated in 1998, and their model assumptions were reviewed by PGG to evaluate the adequacy of WHPAs given future demand projections. The existing one, five, and ten-year WHPAs were delineated based on the 1992 demand plus five percent, which is approximately equal to the 1997 demand. The six-month WHPAs were delineated using a more aggressive pumping regime, with pumping based on projected 2010 demand during the six highest demand months (May to October) when 62.5% of annual pumping occurs. Additionally, the six-month WHPAs assume that one major well field (either the Port or BMS) is non-functional, representing an emergency condition.

Table 1 compares the pumping assumptions used for capture zone delineation with average pumping rates from 2006 to 2008. Significant information conveyed in Table 1 includes:

- COT’s current (2006 to 2008) average daily demand exceeds the one, five, and ten-year modeled demand by approximately 11%. However, as pumping is not uniform between well fields, different well fields have different magnitudes of exceedence.

- Current well field demand during the six month period of peak usage remains significantly lower than the demand assumed for six-month capture zone modeling.
- Modeled pumping rates and average pumping rates from 2006 to 2008 all fall within the sustainable pumping rates for each well. One exception is the Trails End well, which had an assumed pumping rate for the six-month WHPA which exceeded its sustainable pumping rate. This previous error is of little consequence as the Trails End wells is no longer used for production.

**Table 1: Capture Zone Modeling Assumptions Compared to 2006 - 2008 Production Data**

Well	Well Field	Data From 1997 WHPP & 1998 WHPA Modeling Reports						Data from 2010 WSP	
		Sustainable Pumping Rate		1, 5, and 10-Year Capture Zone Pumping Rate		6-Month Capture Zone Pumping Rate		2006-2008 Average Production	6-month Demand, 62.5% of Annual Prod.
		gpm	mgd	gpm	mgd	gpm	mgd	mgd	mgd
2	Palermo	220	0.32	59	0.08	191	0.28	0.03	0.03
3	Palermo	290	0.42	77	0.11	252	0.36	0.12	0.15
4	Palermo	480	0.69	128	0.18	365	0.53	0.20	0.25
5	Palermo	250	0.36	67	0.10	243	0.35	0.16	0.20
6	Palermo	450	0.65	120	0.17	330	0.48	0.25	0.31
7	Port	480	0.69	128	0.18	417	0.57		
8	Palermo	330	0.48	88	0.13	287	0.41	0.26	0.33
9	Port	400	0.58	107	0.15	326	0.45	0.02	0.03
10	Port	485	0.70	130	0.19	422	0.58	0.04	0.05
11	Port	275	0.40	73	0.11	239	0.33	0.06	0.07
12	BMS	750	1.08	200	0.29	482	0.58	0.62	0.78
14	BMS	2350	3.38	628	0.90	1677	2.01	1.07	1.33
15	Port	800	1.15	214	0.31	417	0.57	0.22	0.27
20	Trails End	75	0.11	20	0.03	209	0.30		
TOTAL		7635	10.99	2040	2.94	5857	5.29	3.05	3.81
TOTAL, Less Well 7*		7155	10.30	1912	2.75	5440	4.72	3.05	3.81
TOTAL, Palermo	Palermo	2020	2.91	540	0.78	1668	2.40	1.02	1.28
TOTAL, Port Less Well 7*	Port	1960	2.82	524	0.75	3563	2.01	0.34	0.42
TOTAL, Bush MS	Bush MS	3100	4.46	828	1.19	2159	2.58	1.69	2.11
Trails End	Trails End	75	0.11	20	0.03	209	0.30		

\*Well 7 is no longer used for production due to water quality concerns. Therefore, to compare current demand with modeled demand production from well 7 must be removed from the modeled demand.

Figure 1 shows existing WHPAs and modeled capture zones from 1998. One, five, and ten-year WHPAs are wider than the modeled capture zones to account for model uncertainty, seasonal variability, and operational uncertainty. The safety buffers also allow room for future demand to “grow into” the delineated WHPAs, although safety factors accommodating the uncertainties shrink with increased demand. Figure 1 differs from previous WHPA maps as it does not show the Trails End well WHPA. The Trails End water rights were transferred to Well 12 at Bush Middle School in January 2006. A change to the City WHP ordinance may be required to implement this change and the intention of this figure is only to illustrate WHPAs affected by current and future pumping.

#### ADEQUACY OF EXISTING WHPAS FOR CURRENT DEMAND

Table 2 compares the modeled demands for the existing capture zones with current (2006 to 2008) and projected average daily demands for COT well fields. The current demand at the Palermo well field (which is on “first call”) exceeded the modeled pumping rate by 32%. As capture zone widths are proportional to pumping rates, the current Palermo capture zone should be approximately 32% wider than modeled. Since the safety buffer built into the existing Palermo WHPA is approximately 130% wider than the modeled capture zone, the existing WHPA is adequate and has a safety buffer width approximately 98% wider than the current capture zone.

The Port well field, which is used mostly on a seasonal basis, currently pumps 55% less water than was modeled. Since current production is less than was assumed for capture zone modeling, the safety buffer for the Port WHPA remains adequate.

Current pumping from the BMS well field exceeds modeled rates by 42%, and therefore the current BMS capture zone is approximately 42% wider than modeled. Since the BMS WHPA is 60% wider than its modeled capture zone, the safety buffer of the BMS WHPA is now only 18% wider than the current capture zone. Given modeling uncertainties and seasonal fluctuations, the existing BMS WHPA is marginally adequate.

**Table 2: Comparison of Average Daily Demand used for Capture Zone Modeling and Future Projections**

Scenario	Average Day Demand (mgd)				Average Day Demand Exceedance Relative to Modeled Average Day Demand			
	Total	Palermo	Port	BMS	Total	Palermo	Port	BMS
1997 Modeled*	2.72	0.78	0.75	1.19				
2006-2008 Historic	3.05	1.02	0.34	1.69	11.9%	31.6%	-55.3%	41.6%
2009 Projected <sup>†</sup>	3.15	1.06	0.35	1.74	15.6%	35.9%	-53.8%	46.3%
2010 Projected <sup>†</sup>	4.62	1.55	0.51	2.56	69.6%	99.4%	-32.3%	114.5%

\*Total Average Day Demand excludes production from Well 7 (which is no longer in use, but was modeled) and the Trails End well (which had its water right transferred). The Port well field Average Day Demand also excludes Well 7.

<sup>†</sup>Projected demands assume the future demand ratio between well fields will equal the historic 2006 to 2008 demand ratio.

## ADEQUACY OF EXISTING WHPAS FOR FUTURE DEMAND

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Projected water demands for COT assume that significant increases will occur through the 2010-2016 planning period (Table 3). If the higher demands are realized early in the planning period and use COT water (assuming only existing supply sources are available), the BMS WHPA will be exceeded and the Palermo WHPA will have a low margin of safety. In this scenario, re-delineation of WHPAs would be warranted. Since WHPAs are not independent, all WHPAs should be remodeled. This assessment compared the percent increase of well field pumping to the percent difference in width between five-year capture zones and five-year WHPAs.

A separate future scenario could consider modifying pumping ratios between well fields so the projected demand is met without exceeding the BMS WHPA. For this scenario, the Port well field would pump 1.3 mgd (75% more than the modeled capture zone pumping rate) and the BMS well field would pump 1.9 mgd (60% more than the modeled capture zone pumping rate). Capture zones for all well fields would be within existing WHPAs but have minimal safety buffers, and therefore re-delineation of WHPAs is recommended.

Alternatively, if large commercial and industrial water user demands are not realized in the near future and the distribution of pumping does not change, the BMS capture zone is still expected to exceed its WHPA at some point in 2011. WHPA re-delineation would then be warranted.

## FUTURE WELLHEAD PROTECTION AREAS

As Tumwater grows, the utility has been reviewing options to increase production at existing facilities to maximize the City's water rights portfolio and evaluate new sources for potable water. In addition to the planning efforts related to new source development in the southwest and northeast, the City acquired additional water rights from the former Olympia Brewery in 2009. As these sources have not yet been developed, this preliminary review is helpful to determine future actions as the City progresses toward development of the proposed sources.

WHPAs are delineated based on calculated capture zones. For this update, the methods used to delineate preliminary capture zones provide rough approximations of zones that would be calculated by methods that incorporate non-uniform flow fields, well interference, and aquifer boundaries. Additionally, drawdown from the future sources would impact capture zones for existing sources, which makes re-delineation of existing capture zones necessary. For these reasons, simultaneous delineation of capture zones for the combined existing and future supply sources is recommended, after which combined WHPAs can be defined.

Six month, one year, five year, and 10 year capture zones were delineated for three potential future water supply sources: the Southwest well field, the Northeast well field, and the Brewery well field (Figure 2). Although the brewery well field consists of up to 21 wells, pumping from the Brewery was assumed to occur from three representative locations: north of the Deschutes River in the shallow aquifer (Brewery well 9), south of the river in the shallow aquifer (Brewery well 27), and from the deeper aquifer (Brewery well 39). Assumed pumping rates were equal the total annual water right ( $Q_a$ ) for one, five, and ten year capture zones. The assumed pumping rate for the six month capture zone was 1.25 times the annual pumping rate, which effectively consumes 62.5 percent of the annual demand over a six month period. Capture zones were delineated using either the calculated-fixed-radius method or a calculation which takes into account the ambient groundwater

gradient (which is assumed to be uniform). Table 3 summarizes parameters used in capture zone delineation, with values obtained from water rights data, well logs, and consultant reports.

**Table 3: Well and Aquifer Parameters Used For Preliminary Capture Zone Delineation at Potential New Sources**

Parameter	Unit	Location				
		SW Well Field	Brewery South	Brewery North	Brewery Well 39	NE Well Field
Calculation Method <sup>1</sup>	-	UFF	UFF	UFF	CFR	CFR
Aquifer Unit <sup>1</sup>	-	Qva	DVA(f)	DVA(f)	DVA(c)	DVA(c)
Average Annual Pumping Rate	gpm	1335	520	520	375	2170
Average Six Month Pumping Rate	gpm	1670	650	650	470	2710
Aquifer Thickness	ft	40	50	40	NA <sup>2</sup>	NA
Well Screen Length	ft	NA	NA	NA	68	40
Hydraulic Conductivity	ft/day	375	125	125	NA	NA
Hydraulic Gradient	ft/ft	0.0008	0.0075	0.0084	NA	NA
Effective Porosity	ft <sup>3</sup> /ft <sup>3</sup>	0.25	0.25	0.25	0.25	0.25

<sup>1</sup>UFF = Uniform Flow Field, CFR= Calculated Fixed Radius, DVA(f)= Deschutes Valley Aquifer (fine), DVA(c)= Deschutes Valley Aquifer (coarse)

<sup>2</sup>NA: Parameter not used for capture zone calculation

Brewery well 39 and the test well at the Northeast well field are screened in the deeper, coarse-grained Deschutes Valley Aquifer (DVA(c)) (Walsh and others, 2003; Golder, in preparation, Pacific Groundwater Group, 2008). That valley-fill aquifer laterally abuts the regional Tertiary/Quaternary undifferentiated aquifer (TQu) identified by Drost and others (1998). As the deep aquifer is confined and several hundred feet below the ground surface, this aquifer has a relatively low contamination risk. For this reason the relatively simple calculated-fixed-radius method was used for capture zone delineation. Based on the volume pumped for a given time period, this method calculates the radius for a cylinder of aquifer which would be required to yield the given volume of water. The only required input data are pumping rate, screen length or aquifer thickness, and aquifer porosity.

Capture zones for Brewery South, Brewery North (wells 9 and 27) and the Southwest well field were calculated using an equation for capture zones in an aquifer with a uniform hydraulic gradient. This method was considered appropriate as shallow aquifer units, which include the fine-grained Deschutes Valley Aquifer unit (DVA(f)) and the regional Vashon Advance Outwash unit (Qva, Drost et al (1998)), are more susceptible to contamination, making a refined capture zone more important. Time-of-travel zones were estimated using the following process: the Cooper-Jacob distance drawdown method for a pumping well was used to simulate the cone of depression, the ambient hydraulic gradient was added to the drawdown caused by the well, the seepage velocity and travel time were then calculated along different segments of the modified drawdown surface using Darcy's equation.

Delineated capture zones are shown in Figure 2, in addition to existing wellhead protection areas (WHPAs) for the Palermo, Bush Middle School, and Port well fields. Existing WHPAs from the Washington Department of Health Source Water Assessment Program database for two water rights recently acquired by the City, Lakeland Manor and Lathrop Business Park, are also shown (and were not calculated for this update). WHPAs are buffers

which include and surround capture zones, accounting for uncertainty and adding an additional margin of safety. The City’s WHPAs are legally defined in the City WHPA ordinance (O97-028).

The former Trails End water source is no longer used by the City. The former WHPA for the Trails End source was therefore removed in preparation of Figure 2.

