Grand Mound Water System Plan
Grand Mound Service Area

I.D. #07158-0

Thurston County Public Works

March, 2012

Lester Olson,

Director

This Water System Plan has been prepared under my direct supervision

RICHARD D. BLINN
STATE OF WASHINGTON
REGISTERED
PROFESSIONAL ENGINEER

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STATE OF WASHINGTON
DEPARTMENT OF HEALTH
SOUTHWEST DRINKING WATER REGIONAL OPERATIONS
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July 17, 2012

Scott Schlemelfenig
Grand Mound
2404 Heritage Court Southwest
Olympia, Washington 98502

Subject: Grand Mound Water System, ID #071580, Thurston County; Water System Plan Update, ODW Project #11-0901

Dear Scott Schlemelfenig:

The Water System Plan (WSP) received by the Office of Drinking Water (ODW) on September 15, 2011, along with subsequent submittals received on March 15, 2012, April 5, 2012, and July 17, 2012, has been reviewed, and in accordance with the provisions of WAC 246-290-100 is **APPROVED**.

Approval of this WSP is valid as it relates to current standards outlined in WAC 246-290 revised October 1, 2011, WAC 246-293 revised September 1997, and RCW 70.116 (Municipal Water Law) effective September 2003, and is subject to the qualifications herein. Future changes in the rules and statutes may be more stringent and require facility modification or corrective action. An approved update of this WSP is required on or before July 27, 2018, unless ODW requests an update or plan amendment pursuant to WAC 246-290-100(9).

APPROVED NUMBER OF CONNECTIONS

Based on information supplied in this WSP, this system has sufficient capacity to meet growth projections in the identified six-year planning period. ODW will reflect this condition by noting on the Water Facilities Inventory (WFI) form and operating permit an "unspecified" designation for this system's approved number of connections.

This system is responsible for permitting the addition of new service connections in a manner consistent with the approved document. ODW expects this system to maintain a process that recognizes all new connections added to this system, and the water demands associated with each connection. The process must assure that physical capacity and water right limitations are not exceeded.

LOCAL GOVERNMENT CONSISTENCY

Robert Smith, Senior Planner for Thurston County Department of Resource Stewardship signed the local consistency statement on June 21, 2011. This meets local government consistency requirements for WSP approval pursuant to RCW 90.03.386 and RCW 43.20.

SERVICE AREA AND DUTY TO SERVE

Pursuant to RCW 90.03.386(2), the service area identified in the WSP service area map may now represent an expanded "place of use" for this system's water rights. Changes in service area should be made through a WSP amendment.

This system has a duty to provide new water service within its retail service area. This WSP includes service policies to describe how this system plans to provide new service within its retail service area.

WATER RESOURCES

The Department of Ecology's (Ecology) e-mail dated November 10, 2011, did not object to approval of this WSP Update. Please work with Ecology to resolve any future water rights questions. The information presented in this WSP will be considered valid as it applies to this approval.

Because Ecology has jurisdiction with respect to water right determinations, ODWs approval of this WSP will not provide any guarantee and should not be considered to provide any guarantee concerning legal use of water or subsequent water rights decisions by Ecology. Depending on Ecology's future actions on this system's water rights, additional planning or other submittals may be required by ODW. Questions concerning water rights or any uncertainties or discrepancies concerning water rights issues should be directed to Ecology.

WATERSHED PLANNING

Ecology has determined this WSP is "not inconsistent" with the approved watershed plan for WRIA 23, the Upper Chehalis Watershed. Please contact Ecology for more information.

If you have any questions, please contact Darin Klein at (360) 236-3038 or Jozsef Bezovics at (360) 236-3034.

Sincerely,

Darin Klein
Office of Drinking Water, Regional Planner

Jozsef Bezovics, P.E.
Office of Drinking Water, Regional Engineer

cc: Thurston County Health Department
Thurston County Planning Department
Amy Nielson, Department of Ecology

GRAND MOUND WATER SYSTEM PLAN

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1.0 DESCRIPTION OF WATER SYSTEM

This document serves as the Water System Plan for the Grand Mound Public Water System. It is a comprehensive plan to evaluate the existing water system, consider future demands, and to determine necessary improvements. Statutory authority is contained in WAC Chapter 246-292-100, Chapter 246-293-250, and Chapter 246-295.

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Department of Health
Identification Number: 07158

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1.1 Ownership and Management

The Grand Mound Public Water System is owned by Thurston County and operated by the County's Public Works Department. The elected Board of County Commissioners sets policy and approves the system's budget. The Utility Operations Manager is responsible for day-to-day operations and maintenance with general oversight from the Director of the Public Works Department.

Grand Mound is a Group A public water system as defined by the Washington State Department of Health. The state-issued operating permit and facilities inventory are attached in Appendix A. The organizational chart is shown in Table 6-1.

1.2 System Background

Formation: The Grand Mound Public Water System was developed after a locally formed Citizens Advisory Committee approached Thurston County and expressed its interest in developing a water supply and wastewater disposal system. Subsequent actions led to the formation of Utility Local Improvement District (ULID) 96-2 that funded the water and sewer system infrastructure.

Growth: The Grand Mound Public Water System began delivering potable water in 1999. The original water system plan forecasted 321 initial Service Connection Equivalent Residential Units (ERUs) for the utility's first year of operation in 1999. Thereafter, the average annual forecasted growth rate was 58 Service Connection ERUs which, if realized, would have resulted in 669 Service Connection ERUs in 2004. The actual growth has been less than forecasted. In 1999, the utility connected 15.2 Service Connection ERUs. The delivery of ERUs increased significantly when the Great Wolf Lodge was constructed and added 500 ERUs to the system. Following 1999, the average connection rate was 26.6 ERUs per year, resulting in a total of 172 ERUs through 2004. The average changed to104 ERUs per year on average from 2004 to 2010 based on the construction of the Great Wolf Lodge and other developments. The average in this time frame is skewed based on the construction of the Great Wolf Lodge. In 2002 the Board of County Commissioners adopted Thurston County Code (TCC) 15.010.230 which authorized properties outside of the Grand Mound Urban Growth Area (UGA) to connect to the water system, providing the development proponent:

- construct the water system infrastructure to service their development,
- provide water rights with sufficient quantity to service their development,
- pay a fee (Equivalent Service Extension Charge) roughly equivalent to the Grand Mound Utility Local Improvement District (ULID) assessment paid by property owners within the ULID; and
- pay an additional capacity charge to fund future municipal water system improvements.

In 2005, a development proponent who met the Board's criteria requested service outside the UGA. The utility amended its water system plan as required by the Municipal Water Law and expanded its service area in 2005 to add 102 acres of residential zoned property. The current Retail Service Area boundaries encompass 1,004 acres in and north of the Grand Mound Urban Growth Area. The current service area is shown in Figure 1-1 below.

TRENDS: In 2010, Grand Mound experienced a lower level of growth than the cumulative total of the previous six years, with fewer new subdivisions going to construction. Several other commercial and retail outlets have expressed interest in developing within the Grand Mound service area. The development trend for the Grand Mound area appears to be flat due to local, regional and national economic circumstances.

Figure 1-1
Grand Mound Water System Zoning

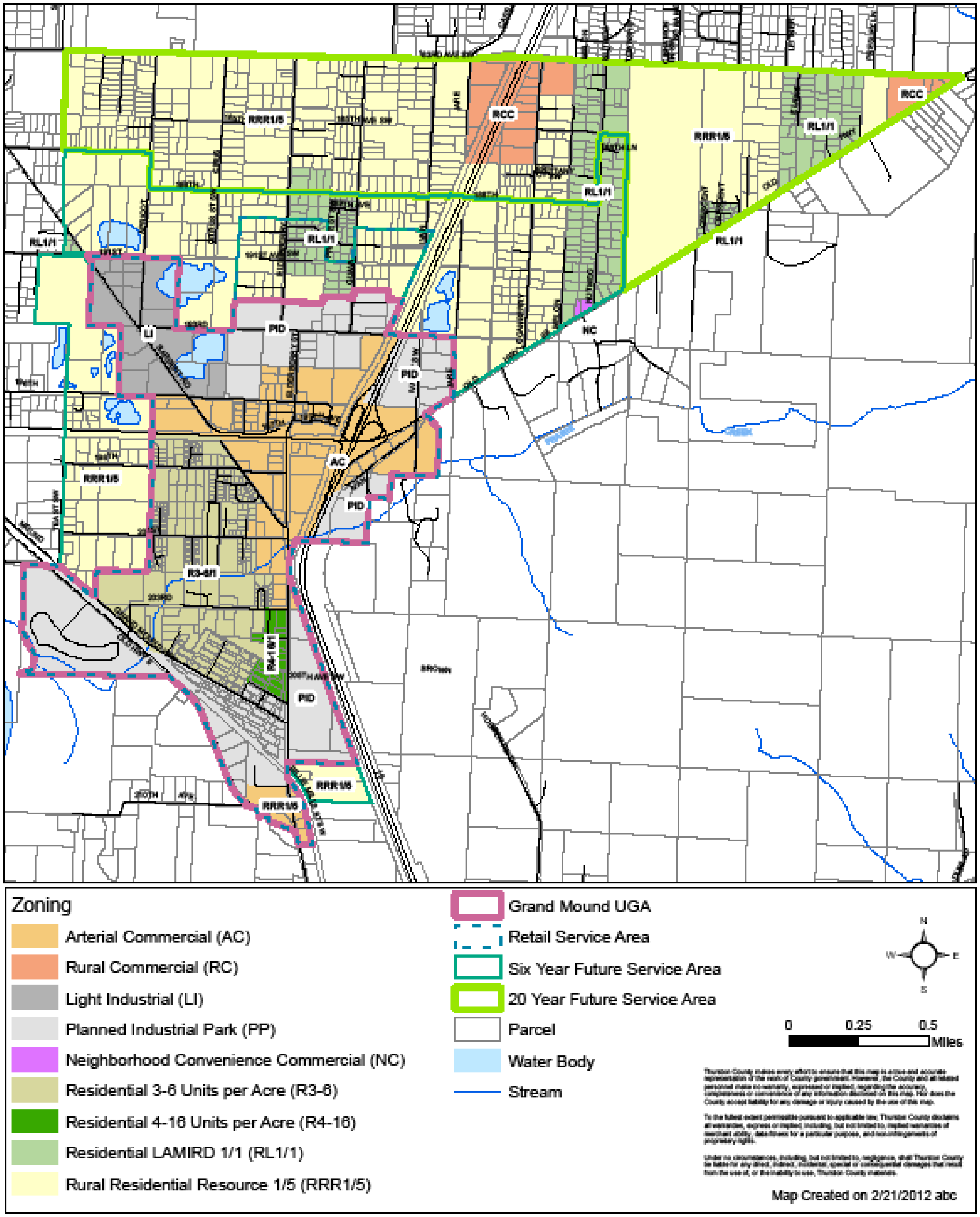

Figure 1-1 Ground Mound Water System Service Area 2012

1.3 Geography

Two small seasonal water courses cross the Grand Mound area. Prairie Creek crosses the area from the northeast to the southwest. Another unnamed creek crosses the southern portion of the area. Both creeks drain to the Chehalis River. The Grand Mound area is relatively flat and slopes from northeast to southwest toward the Chehalis River. There is an underlying aquifer generally under the entire Grand Mound area. Well logs show that water is lying quite close to the surface, varying from 30 feet to deeper. The water in the aquifer moves in the same northeast to southwest direction as the surface water. The aquifer is the source of all domestic water for Grand Mound residents. For more detailed information on subsurface water, see the Grand Mound Feasibility Assessment (Pacific Ground Water Group, 1995) in Appendix A**.**

The Grand Mound service area is generally flat prairie land which slopes gently toward the Chehalis River. The elevation varies from approximately 50 feet to 85 feet above sea level. The soils are generally Spanaway, Nisqually, and Everett type gravelly, sandy soil, which is very porous and drains rapidly. In undeveloped areas, it is covered in typical prairie vegetation. 1.2.2 Adjacent Purveyors

1.4 Adjacent Water Systems

There are seven (7) Group B and five (5) Group A nonexpanding water systems within the Grand Mound service area, Table 1-1. Grand Mound shares a common 20-year Future Service Area border with the Rochester Water Association to the east as shown in Figure 1-1. Department staff met with the Rochester Water Association and jointly drafted a mutual boundary between the two expanding Group A systems. Service area maps and a draft copy of the Grand Mound Public Water System Plan have been shared with the major purveyors adjacent to Grand Mound.

Adjacent Purveyors

Grand Mound Public Water System Service Area

NAME	GROUP	TYPE	SEC	TNSHP	RNG	OPERATOR	PHONE	Residential Connections	NON Res Connections
ATLAS CONCRETE PRODUCTS	B		2	15	03W	MIKE SCHUH	(253) 833-3705 EX.460	0	2
G&M ESTATES	A	TNC	14	15	03W	DAVID GERTS	(360) 943-6318	2	3
GRAND MOUND JUNCTION MOBILE HOME PARK	B		13	15	03W	ROY GORUD	(206) 542-1539	7	0
GUAVA ST. WEST	B		13	15	03W	STEVE HARRINGTON	(360) 357-3277	6	
GUAVA ST. EAST	B		13	15	03W	STEVE HARRINGTON	(360) 357-3277	6	
JUNCTION BAR & GRILL	A	TNC	13	15	03W	REX WOLFF	(360) 273-2472	2	1
MAPLE LANE SCHOOL	A	COMM	14	15	03W	DAN MCNAMARA	(360) 273-3188	1 (64-UNIT) COMPLEX	7
MARTIN SAND AND GRAVEL	B		11	15	03W	MONTE SQUIRES	(360) 736-2851	0	2
TWIN FIRS MOBILE HOME PARK	A	COMM	13	15	03W	AARON JONES	(360) 273-6943	INACTIVE	0

NAME	GROUP	TYPE	SEC	TNSHP	RNG	OPERATOR	PHONE	Residential Connections	NON Res Connections
HOUSING MART (193RD)	B	COMM	12	15	03W	GARY STOSKOPF	(360) 273-8812	0	1
GRAND MOUND MOTEL	B		12	15	03W	ANGEL ANGROVE	(360) 273-8812	3	0
PRAIRIE VISTA (RWA)	A	COMM	1	15	03W	LOWELL DEGUISE	(360) 273-9688	21	0

TNC = TRANSIENT NON COMMUNITY

COMM = COMMUNITY (i.e. residential)

RWA = Rochester Water Association

Table 1-1

1.5 Ordinances and Bylaws

The Thurston County Board of County Commissioners establishes policies, codes and ordinances for the Grand Mound Public Water System. The county has adopted a set of design standards for new development, which regulates design, materials, fire flow, and inspection. (See Appendix K: "Development Standards, Water and Sewer System, Grand Mound.") Standards are enforced and fees collected during the county's development review and inspection process.

For regional planning purposes the Grand Mound Public Water System Plan follows guidelines set forth in the South Thurston County Urban Growth Areas Abbreviated Coordinated Water System Plan, June 2000 (Appendix L).

Thurston County intends to establish a Grand Mound Public Water System Goal setting forum comprised of residential, commercial and industrial customers, as well as utility staff. The forum will develop goals that will help reduce water leakage and increase water efficiency.

1.6 Inventory of Existing Facilities

The Grand Mound Public Water System is comprised of two wells, a single 500,000-gallon reservoir, approximately six miles of distribution line, and a gas chlorination unit located at the Grand Mound Wastewater Treatment Plant. The system has 195 connections and is approved for 1,000 connections. The most current Water Facilities Inventory is in Appendix A. Well logs are located in Appendix N, Vulnerability Assessment Forms Version 2.2.

- Well #1 is located at 20248 Grand Mound Way. The depth is 62 feet with a pumping rate of 425 gallons per minute (gpm).
- Well #2 is located at 20041 Tea Street SW. The depth is 60 feet with a pumping rate of 425 gpm.
- Grand Mound Reservoir is located at 5919 Ivan Street SW. The capacity is 487,000 gallons.
- The gas chlorination and pH adjustment units are located at 20248 Grand Mound Way. The unit consists of one chlorine cylinder on line.

1.7 Related Plans

Grand Mound Public Water System is consistent (Chapter 10, Local Government Consistency Checklist) and compatible with local land-use plans, as well as the South Thurston County Urban Growth Areas Abbreviated Coordinated Water System Plan, June 2000. The following plans relate to the Grand Mound Public Water System Plan.

State Growth Management Act (RCW36.70A) stipulates goals and policies related to provision of services with designated growth areas.

Thurston County County-Wide Planning Policies, November 2004. These policies promote contiguous and orderly development and the provision of urban services through policies that call for:

a. Compatible development standards and road/street levels of service among adjoining jurisdictions;

b. Development within unincorporated growth areas to conform to the development standards of the associated city or town;

c. No extensions or urban services or facilities, such as sewer and water, beyond urban growth boundaries except to serve existing development in rural areas with public health or water quality problems. (Thurston County sought, and received, permission to amend the 1999 Grand Mound Public Water System Plan in order to extend water service past the UGA and into an area zoned for urban densities. The County reasoned that extending the service boundary would achieve the twin goals of promoting orderly development in an area designed for urban expansion, and protecting Grand Mound's shallow, vulnerable aquifer – the sole source of the community's drinking water. Permission to amend the plan was granted by the Washington State Department of Health in a June 8, 2005 letter to Utility Operations Manager Mark Petrie.)

Thurston County Comprehensive Plan, 2004: The Comprehensive Plan establishes land-use patterns and anticipates how population trends will affect future development in Thurston County. The plan permits subarea plans to be prepared for areas where more detailed land-use plans, policies and designations are needed to address unique features or needs. There are two subarea plans in the Grand Mound area:

Rochester Subarea Plan (1996): Establishes residential densities, with policies for commercial, industrial, and agricultural land use within the Rochester and Grand Mound subarea.

Grand Mound Subarea Plan for the Grand Mound Urban Growth Area, December 1997: This plan represents the detailed plan for lands within the Grand Mound UGA.

South Thurston County Urban Growth Areas Abbreviated Coordinated Water System Plan (CWSP), June 2000. The CWSP ensures reliable urban-level water service within the designated UGAs for Yelm, Rainier, Tenino, and Grand Mound. It links water service review conducted by state and local health agencies with Urban Growth Area land-use and utility-planning objectives. The plan seeks to avoid the proliferation of small, inadequate water systems in the UGAs. The plan provides a predictable and timely process for determining water service to new land uses within the UGAs.

1.8 Existing Retail Service Area Characteristics

The retail service area encompasses all 2,671.8 acres of the Grand Mound Urban Growth Area. Zoning within the retail service area is a mix of residential, commercial, industrial and rural zones. The Grand Mound Public Water System service area and adopted zoning is shown Figure 1-1. Existing water lines and future mains are illustrated in Figure 1-2.

1.9 Future Service Area

Where possible, the water system's Future Service Areas were drawn to include residential zones within the Grand Mound and Rochester subareas as adopted in the Thurston County Comprehensive Plan. Rural residential zonings were only included to: a) protect the source production wells' sanitary control areas, or b) connect adjoining lands of higher residential densities (Figure 1-1).

Thurston County will incrementally expand into the 6-year Future Service Area as economic and development conditions warrant. Prior to requesting a Water System Plan amendment to expand the current retail service area, the county will require that development proponents meet the criteria codified in TCC 15.010.230.

1.10 Service Area Policies

Thurston County Code Section 15 Water Systems (Appendix M) establishes service policies for the Grand Mound Public Water System (Appendix M). To coordinate with adjacent utilities, the Public Works Department follows the policies and guidance contained in the South County Urban Growth Areas Abbreviated Coordinated Water System Plan (Appendix L).

1.11 Water Availability

Water service is available within ULID 96-2 upon request. For properties outside the ULID, water is available only to developments that meet criteria codified in TCC 15.010.230.

1.12 Utility Local Improvement District 96-2

Thurston County formed the Grand Mound Utility Local Improvement District (ULID) 96-2, in 1999. Within the ULID, the Grand Mound Public Water System provides water service in a timely and reasonable manner.

1.12.1 Outside of the ULID 96-2, but within the retail service area

Thurston County adopted code to finance the building and administration of water infrastructure in retail service areas outside of the ULID, with an emphasis on protecting water-capacity for property owners within the original ULID boundaries. TCC 15.10.220 (Grand Mound Water Utility Connections outside the ULID No. 96.2 and TCC 15.10.230 (Grand Mound Water Utility Connections outside the UGA_as seen in APPENDIX M) require that:

- Owners/developers pay a service extension charge to finance the cost of laying new pipe;
- Owners/developers pay an additional capacity charge to finance the cost of expanded capital projects; and,
- Owners/developers pay a water rights acquisition fee or in lieu of a fee, transfer a viable water right in the amount of the annual average water needed by the proposed new facility.

1.13 Wholesaling/Wheeling of Water

The Grand Mound Public Water System does not wholesale water to customers and does not foresee wholesaling in the future. Wheeling water through water system mains is not anticipated during this 6-year planning period.

1.14 Annexation Policies

Thurston County will petition the Washington State Department of Health to amend the retail service area boundary if the proponent satisfies the following criteria:

1) The proponent complies with TCC 15.10.220 or TCC 15.10.230;

2) The proponent's property is located within the Grand Mound Six-Year Future Service Area; and,

3) The annexation does not conflict with provisions of the South Thurston County Coordinated Abbreviated Water System Plan dated 2000.

1.14.1 Direct Connection

New developments within the Grand Mound Urban Growth Area are required to connect directly to the Grand Mound Public Water System. TCC 15.09.040 requires all new developments within the Grand Mound service area to connect to the county sewer system. (The entire Grand Mound Urban Growth Area is within the county sewage service area.) TCC 15.10.050 requires that developers connect to the water system as a condition of connecting to the sewer system.

1.14.2 Latecomers Agreements

TCC 15.010.220 and TCC 15.010.230 require new developments to fund and build their own connections to the Grand Mound Public Water System. The codes authorize the Public Works Department to administer a latecomer's agreement (Appendix M) to recover the pro-rata share from benefiting properties to reimburse the original developer.

1.14.3 Formation of Utility Local Improvement Districts (ULID) Outside of Legal Boundaries

In 2002, Thurston County adopted TCC 15.010.220 and TCC 15.010.230, which effectively made it unnecessary to form additional ULIDs outside of the original ULID boundary. The codes provide for an Additional Capacity Charge (ACC), and a Service Extension Charge, on parcels outside of the original ULID boundaries in order to finance additional infrastructure capacity in those areas. The charges are roughly equivalent to the assessments paid by property owners within ULID 96-2. Fees are paid at the time application for water service is made. (Appendix M)

1.14.4 Oversizing

The Public Works Department reserves the option to require oversizing of pipes in the Development Standards for Water and Sewer Systems, Thurston County

1.14 5 Extensions

TCC 15.010.220 and TCC 15.010.230 require new developments to fund and build extensions in order to connect to the Grand Mound Public Water System. The codes authorize the Department of Public Works to administer a latecomer's agreement (Appendix M) to recover the pro-rata share of cost from benefiting properties to reimburse to the original developer.

1.15 Design and Performance Standards

The Thurston County Board of County Commissioners adopted the Development "Standards for Water and Sewer Systems, January 2007"(http://www.co.thurston.wa.us/wwm/Engineering_Standards/Water_Sewer_Standards/Water_Sewer_Standards.htm) and WSDOT's "Standard Specifications for Road, Bridge and Municipal Construction," latest edition (Thurston county Code 15.04.070).

1.16 Urban Growth Areas

The Grand Mound Pubic Water System provides retail water service to the Grand Mound Urban Growth Area. For properties outside of the ULID 96-2, the developer is required through TCC

15-10.220 to construct the infrastructure, pay for additional utility capacity and fund or provide water rights.

1.17 Cross Connection Control Program

The Department of Public Works has an active cross-connection control program that meets the requirements of WAC 246-290-490. The program is located in Appendix I.

1.18 Satellite Management Agencies

Thurston does not currently allow satellite extensions to the Grand Mound Public Water System. If water service is requested in the 6-year or 20-year future service area, and Grand Mound cannot provide timely and reasonable service, the county will follow the policy guidance contained in Section 4 of the South Thurston County Abbreviated Water System Plan. The abbreviated plan allows neighboring jurisdictions to provide service or, as a last resort, allows the proponent to build a new water system. Thurston County will review its satellite management policies in the near future to determine the appropriateness of this policy given the State's adoption of the Municipal Water Law.

1.19 Complaints

Complaints are logged on a complaint form, entered into a database table, and investigated by operations personnel. Customers are usually contacted in person or by phone and informed of the results of the investigation. If complaints are not resolved satisfactorily, customers may discuss the complaint with the supervisory chain to include the Board of County Commissioners.

1.20 Potential New Customer

The Washington State Department of Corrections is considering the Maple Lane School site as one of three potential sites to locate the new Westside Prison Reception Center. The proposed center would be about 356,000 square feet of building and provide space for 1,024 beds. If Grand Mound is selected, the water main system may require a new reservoir and additional Watermain to service the facility.

Chapter 2

2.0 BASIC PLANNING DATA AND WATER DEMAND FORECASTING

The objective of this chapter is to define basic planning data, future land use, and future water demands to ensure that the Grand Mound Public Water System adequately plans for future water needs.

2.1 **Cu**rrent Population, Service Connections, Water Use, and Equivalent **Residential Units**

2.1.1 Current Population

The current population of the Grand Mound Urban Growth Areas is 1,150: (Thurston Regional Planning Council, Populations and Employment Forecast Work Program - 2011)

2.1.2 Total Service Connections

The Grand Mound Public Water System began supplying water to the public in May 1999. Then majority of system connections were residential services. A breakdown of connection types is listed in Table 2-1. As of August 2010, the Grand Mound Public Water System had 248 service connections.

Number of Existing Service Connections at Year-End by Type of Service						
Type	Year					
	2005	2006	2007	2008	2009	2010
Single Family	82	102	124	136	148	195
Commercial/Industrial	40	42	46	48	50	53
Totals =	122	144	170	184	198	248

Table 2-1, Number and Type of Connections

2.1.3 Water Use Data Collection

Water consumption data is listed in Appendix D. The history of water consumption is summarized in Table 2-2 below. Please note the summary below captures the six years of operation of the Grand Mound Water System.

SOURCE PRODUCTION WELLS 1 & 2 (GALLONS)						
	Year					
Type	2005	2006	2007	2008	2009	2010
Single Family	9,625,640	17,544,848	15,305,499	18,235,320	21,036,106	20,133,483
Commercial/Industrial	6,630,360	6,711,552	11,965,501	49,933,189	53,880,994	48,568,617
Totals =	16,256,000	24,256,400	27,271,000	68,168,509	74,917,100	68,702,100

Note: proportioned values for metered customer water

Table 2-2, Source Production

2.1.4 Equivalent Residential Units

An Equivalent Residential Unit (ERU) is the average water consumed by one single family residence in one day. The ERU consumption rate (typically noted in gallons per day) is derived by dividing the average daily residential consumption for one year by the number of single family connections for that particular year. As a result, the number of ERUs consumed through a system equals the annual water consumption divided by the ERU consumption rate.

After 12 years of operation, the Grand Mound Public Water System is characterized by fewer commercial connections using almost 2/3 of the water consumed. With a lack of established history for residential users, water consumption based on single-family connections in Grand Mound is skewed. Therefore, data from 2010 is used to establish the most accurate ERU.

1 ERU_{2010} = 20,133,483/195/365 =282 gal/day

In 2010, the total water system had 667 ERUs including all water use (residential and commercial)

The ADD_{2010} for the entire water system is 188,096 gallons per day (see Table 2-10 below.

The MDD using a peaking factor of 1.7 is 319,763 gallons per day

The PHD computations maximum conditions are shown in Table 2-10 C

2.2 Projected Land Use, Future Population, and Water Demand

2.2.1 Projected Land Use

Where possible, the water system's Future Service Areas were drawn to include residential zones found within the Ground Mound and Rochester subarea plans as adopted in the Thurston County's Comprehensive Plan. Rural residential zonings were included only when it was necessary to:

a) Protect the source production wells' sanitary control areas, or

b) Connect adjoining lands of higher residential densities. Refer to Table 2-3 and

Figure 2-1 for projected land uses.

Zoning	Current Service Areas By Zoning [1.] Acres	6 - Year Projected Service Area Acres	20 - Year Projected Service Acres Acres
Arterial Commercial	260.4	0	0
Light Industrial	0	0	0
Planned Industrial Park	0	.4	0
Rural Commercial	109.2	0	85.6
Neighborhood Convenience	362.6	1.9	0
Residential 3-6 units per acre	80	0	0

Zoning	Current Service Areas By Zoning [1.] Acres	6 - Year Projected Service Area Acres	20 - Year Projected Service Acres Acres
Residential 4-16 units per acre	227.2	0	0
Rural Residential 1 unit per acre	20.3	89.8	125.6
Rural Residential 1 unit per 5 acres	26.2	586.2	696.4
Total	1,085.9	678.3	907.6
Total Water System		2,671.8	3,5579.4

1. Not all properties in zoning areas are currently connected

Table 2-3 Projected Land Use within 6 and 20 Year Future Service Area

2.2.2 Projected Population

Population figures used in this plan were drawn from the Thurston County Regional Planning council.

Current Retail Service Area	Six Year Future Service Area	20 Year Future Service Area	Total Population for All Service Areas
896	515	829	2,241

Table 2-4 Six-Year Population Forecast

Current Retail Service Area	Six Year Future Service Area	20 Year Future Service Area	Total Population for All Service Areas
2,814	1,617	2,602	7,033

Table 2-5 Twenty-Year Population Forecast

Current Retail Service Area	Six Year Future Service Area	20 Year Future Service Area	Total Population for All Service Areas
1,351	755	1269	3375

Table 2-6, Six Year Employment Forecast

Current Retail Service Area	Six Year Future Service Area	20 Year Future Service Area	Total Population for All Service Areas
1,035	10	25	1,070

Table 2-7, Twenty Year Employment Forecast

2.2.3 Projected Non-Residential Water Needs

As noted in Section 2.2.1, the projected land use includes a mixture of commercial, industrial, and residential zonings. The resulting zonings will likely result in substantially more commercial and industrial connections to the Grand Mound Public Water System.

2.2.4 Projected Non-Revenue Water

"Non-revenue" water refers to water produced by a water system but not consumed by customers. Non-revenue water is divided into two categories: accounted water and unaccounted water is distribution system leakage (DSL). Examples of accounted water include water that is used to flush the system and hydrants, and to service the Grand Mound wastewater treatment plant.

Until recently, all accounted water has been estimated. In 2005, system employees and the local fire department committed to record the duration and number of times non-revenue water is consumed during non-emergency situations. Other improvements are also planned, such as metering non-revenue water at the Grand Mound wastewater treatment.

Thurston County anticipates that the overall percent of accounted non-revenue water will decrease as revenue-producing connections to the water and sewer system increase. Additional connections will mean that more customers are consuming water and therefore "flushing the system," and that the wastewater treatment plant will receive an adequate volume of water.

Specific incidents that resulted in DSL water were not recorded. However, operations and maintenance personnel describe several events that resulted in DSL water such as fire fighting, main breaks due to construction, worn meters, and leaks due to corrosion. Table 2-7 shows the non-revenue water volumes for 2005 through 2010.

ANNUAL NON-REVENUE WATER SUMMARY [2.]							
Year	Source Production (Gal/Yr)	Service Meter Readings (Gal)	Non-Revenue Water				
			Accounted For		Unaccounted For		
			Makeup Water	System Flushing	Gal/Yr	%	ERUs[1.]
2005	16,256,000	11,984,900	780,900	800,100	2,690,100	16.5%	26.0
2006	24,256,400	15,805,300	850,500	1,000,000	6,600,600	27.2%	63.9
2007	27,271,000	24,439,400	856,200	500,200	1,475,200	5.4%	14.3
2008	68,168,500	58,325,200	900,100	600,100	8,343,100	12.2%	84.0
2009	74,917,100	72,686,600	1,100,100	400,000	730,400	1.0%	7.4
2010	68,702,100	65,442,700	1,000,000	600,000	1,659,400	2.4%	16.1
Notes							
1. At one ERU= 282 gal/day							

Table 2-8, Non-Revenue Water Summary

2.2.5 Water Rates

Monthly water bills include two rates: a water-usage rate and a water base rate. Water-usage rates are based on how much water is actually used as measured by a water meter. Water base rates are calculated using ERUs, much like the connection fees. One ERU is assigned to every 700 cubic feet of water used per month.

2.2.5.1 Residential Rates

For billing purposes, an established single-family-residence is assigned one ERU at $30.26 per ERU for the base rate, and then billed $1.72 for every 100 cubic feet used as measured at the residential meter.

2.2.5.2 Commercial Billing

For commercial billing purposes, an ERU value is assigned based on the type of establishment TCC 15.12.015 (Appendix M) which determines the base rate. For water usage, the established charged is $1.72 per 100 cubic feet used as measured at the establishment’s meter.

2.2.6 Water Demand Forecasting

2.2.6.1 Peaking Factors

To produce the best, most reasonable forecasting figures, the Grand Mound Public Water System draws data from three sources to forecast future water demand: the estimating guidelines of the Water System Design Manual, existing data collected by the system, and projected population and zoning information provided by the Thurston Regional Planning Council.

This data is used to produce an Average Daily Demand (ADD) of water on the system. Additional peaking factors, including Maximum Daily Demand (MDD) and Peak Hourly Demand (PHD), are used to project potential system-limiting demands.

A Maximum Daily Demand peaking factor of 1.7 is usually thought to be sufficiently conservative for planning purposes in Western Washington, and is used herein for the Grand Mound Plan, all according to the Water System Design Manual. Using the ADD2010 from Section 2-1.4, the resulting MDD2010 is 479 gpd/ERU.

The Peak Hourly Demands are shown in Table 10 for Residential, Commercial and combined conditions

2.2.6.2 Forecasting

Population projections for the Grand Mound area provide a framework for estimating future water demands. Table 2-9 shows the existing water demand per capita based on single family connections.