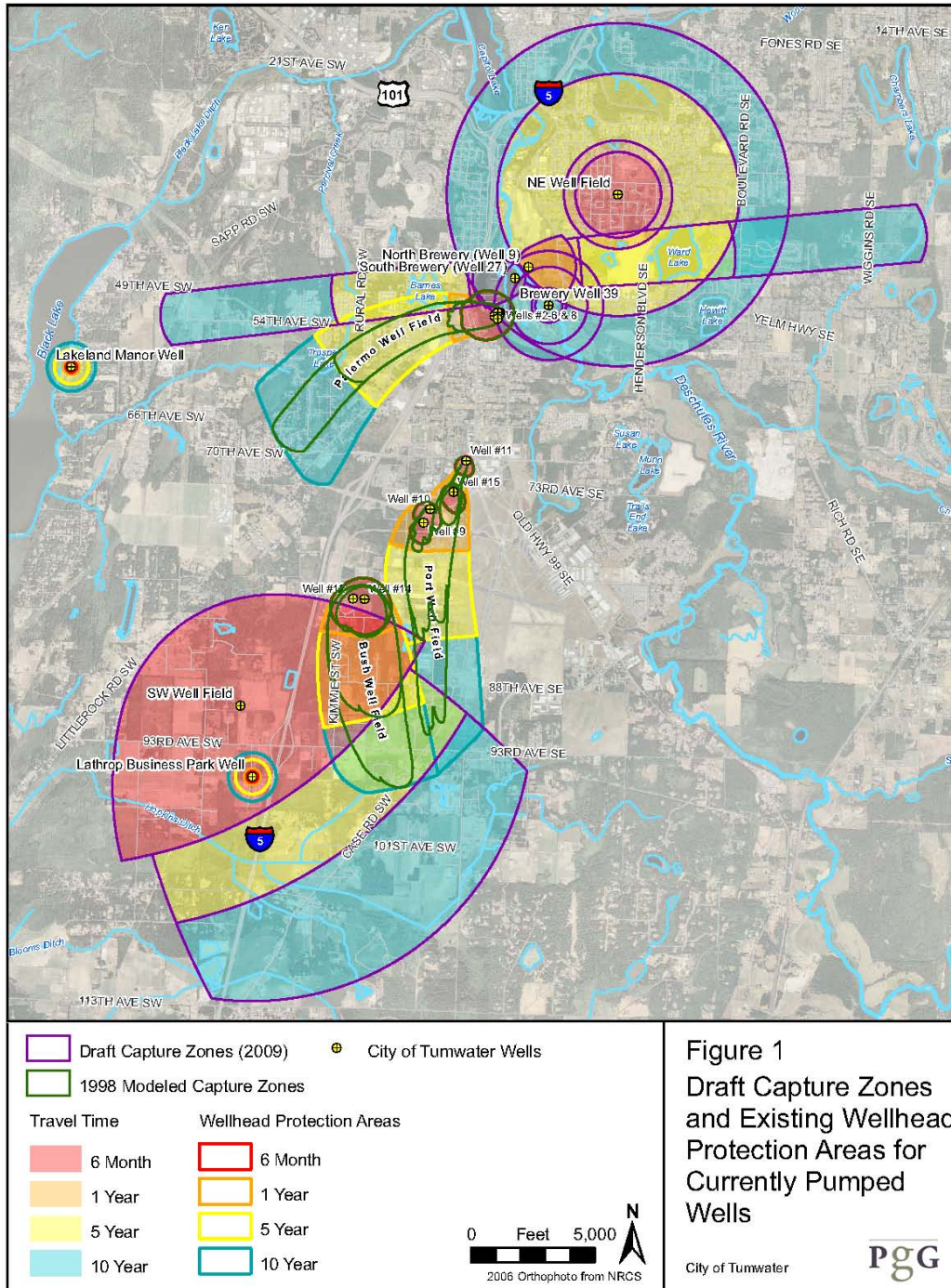


Figure 2: Draft Capture Zones and Existing Wellhead Protection Areas for Currently Pumped Wells

## IDENTIFYING POTENTIAL SOURCES OF CONTAMINATION

A potential contaminant source inventory generally identifies all land uses in the delineated area and lists the location of certain land uses as well as potential contaminant sources in relation to the well.

### INVENTORY METHOD

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The City began coordination with Thurston County to review and inventory the land uses and businesses within Tumwater's WHPAs. The initial inventory was completed by performing "windshield surveys", a drive-through survey of the target areas. The City identified 173 total businesses within these areas, 42 of which were businesses that had the potential to use or store hazardous materials or produce a hazardous waste stream. Included in the inventory were such businesses as light industry manufacturers, medical/dental offices, auto shops, schools, printers, fire stations, jewelers, construction companies.

Following the initial survey, the City sent each of the 42 businesses identified as handling hazardous wastes a letter describing the City's technical assistance campaign (refer to Exhibit A for an updated version). The businesses were contacted by phone to schedule a non-regulatory technical assistance visit at their convenience. City and County staff completed the initial technical assistance visits from June to September 1999 with three follow-up visits in the summer of 2000.

Early in 2001, the Cities of Lacey, Olympia, and Tumwater joined the County to discuss the potential of a regional WHPA program. Based on previous individual WHPA programs, an agreement was reached to create an on-going inspection and inventory program on a regional basis. This program was funded at a level sufficient to support Business Pollution Prevention outreach efforts every two years in each City's WHPA. Inspections include an inventory of hazardous wastes and hazardous materials at each site, storage practices, spill preparedness, secondary containment, and recycling and disposal practices. Similar to the previous survey and technical assistance effort, the inspections used a technical assistance approach, backed by the compliance authority of the Thurston County Nonpoint Source Pollution Ordinance.

Since then, the City has coordinated with Thurston County to follow a similar methodology to inventory and survey WHPAs every two years. During each technical assistance visit, an inventory form is used to collect information about a business' source of drinking water, stormwater controls, solid waste and wastewater disposal, floor drains, fuel tanks, historical land use, hazardous waste generation, and spill/emergency response preparedness. For each business that participates in the survey, notes are taken using a standardized inventory form (Exhibit B). Where appropriate, City and County staff provide educational literature about specific waste streams or management practices with the business.

An on-site assessment of hazardous waste management is performed as a component of the technical assistance visit. The assessment reviews the handling of hazardous materials used by each business and, where needed, makes suggestions to voluntarily adopt Best Management Practices (BMPs). BMPs are non-regulated practices designed to reduce generation of hazardous waste, use less toxic products, recycle, and make improvements in hazardous waste management.

At the conclusion of the technical assistance visit, City and County staff notify the business representative as to whether their business complied with the Thurston County Nonpoint Source Pollution Ordinance. A Notice of Compliance is issued to businesses in compliance with the ordinance (either at the time of the technical assistance visit or after corrective action had been documented during a follow-up visit). Businesses not in compliance are given fact sheets about their specific management issues and a follow-up date is set for a regulatory inspection, to be conducted under the authority of Thurston County's Nonpoint Source Pollution Ordinance.

A customer survey form with a self-addressed stamped envelope is also left with each business participating in the campaign. The evaluation form asks businesses to describe any changes they had made in their hazardous waste management practices as a result of each campaign. The survey also asks businesses how they find out about hazardous waste management, how useful they find the program, and their impressions on the quality of service provided by the Thurston County's Business Pollution Prevention Program.

## INVENTORY UPDATES

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Every two years, the City conducts the WHPA Business Pollution Prevention Program assisted by the County. The service area for the City of Tumwater program is the geographic areas designated as WHPAs within the City and the adjacent areas of Thurston County. Regulatory coordination between the County and varied other agencies, such as Tumwater Fire Department, Olympic Air Pollution Control Authority, and Ecology, is necessary to help reduce the potential for governmental inspection overlap.

As previous programs have indicated, many companies are currently handling and disposing of their wastes properly. Since resources are limited, annual inspection of all businesses within the WHPA is not necessary. The ongoing Inventory and Business Pollution Prevention programs provide an inspection to every eligible site at least once every six years, as determined by a risk matrix developed by the City and County. This matrix assesses the overall activities of the business, focusing on the storage, handling, and disposal practices of hazardous materials and assigns an objective, numerical value to the business. This numerical value segregates the high-risk entities, ensuring a technical assistance visit. High-risk sites receive inspections during each round of site visits. Any new company within a WHPA receives an inspection during their first year of business.

Any business not receiving a technical assistance visit in any given year receives a self-reporting inventory form (Exhibit A). These forms are used to update records on the business activities. If it is determined that the business has considerably altered business practices, City staff add that business to the next round of site visits to ensure that safe handling, storage, and disposal practices of hazardous materials continues uninterrupted.

The City of Tumwater currently has 54 businesses within the WHPAs. A list of businesses is found in Exhibit E.

## INVENTORY LIMITATIONS

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It may not be possible to inventory all properties due to access limitations. In the event that a business denies City or County staff access to a site, staff will work with other regulatory agencies, such as the local Fire Department, Olympic Region Clean Air Agency, Department of Ecology, etc., to acquire the information necessary to complete inventory assessments. In previous years, the City has generally received solid support

from the business community for this program; access to a selected property has only been denied once. Because the technical assistance program is not mandatory, that particular site visit was cancelled and other avenues to determine compliance were considered, such as coordination with other regulatory agencies.

Another challenge is the lack of a sufficient methodology to assess changed uses at existing business locations. For example, while a particular type of business may have been established at the time of site development and development review, different business or different processes may subsequently move into a site without the Water Resources staff being informed of the changed circumstances. The City reviews land uses in the WHPAs regularly, generally through “windshield surveys”, to note where land uses have changed; however, the possibility of missing an activity or inaccurately assessing the land use remains.

## GROUNDWATER MONITORING

Groundwater monitoring in WHPAs is a highly recommended management tool. An effective groundwater monitoring program can provide an early warning prior to the arrival of contaminated groundwater at production well(s). The monitoring wells should be located such that an early warning would provide enough lead time to either intercept the in-coming contamination before it can reach the well, or arrange for an alternate drinking water supply or treatment. The groundwater monitoring program should include periodic monitoring of groundwater for suspected or known contaminants that may be flowing toward a drinking water supply well.

Groundwater monitoring also serves as a way to measure the effectiveness of source management strategies. For example, the effectiveness of BMP's implemented for fertilizer and/or pesticide applications to agricultural land can be evaluated with a well-designed groundwater-monitoring program. Groundwater monitoring is also recommended when WHPAs lie within residential or commercial/industrial areas, to evaluate the effects, if any, on the drinking water aquifer from septic systems, pesticide and fertilizer applications, and commercial and industrial activities.

The City's current monitoring well network is identified in Figure 3.

Groundwater monitoring serves a number of purposes in the context of wellhead protection. There are three types of monitoring:

1. Water supply monitoring – Water supply monitoring is required by state and federal law to ensure that water delivered to customers is safe to drink. The City routinely monitors the water supply as required at the source(s) and at various points throughout the distribution system.
2. Early warning monitoring – Monitoring groundwater either within a specified WHPA or in the areas immediately upgradient from those WHPAs allows the utility to identify problems and gain some response time to mitigate the potential effects of contamination. Tumwater has an early warning network of monitoring wells as shown in Figure 3. The City contracts with Thurston County to monitor them on a routine basis. Thurston County currently monitors the groundwater routinely for the following parameters: Nitrate, Volatile Organic Compounds, Inorganic Compounds, and Physical Parameters (Temp, D.O., Specific Conductance, and pH). Water Level measurements are taken monthly.

3. Commercial/Industrial site-specific groundwater monitoring – Groundwater monitoring of industries with a high potential for contaminating groundwater allows for early recognition of problems and prompt remediation. Although remediation may not solve the problem, it can keep the contamination from spreading. Several industrial and commercial facilities have been required to install monitoring wells within the WHPA as a condition of development approval under TMC 16.26. In general, the wells are not required to be monitored by the customer, but are made available to City staff for inclusion into the early warning network or follow-up monitoring as needed. In some cases where contamination has been identified on a site, the business may enter the Voluntary Clean-up Program administered by DOE. More information on this program, and the businesses taking advantage of it, can be found here:

<http://www.ecy.wa.gov/programs/tcp/vcp/Vcpmain.htm>

## MONITORING WELL WATER QUALITY

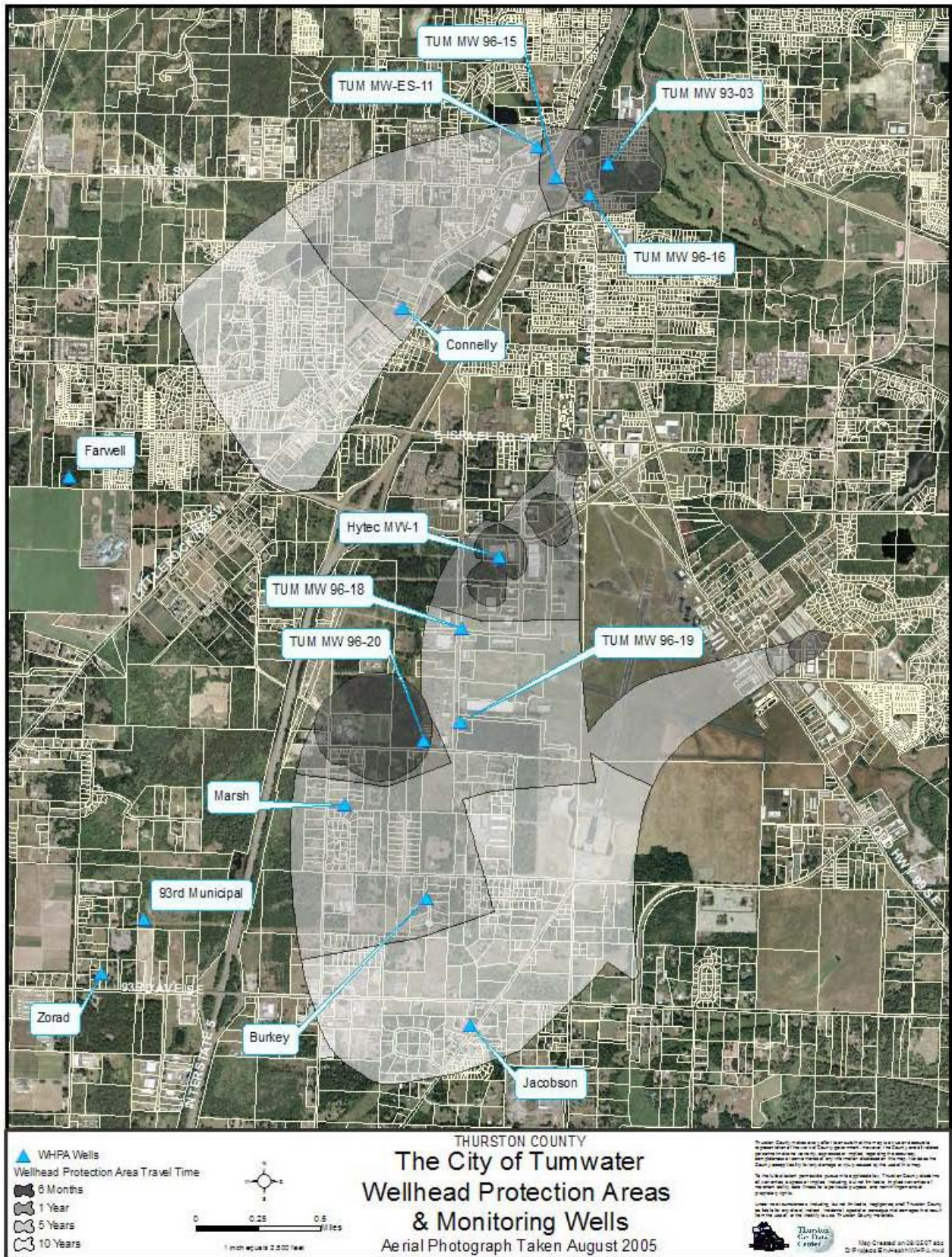
As part of this update, PGG reviewed water quality data for the past 10 years from the City's WHPA monitoring well network for notable issues or trends. Water quality data for nine wells, collected between 1992 and 2001, near the City's WHPAs from Thurston County's groundwater monitoring network were also reviewed. Though available data from the County monitoring network does not represent current concentrations, historic data can be used to identify background concentrations or regions with potential water quality concerns. Primary water quality concerns include local iron and manganese concentrations which exceed their respective secondary MCLs and locally elevated nitrate concentrations which do not exceed the primary MCL. Other water quality concerns identified include chloroform detections at one well in the City's monitoring well network.