EXISTING WATER DEMAND Per CAPITA (Single Family Connections)			
Year	Single Family Population [1.]	Water Consumed[2] (gal/yr)	Water Demand (gpcd)
2005	188	7,096,600	103.3
2006	235	11,432,100	133.2
2007	285	13,716,300	131.8
2008	312	15,602,200	136.9
2009	340	20,409,800	164.3
2010	468	19,178,300	112.2

1. Assuming 2.3 persons per single family connection
2. Water consumed by single family connections

Table 2-9, Existing Water Demand Per Capita

The above table reflects a discrepancy in water demand per-capita per-day from more typical values. This is likely because the Grand Mound Public Water System began operation in 1999, and a significant number of single-family connections did not occur until 2002. However, existing trends over the past several years may provide a basis for forecasting a demand of 100 gallons per-capita demand, (gpcd) per-day.

The 6-year and 20-year water demand forecast for a system with less than 10,000; commercial and residential connections can be combined.

The total amount of water pumped in 2010 was 68,702,100 gallons. Using the ERU of 282 gallons per day and utility's projects of 5 new ERUs through 2015 and 18 new ERUs to 2032, all with 2% growth in all commercial we can compute the use shown in Table 2-10 below.

COMPUTED ERUs & FLOWS					
Year	Total ERUs	Total Pumped	Residential	Great Wolf	Other Comm
2010	667	68,702,100	20,133,483	41,996,396	4,666,266
2011	662	68,226,138	20,630,223	42,836,324	4,759,592
2012	676	69,674,796	21,126,963	43,693,050	4,854,783
2013	691	71,142,493	21,623,703	44,566,911	4,951,879
2014	705	72,629,609	22,120,443	45,458,249	5,050,917
2015	720	74,136,532	22,617,183	46,367,414	5,151,935
2016	747	76,955,183	24,405,447	47,294,763	5,254,974
2017	775	79,794,442	26,193,711	48,240,658	5,360,073
2018	802	82,654,721	27,981,975	49,205,471	5,467,275
2019	830	85,536,440	29,770,239	50,189,581	5,576,620
2020	859	88,440,028	31,558,503	51,193,372	5,688,152
2021	887	91,365,922	33,346,767	52,217,240	5,801,916
2022	916	94,314,569	35,135,031	53,261,584	5,917,954
2023	945	97,286,424	36,923,295	54,326,816	6,036,313
2024	974	100,281,950	38,711,559	55,413,352	6,157,039
2025	1003	103,301,622	40,499,823	56,521,619	6,280,180
2026	1032	106,345,922	42,288,087	57,652,052	6,405,784
2027	1062	109,415,343	44,076,351	58,805,093	6,533,899
2028	1092	112,510,387	45,864,615	59,981,195	6,664,577
2029	1123	115,631,566	47,652,879	61,180,819	6,797,869
2030	1153	118,779,404	49,441,143	62,404,435	6,933,826
2031	1184	121,954,433	51,229,407	63,652,524	7,072,503
2032	1215	125,157,198	53,017,671	64,925,574	7,213,953
Notes:					
Projected numbers are based on utility's actual flows and customer count - 2010: Shown light green					
Inversely computed from actual 2010 flows and accounts					
Based on actual ADD of 188,095 gpd in 2010 + 5 ERUs until 2015; then 18 ERUs					
Great Wolf Demand assumed to increase 2% per year.					
Planning horizon for this WWP shown gray shaded and underlined					

Table 2-10 Computed Flows & ERUs

Residential Flow Factors for Planning Period					
Year	ERUs	Residential Flows GPD	ADD gpd/ERU	MDD gpd/ERU	PHD gpm
2010	195	54,990	282	479	176
2011	181	51,042	282	480	180
2012	185	52,170	282	480	183
2013	190	53,580	282	479	185
2014	194	54,708	282	479	188
2015	199	56,118	281	478	191
2016	216	60,912	297	505	204
2017	233	65,706	295	502	214
2018	249	70,218	294	499	224
2019	266	75,012	292	497	234
2020	284	80,088	291	495	245
2021	300	84,600	290	493	255
2022	317	89,394	289	491	265
2023	334	94,188	288	490	275
2024	351	98,982	287	488	286
2025	368	103,776	287	487	296
2026	384	108,288	486	306	296
2027	401	113,082	485	317	306
2028	418	117,876	484	327	317
2029	436	122,952	483	337	327
2030	452	127,464	482	348	337
2031	469	132,258	482	358	348
2032	486	137,052	481	368	358

Table 2-10A Residential Flow Characteristics

Commercial Flow Factors for Planning Period					
Year	ERUs	Commercial Flows GPD	ADD gpd/ERU	MDD gpd/ERU	PHD gpm
2010	472	46,662,662	332	564	399
2011	481	47,595,915	343	584	420
2012	491	48,547,834	337	574	420
2013	501	49,518,790	331	563	420
2014	511	50,509,166	327	555	421
2015	521	51,519,349	322	547	422
2016	531	52,549,736	320	543	426
2017	542	53,600,731	306	520	415
2018	553	54,672,746	294	500	407
2019	564	55,766,201	284	483	400
2020	575	56,881,525	274	466	393
2021	587	58,019,155	266	452	389
2022	599	59,179,538	258	439	385
2023	611	60,363,129	252	428	382
2024	623	61,570,392	245	417	379
2025	635	62,801,799	240	408	377
2026	648	64,057,835	235	400	376
2027	661	65,338,992	230	392	375
2028	674	66,645,772	226	384	375
2029	687	67,978,687	222	377	375
2030	701	69,338,261	218	371	376
2031	715	70,725,026	215	365	376
2032	729	72,139,527	212	360	378

Table 2-10B Commercial Flow Characteristics

Total Grand Mound Flow for Planning Period					
Year	ERUs	Residential Flows GPD	ADD gpd/ERU	MDD gpd/ERU	PHD gpm
2010	667	68,702,100	282	479	459
2011	662	68,226,138	282	480	457
2012	676	69,674,796	282	480	465
2013	691	71,142,493	282	479	473
2014	705	72,629,609	282	479	482
2015	720	74,136,532	282	479	491
2016	747	76,955,183	282	479	507
2017	775	79,794,442	282	479	524
2018	802	82,654,721	282	480	541
2019	830	85,536,440	282	480	557
2020	859	88,440,028	282	479	574
2021	887	91,365,922	282	479	591
2022	916	94,314,569	282	479	608
2023	945	97,286,424	282	479	626
2024	974	100,281,950	282	479	643
2025	1003	103,301,622	282	479	661
2026	1032	106,345,922	282	480	678
2027	1062	109,415,343	282	480	696
2028	1092	112,510,387	282	480	714
2029	1123	115,631,566	282	479	732
2030	1153	118,779,404	282	479	751
2031	1184	121,954,433	282	479	769
2032	1215	125,157,198	282	479	788

Table 2-10C Combined Flows Characteristics

Chapter 3

3.0 SYSTEM ANALYSIS

The objective of this chapter is to determine whether the Grand Mound Public Water System's existing facilities can meet the existing and projected demands for high-quality water. This chapter will provide a layout of the water system and a projected system hydraulic analysis, and describe proposed improvements.

Please refer to Figure 3-1 for a water system infrastructure map.

3.1 System Design Standards

The Grand Mound Public Water System is designed according to standard engineering practices and guidelines established by the Washington State Department of Health "Water System Design Manual." (Use of the manual's guidelines is described below.)

Thurston County also requires new construction projects to meet minimum construction standards in order to connect to the Thurston County's Development Standards for Water and Sewer Systems (http://www.co.thurston.wa.us/wwm/Engineering_Standards/Water_Sewer_Standards/Water_Sewer_Standards.htm) (Appendix K).

These standards are outlined in Chapter 7 of this Plan.

3.1.1 Water Quality Parameters

The quality of water in the Grand Mound Public Water System is monitored regularly in accordance with state and federal standards. A list of the monitored parameters and their testing frequency are shown in Appendix H. The most recent water quality reports are also included in Appendix H.

3.1.2 Average and Maximum Daily Demands

Water demands used for design purposes are calculated according to the Water System Design Manual. These demands are expressed at a flow rate of gallons per minute (gpm) and include the Average Daily Demand (ADD) and Maximum Daily Demand (MDD).

The ADD is determined by multiplying the average per capita demand by the estimated population for projected years. The ADD estimates the average daily demand for projected planning years.

The MDD is determined by multiplying the ADD by the maximum day peaking factor. This peaking factor is the highest daily consumption of the year divided by the ADD. The WSDOH preferred Western Washington peaking factor range is 1.7. The MDD estimates the highest daily demand for the projected planning years.

3.1.3 Peak Hourly Demand

The Peak Hourly Demand (PHD) is another water demand used for design purposes. The PHD, expressed in gallons per minute, is a calculated value based on Equation 5-1 from the Water System Design Manual.

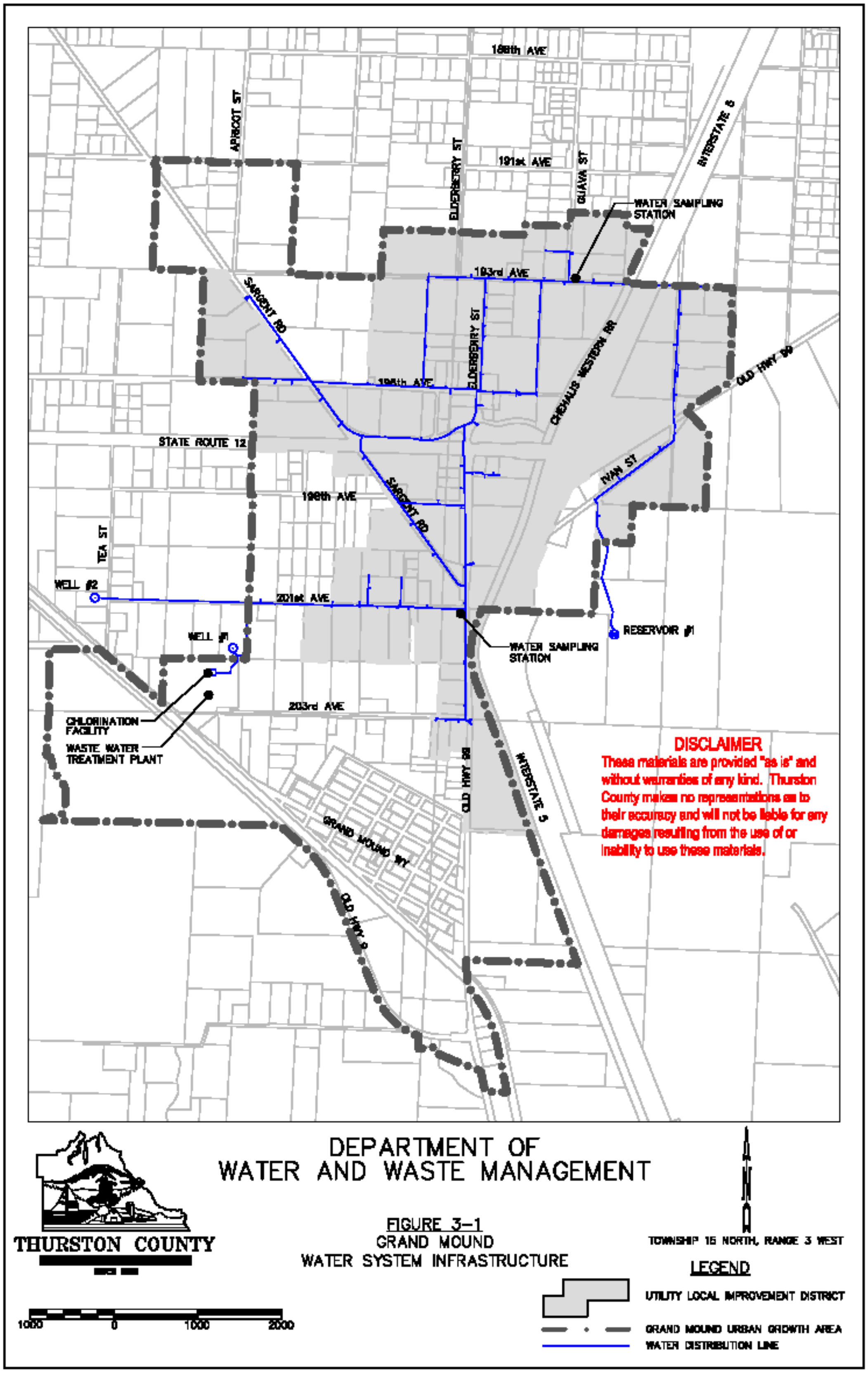

FIGURE 3–1
GRAND MOUND
WATER SYSTEM INFRASTRUCTURE

3.1.4 Storage Requirements

Grand Mound's water-storage system has been designed to be implemented in two phases. The capacity for water storage was verified using standards outlined in Chapter 9 of the Water System Design Manual. Analysis of the water system's storage is contained in Section 3.3.3.2.

3.1.5 Fire Flow Rate and Duration

For planning purposes, a fire flow demand of 2,000 gpm for two (2) hours has been recommended by the Thurston County Fire Marshal to be used in the design of structures being served by the Grand Mound Water System. This fire flow demand can be converted to an allowable fire area constructed in accordance with Thurston County Code. The fire area varies depending on construction type and allowable fire flow demands and rates. Thurston County provides Table III-A-A from Thurston County Code 14.32.110 as a guide for allowable fire area in square feet based on various fire flow rates. When the Water Plan was last updated in 2006 the Great Wolf lodge did not exist and the fire flow was not upgraded at that time.

3.1.6 Minimum System Pressure

The Grand Mound Public Water System is designed to meet the minimum system pressures described in WAC 246-290-230, including minimum system pressures at PHD flows (30 psi throughout the system) and minimum system pressures at MDD (20 psi throughout the system) with fire flow. These values are noted in Section 2.2.6.

3.1.7 Minimum Pipe Sizes

The Grand Mound Public Water System is designed to meet the minimum pipe sizes described in WAC 246-290-230. The chapters that relate to the system describe minimum diameters of distribution mains. These values are noted in Section 3.3.4 of this plan.

3.1.8 Telemetry System

The Grand Mound Public Water System uses the computerized telemetry program, WonderWare Version 10.1, to operate and control major functions of the water system. Wonder Ware uses both a dedicated telephone circuit and radio frequency transmissions to control functions at the source, distribution, and storage facilities.

3.1.9 Backup Power Requirements

According to Department of Health standards, each water system should have sufficient backup power to accomplish the following:

- ensure 30 psi water system pressure ADD; and,
- ensure fuel types and storage are consistent with the Wellhead Protection Plan for the water supply source.

Backup power is provided from the wastewater treatment plant's diesel powered auxiliary generator. This generator provides power to operate Well #1, the chlorination system, the pH adjustment system and the Supervising Controlled and Data Acquisition (SCADA) system. Well #2's backup power is by way of a portable generator unit that is available on the waste water treatment plant site. On-call staff is available 24 hours a day, seven days a week by way of a local call center.

3.1.10 Valve and Hydrant Spacing

The Development Standards for Water and Sewer Systems, Thurston County, Chapter 2, requires hydrants be provided:

1 At least one hydrant at all roadway intersections;

2 At a maximum interval of 330 feet or watermain in all areas except single family and duplex residential areas;

3 At an interval of 600 feet of watermain for single-family and duplex residential area;

4 When any portion of a proposed building is in excess of 150 feet from a water supply on a public street,on-site hydrants shall be required.

Valves shall be installed at a maximum interval of one valve every 1,000 lineal feet of watermain.

3.1.11 Other System Policies that Affect Performance and Design

The Grand Mound Public Water System benefits from additional design features and supportive public policies, which bolster the system's reliability and performance. This includes the use of water distribution main looping, and the placement of hydrants at the end of distribution mains.

The looping of distribution mains helps provide a dependable, better quality of water. Approximately 80 percent of Grand Mound's distribution main is either looped or capable of providing water service from either direction of the distribution main. Where distribution mains are not looped, hydrants are located at the end of water mains to allow for flushing.

3.2 Water Quality Analysis

The Grand Mound Public Water System routinely tests the quality of its water according to requirements set by the Washington State Department of Health and the Safe Drinking Water Act. The testing process is outlined in a Comprehensive Monitoring Plan described in Chapter 6. As a part of this plan, samples are taken bi-weekly for the presence of coliform.

A Department of Health summary of water quality reports on Nitrate levels for 2009 and 2010 is included in Appendix C. This summary does not show a trend of water quality variations for the parameters tested.

The system is currently fed by groundwater drawn from two wells. The water quality at each source is also monitored in accordance with state and federal regulations. A description of the scheduled water quality tests is noted in Chapter 6.

The Grand Mound Public Water System holds waivers from the Department of Health for Synthetic Organic Compounds/Pesticides (SOC).

Currently the system uses approximately 10 percent of its connection capacity based on Phase 1 build-out. The connections are found at various locations throughout the system. To maintain chlorine residuals and provide an acceptable quality of water, the system is flushed on a regular basis. System flushing and the estimated amount of water volume consumed due to flushing is discussed Section 2.2 of the Plan.

3.3 System Description and Analysis

The Grand Mound Public Water System is comprised of; two municipal wells, a single reservoir, a gas chlorination unit and pH modification unit that is located at the Grand Mound Wastewater Treatment Plant, A scaled map of water system service area and locations for each system component is provided in Figure 3-1. A schematic of the water system components in provided in Figure 3-2.