Concentrations of volatile organic compounds, inorganic compounds, and nitrate from the water quality monitoring program at City water supply sources were also reviewed for this update. No trends were observed, and with adequate treatment of water affected by historic trichloroethylene contamination near the Palermo well field, water supplied to the potable system is of good quality.

## IRON AND MANGANESE

Elevated iron and manganese concentrations in groundwater are a common problem in western Washington. These metals are generally derived from aquifer materials and often do not reflect an anthropogenic source. They are regulated with secondary MCLs to avoid provision of water with poor aesthetic qualities. Samples from four monitoring wells (City wells 96-16 and 96-18 and County wells Dalrymple and Pabst Brewing) were found to consistently exceed the iron MCL (0.3 mg/L), while three wells (County wells Dalrymple, Pabst Brewing, and Yi) consistently exceed the manganese MCL (0.050 mg/L). As these monitoring wells were analyzed for total metals rather than dissolved, the concentrations are likely non-representative and higher than in-situ aquifer concentrations. Regardless, elevated concentrations in production wells would not pose a health concern, though they may affect taste and/or appearance and require treatment. PGG recommends that monitoring programs using monitoring wells be changed to filter samples in the field through 0.45-micron filters, and thus provide dissolved metals concentrations.

Figure 3: City of Tumwater Monitoring Well Network



## NITRATE

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Groundwater nitrate concentrations are low to moderate throughout the City WHPAs, but higher concentrations occur in a few nearby areas.

The primary MCL for nitrate of 10 mg/L as nitrogen has been exceeded multiple times in the last five years at the Farwell monitoring well. Nitrate-nitrogen data from 2008 to 2009 at the well had concentrations between 3 and 6 mg/L, which suggests concentrations are decreasing. The Farwell monitoring well is outside the 10 year Palermo well field WHPA in an area served by septic systems that is near playing fields and agricultural fields. Both septic effluent and leached fertilizer can cause elevated groundwater nitrate concentrations. Given that this type of land use occurs near the Palermo well field WHPA, it is possible that future nitrate concentrations could increase at Palermo.

In addition to the Farwell monitoring well, two other City monitoring wells (96-16 and Marsh) and one County monitoring well (Yi) have consistently elevated nitrate (above 2 mg-N/L). Concentrations at these wells may reflect either local point sources (such as septic systems) or non-point sources (many more distant septic systems and/or regions with high fertilization). Continued monitoring of nitrate at monitoring wells is recommended to ensure that waters within WHPAs are of high quality.

In September 2005 the City collected nitrate samples from four private wells along Liberty Street SW (Figure 2). All wells had concentrations exceeding background groundwater nitrate concentrations (ie greater than 2 mg-N/L), and two wells had concentrations of 8.28 and 9.92 mg-N/L. Along this street septic systems are used for sewage treatment, and the northern half of the street overlaps a high groundwater hazard area. Locally elevated groundwater nitrate concentrations are likely due to the lower level of nitrogen treatment which often occurs at septic drain fields in shallow groundwater areas. Since this area is north of the Palermo WHPA and South Brewery capture zone, current and future capture zones are not expected to be influenced by these high concentrations. Also, locally high groundwater nitrate concentrations often decrease with distance due to dilution or denitrification.

## CHLOROFORM

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Chloroform (also known as trichloromethane) has been consistently detected at City monitoring well 96-16 (Figure 4) since 2003. Concentrations have ranged from 0.6 ug/L to 1.7 ug/L and have high seasonal variability and no obvious long-term trend. A drinking water standard does not exist for chloroform, while the Department of Ecology has set a Groundwater Contaminant Level (GWCL) of 7 ug/L for groundwater protection (WAC 173-200-40). Since the observed chloroform concentrations are localized and low, chloroform does not pose a risk to City water supply. In 2009, the City conducted a preliminary review of local businesses to assess if a definable source of chloroform exists. While some materials, such as bleach-based cleansers, are in use, no identifiable pathway was determined to exist in the immediate area.

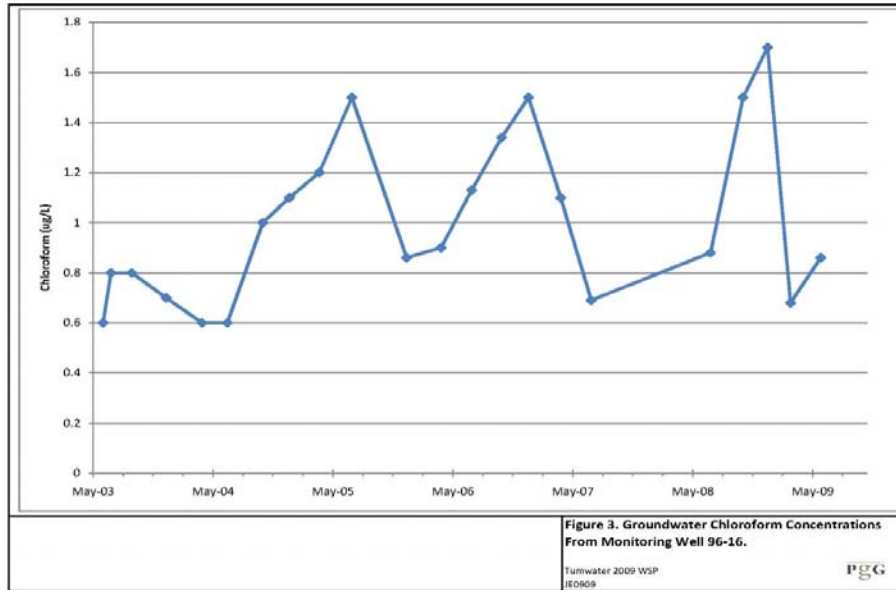


Figure 4: Groundwater Chloroform Concentrations from MW 96-16

## GROUNDWATER ELEVATIONS

Groundwater elevations from the Salmon Creek Basin monitoring network were reviewed for the time period of 2003 through 2009, with data obtained from the Thurston County Monitoring Data website. Monitoring network data came from 10 monitoring wells, with data collected at roughly daily (or more frequent) intervals by pressure transducers. Annual fluctuations in groundwater levels were generally between 10 and 14 feet. Many wells had higher water levels from 2006 through 2008 likely due to greater precipitation recharge for those years relative to years prior. No wells showed obvious long term increasing or decreasing trends.

Groundwater elevations from the City’s WHPA monitoring well network were also examined, with data from 1998 through 2008 reviewed. Two monitoring wells added to the City’s network more recently (Jacobson and Zorad) were also reviewed. A total of 19 wells had groundwater data spanning two years or more with either quarterly or more frequent monitoring. Most wells were monitored on a roughly monthly basis. Annual fluctuations in groundwater elevation were generally between three and 10 feet. No wells showed obvious increasing or decreasing trends, and any trends observed appear to reflect variations in precipitation recharge.

## MANAGING THE WELLHEAD PROTECTION AREA

The goal of the Wellhead Protection Plan is 1) to protect source water by avoiding the presence of potentially polluting materials and activities in WHPAs; and 2) to continue to evaluate and manage activities and facilities in wellhead protection areas, to ensure land use activities pose minimal threat to the source water.

Minimizing the risk of groundwater contamination within a WHPA will depend primarily upon source controls and land use controls. Land use controls may include outright acquisition, purchase of development rights, or zoning. Zoning may either prohibit an activity outright, or establish conditions under which an activity may locate within a WHPA. These source controls vary depending on the proximity to the wellhead, the vulnerability of the water supply, and existing land uses.

Overlay zoning is commonly used where land uses and development are already established and when it would be impractical to downzone a sensitive area. Overlay zones are used to establish requirements that supplement the requirements of the underlying zone. This is an effective approach since traditional zoning categories generally do not consider groundwater protection. Traditional zoning plans split industries into categories such as light and heavy industry. These categories were initially developed based on noise, smoke, and other nuisance factors, while not considering groundwater protection among other environmentally impacting issues. Some light industry applications such as furniture refinishers and dry cleaners, have caused significant groundwater contamination despite the fact that in other respects, they are compliant with zoning requirements. Therefore, ensuring proper development and management of acceptable activities within a WHPA is needed. The TMC provides for the prohibition of certain uses, limitations on development and certain types of activities, and ongoing oversight of activities in WHPAs.

The Aquifer Protection Overlay deviates from traditional zoning regulations in one important respect – prohibiting the continued existence or reactivation of non-conforming uses “grand-fathered” or previously approved. Non-conforming Uses are those activities that were once legally established in the city; however, changing federal, state or local regulations no longer allow the use. In 2005, the City adopted a revised standard for non-conforming uses, requiring the cessation of activities no longer authorized, such as gas stations within the 6-month or 1-year wellhead protection area capture zone. The ordinances were adopted into Tumwater Municipal Code under sections 16.26.057 and 16.26.058..

### AQUIFER PROTECTION OVERLAY

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All regulations pertaining to new development, such as Wellhead Protection and Aquifer Protection Standards, are administered by the City’s Development Services Department, in coordination with Water Resources.

Any new development or expansion/enlargement of existing facilities within the WHPA that fall under the conditions set forth in Table 4 are prohibited according to Tumwater Municipal Code (TMC) 16.26.040. According to the existing ordinance, if a request of existing facilities for the expansion or enlargement of their facility associated with the land uses in Table 4 in no way increase the risk of groundwater contamination, the request will be granted. Additionally, Tumwater will not deny any governmental agency a development request for a groundwater protection facility within these sensitive areas, such as work completed in the Palermo WHPA

by the EPA designed to remove contaminants and enhance drinking water supplies. Properly permitted and operating on-site septic systems are not prohibited within WHPAs.

Any new land use not found in Table 4, that uses, stores, handles, or disposes of hazardous materials within any WHPA, above the minimum requirements set forth in TMC 16.26.050, must submit documentation which demonstrates that all known available and reasonable technologies (AKART) will be used to prevent any potential impact to the groundwater. In the event that an existing facility proposes expansion, all known available and reasonable technologies must be implemented with respect to the enlarged portion of the facility only. In reality, because all developments must meet the handling and containment requirements of the Thurston County’s Nonpoint Source Pollution Ordinance, these developments should be compliant with AKART requirements as a result of regular site visits.

**Table 4: Land Uses Prohibited Within WHPAs**

Capture Zone	6-month & 1-year	6-month, 1-year, 5-year & 10-year
<b>Prohibited Land Use</b>	Land spreading facilities	Landfills
	Agricultural operations including stockyards and feedlots involving the raising or keeping of farm animals	Hazardous waste transfer, storage, and disposal facilities
	Gas stations, petroleum product refinement, reprocessing, and storage, and liquid petroleum products pipeline.	Wood and wood products preserving facilities.
	Automobile wrecking yards	Chemical manufacturing
	Wood waste landfills	
	Dry cleaners, excluding drop-off only facilities.	

For existing uses, identified by the WHPA pollution source inventory, that use, store, handle, or dispose of hazardous materials above the minimum quantity thresholds listed in TMC 16.26.050.A-C, the facility owner/managers are required to submit upon request a pollution prevention plan that is designed to adequately protect the City’s source water supply. In the event a facility does not have such a plan in place, the City will work with the business to develop and implement a plan.

Another measure implemented by the City to enhance groundwater protection was to adopt an ordinance to require the cessation and removal of non-conforming uses within WHPAs. The first element reduced the time period a non-conforming land use could be reinstated after the discontinuation at a site from two years to six months. The second element of this ordinance revision required any existing non-conforming uses within a WHPA to cease operation 10 years following the passage of the ordinance in 2003. Three separate businesses were affected by the ordinance, one of which has since closed operations and restored the site.

## **PUBLIC EDUCATION**

Helping people understand their role in protecting WHPAs is critical for the protection of the City’s drinking water. The educational strategies selected are similar to those used throughout the northern Thurston County region; however, education efforts are primarily focused to reach sites and targeted land uses within WHPAs, both residential and commercial, and could be expanded to the general public.

The City routinely provides information to residents and businesses within Tumwater. The Annual Water Quality report is a primary tool to distribute information related to protecting groundwater. Other efforts include bill box messaging, participation in Thurston County's HazoHouse and WasteMobile programs, storm drain marking and business technical assistance. In addition, the City distributes wellhead protection information, including BMPs, at a number of workshops and festivals. In many of the outreach methods, especially workshops, the wellhead protection messages are included as a benefit gained through the implementation of the sustainable practices targeted by the workshop.

Review of the wellhead protection program indicates that adequate outreach to businesses within the WHPAs has occurred. Currently, businesses deemed to have elevated risk for introduction of contaminants to groundwater are inspected annually, either through the WHPA Business Pollution Prevention Program or through a targeted land use campaign conducted by Thurston County. All businesses within WHPAs receive an inspection at least once every six years.

Assuming existing WHPAs are re-delineated and new WHPAs are delineated for future sources, a substantially larger area will need to have business practices inventoried and monitored. Additional monitoring wells may also be necessary to ensure that regions up gradient from all water supply sources have an adequate early contaminant detection network in place.

## CONTINGENCY PLANNING

Contingency planning is imperative in case of the loss or degradation of a drinking water supply. Included in the City's 2010 Comprehensive Water Plan Update, the Water Shortage Response Plan provides an outline of response actions to be taken in the event of an emergency condition, such as drought, or loss of source due to contamination or mechanical failure. Long-term planning for additional, redundant water sources is also in progress, with current studies taking place in northeast and southwest Tumwater and development of the water rights acquired from the former Olympia Brewery site.

The Water Shortage Response Plan identifies threats to the City's source water and defines severity stages allowing a phased response to water shortage or other water system emergency. These stages outline steps the City will take as shortages are identified and are appropriate to the severity of the stage identified. In most years, the City automatically enters the "Voluntary Conservation Stage" and actively promotes efficient uses of water through the highest peak demand period. The City relies heavily on public education and outreach during early stages of the plan, which increase to include mandatory restrictions as the emergency situation becomes more severe. A copy of the 2010 Water Shortage Response Plan can be found in Appendix G of the 2010 Water System Plan or on the City's water resources web site.

## IDENTIFICATION OF POSSIBLE DISRUPTION THREATS

Principal threats to the City's public water supply have been identified as a spill, leak, or discharge in the wells' capture zones that could contaminate the source water, but also include climatic conditions, such as drought. For purposes of wellhead protection, the principal threats include spills from vehicles, spills from mobile liquid holding tanks, leaks from above or underground storage tanks, leaks from waste-carrying pipes, and leaks from

commercial liquid fuel pipelines in or around the WHPAs. Also of concern are diffuse potential sources of contamination that may enter groundwater through inactive well casings in WHPAs, or active casings inadequately constructed or maintained. The potential threat from terrorist action was evaluated in a Vulnerability Assessment completed in 2004 and considered low; however, additional measures were identified and implemented in the following years to further protect the water system from security risks.

#### EMERGENCY COORDINATOR

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The emergency coordinator for wellhead protection purposes for the City of Tumwater is the Director of Public Works or his/her designee. The contact phone number is (360) 754-4140. The backup emergency coordinator is the Water Resources Program Manager or his/her designee and can also be reached at (360) 754-4140. In case of an after-hours emergency or on weekends, Public Works Operations Duty Staff may be reached by calling (360) 754-4150.

The emergency coordinator is familiar with the city, state, and federal emergency procedures and is responsible for contacting the appropriate officials should a spill or other threat to the source water occur. The Washington State Department of Ecology 24-hour Spill Hotline phone number for oil spills is (800) OILS-911. All other spills of hazardous materials can be reported at (360) 407-6300.

## RECOMMENDATIONS

- Groundwater quality is generally very good based on review of groundwater quality from groundwater monitoring wells near the WHPAs. However, locally elevated nitrate, iron, and manganese concentrations occur. Increasing concentration trends were not observed. Monitoring should continue in the future as data from the monitoring well network can provide an early warning of future water quality trends at water supply wells.
  - When collecting samples from monitoring wells, consider filtering samples in the field through 0.45-micron filters, to provide dissolved metals concentrations.
  - Continued monitoring of nitrate at monitoring wells is recommended to ensure that waters within WHPAs are of high quality. It is further recommended to develop and distribute nitrate-based BMP literature.
- Preliminary capture zones were delineated for future water supply sources using simplified standard hydrogeologic approaches (fixed radius and uniform flow field methods). By these simple methods interference from multiple pumping wells are not accounted for and capture zones in the same aquifer may overlap. A modeling approach that calculates interference effects within an aquifer is recommended for final re-delineation of all capture zones, with WHPAs delineated (or modified for existing sources) accordingly.
- Seasonal groundwater elevation trends caused by variation in precipitation and discharge were observed, with no long-term trends discernable. Although changes to this cyclic stability are not anticipated, water level monitoring should be continued to allow early identification of long-term declines. Additionally, review ownership of Center St monitoring wells and coordinate data acquisition to enhance current databases.
- Creation of a water quality database is recommended for the City monitoring well network and water supply sources. Laboratories can easily generate electronic data deliverables (EDDs) that allow for the rapid input of laboratory data into a database. By having water quality data stored in a database, contaminant occurrences can be easily reviewed and detrimental trends more easily identified. Groundwater elevation data from City monitoring wells should also be stored in the database so that seasonal trends can be more easily investigated.
- When WHPAs are re-delineated, an expanded survey of businesses in the new WHPAs is recommended as part of the wellhead protection program. Regardless of WHPA re-delineation, monitoring commercial and industrial practices and performing educational outreach in the WHPAs should continue, as WAC 246-290-135 requires the potential contaminant source inventory list to be updated every two years.
- Additional recommendations for the wellhead protection plan which were initially suggested in the 2003 Water Supply Plan (Earth Tech, 2003) and are reiterated here include: conduct residential outreach in WHPAs on hazardous materials handling, storage, and disposal; continue work with the County to keep

the wellhead protection program business survey database updated; and coordinate with emergency response teams for notification of chemical spills in WHPAs.

- Initiate a review of options for in-house collection of groundwater quality and elevation data.
- Develop a residential WHPA program to build upon existing City and County outreach efforts. This program would be similar in effect to the Regional Business Technical Assistance program described in this report, but would focus primarily on residents. This would be an educational effort for homeowners and homeowner associations and would offer technical assistance for the storage, use, and disposal of hazardous materials. The City should discuss opportunities to integrate this type of program into the regional groundwater program, or through the regional ETAC program.
- Continue to work with Thurston County staff to carry out groundwater monitoring in the City's WHPA monitoring network and conduct surveys of businesses in the City's WHPA to insure compliance Thurston County's Nonpoint Source Pollution Ordinance.
- Develop a contaminant spreadsheet for the Wellhead Protection Survey database, which is currently under development. Under the 1994/1995 Program, PGG created a database to track the survey information. The database was tied to parcel numbers. Because of the extensive revision to the survey during the 1999 Program, PGG was engaged by the City to modify the database. However, because of limited funding, the City could not add to the database the detailed contaminant spreadsheet that was added to the survey form for the 1999 Program. The City should add the contaminant spreadsheet to the database and input the 1999 Program contaminate survey data. This information will assist in identifying trends. In 1999, the estimated cost for consulting services to add the contaminant spreadsheet was approximately \$2000.
- Evaluate additional programs or authorities needed to fully implement and enforce the provisions of the City's Wellhead Protection Ordinance. Review the Critical Aquifer Recharge Areas guidance from Ecology for consideration of improvements to the City's ordinance for groundwater protection.
- Continue to work with the Tumwater Fire Department and other emergency responders to strengthen emergency response as it relates to groundwater protection. For example, responders should receive training to minimize contamination risk to drinking water supplies; insure notification of Public Works staff; and trigger contingency plans (such as discontinuing pumping at wells near a spill).

## ACKNOWLEDGEMENTS & REFERENCES

Pacific Groundwater Group provided extensive review and support for the information contained within this 2010 WHPA Program Update. We thank Charles “Pony” Ellingson and Glenn Mutti-Driscoll for their contribution.

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Earth Tech, Inc. 2003. *City of Tumwater 2003 Water System Plan*. Consultant’s Report for City of Tumwater.

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Pacific Groundwater Group, 2009, Groundwater Capture Zone Delineation and Review of Groundwater Trends. Consultant memo to City of Tumwater.

Pacific Groundwater Group, 2008, Conceptual Hydrogeologic Model in Support of Changes to Former Olympia Brewery Water Rights. Consultant report to Cities of Tumwater, Olympia, and Lacey.

Walsh. T.J., Logan, R.L., Schasse, H.W., and M. Polenz. 2003. Geologic Map of the Tumwater 7.5 Minute Quadrangle Thurston County, Washington. Washington Division of Geology and Earth Resources, OFR 2003-25.

## IMPORTANT EMERGENCY CONTACTS

Washington State Dept. of Health – (877) 481-4901

Washington State Dept. of Ecology – (360) 407-6300

EPA Region 10 Duty Officer – (206) 553-1264

Thurston County Environmental Health Dept. – (360) 754-4111

### TO REPORT SPILLS WITHIN THE CITY OF TUMWATER:

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#### **In case of an emergency, dial 9-1-1**

Fire Department – (360) 754-4170

City of Tumwater, Public Works – (360) 754-4140

City of Tumwater, Operations – (360) 754-4150

After hours or on weekends:

After-Hours Duty Staff – 360-754-4150

### FOR SPILLS ON STATE HIGHWAYS:

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WA State Patrol – (360) 806-9367 (24-hour pager)

### OTHER EMERGENCY CONTACTS:

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FBI Hotline – (206) 622-0460

State Emergency Management Duty Officer – (800) 258-5990

National Response Center – (800) 424-8802

Dept. of Homeland Security National Operations Center – (202) 282-9685

National Guard Joint Operations Center – (253) 512-8773

EXHIBIT A – TECHNICAL ASSISTANCE CAMPAIGN PARTICIPATION LETTER



{Date}

{Business Name}  
{Business Address}  
{City, State, Zip}

**SUBJECT: Tumwater Wellhead Protection – Business Pollution Prevention Program**

Dear {Business Contact}:

Your business is located in a City of Tumwater Wellhead Protection Area. Within a wellhead protection area any pollutants or chemicals that spill or leak on the ground can enter groundwater and contaminate your drinking water supply. For this reason, Thurston County and the City of Tumwater are once again teaming up to provide technical assistance to businesses that operate in wellhead protection areas.

Approximately {number} years ago you received a hazardous waste inspection from the Thurston County Health Department and the City of Tumwater. As a result of the site visit, the specialists verified safe handling, storage and disposal of hazardous material by your company. Good job!

As part of this ongoing wellhead protection program, county and city specialists visit about one third of the hazardous material handling companies that are located in Tumwater's Wellhead Protection Areas every other year. Each business will be visited within a six-year cycle. Some businesses will be visited more frequently than others depending on proximity to the city's wells, the type and amounts of hazardous material stored, past compliance, and whether or not a **self report form**, like the one attached, is returned with disposal receipts. If you received this letter you *may* be selected for a technical assistance visit this year, but sending back your report form will make a site visit *less* likely.

Please take a few minutes to review and return the enclosed form. To make it as easy as possible, the form already lists information we gathered during the last inspection about your hazardous materials management. Some of our information may be incomplete. **We ask that you update the attached form to reflect current practices. In addition, the Health Department asks that you photocopy and attach your most recent disposal receipts or waste manifests for each hazardous waste produced at your site. A pre-addressed and stamped envelope is provided here for you to return the survey.**

If you have any questions or need assistance, please contact Mark Koster at 754-4111 during normal working hours. Even if your inventory has not changed or you do not produce a hazardous waste stream, please return the survey within two weeks of receipt. Thank you for your commitment to protecting our drinking water.

Respectfully,

Mark J. Koster  
Thurston County Environmental Health

Dan Smith  
City of Tumwater

SELF REPORTING FORM INCLUDED WITH INTRODUCTION LETTER

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IS THIS CONTACT INFORMATION CORRECT?

Business Name: \_\_\_\_\_  
 Contact Person : \_\_\_\_\_  
 Address: \_\_\_\_\_  
 City, State, Zip: \_\_\_\_\_  
 Telephone: \_\_\_\_\_

Corrections

Business Name \_\_\_\_\_  
 Contact Person \_\_\_\_\_  
 Address \_\_\_\_\_  
 City, State \_\_\_\_\_ ZIP \_\_\_\_\_  
 Telephone \_\_\_\_\_ E-Mail \_\_\_\_\_

IS THIS HAZARDOUS MATERIAL INVENTORY CORRECT?

Please verify the information collected during our last site visit and make corrections wherever necessary.

Hazardous Product or Waste	Amount stored on site		How do you dispose of each hazardous waste?		When was your last disposal? <i>* Remember to attach copies of your most recent disposal receipts.</i>	
	Last Visit	Now	Last Visit	Now	Last Visit	Now
Pesticides – Solid	20 lbs.		Used	N/A	N/A	N/A
Pesticides – Liquid	1 gallon		Used	N/A	N/A	N/A
Used Oil (W)	2 gallons		HazoHouse	_____	Unknown	_____

Signature \_\_\_\_\_ Date \_\_\_\_\_

Use self-addressed envelope to mail your report to:  
 Thurston County Environmental Health; 2000 Lakeridge Drive, Building 4, Olympia, WA 98502.