3.3.1 Source

Two wells withdraw groundwater to supply the Grand Mound Public Water System. Both wells withdraw water from the same aquifer. The wells are approximately 60 feet deep and located within 0.4 miles of each other. Well logs are attached to the Vulnerability Assessment Forms, Appendix N.

The well houses, their appurtenances, and transmission lines from the well houses to the chlorination facility are all approximately twelve years old and in good condition. The intake facilities have been monitored and inspected since the system began operating in 1999. To date, maintenance of the intake facilities has not been necessary, nor is any scheduled maintenance required in the foreseeable future.

Well House #1 is located approximately 0.1 mile from the system's chlorination and PH adjustment facilities. Well House # 2 is located approximately 0.5 mile from the chlorination and PH adjustment facilities.

Figure 3-3 Photograph of Well House #1 Exterior

Each well house includes a 2-stage centrifugal pump with a 20-horsepower motor, a water meter, a backflow prevention system, and other appurtenances necessary to meet Department of Health standards. Both wells are capable of producing a maximum of 1,000 gpm, with a sustainable rate of 462 gpm for well #1 and 529 gpm for well #2.

Figure 3-4 Photograph of Well House #1 Interior

Fluctuations in the water table were monitored informally when aquifer levels were measured during the wells' construction. With the exception of anticipated seasonal changes, this monitoring did not reveal any variations or trends.

3.3.1.1. Source Capacity Analysis

Thurston County has compared existing and projected demands for water from the Grand Mound Public System, and compared the data with existing water rights granted to the system.

The water demands are summarized below. The water rights are listed in Tables 4-1 and 4-2 of Chapter 4 in this plan.

- As illustrated in Table 2-2 of Chapter 2, during 2010, 68.70 MG of water were pumped from the Grand Mound Public Water system. In six years, the projected water demand will be 79.79 MG/yr, and within 20 years the demand will rise to 125.16 MG. Projected water demands are listed in Table 2-10.
- Existing water rights are expected to meet the annual average daily demand well beyond 2032, based on instantaneous flow rates and annual average withdrawal rates.
- The source capacity is based on equations in Chapter 6 of the Water System Design Manual. These equations are shown below. Equation 6-1 is used to determine the allowable ERUs associated with source capacity based on an annual demand time period. Equation 6-2 is used to determine the allowable ERUs associated with source capacity based on a maximum day demand. Well No. 1 can pump 462 gpm and Well No. 2 529.

- **Equation 6-1: ERU Based on Annual (Average) Demand**

  - $$N_a = \frac{V_a}{(365)(ADD)} = \frac{\sum_{a}^{1}(Q_a)(t_a)}{(365)(ADD)}$$

- Where: N_a = *number of ERUs based on annual demand*

  V_a *(gpm)* = *the annual volume of water available and used from all sources for the system (except emergency sources)*

  - *ADD (gpd/ERU) = average daily demand per ERU*
  - Q_a *(gpm)* = *flow rate from source "a," 462 gpm.*
  - T_a *(min/yr)* = *time that source "a" is used per year*

- For the Grand Mound Public Water System:

  - V_{a2017} = *the annual volume of water available and used from all sources for the system*
  - V_{a2017} = 79,794,442 (see Table 2-10)
  - ADD = 295 gpd/ERU (See Table 2-10 above)
  - Assume T_a = 18 hour/day = 394,470 min/yr.
  - N_a = $\frac{462\,gal/\min * 394{,}470\min}{365 * 295\,gpd/ERU}$ = 1,695 ERUs

- **Equation 6-2: ERU Based on Maximum Daily Demand**

  - $$N_m = \frac{V_d}{MDD} = \frac{\sum_{d}^{1}(Q_d)(t_d)}{MDD}$$

- Where: $N_{m\ 2017}$ = *number of ERUs based on maximum daily demand in 2017*
  - V_d *(gpd$_{max}$) = total volume of water available and used for a maximum day's demand for the system in 2017.*
  - *MDD (gpd/ERU) = maximum daily demand per ERU in 2017*
  - Q_d *(gpm) = flow rate of source "d," = 529 gpm*
  - t_d *(min/day) = time that source operates per day at 18 hours/day*

- For the Grand Mound Public Water System:
  - $V_{d\ 2017}$ = instantaneous flow rate for one day in 2017
  - $V_{d\ 2017}$ = 79,794,442*1.7 (peaking factor)/365
  - $V_{d\ 2017}$ = 371,391 gal/day
  - MDD_{2017} = 502 gpd/ERU (see See Table 2-10 above)
  - T_a = 18 hours or 1,080 min.(assumed)
  - $N_{m\ 2017} = \frac{529 * 18 * 60}{502 gpd / ERU}$ = 1,138 ERUs

- In summary, by 2017, the Grand Mound Public Water System's capacity will meet the annual daily demand.

- **SOURCE CAPACITY ANALYSIS 2017**

1,691 ERUs	Based on Annual (Average) Demand
1,138 ERUs	Based on Maximum Daily Demand
999 Connections Approved by DOH Check	

3.3.2 Water Treatment

3.3.2.1 General Description and Condition

The Grand Mound Public Water System treats its water by adding chlorine gas and sodium hydroxide to raw water produced by both wells. The treatment process occurs at one central facility. This facility is located in a ventilated concrete block room adjacent to the Grand Mound Wastewater Treatment Plant.

The system uses chlorine gas to disinfect the water, prevent the growth of algae and microorganisms, and to prevent unpleasant tastes and odors. The chlorination treatment system is approximately twelve (12) years old and is currently in good condition. The chlorination and pH adjustment systems have a life expectancy of 50 years. A photograph of the chlorination injection location along the water main is shown below.

Figure 3-5 Photograph of the Chlorination Injection Equipment and Location

- The chlorination treatment process is run by a Supervisory Control and Data Acquisition (SCADA) system, which monitors and controls the addition of chlorine and pH modification system. The process is continuous and injects gaseous chlorine into the supply water at a typical rate of 1-2 mg/l. The target residual for disinfecting water in the distribution system is 0.25 ppm. At this rate, microorganisms associated with disease cannot survive.
- The chlorination system is designed to provide maximum instantaneous treatment to a flow rate of 1,000 gpm. No fluctuations or trends in treatment capacity have been observed for this system.

The treatment system faces two operational difficulties. The first is a reoccurring issue with low chlorine residual levels in the treated water at the storage facility. This is because customer demand for water is often so low that water is kept in the storage facility for long periods of time. The second difficulty is a technical malfunction with equipment when both wells are in operation. Resolution to these items is addressed later in this chapter.

3.3.2.2 Water Treatment Capacity Analysis

Based on the existing and projected demands for water as identified in Chapter 2, the current water treatment system is capable of meeting current and future water needs.

3.3.2.3 Anticipated Future Water Treatment

At this writing, no additional water treatment of raw water is anticipated for the system.

3.3.3 Storage

3.3.3.1 General Description and Condition

The Grand Mound Public Water System currently includes one storage reservoir (Figure 3.6). This facility is a welded steel standpipe, 45-feet high and 42-feet wide. The standpipe was built in 1998, along with most of the other system facilities. The standpipe is located on a hillside east of Interstate 5 and outside of the system boundary. The location of the standpipe is shown in Figures 3-1 and 3-2.

Figure 3-6 Photograph of the System's Storage Facility

The storage facility has a capacity of approximately 0.5 MG, and it is in good condition, the tank was inspected in 2006. The anticipated life expectancy of the facility is 50 years

This storage facility is contained within the system's one pressure zone. The water system's wells currently have the capacity to send about 1,000,000 gallons to the storage facility each day. The average daily demand in 2011 was 26,000 gallons. Resulting turnover of water is approximately 18 days.

With the construction of the Great Wolf Lodge the Thurston County fire marshal has recommended the fire flow be increased to 2,000 GPM for duration of 120 minutes, which is approximately 240,000 gallons.

3.3.3.2 Storage Capacity Analysis

As discussed in Chapter 2, the Grand Mound Public Water System is expected to have up to 775 ERUs connections by the projected 6-year planning period (2017), and up to 1,215 ERUs within the 20-year period (2032). Great Wolf is expected to require 425 ERUs in 2012 and up to 630 ERUs in 2032. Other commercial users will require 47 ERUs in 2012 and 70 ERUs by 2032.

MINIMUM REQUIRED STORAGE FACILITY VOLUMES							
	Reservoir Parameter (gal)						
Design Year	Operational Storage	Equalizing Storage [1.]	Fire Suppression Storage	Standby Storage [2.]	Dead Storage	Required Storage	Available Storage
2012	82,905	0	240,000	135,200	200	458,305	500,000
2017	82,905	0	240,000	155,000	200	478,105	500,000
2032 [3.]	Unkn	Unkn	Unkn.	Unkn	Unkn	Unkn	Unkn

Notes

1. Two days(ADD)N< $t_m(Q_s\text{-}Q_L)$ until 2031. See Table 10C. Use 200 gal per DOE Design Standards.
2. 2012 ERUs = 676; 2017 ERUs= 775. See Table 2-10C
3. Demand conditions and required storage are difficult to predict.

Table 3-1, Storage Facility Volumes

Operational Storage is determined using the 42-foot diameter reservoir operating through a height of 8 feet (Shut off at 315.5, pumps on at 307.5 = 8 feet).

Based on the equations contained in the Water System Design Manual and the forecasted demand for water, both the equalizing and standby storage are unnecessary. This is due to the water system's large pumping capacity relative to the low demand. Therefore, most of the storage may be saved for operational uses or fire suppression.

The above storage volumes provide for a fire flow at a rate of 2000 gpm for two (2) hours. Additionally, hydraulic analysis indicates the system, using the reservoir capacities as described above will require an additional storage reservoir capacity as the system expands.

3.3.4 Distribution System

3.3.4.1 General Description and Condition

The water distribution system for the Grand Mound Public Water System consists of approximately 37,000 linear feet of water main piping. The water main ranges in size from 8 inches to 14 inches. All water mains are currently made of PVC piping and are contained within one pressure zone. This pressure zone typically operates at a pressure of 50-60 psi at most locations. The majority of piping was installed in 1998 with additions constructed as development occurred and is generally in good condition.

The typical separation between water and sewer lines is 10 ft, minimum. However, where steel encasements have been bored under state highways, the separation is less than two (2) ft. In these cases, each pipe is sleeved in a secondary ductile iron pipe for protection purposes.

The valve locations and hydrant spacings meet the state requirements. The system requires valves to be spaced at a maximum interval of one valve every 1,000 ft and hydrants to be spaced every 600 ft in residential areas and every 330 ft in commercial areas.

This system does contain dead-end lines. These lines are shown in Figure 3-1, of the water system infrastructure map. Dead-end lines are equipped with hydrants to facilitate system flushing.

Leaks in the conveyance system are sporadic, however, they do occur. When leaks occur, they are often caused by service line breaks due to independent contractor activities, auto impacts to fire hydrants, and corrosion of system components. System leaks include conveyance system breaks and component failures.

Due to the age and type of materials used in the conveyance system, there is currently no program in place to replace any part of the conveyance. The life expectancy of the PVC piping is 50 years.

A dedicated computer workstation, using the SCADA system, is used to monitor and report system pressures. Data collected by the SCADA system is recorded onto the workstation should future analysis be necessary. The SCADA system records historical flow rates at both wells, the system pressure at both wells, the reservoir level, the reservoir alarm settings, the chlorinator feed speed control, and other pertinent data.

3.3.4.2 Hydraulic Capacity Analysis

The Grand Mound Public Water System uses the hydraulic modeling software H2ONET, for AutoCAD 2011, from Innovyze. This software is used to evaluate the hydraulic capacity of the water system. No system deficiencies were found when the model was calibrated. Appendix G provides modeling test results that calibrate, forecast, and map the modeling network.

H2ONET models are based on the concept of energy conservation using the Hazen-Williams equation and related coefficients. A crucial assumption made for this model is the Hazen-Williams roughness constant (C) for pipe roughness. This model uses C = 150, while the design for the PVC pipe used in water system varies with age from C = 130-150.

For the model to accurately simulate real-world conditions, accurate water-system data is required. This includes the physical properties of pipe, junctions and fittings, reservoir(s), and well(s). The physical properties of each of these elements must be accurately described to create an accurate simulation. Physical properties may include dimensions, elevations, material type, pipe lengths, fitting type, etc. With the exception of junction elevations, this model uses the physical properties from the Grand Mound Public Water System based on record drawings produced by Earthtech in 1998. Junction elevations are taken from Thurston County Geodata's two (2) ft contours, with the junction elevations taken at 3-feet below the ground surface.

Successful modeling also requires the accurate input of information related to water system operations and water system demands throughout the system. This model uses the system operations based on the Earthtech design report for Grand Mound Water System – Phase 1. The system demands can be either actual (based on records) or assumed. For model verification, this model uses actual demands from 2010

H2ONET is also capable of generating alarms during the modeling process to warn of problems in the water system. High- and low-pressure limits were established for the Grand Mound Public Water System. The alarms warn the modeler of pressure variations exceeding the lower limits based on WAC 246-290-230 and the higher limits of 80 psi and 100 psi.

The model also included other assumptions specifically tailored for Grand Mound, including the location of demand junctions, or "nodes." These nodes were placed at locations where fire hydrants exist and where there are pipe junctions

For calibration purposes, the model is provided with actual flows to record system responses. During these flow tests, system response data (such as flow rates, system pressures, water inputs to the system, and reservoir elevations) are all recorded. Alarms are produced if pressures at any point in the system fell below 30 psi during PHD, or 20 psi during fire flow.

In this instance, the data collected includes the actual known large flow from a fire hydrant (located at a specific junction in the model), a water system pressure reading from an adjacent hydrant, water level reading in the reservoir, and the operational status of the source wells. The corresponding multiple estimated residential flows are based on usage records for a period similar to that during the calibration flow test.

After performing the calibration flow test, some of the collected system response data are entered into the model. Scenarios are run using the collected data, and the model output data is compared to the remaining collected data. If the model output data corresponds with remaining collected data, the model is considered accurate.

However, if the model output data does not correspond with the remaining collected data, the model should be adjusted to more accurately simulate the response of the water system. Modeling elements that might be adjusted include pipe roughness coefficients, minor losses at fittings, and general system operation and demand data.

For the calibration of the Grand Mound Public Water System model, the assumed Hazen-Williams pipe roughness constant of 150 provided a conservative model response. All modeling results displayed less pressure than those actually observed in the field. Therefore, the C-value should remain at 150 until the age of the pipe produces lower pressures.

Use of this value provided a model that resulted in junction pressure differences between the model data and collected data typically less than 3 psi (or approximately 5%). This is an acceptable difference for calibration purposes.

3.4 Summary of System Deficiencies

The Grand Mound Public Water System has completed a review of system deficiencies. These deficiencies have been grouped in Table 3-2 below by category of deficiency and rated based on priority

GRAND MOUND WATER SYSTEM DEFICIENCIES	
Description of Deficiency	Priority Rating
<u>Category 1 - Source Issues</u>	
Both current wells are relatively shallow in depth. At the current depths with the transmissive soils overlying the wells, the wells have an increased potential risk of being influenced by surface water run-off.	4
Currently well #2 does not contain auxilliary power.	6
<u>Category 2 - Treatment Issues</u>	
None	
<u>Category 3 - Conveyance Issues</u>	
The conveyance system contains only two (2) dedicated sampling stations.	8
The distance between the existing hydrants and corresponding foot valves is minimal.	11
Some distribution mains dead end. The water in those dead ends is more likely than water at other locations to become stagnant.	10
<u>Category 4 - Storage Issues</u>	
More storage may be required needed depending on actual growth.	7
At this wring the reservoir is not provided with auxiliary power. Mobil power is available in near proximity.	9

Table 3-2, System Deficiencies

Some deficiencies listed above are low priority and will be corrected in the future as additional connections to the water system are made or as the developed water system standards are implemented.

Therefore, these projects have not been chosen to advance as formal improvement projects. These projects include the reduction of stagnant water in the reservoir, the reduction of stagnant water in dead end locations, and the increased distance between hydrants and foot valves.

All other deficiencies are noted as improvement projects in Section 3.5.

3.5 Selection and Justification of Proposed Improvement Projects

The Grand Mound Public Water System produces a 6-year capital facility plan (CFP) for approval by the Thurston County Board of Commissioners each year. Commissioners refer to the plan when making budgeting decisions and the plan drives how projects are prioritized. System deficiencies noted in Section 3.4 that can be corrected with improvement projects are included in either the 6-year or 20-year CFP list.

Tables 3-3 summarizes projects based on this 6-year CFP, respectively. The costs are estimated based on full implementation of the project. Sections 3.5.1 through 3.5.7 further describe the projects, including system upgrades to construction of a new second reservoir.

PROPOSED IMPROVEMENT PROJECTS FOR SIX YEAR PLANNING [1.]		
Projects	Location	Expected Costs
Grand Mound Water System Upgrades	System Wide	$60,600
Grand Mound Way Watermain Loop	Grand Mound Way	$1,000,000
Second Grand Mound Reservoir and Booster Station	Unknown	$2,025,000
Land Acquisition for Well # 3	Unknown	$150,000
Grand Mound Well and Pump # 3	Unknown	$350,000
Land Acquisition for Well # 4	Unknown	$150,000
Grand Mound Well and Pump # 4	Unknown	$350,000
EXPENDITURE TOTAL		**$4,085,600**
Notes 1. These projects will be completed with other than Operating Funds resources		

Table 3-3, Improvements for the Six Year Planning

3.5.1 Grand Mound Water System Upgrades

Installation of well drains for wells #1 and #2, Water treatment system upgrades, water distribution upgrades, eliminated butter fly valves, service and upgrade chlorination equipment and add new and upgrade water quality sample stations.