Thank you!

**EXHIBIT B – STANDARD COUNTY INVENTORY FORM**

Form used by the County for tracking materials used, handled and stored at local businesses. For more information on this form, please contact Thurston County Environmental Health.

**Commercial Parcel Inventory Form**

Visit Date:	County Staff:	City Staff:
Time On Site:	Time Off Site:	
Drainage ( <u>sub-basin</u> )		
Business Name:	SIC Code:	
Business Owner:	Business Owner Address: City: State: Zip:	
Contact (on-site):	Title:	
Site Address: City: Zip: Phone:	Mailing Address: City: State: Zip: Phone:( )	
Parcel #	EPA ID #:	
Land Owner: Address: City: State: Zip: Phone:( )		
1. Nature of Property: <input type="checkbox"/> Home Business <input type="checkbox"/> Commercial <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other <input type="checkbox"/> Government Site ( <b>Circle one:</b> County, City, State, Federal)		
Is the facility: <input type="checkbox"/> Owned <input type="checkbox"/> Rented <input type="checkbox"/> Leased What year did you begin conducting business at this site? What year was the building constructed? What kind of past businesses have been conducted at the property (give years if possible)?		
6. Has there been past environmental inspections at the facility ( <b>Get a copy</b> )? <input type="checkbox"/> Yes, Year _____ <input type="checkbox"/> No <input type="checkbox"/> Unknown <b>If "Yes" by whom:</b> _____ <b>What type:</b> <input type="checkbox"/> Phase I <input type="checkbox"/> Phase II <input type="checkbox"/> Unknown		
7. Did the facility complete a Tier Two Report? ( <b>Get a copy</b> ) <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown		
8. Does the facility have any of the following permits? <input type="checkbox"/> NPDES Point Source Discharge Permit <input type="checkbox"/> NPDES Stormwater Permit <input type="checkbox"/> Wastewater Pretreatment Permit <input type="checkbox"/> State Waste Discharge Permit <input type="checkbox"/> Other		
9. Do you know the facilities generator status? <input type="checkbox"/> SQG <input type="checkbox"/> MQG <input type="checkbox"/> LQG <input type="checkbox"/> Unknown		

10. What is your facilities drinking water source? <input type="checkbox"/> City water <input type="checkbox"/> Community well <input type="checkbox"/> Private well <input type="checkbox"/> Unknown <b>Name of water system</b> (well or unique ID #)
11. Is there an on-site well? <input type="checkbox"/> Active <input type="checkbox"/> Inactive <input type="checkbox"/> Decommissioned <b>If well was decommissioned-</b> Method: _____ Year: _____ <u>Was well decommissioned by a licensed driller?</u>
12. Do you store chemicals in your well house? <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Not Applicable <b>If yes, list chemicals and quantity</b>
13. What is facilities' means of wastewater disposal? <input type="checkbox"/> City sewer <input type="checkbox"/> Community septic <input type="checkbox"/> Unknown <input type="checkbox"/> On-site septic ( <b>Type: Gravity, Mound, Sand filter, Pressure dist., other _____</b> ) <b>If the facility has on-site septic:</b> a) When was septic tank last pumped? b) Do you use additives? <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Unknown <b>Type of additives:</b> _____ <b>How Often?</b> _____
Where does stormwater runoff go? ( <b>check all applicable answers</b> ) <b>Flow Direction:</b> <input type="checkbox"/> N <input type="checkbox"/> NE <input type="checkbox"/> E <input type="checkbox"/> SE <input type="checkbox"/> S <input type="checkbox"/> SW <input type="checkbox"/> W <input type="checkbox"/> NW <input type="checkbox"/> Discharges to surface water ( <b>Circle One:</b> Ditch, stream, river, wetland, lake, constructed retention pond) <input type="checkbox"/> Discharges to a city storm drain <input type="checkbox"/> Discharges to a neighboring property <input type="checkbox"/> Does not run off-site (little slope, site vegetated) <input type="checkbox"/> Unknown <input type="checkbox"/> Other
15. Does the facility wash vehicles or equipment on-site? <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Not Applicable <b>If yes, list method, equipment, location, and frequency?</b>  <b>If outside, where does wash water drain to?</b> <b>Type of soap/detergent and disposal method</b>
16. How does facility clean the floors? <input type="checkbox"/> Sweep <input type="checkbox"/> Mop <input type="checkbox"/> Dry Mop <input type="checkbox"/> Other
17. Does facility have floor drains? <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Not Applicable <b>If yes, how many, where?</b>
18. Where do work area floor drains discharge? <input type="checkbox"/> City sewer <input type="checkbox"/> On-site septic <input type="checkbox"/> Community septic <input type="checkbox"/> City storm drain, ditch, stream, wetland or lake <input type="checkbox"/> Open bottom sump or vault <input type="checkbox"/> Unknown <input type="checkbox"/> Sealed ( <b>When</b> ) _____ <input type="checkbox"/> Other
19. Does facility have an oil/water separator? <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Not Applicable <b>If yes, where does it discharge?</b> <input type="checkbox"/> City sewer <input type="checkbox"/> On-site septic <input type="checkbox"/> Community septic <input type="checkbox"/> City storm drain, ditch, stream, wetland or lake <input type="checkbox"/> Other <b>If yes;</b> How often is it cleaned? _____ When was last cleaning? By whom? _____ Where is sludge disposed?
20. Does the facility have hydraulic lifts? <input type="checkbox"/> No <input type="checkbox"/> Yes, installation <b>If yes, have you ever had any hydraulic leaks?</b> <input type="checkbox"/> No <input type="checkbox"/> Yes, <b>When</b> <b>Quantity</b>

21. Which type of spill kit does the facility have?	<input type="checkbox"/> floor dry	<input type="checkbox"/> absorbent pads	<input type="checkbox"/> None
	<input type="checkbox"/> Other		
22. Does facility have Material Safety Data Sheets for chemicals on-site?	<input type="checkbox"/> No	<input type="checkbox"/> Yes	
23. Has facility ever had fuel or heating oil tanks?	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> Unknown
Does the facility have storage tanks now?	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> Unknown
<b>If yes, describe type:</b>	<input type="checkbox"/> AST	<input type="checkbox"/> UST	<input type="checkbox"/> Vehicle mounted
<u>Number of Tanks</u>			
<u>Liquid Contained</u>			
<u>Volume of Each</u>			
<u>Containment</u>			
<u>Location (inside / outside)</u>			
<u>Abandoned? (when)</u>			
<u>Removed? (when)</u>			

HAZARDOUS MATERIALS DESCRIPTION	P=PRODUCT W=WASTE L=LIQUID S=SOLID	CONTAINER LABELED?	SECONDARY CONTAINMENT (CAPACITY OK?)	WASTE DISPOSITION (VENDORS – LAST PICKUP)

**Comments:**


OIL, OIL FILTERS, HYDRAULIC/TRANSMISSION/LUBE OIL, CUTTING OILS/FLUIDS, BRAKE FLUID, ANTIFEEZE AND RECYCLER FILTERS, SOLVENT, SOLVENT FILTERS, CFC/FREON, PAINTS, PAINT BOOTH FILTERS, SHOP TOWELS, SPILL MATERIALS, WASTEWATER SLUDGE, MSDS, BATTERIES, TIRES, ACCUMULATED WASTES, VEHICLE WASH, HEAVY METAL DUST/SOLIDS

**SITE DRAWING**

**↑ North**

Show flow path, drainage structure and pipes, facilities and surface cover.

**EXHIBIT C – 2009 UNDERGROUND STORAGE TANK (UST) LOCATIONS**

UST_ID	Site Name	Address	Tank Status	Install Date	Capacity Range	Substance Stored
8629	7-ELEVEN 2303-14479-M	5310 CAPITOL BLVD S	Removed	9/1/1972	10,000 to 19,999 Gallons	Unleaded Gasoline
8629	7-ELEVEN 2303-14479-M	5310 CAPITOL BLVD S	Removed	5/1/1979	10,000 to 19,999 Gallons	Unleaded Gasoline
8629	7-ELEVEN 2303-14479-M	5310 CAPITOL BLVD S	Removed	9/1/1972	10,000 to 19,999 Gallons	Unleaded Gasoline
513649	7-ELEVEN STORE 2303-32832H	1022 CROSBY BLVD SW	Operational	7/22/1999		Unleaded Gasoline
513649	7-ELEVEN STORE 2303-32832H	1022 CROSBY BLVD SW	Operational	7/22/1999		Unleaded Gasoline
4873	ACCENT BUILDING SPECIALTIES INC	3100 29TH AVE SW P O BOX 7638	Removed	12/31/1964		Leaded Gasoline
97546	AIRPORT FUEL STOP	8220 CENTER ST SW	Operational	12/1/1988	10,000 to 19,999 Gallons	Diesel
97546	AIRPORT FUEL STOP	8220 CENTER ST SW	Operational	12/1/1988	10,000 to 19,999 Gallons	Leaded Gasoline
97546	AIRPORT FUEL STOP	8220 CENTER ST SW	Operational	12/1/1988	10,000 to 19,999 Gallons	Unleaded Gasoline
102448	AIRPORT SHELL	7219 CAPITOL BLVD S	Operational	7/18/1994	5,000 to 9,999 Gallons	Unleaded Gasoline
102448	AIRPORT SHELL	7219 CAPITOL BLVD S	Operational	7/18/1994	5,000 to 9,999 Gallons	Unleaded Gasoline
102448	AIRPORT SHELL	7219 CAPITOL BLVD S	Operational	7/18/1994	10,000 to 19,999 Gallons	Unleaded Gasoline
429259	ALBERTSONS 407 FUEL CENTER	701 TROSPER RD SW	Operational	7/1/1997	20,000 to 29,999 Gallons	Unleaded Gasoline
429259	ALBERTSONS 407 FUEL CENTER	701 TROSPER RD SW	Operational	7/1/1997	10,000 to 19,999 Gallons	Unleaded Gasoline
890	ANDY JOHNSON & CO INC	2450 MOTTMAN RD SW	Closed in Place	12/1/1976		Leaded Gasoline
890	ANDY JOHNSON & CO INC	2450 MOTTMAN RD SW	Closed in Place	12/1/1976		Unleaded Gasoline
890	ANDY JOHNSON & CO INC	2450 MOTTMAN RD SW	Closed in Place	12/1/1976	111 TO 1,100 Gallons	Unleaded Gasoline
890	ANDY JOHNSON & CO INC	2450 MOTTMAN RD SW	Closed in Place	12/1/1976	111 TO 1,100 Gallons	
2597	BLACK HILLS DISTRIBUTING	6080 LINDERSON WAY	Removed	12/31/1964		Leaded Gasoline
2597	BLACK HILLS DISTRIBUTING	6080 LINDERSON WAY	Removed	12/31/1964		Leaded Gasoline
100109	CALVARY CEMETERY	3850 CLEVELAND AVE SE	Exempt	12/31/1964		Heating Fuel
100109	CALVARY CEMETERY	3850 CLEVELAND AVE SE	Removed	12/31/1964		Unleaded Gasoline
4465	CAPITOL SHELL	5200 CAPITOL BLVD	Operational	1/1/1988	10,000 to 19,999 Gallons	Unleaded Gasoline
4465	CAPITOL SHELL	5200 CAPITOL BLVD	Operational	1/1/1988	10,000 to 19,999 Gallons	Unleaded Gasoline
4465	CAPITOL SHELL	5200 CAPITOL BLVD	Operational	1/1/1988	10,000 to 19,999 Gallons	Unleaded Gasoline
4465	CAPITOL SHELL	5200 CAPITOL BLVD	Operational	1/1/1988	10,000 to 19,999 Gallons	Diesel
4465	CAPITOL SHELL	5200 CAPITOL BLVD	Removed	12/31/1964		Heating Fuel
4465	CAPITOL SHELL	5200 CAPITOL BLVD	Closed in Place	1/1/1988	111 TO 1,100 Gallons	Used Oil/Waste Oil
100699	CENTRAL REDDI-MIX INC	3150 29TH ST SW	Removed	12/31/1964		
5067	CHEVRON 90956	670 TROSPER RD SW	Removed	12/31/1964		Unleaded Gasoline
5067	CHEVRON 90956	670 TROSPER RD SW	Operational	2/23/1989	10,000 to 19,999 Gallons	Unleaded Gasoline
5067	CHEVRON 90956	670 TROSPER RD SW	Removed	12/31/1964		Leaded Gasoline