3.5.2 Grand Mound Way Watermain Loop

Installation of a new water main from Grand Mound Way to existing treatment plant.

3.5.3 Second Grand Mound Reservoir and Booster Station

Siting, design and construction of a second reservoir and booster station to meet future development and fire flows for emergency services when new water demands require.

3.5.4 Land Acquisition for Well # 3

Locate and purchase land for future well #3.

3.5.5 Grand Mound Well and Pump #3

Development of well #3 will involve drilling of a new well and capping of the well for future use. Future development of this well depends on future demand but would include a new well pump station and connecting the well into the existing water distribution network.

3.5.6 Land Acquisition for Well # 4

Locate and purchase land for future well #4

3.5.7 Grand Mound Well and Pump # 4

Development of well #4 will involve drilling of new well and capping of the well for future use. Future development of this well depends on future demand but would include a new well pump station and connecting the well into the existing water distribution network.

Chapter 4

4.0 WATER RESOURCE ANALYSIS & WATER USE EFFICIENCY (WUE)

The Thurston County Conservation Program compares existing water rights with future water needs.

4.1. Conservation Program Development and Implementation

The Grand Mound Public Water System currently has sufficient water rights and system capacity to satisfy all customer demands through the 6-year and 20-year planning horizons. At this time the system's conservation program meets the State's minimum requirements.

4.1.1 Conservation Objectives

Through its conservation program, the Grand Mound Public Water System strives to reduce the maximum daily demand upon the system. The following objectives are identified:

Reduce unaccounted for water.

Maintain a loss rate of less than 10%.

Reduce the amount of water used for landscaping.

Water Use Efficiency Measures

At a minimum, the State of Washington requires the following conservation measures:

- Meter all water supply sources;
- Publicly promote the conservation program;
- Consider the benefits and costs of installing individual service meters and implementing a conservation rate structure; and
- If the unaccounted water is greater than 10%, implement a program to detect and repair leaks, evaluate and repair faulty meters, and correct other operation problems that may be causing the unaccounted water problem.

For a small Group A water systems, the state recommends conservation programs include the following components:

- Public education to promote the conservation program, using bill inserts, Web information and other methods.

Technical assistance.

4.2 Source of Supply Analysis

Based on the 20-year forecast for the Grand Mound Public Water System outlined in Chapter 2, no additional water rights will likely be necessary to operate the water system. If developers request an expansion to service-area boundaries in the future, they must supply and dedicate water rights to the system. The volume of dedicated water rights must meet or exceed the forecasted demand for the proposed expansion. By requiring dedication of water rights in this manner, the system can expand beyond the forecasted area while maintaining a sufficient supply of water.

4.2.1 Enhanced Conservation Measures

Since the Grand Mound Public Water System's current water rights are expected to sufficiently meet current and future water needs, the system has no plans for pursuing additional water rights at this time. Subsequently, no enhanced conservation measures will be noted.

4.2.2 Water Right Changes

Thurston County recently purchased water rights C-22A, C-10790, C-8031 and CSWC-321A. The new water rights add 496.75 Annual acre feet to the water rights already owned by the County for a total of 1023.15 acre feet per year.

4.2.3 Interties

See Section 4.5.

4.2.4 Artificial Recharge

At this time, the Grand Mound Public Water System does not perform any activities regarding artificial recharge.

4.2.5 Use of Reclaimed Water and other Non-Potable Sources

At this time, the Grand Mound Public Water System does not use reclaimed or any other non-potable, water sources.

4.2.6 Treatment

No additional sources of supply are being pursued as a result of water quality problems.

4.3 Water Right Evaluation

4.3.1 Permits, Certificates, Claims, and Applications

The Grand Mound Public Water System possesses six water rights, which are currently appropriated. These water rights provide sufficient water to meet the 20-year forecast outlined in Chapter 2. A complete list of these water-right permits, certificates, or claims are noted in Tables 4-1 and 4-2 (Water System Planning Handbook Tables 3 and 4, respectively) located at the end of this chapter.

4.3.2 Narrative Description

The Grand Mound Public Water system is supplied by groundwater that is extracted from wells. The locations of these sources are located in Township 15 North, Range 3 West, as shown in Figure 3-1. The depths of the wells are noted in Section 3.3.1. The sources provide water for domestic, industrial, and commercial water use. This water will be consumed in the area in accordance with the water rights. This area currently consists of the utility local improvement district shown in Figure 3-1.

The period of use for these water rights is noted as year-round, or continuous. This period of use, along with a list of corresponding provisions, is noted Tables 4-1 and 4-2.

4.3.3 Water Rights, Current Water Usage, and Projected Needs

Based on the information shown in Tables 4-1 and 4-2, existing water rights meet the forecasted 20-year water demand noted in Chapter 2. Therefore, it is anticipated that additional water rights will not be needed for the time period noted.

4.3.4 Water Reservations

The Grand Mound Public Water System does not currently hold any water reservations granted by the Department of Ecology.

4.4 Water System Reliability Analysis

The Grand Mound Public Water System provides a dependable source of water by maintaining reliable water sources, water rights, and facilities. The reliability of the water system is further analyzed below. In addition, using total pumpage rate verses metered sales equals distribution system leakage (DSL) of 2.4 percent.

4.4.1 Summary of System Reliability Efforts

4.4.1.1 Source Reliability

The source of supply to the water system consists of two shallow wells placed in transmissive soils and located adjacent to the Chehalis River and other smaller tributaries. Historical data trends on both wells have shown little variation of aquifer levels (based on well production logs) since their inception in 1996.

The quality of the water supplied by the source wells has also remained consistent. When the wells were constructed, the need for water quality treatment, including treatment for pH levels, was noted. The pH Adjustment System was constructed in 2008.

In conjunction with the wellhead and water quality protection efforts noted in Chapter 5, the sources for the water system are considered reliable.

4.4.1.2 Water Right Adequacy

With the existing water rights listed in the Water System Plan**,** WATER RIGHTS SELF ASSESSMENT – 6 YEAR FORECAST Table and 20 YEAR FORECAST Table exceeding the forecasted 20-year water demand noted in Chapter 2, the water rights for the Grand Mound Public Water System are adequate and, therefore, considered adequate.

4.4.1.3 Facility Reliability

If an emergency or power outage occurs, the Grand Mound Public Water System is capable of operating on the existing diesel-powered auxiliary generators and supplying enough water to meet the forecasted 20-year demand. This includes the fire flow requirements noted in Chapter 3.

The proposed improvement projects related to system reliability (as noted in Chapter 3) are all optional. Therefore, the system is considered sufficiently reliable.

4.4.2 Water Use Efficiency Planning

The Public Works Department has developed a preliminary Water Use Efficiency Policy and is currently developing a Water Use Efficiency Plan based on the 2007 Water Use Efficiency Guild Book change date, Department of Health. The Department of Public Works current policy recognizes that water shortages may be caused by a number of circumstances, such as drought, water contamination, shallow wells and/or the loss of a water source.

The Department of Public Works had a Water Conservation Forum for the Grand Mound Water System on May 23,2011in the Rochester High School Library. We explained to the area residents that the Water Use Efficiency Plan information will be incorporated into the Water System Plan and that we needed to have an achievable goal in the plan. We decided that our goal would be to reduce the water consumption from our wells. The method to accomplish this would be to establish a tiered rate structure that would encourage residents to save money by using less water and purchase the water at a lower commodity rate then that available under a flat rate structure.

The Public Works Department is prepared to implement a phased response depending on the severity of the shortage. The phases of response are:

Phase 1: Voluntary conservation

Goal: Reduce water use by 5 -10%.

Method:

- Voluntary reduction of customer lawn and garden irrigation.
- Reduce the number of toilet flushes.
- Voluntary reduction of nonessential commercial and industrial use.

Public Information and Education

During the voluntary conservation phase, the Public Works Department will inform utility customers of conservation goals, the appropriate conservation measures, and future actions that might be taken if conservation goals are not met. The department will use the following methods to inform customers:

- Press releases to local newspapers;
- Utility billing inserts; and
- Postings on the department Web site.
- Implement a tiered water use rate structure

Phase 2: Mandatory conservation

Criteria: Conservation goals are not being met or the nature of the water shortage requires more stringent measures.

Goal: Reduce water use by 10 – 30%.

Method:

The Board of County Commissioners approves a resolution designating mandatory conservation measures and civil penalties for noncompliance

- Irrigation would be allowed only on designated days and for a limited number of hours.
- Customers would be asked to reduce the number of toilet flushes.
- Commercial and industrial customers would confine water use to essential activities. (For example, restaurants would provide drinking water to customers only upon request.)

Public Information and Education

During the mandatory conservation phase, the Public Works Department will inform utility customers of conservation goals, conservation measures, and penalties for failing to comply with mandatory measures, and future actions that might be taken if mandatory conservation goals are not met. The department will inform customers through:

- Residential, industrial and commercial door hangers;

- Press releases to local newspapers;
- Utility billing inserts; and
- Information posted on the department Web site.

Phase 3: Water Shortage Emergency

Criteria for Phase 3: Conservation goals are not being met or the nature of the water shortage requires more stringent measures.

Goal: Reduce water use by greater than 30 %, provide adequate drinking water supplies.

Method:

- Board resolution declaring a water shortage emergency.
- Ban on irrigation.
- Reduce the number of toilet flushes
- Ban on commercial and industrial water use as appropriate in order to maintain public drinking water supplies.
- Activation of Thurston County's Emergency Response Plan to arrange for drinking water supplies in concert with state, federal and nongovernmental agencies.
- Implementation of long-term contingency plan.

Public Information and Education

During a water shortage emergency, the Public Works Department will inform utility customers of conservation requirements, conservation measures, penalties for failing to comply, and the next actions that will be taken should emergency conservation goals not be met. The department will also inform customers where, and when, they could obtain emergency drinking water. The department will inform customers through:

- Residential, industrial and commercial door hangers;
- Press releases to local newspapers, radio, and television media;
- Utility billing inserts;
- Posting on the department Web site; and
- Emergency broadcast as applicable.

4.5 Interties

A permanent intertie with the Rochester Water System is not considered feasible due to incompatible corrosion control treatment processes between the two systems. Rochester uses calcium carbonate while Grand Mound uses sodium hydroxide. However, while a permanent intertie is not feasible, the two water-systems do share a common boundary between the non expanding Group "A" Public Water System known as Prairie Vista Water system and Grand Mound System. At this location, there is sufficient infrastructure to implement an emergency intertie within a relatively short timeline should either system require and a short-term emergency source. Over the six-year planning horizon, Grand Mound will coordinate with Rochester to establish an emergency intertie agreement at the Prairie Vista/Grand Mound boundary and other locations as the Grand Mound system expands.

4.6 Reclaimed Water

The Public Works Department has anticipates developing an Engineering Report that evaluates the methods to create Class A Water from sewage treatment plant effluent. The end use of class "A" water has not been determined, but maybe infiltrated using an approved method for the purpose of aquifer recharge.

4.7 Meter Service

The Public Works Department currently meters all water connections (except fire hydrants). All new connections are required to have a water meter.

4.8 Consumer confidence Report

Each year the department prepares a consumer confidence report which is distributed to all water customers.

Table 4-1

WATER RIGHTS SELF ASSESSMENT – 6 YEAR FORECAST

PERMIT CERTIFICATE OR CLAIM #	NAME ON DOCUMENT	PRIORITY DATE (List oldest first)	SOURCE NAME/ NUMBER	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	EXISTING WATER RIGHTS		FORECASTED WATER USE FROM SOURCES (6-year Demand)		FORECASTED WATER RIGHT STATUS (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
Permits/ Certificates 1. G2-28527P	THUSTON COUNTY	JUNE 12, 1992	WELLS 1&2	PRIMARY	870	521	425	61	445	460
2.GA-20904C	BARRET'S MOBILE HOMES	MARCH 29, 1973	"	ADDITIVE	80	5.2	0	0	0	0
3.C-220A	THURSTON CO.	DEC. 1, 1948	WELLS 3 &4	"	70	10.5	0	0	0	0
4.C-10790	"	AUG. 13, 1969	"	"	373	83.25	0	0	0	0
5.C-8031	"	FEB. 7, 1961	"	"	314	140	0	0	0	0
6.CSWC-3210A	"	SEPT. 14, 1943	"	"	476	263	0	0	0	0

TOTAL	**************	*********	*********	****************	2,183	1,023.2	425	61	525	465.4

INTERTIE NAME/ IDENTIFIER	NAME OF PURVEYOR PROVIDING WATER	EXISTING LIMITS ON INTERTIE USE		FORECASTED CONSUMPTION THROUGH INTERTIE		FORECASTED INTERTIE SUPPLY STATUS (Excess/Deficiency)	
		Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
1. NONE							
2.							
3.							
4.							
TOTAL	***	0	0	0	0	0	0

PENDING WATER RIGHT APPLICATION (New/Change)	NAME ON APPLICATION	DATE SUBMITTED	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	PENDING WATER RIGHTS	
				Maximum Instantaneous Flow Rate (Qi) Requested	Maximum Annual Volume (Qa) Requested
1. NONE					
2.					
3.					
4.					

Table 4-2

WATER SYSTEM Plan

WATER RIGHTS SELF ASSESSMENT – 20 YEAR FORECAST

PERMIT CERTIFICATE OR CLAIM #	NAME ON DOCUMENT	PRIORITY DATE (List oldest first)	SOURCE NAME/ NUMBER	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	EXISTING WATER RIGHTS		FORECASTED WATER USE FROM SOURCES (20-year Demand)		FORECASTED WATER RIGHT STATUS (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneou s Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneou s Flow Rate (Qi)	Maximum Annual Volume (Qa)
Permits/ Certificates 1. G2-28527P	THURSTON COUNTY	JUNE 12, 1992	WELLS 1 & 2	PRIMARY	870	521	450	132	420	389
2.G2-20904C	BARRETT'S MOBILE HOMES	MAR. 29, 1973	WELLS 1 & 2	ADDITIVE	80	5.4	0	0	80	5.4
3.C220A	THURSTON COUNTY	DEC. 1, 1948	WELLS 3 & 4	"	70	10.5	0	0	70	10.5
4.C-10790	"	AUG. 13, 1969	"	"	373	83.25	0	0	373	83.25
5.C-8031	"	FEB. 7, 1961	"	"	314	140	0	0	314	140
6. CSWC-3210A	"	SEPT. 14, 1943	"	"	476	263	0	0	476	263
Claims										

TOTAL	**************	*********	*********	****************	2,183	1,023.2	450	132	1,733	891.15

INTERTIE NAME/ IDENTIFIER	NAME OF PURVEYOR PROVIDING WATER	EXISTING LIMITS ON INTERTIE USE		FORECASTED CONSUMPTION THROUGH INTERTIE		FORECASTED INTERTIE SUPPLY STATUS (Excess/Deficiency)	
		Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
1. NONE							
2.							
3.							
4.							
TOTAL	**						

PENDING WATER RIGHT APPLICATION (New/Change)	NAME ON APPLICATION	DATE SUBMITTED	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	PENDING WATER RIGHTS	
				Maximum Instantaneous Flow Rate (Qi) Requested	Maximum Annual Volume (Qa) Requested
1. **NONE**					
2.					
3.					

Table 4-1

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Chapter 5

5.0 SOURCE WATER PROTECTION

The objective of this chapter is to describe the Grand Mound Wellhead Protection Program.

5.1 Wellhead Protection Program

Pursuant to state regulations, Thurston County prepared a wellhead protection program for the Grand Mound Public Water System.

5.1.1 Overview

Thurston County implemented an ambitious wellhead protection program through the Thurston County Nonpoint Source Pollution Ordinance (Appendix F**)**. The program includes the following elements:

- **Land Use Development Review:** Thurston County Environmental Health reviews all new land use development applications within the Grand Mound Public Water System area. Thurston County's Environmental Health assesses the risks associated with the proposed projects and requires, as applicable, an inventory of potential groundwater contaminants. The department also requires new applicants to develop spill plans and provide secondary containment for hazardous materials, including petroleum products. Environmental Health provides educational materials and technical assistance to help them achieve these goals (Appendix F).
- **Public Information and Education:** Environmental Health offers the Business Technical Assistance Program to help businesses understand and remain in compliance with Article 6 of the Nonpoint Source Pollution Ordinance. Through the program, Environmental Health staff members visit businesses located in at-risk areas, such as wellhead protection areas. Environmental Health has routinely inspected all businesses using hazardous material within the Grand Mound Wellhead Protection Area since 2001. Reports are included in Appendix F. Inspections beginning in 2011will use the latest well head protection areas delineated for this report.
- **Enforcement: Thurston County's** Nonpoint Source Pollution Ordinance includes regulatory provisions that allow for civil and criminal penalties for noncompliance (Article 6, Section 4.1a and Section 4.1b & c – see Appendix F).