UST_ID	Site Name	Address	Tank Status	Install Date	Capacity Range	Substance Stored
5067	CHEVRON 90956	670 TROSPER RD SW	Operational	2/23/1989	10,000 to 19,999 Gallons	Leaded Gasoline
5067	CHEVRON 90956	670 TROSPER RD SW	Removed	12/31/1964		Unleaded Gasoline
5067	CHEVRON 90956	670 TROSPER RD SW	Operational	2/23/1989	10,000 to 19,999 Gallons	Unleaded Gasoline
5067	CHEVRON 90956	670 TROSPER RD SW	Removed	12/31/1964	111 TO 1,100 Gallons	
5067	CHEVRON 90956	670 TROSPER RD SW	Removed	12/31/1964		Used Oil/Waste Oil
9534	CIRCLE K/76 # 2705577	501 TROSPER RD SW	Operational	1/1/1988	10,000 to 19,999 Gallons	Unleaded Gasoline
9534	CIRCLE K/76 # 2705577	501 TROSPER RD SW	Operational	1/1/1988	10,000 to 19,999 Gallons	Unleaded Gasoline
9534	CIRCLE K/76 # 2705577	501 TROSPER RD SW	Operational	1/1/1988	10,000 to 19,999 Gallons	Leaded Gasoline
9534	CIRCLE K/76 # 2705577	501 TROSPER RD SW	Removed	1/1/1988	111 TO 1,100 Gallons	Used Oil/Waste Oil
100563	CITY OF TUMWATER	7200 NEW MARKET ST	Operational	5/14/1987	2,001 to 4,999 Gallons	Diesel
100563	CITY OF TUMWATER	7200 NEW MARKET ST	Operational	5/14/1987	2,001 to 4,999 Gallons	Unleaded Gasoline
100563	CITY OF TUMWATER	7200 NEW MARKET ST	Operational	5/14/1987	111 TO 1,100 Gallons	Used Oil/Waste Oil
4765	CONTINENTAL BAKING CO TUMWATER	6301 CAPITAL BLVD	Removed	10/1/1956	5,000 to 9,999 Gallons	Leaded Gasoline
11337	CORNELIUS DOELMAN	7747 LITTLEROCK RD	Removed	12/31/1964	5,000 to 9,999 Gallons	Diesel
488638	CORNERSTONE CHEVRON 3	7160 CAPITOL BLVD SE	Operational	2/18/1999		Leaded Gasoline
488638	CORNERSTONE CHEVRON 3	7160 CAPITOL BLVD SE	Operational	2/18/1999		Leaded Gasoline
547113	COSTCO 64	5500 LITTLEROCK RD SW	Operational	7/15/2000	20,000 to 29,999 Gallons	Unleaded Gasoline
547113	COSTCO 64	5500 LITTLEROCK RD SW	Operational	7/15/2000	20,000 to 29,999 Gallons	Unleaded Gasoline
547113	COSTCO 64	5500 LITTLEROCK RD SW	Operational	7/15/2000	20,000 to 29,999 Gallons	Unleaded Gasoline
8328	DAPPAUL INC	PO BOX 4094 8200 KIMMIE RD	Removed	12/31/1964		Heating Fuel
8328	DAPPAUL INC	PO BOX 4094 8200 KIMMIE RD	Removed	12/31/1964	111 TO 1,100 Gallons	Leaded Gasoline
2016	DART CONTAINER CORPORATION	600 ISRAEL RD SE	Removed	3/1/1985		
2016	DART CONTAINER CORPORATION	600 ISRAEL RD SE	Removed	12/31/1964		Heating Fuel
9227	DESCHUTES ANIMAL CLINIC INC PS	7248 CAPITOL BLVD	Closed in Place	12/31/1964	111 TO 1,100 Gallons	Unleaded Gasoline
9227	DESCHUTES ANIMAL CLINIC INC PS	7248 CAPITOL BLVD	Removed	12/31/1964		Unleaded Gasoline
6639	E MAYNARD CONST CO	1710 65 AVE SE	Removed	12/31/1964		
3465	EQUILON ENTERPRISES LLC	7370 LINDERSON WAY SW	Removed	12/31/1964		Leaded Gasoline
3465	EQUILON ENTERPRISES LLC	7370 LINDERSON WAY SW	Removed	1/1/1989	2,001 to 4,999 Gallons	Other Petroleum
3465	EQUILON ENTERPRISES LLC	7370 LINDERSON WAY SW	Removed	12/31/1964		
3465	EQUILON ENTERPRISES LLC	7370 LINDERSON WAY SW	Exempt	12/31/1964		
234	GREAT WESTERN SOIL	9418 OLD HWY 99 SE	Removed	1/1/1970		Unleaded Gasoline
234	GREAT WESTERN SOIL	9418 OLD HWY 99 SE	Removed	1/1/1970		
234	GREAT WESTERN SOIL	9418 OLD HWY 99 SE	Removed	1/1/1970		
234	GREAT WESTERN SOIL	9418 OLD HWY 99 SE	Removed	12/31/1964	111 TO 1,100 Gallons	Used Oil/Waste Oil
7700	GULL 256	5101 CAPITOL BLVD	Removed	12/31/1964		Leaded Gasoline

UST_ID	Site Name	Address	Tank Status	Install Date	Capacity Range	Substance Stored
7700	GULL 256	5101 CAPITOL BLVD	Removed	12/31/1964		Unleaded Gasoline
7700	GULL 256	5101 CAPITOL BLVD	Removed	12/31/1964		Unleaded Gasoline
7700	GULL 256	5101 CAPITOL BLVD	Removed	12/31/1964		
11947	HARRISON BUILDING SUPPLY	2780 29TH AVE SW	Removed	12/31/1964		Unleaded Gasoline
619220	HOPES	6715 HENDERSON BLVD	30 Day Notice		111 TO 1,100 Gallons	Unleaded Gasoline
619220	HOPES	6715 HENDERSON BLVD	30 Day Notice		111 TO 1,100 Gallons	Unleaded Gasoline
619220	HOPES	6715 HENDERSON BLVD	30 Day Notice		1,101 to 2,000 Gallons	Unleaded Gasoline
4861	HYTEC INC	711 AIRDUSTRIAL WAY	Removed	12/31/1964		
10856	J 4 ASSOCIATES	3939 CLEVELAND	Removed	12/31/1964	10,000 to 19,999 Gallons	Hazardous Substance
10856	J 4 ASSOCIATES	3939 CLEVELAND	Removed	12/31/1964	10,000 to 19,999 Gallons	Hazardous Substance
10982	JACK N THE BOX DREWS MOBIL	110 TROSPER RD	Removed	12/31/1964	111 TO 1,100 Gallons	Leaded Gasoline
10982	JACK N THE BOX DREWS MOBIL	110 TROSPER RD	Removed	12/31/1964	2,001 to 4,999 Gallons	Unleaded Gasoline
10982	JACK N THE BOX DREWS MOBIL	110 TROSPER RD	Removed	12/31/1964	5,000 to 9,999 Gallons	Unknown
6410	JOHNSON & MADDOX CONSTRUCTION CO	2201 93RD AVE SW	Removed	6/1/1982		Unleaded Gasoline
6410	JOHNSON & MADDOX CONSTRUCTION CO	2201 93RD AVE SW	Removed	6/1/1982		
11487	L R WHISLER	2875 R W JOHNSON BLVD	Removed	6/15/1974	111 TO 1,100 Gallons	Unleaded Gasoline
101701	LABOR & INDUSTRIES BLDG	7273 LINDERSON WAY SW	Operational	7/15/1992	2,001 to 4,999 Gallons	Diesel
3963	LESNICK NEWS CO INC	2442 MOTTMAN RD SW	Removed	12/31/1964		Leaded Gasoline
101093	LITTLE ROCK FOOD MART	7000 LITTLEROCK RD SW	Operational	8/1/1984	10,000 to 19,999 Gallons	Unleaded Gasoline
101093	LITTLE ROCK FOOD MART	7000 LITTLEROCK RD SW	Operational	8/1/1984	10,000 to 19,999 Gallons	Diesel
101093	LITTLE ROCK FOOD MART	7000 LITTLEROCK RD SW	Operational	8/1/1984	10,000 to 19,999 Gallons	Unleaded Gasoline
4648	MASONIC MEMORIAL PARK CEMETERY	455 NORTH ST	Removed	12/31/1964	111 TO 1,100 Gallons	Leaded Gasoline
4406	MELODY FOOD MART	415 CLEVELAND AVE SE	Operational	6/15/1970	10,000 to 19,999 Gallons	Leaded Gasoline
4406	MELODY FOOD MART	415 CLEVELAND AVE SE	Operational	6/15/1970	2,001 to 4,999 Gallons	Diesel
4406	MELODY FOOD MART	415 CLEVELAND AVE SE	Operational	6/15/1970	10,000 to 19,999 Gallons	Unleaded Gasoline
1584	MERCHANTS MOVING & STORAGE	5880 LINDERSON WAY	Exempt	12/31/1964	111 TO 1,100 Gallons	
1584	MERCHANTS MOVING & STORAGE	5880 LINDERSON WAY	Removed	12/31/1964		Leaded Gasoline
491304	METAL CRAFT LIFT STATION	BOSTON ST	Removed	1/1/1900		Diesel
2335	MUTUAL MATERIALS CO TUMWATER	3150 29TH AVE SW	Removed	12/31/1964		Unleaded Gasoline
2335	MUTUAL MATERIALS CO TUMWATER	3150 29TH AVE SW	Removed	12/31/1964		
488445	NEW MARKET VOCATIONAL SKILLS CENTER	7299 NEW MARKET ST	Removed	10/1/1995		Used Oil/Waste Oil
1814	ODD FELLOWS MEMORIAL PARK	100 CLEVELAND AVENUE	Removed	12/31/1964	111 TO 1,100 Gallons	Leaded Gasoline
12158	OLYMPIA (MOTTMAN) MAINTENANCE SITE	2520 R W JOHNSON RD SW	Removed	12/31/1964		
12158	OLYMPIA (MOTTMAN) MAINTENANCE SITE	2520 R W JOHNSON RD SW	Removed	12/31/1964		Unleaded Gasoline
12158	OLYMPIA (MOTTMAN) MAINTENANCE SITE	2520 R W JOHNSON RD SW	Operational	1/1/1988	2,001 to 4,999 Gallons	Diesel

UST_ID	Site Name	Address	Tank Status	Install Date	Capacity Range	Substance Stored
12158	OLYMPIA (MOTTMAN) MAINTENANCE SITE	2520 R W JOHNSON RD SW	Operational	1/1/1988	2,001 to 4,999 Gallons	Unleaded Gasoline
1050	OLYMPIA FUEL & ASPHALT INC	3231 MOTTMAN RD SW	Removed	12/31/1964		Unleaded Gasoline
1050	OLYMPIA FUEL & ASPHALT INC	3231 MOTTMAN RD SW	Operational	7/29/1991	10,000 to 19,999 Gallons	Heating Fuel
1050	OLYMPIA FUEL & ASPHALT INC	3231 MOTTMAN RD SW	Operational	7/29/1991	10,000 to 19,999 Gallons	Unleaded Gasoline
1050	OLYMPIA FUEL & ASPHALT INC	3231 MOTTMAN RD SW	Operational	7/29/1991	10,000 to 19,999 Gallons	Diesel
1050	OLYMPIA FUEL & ASPHALT INC	3231 MOTTMAN RD SW	Operational	6/26/1992	5,000 to 9,999 Gallons	Unleaded Gasoline
102191	OLYMPIA SCHOOL DISTRICT	3000 SW JOHNSON BLVD	Operational	7/28/1993		Antifreeze
102191	OLYMPIA SCHOOL DISTRICT	3000 SW JOHNSON BLVD	Operational	7/28/1993		Used Oil/Waste Oil
102191	OLYMPIA SCHOOL DISTRICT	3000 SW JOHNSON BLVD	Operational	7/28/1993	10,000 to 19,999 Gallons	Unleaded Gasoline
102191	OLYMPIA SCHOOL DISTRICT	3000 SW JOHNSON BLVD	Operational	7/28/1993	10,000 to 19,999 Gallons	Diesel
102191	OLYMPIA SCHOOL DISTRICT	3000 SW JOHNSON BLVD	Operational	7/28/1993	10,000 to 19,999 Gallons	Diesel
2841	OLYMPIA SUBSTATION	5240 TROSPER ST W	Removed	12/31/1964	111 TO 1,100 Gallons	
2841	OLYMPIA SUBSTATION	5240 TROSPER ST W	Removed	9/1/1991		Diesel
2841	OLYMPIA SUBSTATION	5240 TROSPER ST W	Removed	12/31/1964		Unleaded Gasoline
2841	OLYMPIA SUBSTATION	5240 TROSPER ST W	Removed	12/31/1964		Leaded Gasoline
2841	OLYMPIA SUBSTATION	5240 TROSPER ST W	Removed	12/31/1964		Unleaded Gasoline
618964	OLYMPIC MOVING & STORAGE	2943 29TH AVE SW	Removed			Unleaded Gasoline
12152	OLYMPIC REGION HEADQUARTERS SITE	5720 CAPITOL BLVD	Removed	1/1/1984		
12152	OLYMPIC REGION HEADQUARTERS SITE	5720 CAPITOL BLVD	Removed	1/1/1975		Unleaded Gasoline
12152	OLYMPIC REGION HEADQUARTERS SITE	5720 CAPITOL BLVD	Removed	1/1/1984		Unleaded Gasoline
12152	OLYMPIC REGION HEADQUARTERS SITE	5720 CAPITOL BLVD	Exempt	12/31/1964	111 TO 1,100 Gallons	Used Oil/Waste Oil
12152	OLYMPIC REGION HEADQUARTERS SITE	5720 CAPITOL BLVD	Closed in Place	12/31/1964		Used Oil/Waste Oil
12152	OLYMPIC REGION HEADQUARTERS SITE	5720 CAPITOL BLVD	Closed in Place	12/31/1964		Used Oil/Waste Oil
12152	OLYMPIC REGION HEADQUARTERS SITE	5720 CAPITOL BLVD	Operational	4/20/1994	10,000 to 19,999 Gallons	Unleaded Gasoline
12152	OLYMPIC REGION HEADQUARTERS SITE	5720 CAPITOL BLVD	Operational	4/20/1994	10,000 to 19,999 Gallons	Diesel
3501	OLYMPIC STRUCTURES INC	2001 93RD AVE SW	Removed	12/31/1964		
3501	OLYMPIC STRUCTURES INC	2001 93RD AVE SW	Removed	12/31/1964		Unleaded Gasoline
5026	PACIFIC COCA-COLA BOTTLING CO	500 SIMMONS LN	Removed	12/31/1964		Leaded Gasoline
3857	PACIFIC DISPOSAL	2905 BLACK LAKE BLVD SW	Removed	12/31/1964		
3857	PACIFIC DISPOSAL	2905 BLACK LAKE BLVD SW	Removed	9/1/1989		Leaded Gasoline
3857	PACIFIC DISPOSAL	2905 BLACK LAKE BLVD SW	Removed	12/31/1964		Leaded Gasoline
3857	PACIFIC DISPOSAL	2905 BLACK LAKE BLVD SW	Removed	9/1/1989	5,000 to 9,999 Gallons	Diesel
491297	PALERMO VALLEY LIFT STATION	M ST	Removed	1/1/1900		Diesel
2048	PEARSON AIR INC	7529 OLD HWY 99	Removed	1/1/1978	10,000 to 19,999 Gallons	Aviation Fuel
2048	PEARSON AIR INC	7529 OLD HWY 99	Removed	1/1/1978	10,000 to 19,999 Gallons	Aviation Fuel