5.1.2 Susceptibility Assessment

The Grand Mound Public Water System operates two wells to withdraw groundwater. The Ground Water Contamination Susceptibility Assessment surveys for Well #1 and Well #2 are located in Appendix F. The Environmental Health Susceptibility Assessment surveys will incorporate new inspection areas in accordance with the new well head delineations created in 2011 for this plan update.

5.1.3 Wellhead Protection Area Information

In March of 2010, the Environmental Health Department prepared new ground water flow maps from ground water data collected from a 40 well network from 2008 thru 2010. Hydraulic gradients (slope of the water table) and ground water flow velocities were recalculated from these new maps along with flow directions and new geologic cross-sections in Appendix O.

Figure 5-1 provides a map of the well head protection areas for wells 1 and 2. Figure 5-2 provides a contamination source inventory for the Grand Mound Public Water System. In addition, a new ground water numerical model was built for the Scatter Creek Aquifer system for the purposes of studying contaminant movement from nitrates (septic field impacts) and wellhead delineations (Appendix O)

Groundwater flow in the Scatter Creek Aquifer is east to west with a south-west flow component towards the Chehalis River in the Grand Mound Area. Hydraulic gradient (dh/dl) ranges from .0027 to .0031 feet per foot at the end of the summer season to the peak of winter. The surface of the ground water table was found to fluctuate as much as 8 to 25 feet per year and calibrated ground water velocities (V) ranged from 11 to 15 feet per day.

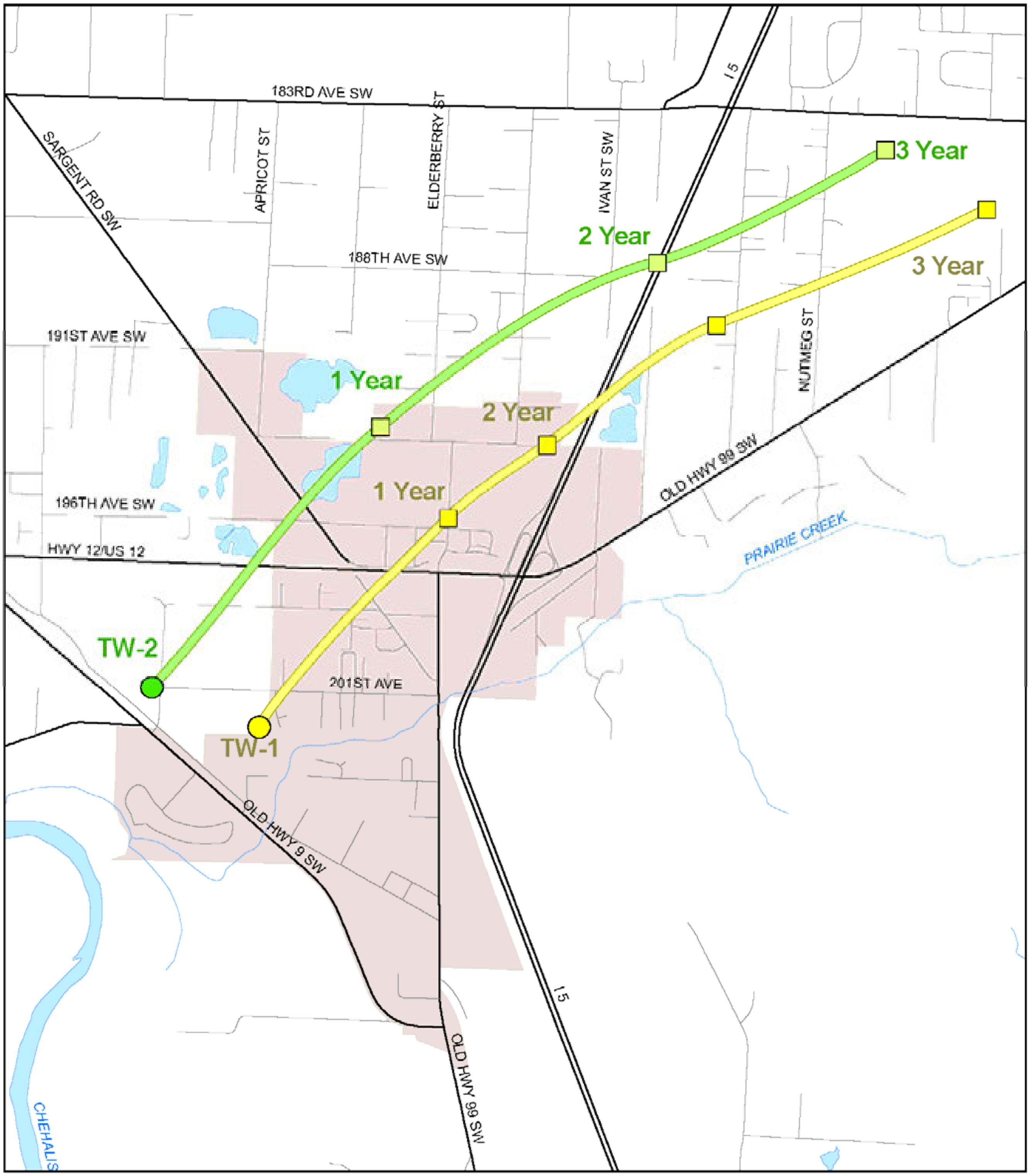
Ground water flow was numerically modeled using Visual Modflow 4.2. New well head capture zone delineations were simulated from a calibrated model. Calibration was done to the latest hydraulic head data collected from a 40 well network over the last few years. The Environmental Health Department completed the 3D model in October of 2010 (Appendix X – Numerical Ground Water Model Report) and prepared new well head simulations for the 2011 Water Comprehensive Plan update. In addition, another round of analytical modeling was done in April of 2011 using WhAEM2000 version 3.2.1. Both the numerical modeling with Visual Modflow and the EPA well head delineation software mimic the same particle paths or well head capture zones. In addition, a preliminary exercise was done placing two 'theoretical' wells (TW-3 and TW-4) northwest of the existing well field (where nitrate concentrations were lower than those coming into the existing well field). This modeling exercise will be used for preliminary planning purposes for acquiring additional water rights as well as well head capture zone delineations. A brief summary was prepared for the additional well placements and is attached as Appendix O.

As illustrated in Figure 5.1a the new well head capture zones for the 1-year and 3-year numerical modeling show 'arched' flow paths. The one year capture extends 5600 feet to the northeast at an angle of approximately 55 degrees from each of the existing municipal wells. This angle then rotates down to an estimated 36 degree angle to a distance of 16,881 feet for the three year zone of capture from the well field (TW-1 and TW-2) as well as for theoretical wells TW-3 and TW-4.

These capture zones are larger than those previously modeled in 1994. This difference is due to using a large calibration dataset which did not exist in the early 1990's. Calibration to real time datasets allows the ground water numerical model to be adjusted and the hydraulic conductivity was lifted to 1000 feet per day (K=1000 ft/day). This new overall hydraulic conductivity for the Scatter Creek Aquifer also corresponds with pumping test derived values for the well field.

The new ground water numerical modeling coupled with the past pumping test data support that the geology of the Scatter Creek aquifer is a matrix of large sized particles (gravel and cobbles) from glacial outburst floods known as the Qygo3 (Yelm Lobe) deposits (WADNR Maps).

These highly transmissive deposits not only pulse higher velocity ground water towards the well head, it also creates a high volume of discharge capable of diluting and keeping the well field from prolonged contamination in the event of spill. We are able to discern the 'drop' in nitrate concentrations over the last three years due to the closure of large agricultural farms.



Waypoint
Well
Travel Path
Urban Growth Area
Stream

Figure 5-1: Wellhead Protection Area
Grand Mound Public Water System

N
W E
S

0 0.25 0.5 1 Miles

Map Created by the Thurston GeoData Center 08/12/2011 abc
Wellhead waypoint data provided by Nadine Romero, Hydrogeologist

5.1.4 Contaminant Source Inventory

A contaminant source inventory was conducted for the original 1999 Water System Plan and includes a list of properties with material or activities that could contaminate surface water or groundwater. In April and May of 2001 Thurston County Environmental Health updated the inventory as part of the Nonpoint Source Ordinance's Business Technical Assistance Program. In March, 2010, the contaminant source inventory was again updated (Figure 5-2 and Table 5-1).

Septic Fields Estimated in 2010

During the numerical ground water model construction in 2010, estimates were made of septic fields added hydraulically 'upgradient' of the well field in new unsewered subdivisions. Preliminary counts estimated from the Thurston County Geodata maps were around 800 homes.

These counts were also placed in the preliminary contaminant fate and transport modeling simulations:

MAP ID	OCCUPANCY	ADDRESS	PARCEL
1	76 Gas Station	6212 SW 197th Ave	55702000200
2	AAA Auto Parts & Sales	20223 Old Hwy 99	51304900200
3	Atlas Concrete Products	19221 Sergeant Road	55801700400
4	Aztec Storage Containers	19946 Old Hwy 99	13512320300
5	C & D Propane Storage	20937 Old Hwy 99	42200900100
6	Conoco	6011 SW 193rd Ave	55700400000
7	Conoco	5845 SW 193rd Ave	55703000000
8	Doelman Dairy	7231 James Road	55901400000
9	Doelman manure spreading field	6711 - 198th (situs)	51300700000
10	Evergreen Propane	20933 Old Hwy 99	42200900000
11	Ferrel Gas, dba Blue Rhino Propane	20935 Old Hwy 99	42200900000
12	Franks RV Repair	19515 Old Hwy 99	31410900900
13	Grand Mound AM-PM/Arco	Old Hwy 99	55702400101
14	Lakeside Industries	6701 196th Ave	55802700000
15	Martin Sand and Gravel	6500 196st Avenue SW	55700900000

16	Modern Machinery Inc	19444 Ivan Street	31410900600
17	Northwest Custom Trailers	19530 Ivan Street	55700300000
18	Pacific Pride Gas	19615 Elderberry St SW	55702000101
19	Quality Rock	6802 SW 196th	55802100000
20	Shell Gas Station	Old Hwy 99	55702400500
21	Top Notch Trailers	19541 Elderberry St SW	55701200500

Table 5-1 Septic Areas in Planning Area

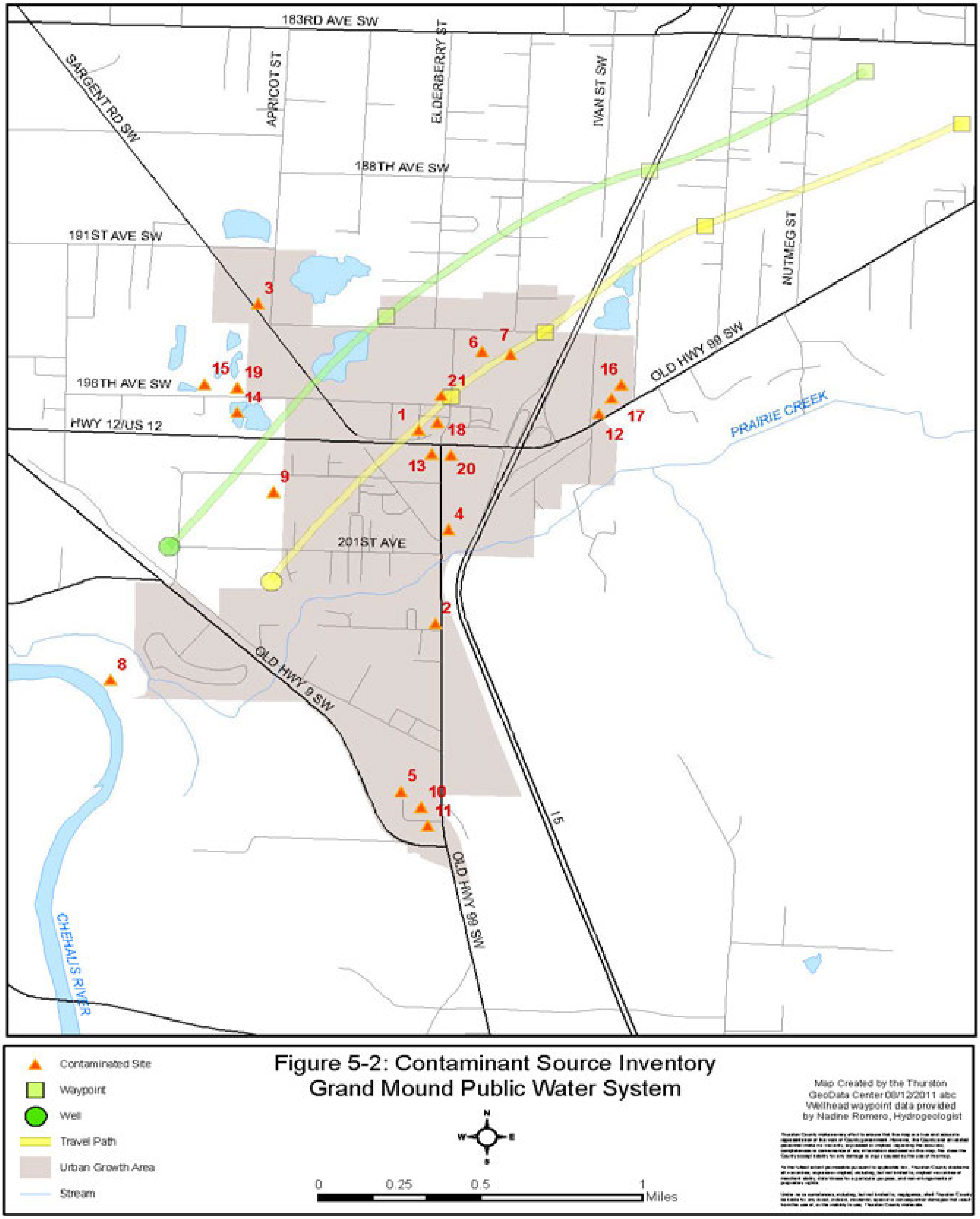


Figure 5-2 Contaminant Source Inventory

5.1.5 Notification of Findings

- **Local Regulatory Authorities:** Thurston County Environmental Health, Development Services, Department of Ecology, Washington State Patrol, and Fire District #1. See Appendix F for Local Regulatory Notification Letter.
- **Businesses:** Businesses that have a spill or release of any hazardous material must notify the Department of Ecology within 24-hours. Thurston County Environmental Health will be notified by the Department of Ecology to either provide information, request investigative assistance, or to document a cleanup of the release. Thurston County Environmental Health will notify Development Services of all releases within the Grand Mound wellhead protection area. See Appendix F for Business Notification Letter.

5.2 Contingency Plan

Nitrates and fecal coliform, known water quality concerns in ~~part of~~ the Scatter Creek Aquifer, could affect Grand Mound source-production wells. Other contamination could occur from spills or leaks associated with transportation, or with industrial or commercial land uses. Source contamination could vary widely in terms of duration, type of contamination and severity of the problem.

The rapid groundwater movement and volume of ground water discharged across the width of the aquifer into the Chehalis River system can quickly carry contamination for some distance to the wellheads. Conversely, rapid dispersal and dilution of a contamination problem could limit the duration of supply disruptions and/or the time that water quality is above regulatory contaminant levels or drinking water standards.

Action strategy in the event of a source contamination concern is:

1. Identify the type of contaminant(s). This will include assessing:
   a. Level of public health concern associated with the contaminant (i.e. elevated water quality indicator versus chemical contamination of the source aquifer);
   b. Known or potential sources of contamination;
   c. Extent of the problem (Are nearby groundwater areas likely to have acceptable water quality conditions?); and
   d. Likely duration of the contamination concern.
2. Evaluate various responses to determine the most cost-effective way to ensure the delivery of high-quality water.

Three principle contingency alternatives identified at this time are:

a. Source relocation;

b. Treatment of water to remove the contaminant; and/or

c. Intertie with an existing adjacent system.

Assessment of applicability and feasibility of these three alternatives is provided below:

Source Relocation Contingency

Applicable to: long-term contamination, where alternate locations have reliable, more secure, groundwater conditions.

New action is being taken in "source relocation contingency": a large grant was funded by the Centennial Clean Water Fund in 2011 ($178,000) to conduct additional numerical ground water simulations in the Scatter Creek Aquifer in 2012. These new contaminant modeling simulations will address various 'land use' scenarios such a future housing developments on septic and future build out to predict impacts the municipal well field and water quality in the Scatter Creek Aquifer. The numerical modeling simulations allow longer prediction capability and forecasting in water quality. It also allows well field relocation and increased water rights ground water withdrawals.

a. Feasibility:

- **Pipeline issues:** It would be expensive to build a transmission pipeline to reach a well site distant from the Grand Mound service area.
- **Site availability:** Sites immediately north of the UGA may be able to accommodate a well field without significant additional pipeline expense. However scattered elevated nitrate levels have been identified in this area. Further north, above 193rd, another potential well site is adjacent to the large Scatter Creek Wildlife Reserve. Depending upon gradient groundwater conditions, this large undeveloped area could potentially provide excellent groundwater protection, however 1-mile of transmission pipe would be required.
- **Cost of treatment:** A separate chlorine dosing facility would be required for each dispersed well site (in contrast to the existing method of treating water at the central Grand Mound Wastewater Treatment Plant). If it were necessary to remove nitrates in the future, it could be cost-prohibitive to develop separate treatment facilities for widely dispersed wells.
- **Blending:** Another disadvantage of a dispersed source is the inability to blend sources to achieve MCL or improve drinking water quality.
- Water rights: Transferring water rights to a new site may entail new conditions or an extended processing time.

b. Initial Contingency Actions

- Monitor sampling of nitrate levels in alternative well areas, particularly north of the UGA (from the UGA boundary to above 193rd).
- If nitrate levels trend upward in either of the source production well areas, solicit property owners in the contingency well locations to provide long-term well-site easements or other form of property acquisition.

Treatment Contingency

a. Applicability

- Best for long-duration problems.
- Reliable, cost-effective treatment methodologies and technologies exist for the contaminant of concern.

b. Feasibility:

- Cost: The capital and operating costs for treating contaminated water may be significant. For example, it would cost $250,000 to $300,000 to build a nitrate facility to obtain about 340 gpm from a 450 gpm well.
- Waste disposal: Wastes produced by a water-treatment process can be expensive to manage. For example, the reverse osmosis process to remove nitrates would provide approximately 75% of the original flow in treated water. The remaining 25% “waste flow” would have to be disposed of through the Waste Water Treatment Plant.

c. Initial Contingency Actions

Identify potential treatment technologies for known contaminants in the Scatter Creek Aquifer, paying particular attention to nitrates.

Identify approximate costs for potential treatment technologies.

Intertie Contingency

a. Applicability

- Best for short-duration problems, or as a temporary source while a long-term solution is developed.
- This contingency would depend on the presence of public water systems with sufficient source and interest in an intertie agreement, located within a cost-effective distance from the Grand Mound service area.

b. Feasibility

- A permanent intertie with the Rochester Water System was not considered feasible due to incompatible corrosion control treatment processes between the two systems. Rochester uses calcium carbonate while Grand Mound plans to use sodium hydroxide. However, while a permanent intertie is not feasible, the two water-systems do share a common boundary between the non expanding Group "A" Public Water System known as Prairie Vista Water system and Grand Mound System. At this location, there is sufficient infrastructure to implement an emergency intertie within a relatively short timeline should either system require and a short-term emergency source. Over the six-year planning horizon, Grand Mound will coordinate with Rochester to establish an emergency intertie agreement at the Prairie Vista/Grand Mound boundary and other locations as the Grand Mound system expands.

c. Initial Contingency Actions

- Over the six-year planning horizon, Grand Mound will coordinate with Rochester to establish an emergency intertie agreement at the Prairie Vista/Grand Mound boundary and other locations as the Grand Mound system expands.

5.3 Spill Response Planning

5.3.1. Overview

Thurston County Ordinance No. 11608, (Appendix F) adopted the Thurston County Comprehensive Emergency Management Plan in January 1998. The plan's Emergency Support Function #10, "Hazardous Materials" (Appendix F) discusses in detail the coordination and procedural steps necessary to respond to a spill, and assigns responsibilities to federal, state, and local authorities and agencies. For the Grand Mound area, the plan identifies Fire District #1 as the incident commander followed by the Washington State Patrol.

Through the Thurston County Nonpoint Source Pollution Ordinance (Appendix F) Environmental Health provides businesses that use and store small quantities of hazardous materials with technical assistance to develop spill plans.

5.3.2 Notification

Thurston County Environmental Health notifies Resource Stewardship and the Department of Ecology with inspection reports containing updated hazardous material lists for businesses inspected within the Grand Mound wellhead protection area.

Chapter 6

6. 0 OPERATIONS AND MAINTENANCE PROGRAM

This section of the Water System Plan (WSP) documents the operation program for the Grand Mound Public Water System. The section demonstrates that water system operations are appropriately managed in accordance with WAC 246-290-100, -300, -310, -320, -440, -480, and -490, and WAC 246-292-020, -050, and -090 (also accepted by the American Public Works Association (APWA) in the Department's September 2011 Accreditation).

6.1 Water System Management and Personnel

Table 6-1 depicts the organizational structure of the Grand Mound Water System.

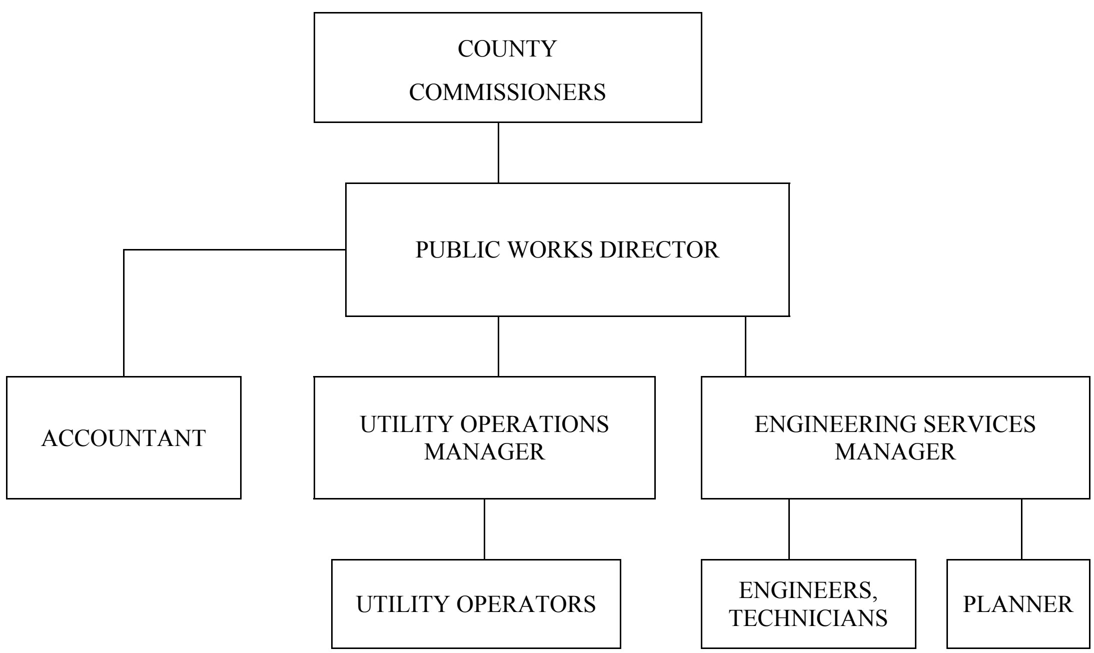


Figure 6-1 Organizational Chart

The Thurston County Board of Commissioners comprises three county commissioners who are elected by the voters within the corporate boundaries of Thurston County. The Board has overall authority over the Grand Mound area.

The Public Works Director is responsible for ensuring that the adopted mission for the water system is carried out. Among other things, the Director is responsible for overseeing the administration of the Public Works Department, the development of budgets, the effective performance of the water system, management of projects, and implementing county ordinances and policies regarding water service. The Director provides strategic guidance on regional issues, and manages key initiatives for the water system, such as the Capital Improvement Program. Responsibilities also include disseminating information throughout the utility, across departments and to the public: community relations, public information, purveyor communications, media relations, and employee communications.

The Utility Operations Manager oversees day-to-day operations, emergency response, capital improvement programs, preventative maintenance, water quality monitoring, the cross-connection control program, budget formulation and administration, public information, and the supervision of the utility operators.

The Utility Operators, under the oversight of the Utilities Operations Manager, are responsible for the normal day-to-day operation of the utility. The Public Works Department provides service to Grand Mound customers 24 hours per day, 365 days per year. The team operates, maintains, and improves the source, treatment, and water transmission and distribution system to protect public safety, public health, and the environment. All members are involved in preventive maintenance, depending on their areas of expertise. Duties include water-quality monitoring, meter repair, servicing customer accounts (connections and disconnections), and customer service and facilities maintenance. Utility Operators install water service and, repair hydrants, maintain and test valves, perform cross-control inspections, provide customer service, repair water lines, and operate/maintain the pump station.

The Utility Operators also troubleshoot and maintain electrical and electronic components, circuitry and controls, hydraulic and mechanical features, and perform record-keeping and meter-reading functions.

The Engineering Manager, Engineers, Technicians and Planner provide technical support for all utility functions. The responsibilities include project engineering, engineering inspection, development review coordination, AutoCAD/GIS/GPS oversight, technical documentation, and customer service.

The Accountants provide support for the entire Public Works Department. Their responsibilities include budget formulation, accounting procedures, administrative support, accounts payable, billing statements, receptionist duties, dispatching, correspondence, records management and customer service.

6.2 Operator Certification

Thurston County is committed to meeting the requirements of the Water Works Operator Certification Program administered by the Washington State Department of Health (WSDOH). Under this program, water systems must employ certified operators to carry out various water system functions including treatment and distribution.

Grand Mound is classified as a "Group A" public water system. The Group A classification requires that certified operators be in charge of all active, daily, and technical operations of the water system. In meeting this requirement, Thurston County maintains certified personnel throughout the utility for a variety of water system operations.

A system of Grand Mound's size requires a Water Distribution Manager II or greater as the certified operator. As an interim basis, Bill Champion fills that capacity. The Cross-Connection Control Program requires a certified Cross-Connection Control Specialist I. Bill Champion is also certified as a Cross-Connection Control Specialist I and Backflow Assembly Tester, allowing him to perform inspections and testing of backflow assemblies in the Grand Mound Public Water System. Exhibit 6-2 shows all water personnel and their certification level.

Certified operators are either on-site or on-call for all critical water system operations. Thurston County also ensures that certified operators are in charge of all segments of the water system as appropriate.

WATER SYSTEM CERTIFICATES		
Employee	**Position**	**Certification**
Lester Olson	Public Works Director	
Scott Schimelfening	Utility Services Manager	
Bill Champion	Utilities Operations	Water Distribution Manager II Water Treatment Plant Operator II Cross Connection Control Specialist I
Vern Prell	Utilities Operations	Water Distribution Manager I Back Flow Assembly Tester
Tony Schall	Utilities Operations	Water Distribution Manager I
Rick Minshull	Utilities Operations	Water Distribution Manager I

Figure 6-2 Grand Mound Water Personnel Certification Level

6.3 System Operation and Control

As described in Sections 1 – 3 of this report, the Grand Mound Public Water System includes two ground water sources, Well #1 (SO1) and Well #2 (SO2). Management of these resources is the responsibility of Thurston County personnel with oversight from the Utility Operations Manager.

6.3.1 Storage and Pumping

Storage and pumping facilities were described in detail in Section 3 but were treated as separate units.

6.3.2 Ivan Street Reservoir

The Ivan Street reservoir stores water for the Grand Mound Public Water System. The reservoir's floor is at elevation is 275.5' and the overflow at 315.5. Water flows from both wells to the water distribution system and then into the reservoir.

This facility has minimal maintenance requirements. The reservoir is inspected regularly to ensure that all hatches are locked and secure, that there are no signs of vandalism, that overflows and vents are not blocked, and that screens are clean and in place.

6.3.3 Telemetry

The water system has an extensive telemetry system. The production wells, chlorination system and the main reservoir are linked together allowing the utility to monitor the operations of the water system. If there is a malfunction of any of these facilities, our distribution operators are alerted via the telemetry system. The system alerts the alarm center as well as our main facility at Grand Mound during normal working hours and after hours.

6.3.4 Identification of Major System Components

The major components for the Grand Mound water system are the wells, storage tank, telemetry and water mains.

A water tank located on Ivan Street controls the water volume and pressure for the Grand Mound Public Water System. The 500,000-gallon reservoir, located in the southeast section of the water system, is at an elevation of 275'. The elevation in the Ivan Street tank dictates the operation of wells: As water use lowers the elevation of water in the tank, the telemetry system signals for the prescribed well to begin pumping. The pumping of the well ensures the system will meet the existing demand, and replenishes the storage tank. When the water elevation returns to the predetermined level, the pumps turn off.

The telemetry is a Supervisory Control and Data Acquisition (SCADA) system and its controls are as follows:

Storage Tank	Control Wells
Ivan Street Tank (0.5 MG)	Well #1 & Well #2

6.4 Routine System Operation

The water system is operated automatically with the SCADA system. Personnel monitor and maintain the system to minimize interruptions.

The two wells are inspected and meter readings taken daily. Flow rates are monitored and water sales and monthly production are compared to determine water losses. The Ivan Street tank's (external area) is inspected weekly. The chlorination equipment is inspected daily and dosage adjusted as needed. Chlorine use is recorded throughout the day.

6.4.1 Preventive Maintenance Program

Thurston County uses a schedule to monitor and maintain facilities throughout the distribution system. A complete list of operation and maintenance tasks is included in the following.

Daily Operations

- Well inspections: Check chemicals, motor vibrations and vandalism.
- Record wells' meter readings.
- Maintain buildings and grounds.
- Check chlorine residuals in the distribution system.

Weekly Operations

- Conduct building cleanup and maintenance.
- Replenish chlorine.
- pH monitoring

Bi-Weekly Operations

- Take coliform samples.

Monthly Operations

- Read commercial and residential meters.
- Shut off service for non-paying customers.
- Inspect wellhead.
- Flush mains.

Quarterly Operations

- Inspect tubing on gas chlorination system.
- Review cross-connection control data base (test assemblies, organize data base).

Annual Maintenance

- Inspect tank.
- System wide -Flush mains.
- Follow state water quality sampling procedures as required (nitrates).

As-Needed Inspections

- Respond to customer service calls.
- Locate mains as requested.
- Repair mains, fire hydrants and service leaks.
- Install new services/meters.
- Call in location for maintenance and service leak repairs.

6.4.2 Equipment and Chemical Supplies

Thurston County keeps equipment and parts ready at all times to respond to routine and emergency maintenance needs. Thurston County's inventory of repair and replacement parts allows for the immediate repair of most system failures. This inventory is updated monthly as invoices are paid and work orders are processed. The county must also maintain sufficient operating chemicals to allow continuous operation of both sources. Depending on the availability of the chemicals, sufficient supplies are stored to allow reasonable order and shipping times. A complete list of suppliers is included as Exhibit 6-3. Manufacturers' technical specifications on major system components are kept on file at the Grand Mound Wastewater Treatment Plant.

Material	**Supplier**
Gas Chlorine	**Jones Chemical** 1919 Marine View Tacoma, WA 98422
Northstar Chemical	14200 SW Tualatin Sherwood Rd Sherwood, OR 97140 (503) 625-3770

Water Quality Analysis Chemical Supplies	**HACH** 100 Dayton Avenue Ames, IA 50010 (800) 227-4224
Distribution Parts (Meter fittings, repair clamps)	**Ferguson Inc** 810 79th Av SE Olympia, WA 98501 360) 943-7363
(Fire Hydrants, valves, fittings, meter boxes)	**H.D. Fowler Company** 3011 Marvin Road Olympia, WA 98516 (360) 459-7300
(Water Meters)	**Hughes Supply** 10708 Golden Given Rd East Tacoma, WA 98445 (253) 531-1144 (253) 405-1563

Exhibit 6-3 Equipment and Chemical Suppliers

6.5 Comprehensive Monitoring Plan

The Grand Mound Public Water System samples water at various locations within the distribution system to protect the health of its customers. Water sampling is conducted in compliance with Department of Health requirements, and based on the size of the population served and the type of sources. Exhibit 6-4 lists the contaminants established by the National Primary Drinking Water Regulations. Exhibit 6-4A lists the secondary drinking water standards for contaminants.