UST_ID	Site Name	Address	Tank Status	Install Date	Capacity Range	Substance Stored
2048	PEARSON AIR INC	7529 OLD HWY 99	Removed	1/1/1978	10,000 to 19,999 Gallons	Aviation Fuel
2048	PEARSON AIR INC	7529 OLD HWY 99	Removed	1/1/1900		Used Oil/Waste Oil
499821	PHILLIPS PROPERTY	6920 CAPITOL BLVD SE	Removed	1/1/1964		Leaded Gasoline
499821	PHILLIPS PROPERTY	6920 CAPITOL BLVD SE	Removed	1/1/1900		Leaded Gasoline
619382	PILOT TRAVEL CENTER 151	2430 93RD AVE SW	Operational	2/7/2007		Unleaded Gasoline
619382	PILOT TRAVEL CENTER 151	2430 93RD AVE SW	Operational	2/7/2007		Diesel
619382	PILOT TRAVEL CENTER 151	2430 93RD AVE SW	Operational	2/7/2007		Unleaded Gasoline
619382	PILOT TRAVEL CENTER 151	2430 93RD AVE SW	Operational	2/7/2007		Diesel
619382	PILOT TRAVEL CENTER 151	2430 93RD AVE SW	Operational	1/25/2007		Diesel
619382	PILOT TRAVEL CENTER 151	2430 93RD AVE SW	Operational	1/25/2007		Diesel
619382	PILOT TRAVEL CENTER 151	2430 93RD AVE SW	Operational	1/25/2007		Diesel
619382	PILOT TRAVEL CENTER 151	2430 93RD AVE SW	Operational	1/25/2007		Diesel
1190	POAGE'S AUTOMOTIVE & TOWING INC	5403 CAPITAL BLVD	Removed	12/31/1964	111 TO 1,100 Gallons	Used Oil/Waste Oil
1190	POAGE'S AUTOMOTIVE & TOWING INC	5403 CAPITAL BLVD	Removed	12/31/1964		Unleaded Gasoline
4658	RESTOVER TRUCKSTOP	2725 93RD AVE SW	Operational	2/3/1969	10,000 to 19,999 Gallons	Diesel
4658	RESTOVER TRUCKSTOP	2725 93RD AVE SW	Operational	2/3/1969	10,000 to 19,999 Gallons	Diesel
4658	RESTOVER TRUCKSTOP	2725 93RD AVE SW	Operational	2/3/1969	10,000 to 19,999 Gallons	Leaded Gasoline
4658	RESTOVER TRUCKSTOP	2725 93RD AVE SW	Operational	2/3/1969	10,000 to 19,999 Gallons	Unleaded Gasoline
4658	RESTOVER TRUCKSTOP	2725 93RD AVE SW	Operational	4/17/1971	5,000 to 9,999 Gallons	Unleaded Gasoline
4658	RESTOVER TRUCKSTOP	2725 93RD AVE SW	Removed	2/3/1969	111 TO 1,100 Gallons	Used Oil/Waste Oil
586154	SAFeway FUEL CENTER 1503	520 CLEVELAND AVE SE STE A	Operational	9/26/2001	20,000 to 29,999 Gallons	Unleaded Gasoline
586154	SAFeway FUEL CENTER 1503	520 CLEVELAND AVE SE STE A	Operational	9/26/2001	20,000 to 29,999 Gallons	Unleaded Gasoline
586154	SAFeway FUEL CENTER 1503	520 CLEVELAND AVE SE STE A	Operational	9/26/2001	20,000 to 29,999 Gallons	Unleaded Gasoline
586154	SAFeway FUEL CENTER 1503	520 CLEVELAND AVE SE STE A	Operational	9/26/2001	20,000 to 29,999 Gallons	Unleaded Gasoline
102095	SHELL 93RD AVE SW TUMWATER	2440 93RD AVE SW	Removed	12/31/1964	111 TO 1,100 Gallons	Used Oil/Waste Oil
102095	SHELL 93RD AVE SW TUMWATER	2440 93RD AVE SW	Removed	12/31/1964		Leaded Gasoline
102095	SHELL 93RD AVE SW TUMWATER	2440 93RD AVE SW	Removed	12/31/1964	111 TO 1,100 Gallons	
102095	SHELL 93RD AVE SW TUMWATER	2440 93RD AVE SW	Removed	12/31/1964		Leaded Gasoline
102095	SHELL 93RD AVE SW TUMWATER	2440 93RD AVE SW	Removed	12/31/1964		Leaded Gasoline
101095	STOP IN GROCERY	515 CUSTER WAY	Removed	12/30/1986	10,000 to 19,999 Gallons	Unleaded Gasoline
101095	STOP IN GROCERY	515 CUSTER WAY	Removed	12/30/1986	10,000 to 19,999 Gallons	Unleaded Gasoline
101095	STOP IN GROCERY	515 CUSTER WAY	Removed	12/30/1986	10,000 to 19,999 Gallons	Leaded Gasoline
4489	TEXACO CAPITOL BLVD TUMWATER	3333 CAPITOL BLVD	Removed	1/1/1964		Leaded Gasoline
4489	TEXACO CAPITOL BLVD TUMWATER	3333 CAPITOL BLVD	Removed	1/1/1964		Unleaded Gasoline
4489	TEXACO CAPITOL BLVD TUMWATER	3333 CAPITOL BLVD	Removed	1/1/1964		Unleaded Gasoline

UST_ID	Site Name	Address	Tank Status	Install Date	Capacity Range	Substance Stored
4489	TEXACO CAPITOL BLVD TUMWATER	3333 CAPITOL BLVD	Removed	1/1/1964		Unleaded Gasoline
4489	TEXACO CAPITOL BLVD TUMWATER	3333 CAPITOL BLVD	Removed	1/1/1964		Hazardous Substance
4489	TEXACO CAPITOL BLVD TUMWATER	3333 CAPITOL BLVD	Removed	1/1/1964		Used Oil/Waste Oil
382347	THURSTON COUNTY YOUTH SERVICES	1520 IRVING ST SW	Removed	1/1/1964		Diesel
9008	TONY CAIRONE	2821 25TH SW	Removed	12/31/1964		
9008	TONY CAIRONE	2821 25TH SW	Removed	12/31/1964		
9008	TONY CAIRONE	2821 25TH SW	Removed	12/31/1964		Used Oil/Waste Oil
9008	TONY CAIRONE	2821 25TH SW	Removed	12/31/1964		
100253	TUMWATER CITY HALL 2ND AVE	215 SECOND AVENUE	Removed	12/31/1964		Unleaded Gasoline
4872	TUMWATER CITY OF PUBLIC WORKS DEPT	517 WEST BATES	Removed	12/31/1964	111 TO 1,100 Gallons	Unleaded Gasoline
4872	TUMWATER CITY OF PUBLIC WORKS DEPT	517 WEST BATES	Removed	12/31/1964		Unleaded Gasoline
4872	TUMWATER CITY OF PUBLIC WORKS DEPT	517 WEST BATES	Removed	12/31/1964		Unleaded Gasoline
4872	TUMWATER CITY OF PUBLIC WORKS DEPT	517 WEST BATES	Removed	12/31/1964		
212	TUMWATER DELI MART	6131 CAPITOL BLVD	Removed	12/1/1981	5,000 to 9,999 Gallons	Unleaded Gasoline
212	TUMWATER DELI MART	6131 CAPITOL BLVD	Removed	12/1/1981	5,000 to 9,999 Gallons	Unleaded Gasoline
212	TUMWATER DELI MART	6131 CAPITOL BLVD	Removed	12/1/1981	10,000 to 19,999 Gallons	Leaded Gasoline
212	TUMWATER DELI MART	6131 CAPITOL BLVD	Operational	5/9/1997	10,000 to 19,999 Gallons	Unleaded Gasoline
212	TUMWATER DELI MART	6131 CAPITOL BLVD	Operational	5/9/1997	10,000 to 19,999 Gallons	Unleaded Gasoline
97523	TUMWATER RENTALS	6135 CAPITOL BLVD	Removed	12/31/1964	1,101 to 2,000 Gallons	Leaded Gasoline
11564	TUMWATER SCHOOL DISTRICT 33	600 W ISRAEL RD	Removed	8/10/1970	10,000 to 19,999 Gallons	Diesel
11564	TUMWATER SCHOOL DISTRICT 33	600 W ISRAEL RD	Removed	8/10/1968	5,000 to 9,999 Gallons	Unleaded Gasoline
11564	TUMWATER SCHOOL DISTRICT 33	600 W ISRAEL RD	Removed	8/10/1968	1,101 to 2,000 Gallons	Unleaded Gasoline
11564	TUMWATER SCHOOL DISTRICT 33	600 W ISRAEL RD	Removed	8/10/1968		Aviation Fuel
11564	TUMWATER SCHOOL DISTRICT 33	600 W ISRAEL RD	Removed	12/31/1964	111 TO 1,100 Gallons	Used Oil/Waste Oil
3698	UNITED PARCEL SERVICE TUMWATER	7383 NEW MARKET ST SW	Removed	6/1/1972	5,000 to 9,999 Gallons	Unleaded Gasoline
3698	UNITED PARCEL SERVICE TUMWATER	7383 NEW MARKET ST SW	Operational	5/26/1995	10,000 to 19,999 Gallons	Unleaded Gasoline
101023	UNITED RENTALS NORTHWEST INC	6070 LINDERSON WAY	Removed	2/15/1990	5,000 to 9,999 Gallons	Diesel
101023	UNITED RENTALS NORTHWEST INC	6070 LINDERSON WAY	Removed	2/15/1990	5,000 to 9,999 Gallons	Unleaded Gasoline
9826	WA DEPT OF PRINTING C B & G MODULAR	7580 NEW MARKET ST SE	Removed	3/5/1981	111 TO 1,100 Gallons	
200540	WA DOT RIGHT-OF-WAY I-5	DESCHUTES PARKWAY	Removed	1/1/1964		Unleaded Gasoline

EXHIBIT D – LEAKING UNDERGROUND STORAGE TANK (LUST) DATABASE

UST Site ID	Release ID	Site Name	Location Address	Release Notification Date	Release Status Change Date	Release Status	Media
8629	591567	7-ELEVEN 2303-14479-M	5310 CAPITOL BLVD S	4/30/2002	4/30/2002	Awaiting Cleanup	Soil
8629	591567	7-ELEVEN 2303-14479-M	5310 CAPITOL BLVD S	4/30/2002	9/18/2006	Cleanup Started	Soil
8629	591567	7-ELEVEN 2303-14479-M	5310 CAPITOL BLVD S	4/30/2002	9/19/2006	Reported Cleaned Up	Soil
890	461709	ANDY JOHNSON & CO INC	2450 MOTTMAN RD SW	1/24/1996	12/5/1995	Cleanup Started	Soil
890	461709	ANDY JOHNSON & CO INC	2450 MOTTMAN RD SW	1/24/1996	1/24/1996	Reported Cleaned Up	Soil
100699	2912	CENTRAL REDDI-MIX INC	3150 29TH ST SW	1/21/1992	1/21/1992	Cleanup Started	Soil
100699	2912	CENTRAL REDDI-MIX INC	3150 29TH ST SW	1/21/1992	12/10/1992	Reported Cleaned Up	Soil
5067	1100	CHEVRON 90956	670 TROSPER RD SW	6/13/1989	6/13/1989	Cleanup Started	Ground Water
5067	1100	CHEVRON 90956	670 TROSPER RD SW	6/13/1989	6/13/1989	Cleanup Started	Soil
5067	1100	CHEVRON 90956	670 TROSPER RD SW	6/13/1989	7/30/1991	Monitoring	Ground Water
5067	1100	CHEVRON 90956	670 TROSPER RD SW	6/13/1989	7/30/1991	Monitoring	Soil
9534	3021	CIRCLE K/76 # 2705577	501 TROSPER RD SW	12/2/1991	10/19/1995	Cleanup Started	Ground Water
9534	3021	CIRCLE K/76 # 2705577	501 TROSPER RD SW	12/2/1991	10/19/1995	Cleanup Started	Soil
9534	3021	CIRCLE K/76 # 2705577	501 TROSPER RD SW	12/2/1991	10/21/1991	Monitoring	Ground Water
9534	3021	CIRCLE K/76 # 2705577	501 TROSPER RD SW	12/2/1991	10/21/1991	Monitoring	Soil
9534	591688	CIRCLE K/76 # 2705577	501 TROSPER RD SW	5/12/2003	5/12/2003	Awaiting Cleanup	Soil
9534	591688	CIRCLE K/76 # 2705577	501 TROSPER RD SW	5/12/2003	5/12/2003	Awaiting Cleanup	Ground Water
9534	591688	CIRCLE K/76 # 2705577	501 TROSPER RD SW	5/12/2003	12/13/2007	Cleanup Started	Soil
9534	591688	CIRCLE K/76 # 2705577	501 TROSPER RD SW	5/12/2003	12/13/2007	Cleanup Started	Ground Water
3465	2966	EQUILON ENTERPRISES LLC	7370 LINDERSON WAY SW	4/4/1991	4/4/1991	Cleanup Started	Ground Water
3465	2966	EQUILON ENTERPRISES LLC	7370 LINDERSON WAY SW	4/4/1991	4/4/1991	Cleanup Started	Soil
3465	2966	EQUILON ENTERPRISES LLC	7370 LINDERSON WAY SW	4/4/1991	6/17/1993	Monitoring	Ground Water
3465	2966	EQUILON ENTERPRISES LLC	7370 LINDERSON WAY SW	4/4/1991	6/17/1993	Monitoring	Soil
234	4493	GREAT WESTERN SOIL	9418 OLD HWY 99 SE	5/20/1993	4/14/1993	Cleanup Started	Soil
234	4493	GREAT WESTERN SOIL	9418 OLD HWY 99 SE	5/20/1993	5/20/1993	Reported Cleaned Up	Soil
4406	1143	MELODY FOOD MART	415 CLEVELAND AVE SE	4/26/1989	4/26/1989	Cleanup Started	Soil
4406	1143	MELODY FOOD MART	415 CLEVELAND AVE SE	4/26/1989	11/30/1988	Reported Cleaned Up	Soil
1584	5126	MERCHANTS MOVING & STORAGE	5880 LINDERSON WAY	4/11/1991	4/19/1991	Cleanup Started	Soil

UST Site ID	Release ID	Site Name	Location Address	Release Notification Date	Release Status Change Date	Release Status	Media
1584	5126	MERCHANTS MOVING & STORAGE	5880 LINDERSON WAY	4/11/1991	4/19/1991	Reported Cleaned Up	Soil
1814	3634	ODD FELLOWS MEMORIAL PARK	100 CLEVELAND AVENUE	3/25/1991	3/25/1991	Cleanup Started	Soil
1814	3634	ODD FELLOWS MEMORIAL PARK	100 CLEVELAND AVENUE	3/25/1991	3/18/1991	Reported Cleaned Up	Soil
2048	455136	PEARSON AIR INC	7529 OLD HWY 99	7/7/1998	6/22/1998	Awaiting Cleanup	Ground Water
2048	455136	PEARSON AIR INC	7529 OLD HWY 99	7/7/1998	6/22/1998	Awaiting Cleanup	Soil
2048	455136	PEARSON AIR INC	7529 OLD HWY 99	7/7/1998	11/16/1999	Cleanup Started	Ground Water
2048	455136	PEARSON AIR INC	7529 OLD HWY 99	7/7/1998	11/16/1999	Cleanup Started	Soil
2048	455136	PEARSON AIR INC	7529 OLD HWY 99	7/7/1998	8/15/2006	Reported Cleaned Up	Ground Water
2048	455136	PEARSON AIR INC	7529 OLD HWY 99	7/7/1998	8/15/2006	Reported Cleaned Up	Soil
4658	3956	RESTOVER TRUCKSTOP	2725 93RD AVE SW	1/1/1988	1/1/1988	Cleanup Started	Ground Water
4658	3956	RESTOVER TRUCKSTOP	2725 93RD AVE SW	1/1/1988	1/1/1988	Cleanup Started	Soil
4658	3956	RESTOVER TRUCKSTOP	2725 93RD AVE SW	1/1/1988	1/1/1988	Monitoring	Ground Water
4658	3956	RESTOVER TRUCKSTOP	2725 93RD AVE SW	1/1/1988	1/1/1988	Monitoring	Soil
100253	2963	TUMWATER CITY HALL 2ND AVE	215 SECOND AVENUE	8/23/1990	8/23/1990	Cleanup Started	Ground Water
100253	2963	TUMWATER CITY HALL 2ND AVE	215 SECOND AVENUE	8/23/1990	8/23/1990	Cleanup Started	Soil
100253	2963	TUMWATER CITY HALL 2ND AVE	215 SECOND AVENUE	8/23/1990	5/29/1997	Reported Cleaned Up	Ground Water
100253	2963	TUMWATER CITY HALL 2ND AVE	215 SECOND AVENUE	8/23/1990	5/29/1997	Reported Cleaned Up	Soil
4872	353759	TUMWATER CITY OF PUBLIC WORKS DEPT	517 WEST BATES	1/31/1996	12/13/2007	Awaiting Cleanup	Ground Water
4872	353759	TUMWATER CITY OF PUBLIC WORKS DEPT	517 WEST BATES	1/31/1996	12/13/2007	Awaiting Cleanup	Soil
4872	353759	TUMWATER CITY OF PUBLIC WORKS DEPT	517 WEST BATES	1/31/1996	1/31/1996	Cleanup Started	Ground Water
4872	353759	TUMWATER CITY OF PUBLIC WORKS DEPT	517 WEST BATES	1/31/1996	1/31/1996	Cleanup Started	Soil
212	2968	TUMWATER DELI MART	6131 CAPITOL BLVD	9/14/1989	9/14/1989	Cleanup Started	Soil
212	2968	TUMWATER DELI MART	6131 CAPITOL BLVD	9/14/1989	5/16/1990	Reported Cleaned Up	Soil
212	406947	TUMWATER DELI MART	6131 CAPITOL BLVD	3/6/1997	3/6/1997	Cleanup Started	Soil
212	406947	TUMWATER DELI MART	6131 CAPITOL BLVD	3/6/1997	1/11/2002	Reported Cleaned Up	Soil
108	4360	TUMWATER LUMBER COMPANY	8277 CENTER ST SW	4/26/1993	4/26/1993	Cleanup Started	Soil
108	4360	TUMWATER LUMBER COMPANY	8277 CENTER ST SW	4/26/1993	7/16/1998	Reported Cleaned Up	Soil
200540	1455	WA DOT RIGHT-OF-WAY I-5	DESCHUTES PARKWAY	6/18/1990	6/18/1990	Cleanup Started	Soil
200540	1455	WA DOT RIGHT-OF-WAY I-5	DESCHUTES PARKWAY	6/18/1990	10/4/1990	Reported Cleaned Up	Soil

**EXHIBIT E – BUSINESSES LOCATED WITHIN TUMWATER’S WHPA**

<b>Business Name</b>	<b>Site Address</b>	<b>City</b>	<b>Characteristics of HazMats, HazWastes</b>
AIRPORT GOLF CENTER	8080 CENTER ST SW	TUMWATER	Facility maintenance products
ASKA CORP	819 78TH AVE SW	TUMWATER	Facility maintenance products/wastes
CARDINAL CG	700 PAT KENNEDY WAY SW	TUMWATER	Facility/equipment maintenance products/wastes
CITY OF TUMWATER PUBLIC WORKS	555 ISRAEL RD SW	TUMWATER	Vehicle maintenance products/wastes
COASTAL NAIL AND STAPLE	715 78TH AVE SW	TUMWATER	Oils and solvents
DAPPAUL CHIP, LLC	8136 KIMMIE ST SW	OLYMPIA	Vehicle/equipment maintenance products/wastes
HARBOR WHOLESale GROCERY	7845 CENTER ST SW	TUMWATER	Vehicle maintenance products/wastes
JOHNSON AND MADDOX	2209 93RD AVE SW	OLYMPIA	Vehicle maintenance products/wastes
JOHNSON MACHINE	1510 93RD AVE SW	OLYMPIA	Machine shop-related wastes
LINE-X OF OLYMPIA	7920 CENTER ST SW SUITE #C	TUMWATER	Bedliner products (A+B composite)
NEW MARKET SKILLS CENTER	7299 NEW MARKET ST SW	TUMWATER	Automotive maintenance products/wastes
OLYMPIC MEMORIAL GARDENS	5725 LITTLEROCK RD SW	TUMWATER	Facility maintenance products and wastes
POAGES AUTO AND TOWING	5403 CAPITOL BLVD S	TUMWATER	Automotive maintenance products/wastes
FOUR STAR ACCESSORY OVERHAUL	7711 NEW MARKET ST SW	TUMWATER	Oils, fuels, materials testing products
TUMWATER PRINTING	7675 NEW MARKET ST SW	TUMWATER	Printing-related products and wastes
WASHINGTON STATE DEPARTMENT OF PRINTING	7580 NEW MARKET ST SW	TUMWATER	Printing-related products and wastes
TUMWATER SCHOOL DISTRICT - FLEET MAINTENANCE	2020 80TH AVE SW	TUMWATER	Automotive maintenance products/wastes
UNITED STATES POSTAL SERVICE	717 76TH AVE SW	TUMWATER	Facility maintenance products/wastes
WASHINGTON STATE DEPARTMENT OF FISH AND WILDLIFE	7600 TERMINAL WAY NORTH	TUMWATER	Aircraft/boat maintenance products/wastes
WASHINGTON STATE PATROL - FLEET SECTION	8611 ARMSTRONG RD SW	OLYMPIA	Automotive maintenance products/wastes
WASHINGTON STATE PATROL - PROPERTY MANAGEMENT	8623 ARMSTRONG RD SW	OLYMPIA	Facility maintenance products
WHITEY’S AUCTIONEERS AND APPRAISALS	5945 LITTLEROCK RD SW	TUMWATER	Vehicle maintenance products
SOLOY CORP	450 PAT KENNEDY WAY SW	TUMWATER	Oils, fuels, paints and coatings
TECTONIX	1850 93RD AVE SW	OLYMPIA	New and used hydraulic oils
SHELLER DIESEL, INC	9144 KIMMIE ST SW	OLYMPIA	Automotive maintenance products/wastes
INTERNATIONAL WOOD PRODUCTS (FORMERLY WELCO LUMBER CO. USA)	8277 CENTER ST SW	TUMWATER	Facility maintenance products
THERMAL SUPPLY, INC	715 78TH AVE SW	TUMWATER	Used oils, new oil products
EVERGREEN VENDING CO	7725 CENTER ST SW	TUMWATER	Automotive maintenance products/wastes
APEX KARTING	7960 CENTER ST SW	TUMWATER	Go-kart maintenance products/wastes, fuel
JIFFY LUBE	5101 CAPITOL BLVD S	TUMWATER	Automotive maintenance products/wastes
COSTCO	5500 LITTLEROCK RD SW	TUMWATER	Consumer-oriented hazardous products
FRED MEYER	555 TROSPER RD SW	TUMWATER	Consumer-oriented hazardous products
HOME DEPOT	1101 KINGSWOOD DR SW	TUMWATER	Consumer-oriented hazardous products
SOUTHGATE ACE HARDWARE	5121 CAPITOL BLVD S	TUMWATER	Consumer-oriented hazardous products
NEW WORLD DRY CLEANER	855 TROSPER RD SW	TUMWATER	Dry cleaning-related wastes

<b>Business Name</b>	<b>Site Address</b>	<b>City</b>	<b>Characteristics of HazMats, HazWastes</b>
NORTHWEST CHIROPRACTIC CENTER	6346 LITTLEROCK RD SW	TUMWATER	Medical imaging-related wastes
TROSPER DENTAL CARE	925 TROSPER RD SW	TUMWATER	Dental wastes
RUSSELL, STEPHEN DDS	6344 LITTLEROCK RD SW	TUMWATER	Dental wastes
CHIROPRACTIC ARTS	100 RUBY ST SE	TUMWATER	Medical imaging-related wastes
SOUTHGATE CLEANERS	5141 CAPITOL BLVD S	TUMWATER	Dry cleaning-related wastes
BANNER FAMILY DENTAL	6340 LITTLEROCK RD SW	TUMWATER	Dental wastes
TERRY HESS, DPM	6336 LITTLEROCK RD SW	TUMWATER	Medical imaging-related wastes
TUMWATER VETERINARY HOSPITAL	1716 LAKE PARK DR SW	TUMWATER	Medical imaging-related wastes
DESCHUTES ANIMAL CLINIC	7248 CAPITOL BLVD S	TUMWATER	Medical imaging-related wastes
TUMWATER MIDDLE SCHOOL	6335 LITTLEROCK RD SW	TUMWATER	Chemistry laboratory-related wastes

<b>NOT IN WHPA INSPECTION PROGRAM</b>			
<b>Business Name</b>	<b>Site Address</b>	<b>City</b>	<b>Characteristics of HazMats, HazWastes</b>
NORTHWEST MARINE TECHNOLOGIES, INC.	955 MALIN LANE SW	TUMWATER	Do not store/generate
SMALL AND SONS	8220 CENTER ST SW	TUMWATER	Underground storage of fuel only (State regulated)
TUMWATER FIRE DEPT	311 ISRAEL RD SW	TUMWATER	Do not store/generate
WASHINGTON STATE CENTRAL STORES	7511 NEW MARKET ST SW	TUMWATER	Do not store/generate
WA CEDAR AND SUPPLY	2001 93RD AVE SW	OLYMPIA	Do not store/generate
UNITED PARCEL SERVICE	7383 NEW MARKET ST SW	TUMWATER	Medium-quantity generator (State regulated)
WASHINGTON STATE DEPT OF TRANSPORTATION - MATERIALS TESTING LAB	2ND ST SW	TUMWATER	Large-quantity generator (State regulated)
GOWER FLYING SERVICE	7825 OLD HWY 99 SE	TUMWATER	Not in active wellhead protection area
PERFORMANCE CORNER	7840B OLD HWY 99 SE	TUMWATER	Not in active wellhead protection area