Contaminant	MCLG Mg/l	MCL Mg/l	Potential Health Effects
Fluoride			Skeletal and dental fluorosis
Fluoride	4.0	4.0	
Phase 1 - Volatile Organics			
Benzene	Zero	0.005	Cancer
Carbon Tetrachloride	Zero	0.005	Cancer
p-Dichlorobenzene	0.075	0.075	Cancer
1,2-Dichloroethane	Zero	0.005	Cancer
1,1-Dichlorothylene	0.007	0.007	Cancer, liver and kidney effects
Trichloroethylene	Zero	0.005	Cancer

1,1,1-Trichloroethane	0.2	0.2	Liver, nervous system effects
Vinyl chloride	Zero	0.002	Cancer
Total Coliform Rule and Surface Water Treatment Rule			
Giardia lamblia	Zero	TT*	Gastroenteric disease
Legionella	Zero	TT*	Legionaires disease
Heterotropic plate count	N/A	TT*	Indicates water quality, effectiveness of treatment indicates gastroenteric pathogens
Total coliform	Zero	<5%	
Turbidity	N/A	TT*	Interferes with disinfection
Viruses	Zero	TT*	Gastroenteric disease
Phase II Rule - Inorganics			
Asbestos	7mf/l	7mf/l	Cancer
Barium	2	2	Circulatory system effects
Cadmium	0.005	0.005	Kidney effects
Chromium (total)	0.1	0.1	Liver, kidney, circulatory disorders
Mercury (total)	0.002	0.002	Kidney, nervous system disorders
Nitrate (as N)	10	10	Methemoglobulinemia
Nitrite (as N)	1	1	Methemoglobulinemia
Nitrate 10itrite (as N)	10		Methemoglobulinemia
Selenium	0.05	0.05	Liver damage
Phase II Rule - Organics			
Acrliamide	Zero	TT*	Cancer, nervous system effects
Alachor	Zero	0.002	Cancer
Atrazine	0.003	0.003	Mammary gland tumors
Carbofuran	0.04	0.04	Nervous, reproductive system effects
Chlordane	Zero	0.002	Cancer
Chlorobenzene	0.1	0.1	Nervous system and liver effects
2,4-D	0.007	0.007	Liver and Kidney damage
o-Dichlorobenzene	0.6	0.6	Liver, kidney, blood cell damage
Cis-l,2-DicWoroethylene	0..007	0.007	Liver, kidney, nervous, Circulatory system effects
Trans-I,2-Dichloroethylene	0.1	0.1	
Dbromochloropropane	Zero	0.0002	Liver, kidney, nervous, Circulatory system effects
1,2-DcWoropropane	Zero	0.005	Cancer
Epichlorohydrin	Zero	TT*	Liver, kidney, cancer
Ethylbenzene	0.7	0.7	Cancer
Ethylene dibromide	Zero	0.00005	Liver, kidney, nervous system effects
Heptachlor	Zero	0.0004	Cancer
Heptachlor epoxide	Zero	0.0002	

Lindane	0.0002	0.0002	Cancer
			Cancer
Methoxychlor	0.04	0.04	Liver, kidney, nervous system, immune system and circulatory system effects
Pentachlorophenol	Zero	0.001	
PCB's	Zero	0.0005	Growth, liver kidney and nervous system effects
Styrene	0.1	0.1	Cancer, liver, and kidney effects
Tetrachloroethylene	Zero	0.005	Cancer
Toluene	1	1	Liver, nervous system damage
			Cancer
Toxaphene	Zero	0.003	Liver, kidney, nervous system and circulatory system effects
2,4,5-TP	0.05	0.05	
Xylenes (total)	10	10	
Lead and Copper Rule			
Lead	Zero	TT**	Kidney, nervous system damage
Copper	1.3	TT*	Gastrointestinal irritation
Phase V Rule – Inorganics			
Antimony	Zero	0.0006	Cancer
Beryllium	0.004	0.004	Bone, lung damage
Cyanide	0.2	0.2	Thyroid, nervous system damage
Thallium	0.0005	0.002	Kidney, liver, brain, intestinal effects
Phase V Rule – Organics			
Abdicate (di(2-ethylthexyl))	0.4	0.4	Decreased body weight
Dalapon	0.2	0.2	Liver, kidney effects
Dichloromethane	Zero	0.005	Cancer
Dinoseb	0.007	0.007	Thyroid, reproductive organ damage
Dioxin	Zero	3.00 E-08	Cancer
Diquat	0.02	0.02	Liver, kidney, eye effects
Endothall	0.1	0.1	Liver, kidney, gastrointestinal effects
Endrin	0.002	0.002	Liver, kidney, heart damage
Glphosate	0.7	0.7	Liver, kidney damage
Hexachlorobenzene	Zero	0.001	Cancer
Hexachlorocyclopentadene	0.05	0.05	Kidney, stomach damage
Oxamyl (vydate)	0.2	0.2	Kidney damage
Phathalate, (di(2-ethylthexyl))	Zero	0.006	Cancer
Picloram	Zero	0.5	Kidney, liver damage
PAH's (benzo(a)pyrene)	Zero	0.0002	Cancer
Simazine	0.004	0.004	Cancer

1,2,4- Trichlorobenzene	0.07	0.07	Liver, kidney damage
1,1,2-Trichloroethane	0.003	0.005	Kidney, liver, nervous system damage
Interim Standards for radionucIides			
Beta and photon emitters	Zero	4 mrem/yr	Cancer
Alpha emitters	Zero	15 pCi/l	Cancer
Radium 226 + 228	Zero	5 pCi/l	Bone cancer
Interim Standards for Disinfection By-Products		0.10	Cancer and other effects
Total Trihalomethanes (TTHM)	Zero		
Other Interim Standards			
Arsenic		0.05	Skin, nervous system toxicity, cancer

Figure 6-4 - Primary Drinking Water Standards for Contaminants

TT denotes that a treatment technique is required

Secondary Drinking Water Standards for Contaminants

Contaminant	SMCL	Units	Effects
Chloride	250.0	Mg/l	Salty taste
Color	15	Color units	Visible tint
Copper	1.0	mg/l	Metallic taste, blue-green stain
Fluoride	2.0	mg/l	Tooth discoloration
Iron	0.3	mg/l	Rusty color, sediment, reddish or orange staining, bittersweet astringent taste
Manganese	0.05	mg/l	Black to brown color, black staining, bitter metallic taste
Silver	0.1	mg/l	Skin discoloration, graying of the white of the eye
Specific Conductivity	700	µmhos/cm	
Sulfate	250.0	mg/l	Salty taste
Turbidity	1	NTU	Cloudy, colored water, visible tint
Total Dissolved Solids	500	mg/l	Hardness, deposits, colored water, staining, salty taste
Zinc	5.0	mg/l	Bitter astringent taste, milky appearance

Figure 6-4A - Secondary Drinking Water Standards for Contaminants

6.5.1 Regulatory Requirements and Policy Guidance

The 1974 Safe Drinking Water Act (SDWA) establishes specific rules for public water suppliers. The U.S. Environmental Protection Agency (EPA) is authorized to develop national drinking water regulations and oversee their implementation.

The Washington State Department of Health (DOH) implements this law on EPA's behalf. The rules are codified in Revised Codes of Washington (RCW) 70.119A. DOH regulates the Grand Mound Public Water System primarily through WAC 246-290. DOH derives its legislative authority from Revised Codes of Washington (RCW) 43.20. Several other DOH regulations also apply to regulating the water system, including:

- WAC 246-292, Water Works Operator Certification. See also RCW 70.119.
- WAC 246-293, Water System Coordination Act (requires coordinated planning among utilities). See also RCW 70.116.
- WAC 246-294, Drinking Water Operating Permits (requires annual permit renewal). See also RCW 70.119.

The water system also operates with guidance from the 2005 Water System Plan. Changes and additions are reflected in this update.

Regulations set strict limits on water quality parameters for the system's two ground water sources. These limits are called "Maximum Contaminant Levels" (MCLs) and can be divided into two groups: primary and secondary (see exhibit 6-4 & 6-4A). Primary MCLs are generally set for health reasons. For example, if the drinking water contains levels of a nutrient, such as nitrate, above the MCL, there may be health concerns for a portion or all of the population drinking the water. In the case of nitrate, if the level is greater than the primary MCL of 10 mg/L, a small portion of the population may experience kidney distress or methoglobinemia. For other contaminants, such as lead or arsenic, nearly all of the population may be affected.

Secondary MCLs are not set for health reasons, but rather because they pose some aesthetic concern or an indirect health concern when levels are high. Aesthetic concerns include colored water, staining, and unpleasant tastes and odors. A parameter can have both a secondary and a primary MCL, such as fluoride. At concentration levels between 2-4 mg/L, fluoride is considered to have aesthetic concerns with side effects such as staining teeth, and at levels above 4 mg/L, it may pose health concerns for some people. Although DOH does not normally enforce secondary MCL's compliance, unless they receive complaints, Thurston County takes great care to minimize the concentration of each of these chemicals.

6.5.2 Total Coliform Rule

Triggered Source Water Monitoring is required when one of the system's routine distribution samples collected under the TCR is total coliform positive. Within 24 hours of notification of the total coliform positive result, you must collect triggered source samples and have them tested for E. coli. You must test each source (prior to treatment) that was in operation at the time the routine sample.

If one of the triggered source samples is E. coli positive, DOH will direct you to either take corrective action or take five additional source samples within 24 hours. If any of the five additional source samples is E Coli positive, you must take corrective actions. Actions are described in Appendix H.

The Grand Mound system serves fewer than 1,000 people leading to the requirement for a triggered source water sample. The sample can be used as both a triggered sample and a repeat sample to meet the requirements of the Total Coliform Rule. In this case, an E coli positive source water sample would result in an Acute Coliform MCL violation under the Total Coliform Rule.

The Total Coliform Rule is based on the presence or absence of coliform in a sample. If one or more coliform bacteria are detected in a sample (referred to as a positive sample), the water system must collect and analyze four repeat samples for each positive sample. One repeat sample must be taken from the same location as the original positive sample. The remaining three repeat samples must be collected within five service connections on each side of the original positive sample location. This procedure must be described in the system's Coliform Monitoring Plan.

All samples that test positive for coliform must be analyzed for fecal coliform or E. coli. Fecal coliform or E. coli is an indicator that sewage or animal waste may have recently contaminated the water.

There are two types of Maximum Contamination Level (MCL) contamination: acute and non acute. Non cute coliform violations occur when more than 5 percent of all monthly routine and repeat samples are positive for coliform. The Department of Health must be notified by the end of the next business day after determining that a non acute MCL violation has occurred. Public notification of the customers is required. This notification must include mandatory health effects language.

Acute coliform violations occur when a routine sample and a related repeat sample both contain coliform, and either fecal coliform or E. coli is present in one of these samples. The Department of Health must be notified within 24 hours after determining that an acute MCL violation has occurred. Public notification of customers, using mandatory health effects language, is required within 72 hours after an acute MCL violation.

The current Coliform Monitoring Plan for the Grand Mound water system is in Appendix H. The Public Notification Plan is in Appendix J.

6.5.3 Lead and Copper Rule

Lead or copper in tap water is predominantly caused by corrosion of plumbing system components, including copper pipes, lead-based solder used to join segments of copper pipe, and brass faucets that contain lead and copper. Exhibit 6-4B has the 2007 through 2010 test results.

The Lead and Copper Rule Minor Revisions or (LCRMR) went into effect in April 11, 2000 do not change the action levels of 1.3 mg/L for copper or 0.015 mg/L for lead or the Maximum Contaminant Level Goals or 1.3 mg/L for copper or 0 mg/L for lead. The basic requirements to optimize corrosion control, deliver public education, and replace lead service lines also are not changed.

In 2002, 2003, and 2004, the Grand Mound water system tested for lead and copper and found levels were higher than the allowable thresholds. Local ground water is slightly acidic. This low pH can cause minor corrosion in pipes, bringing trace amounts of copper and lead into the water system. The Washington State Department of Health recently agreed to loan funds to Thurston County to complete design work for a remedial project. Construction of the new Sodium Hydroxide system was completed in 2007 and is on line.

Year	Contaminant	Level	MCL
2004	LEAD	.0071.015	
2004	COPPER	5.01	1.3
2007	LEAD	.006	.015
2007	COPPER	.56	1.3
2008	LEAD	.013	.015
2008	COPPER	.098	1.3
2009	LEAD	.008	.015
2009	COPPER	.53	1.3
2010	LEAD	.0125	.015
2010	COPPER	1.35	1.3

Figure 6-4B Lead and Copper Results

6.5.4 Consumer Confidence Report

A major goal of the Safe Drinking Water Act is reinforce the philosophy that customers have a right to know about the quality of water they drink every day, and that water systems have a responsibility to inform customers about the quality of their water. Accordingly the regulation requires purveyors to report water-quality data every year in “Consumer Confidence Reports.” The reports must include:

- Plain language explanations and definitions for MCLs and MCLGs.
- Plain language explanations of the health concerns associated with contaminants.
- Information about the source of a water system’s supply and the level of detected contaminants at the source.
- Information about the health effects of contaminants found in violation of their respective standards.
- Information about unregulated contaminants.

The Grand Mound water system mails its consumer confidence report in June each year.

6.6 Emergency Response Program

The Washington State Department of Health (DOH) requires that an Emergency Response Program be included in the overall operations program (WAC 246-290). The purpose of an ERP is to guide personnel through potential system malfunctions, natural disasters, and other events that might alter routine operations. The program must include a call-up list of staff, procedures for notifying the public and other affected organizations, a vulnerability analysis of the water system, and contingency plans in case normal operating procedures are disrupted. Thurston County has an existing ERP, which covers all departments.

An emergency call-up roster is shown in Appendix J. An updated copy of this list with phone numbers should be kept at the Ground Mound Wastewater Treatment Plant, the Utility Operation Manger’s Office, the Public Works office at 2404-A Heritage Court S.W., Central Dispatch, the Emergency Operations Center, and other management, dispatch and emergency stations. During non-working hours, the Public Works office in Olympia fields calls from the public. Depending on the nature of the complaint, the front office staff or the Utility Operations Manager will contact the appropriate on-call personnel at Grand Mound via landline or wireless communication (cellular phone or pager). Water facility alarms (well sites, chlorination equipment and reservoir) are transmitted to the Grand Mound main facility and at a private monitoring center (Custom Security) during normal working hours as well as after hours and on weekends. The alarm center contacts the on-call personnel via pager.

6.6.1 General Field Response

During an emergency, Thurston County personnel are expected to act promptly to eliminate any immediate threat to public health or safety. Where appropriate, bystanders may be warned, traffic diverted, valves shut off, dangerous materials removed, or other necessary actions taken, provided those actions do not pose further risk to the public or staff. Next, the Utility Operations Manager, or a designee, is contacted, and a crew dispatched to assess the damage and determine the materials and resources necessary for correction. It is essential for Thurston County to regularly update its inventory of repair supplies and a list of those supplies, and that the information is readily available to respond quickly and restore service.

6.6.2 Responsibilities

In the event of an emergency, the following responsibilities are suggested.

Public Works Director

- Keep county commissioners, and the public, informed;
- Act as liaison between the Utility Operations Manager and county commissioners;
- Assess disaster/damage; and
- Prepare warning information for users.

Utility Operations Manager

- Oversee operations;
- Assess system damage;
- Assess available equipment and resources;
- Formulate plan for corrective action;
- Determine or authorize emergency response actions;
- Document incident and response action taken; and
- Maintain contact with and approval from the Department of Public Works Director.

Field Operators

- Take immediate action to protect life and property;
- Note damage and apparent cause;
- Notify the Public Works office;
- Keep Utility Operations Manager informed; and
- Help take correction action.
- Office Staff
- Contact county agencies and other jurisdictions as appropriate;
- Answer incoming phone calls; and
- Maintain contact with crews.

Sheriff/Fire District

- Maintain crowd and traffic control;
- Provide security;
- Provide fire control; and
- Provide emergency aid.

6.6.3 Notification Procedures

In general, the Utility Operations Manager or designee should immediately notify the DOH regional engineer for Thurston County at (360) 236-3046 if water is expected, or required to be shut down for more than 24 hours, if the quality of water is unacceptable, or if a public health risk associated with the water system is detected.

Revisions to the Public Notification Rule, implemented in June 2002, reduces from 72 hours to 24 hours the time a water utility has to notify its customers of a Tier 1 violation. Examples of Tier 1 violations include: fecal coliform positive samples, failure to confirm a positive total coliform for fecal coliform bacteria, MCL violation for nitrates, a loss of treatment (whether through filtration failure or loss of disinfectant residual), a turbidity reading exceeding 5.0 Nephelometric Turbidity Unit (NTU), or a waterborne disease outbreak. The Public Notification policy is enclosed in Appendix J.

6.6.4 Vulnerability Analysis

This is a brief overview of the vulnerability of the water system for Grand Mound. This does not replace the EPA requirement for a vulnerability assessment, completed for the Department's APWA Accreditation.

6.6.4.1 Water Sources

Well #1 and Well #2 supply all of the water to the Grand Mound water system. These sources are susceptible to both natural and manmade events and conditions that could affect water quantity and quality. Natural events include drought, earthquakes, and high rainfalls. Pumps are submersible; however, the electrical controls are aboveground in an enclosed building where floodwater would be hard to reach.

These facilities are susceptible to mechanical failures and power outages. Mechanical failure is not a big concern because there are two separate sources of water. Well #1 (SO1) is equipped with auxiliary generator, which will operate all of the equipment at the well site. Well #2 (SO2) has auxiliary power hook-ups by way of a portable generator. Neither site is dependent on telephone lines for successful operation.

In the event that both wells were out of service, the system could operate using water from the storage reservoirs for a period of time. The half- million gallons of storage constitutes more than 0.5 days of average usage for the system.

6.6.4.2 Reservoir

Reservoirs may be vulnerable to structural damage, water contamination and vandalism. Grand Mound's reservoir on Ivan Street was built to deter vandalism: The reservoir is fenced and locked, and the site is inspected weekly. Fencing and other security measures will be considered in the upcoming Vulnerability Assessment. However, the reservoirs are still susceptible to natural disasters, such as earthquakes, and man-made disasters.

6.6.4.3 Transmission and Distribution System

The transmission and distribution systems are susceptible to both man-made and natural disasters, such as vandalism, pressure surges, contamination, corrosion, erosion, earthquakes, and material failures. To reduce the number of breaks to the system, Thurston County has established design and engineering standards for all new installations. In addition, standards are in place to require strategically-placed valves and looping of lines to help isolate broken pipes and maintain water service. Grand Mound has an up-to-date mapping system of pipes and valves, and subscribes to the One-Call System that helps locate facilities to prevent accidental dig ups. The county has developed and implemented a cross-connection control program to help eliminate foreign substances from being accidentally back-siphoned into the water system.

6.7 Contingency Operational Plan

The contingency plan presented herein serves as a guide to county personnel for developing response procedures. It provides an emergency roster, establishes DOH notification procedures, lists sources for locating and obtaining repair parts and materials, prioritizes the duties of response personnel, and presents a skeleton field response procedure.

6.7.1 Emergency Roster

Public Works employees' normal work week is Monday through Friday. During off-hours, weekends, and holidays, on-call personnel are available on a rotating basis in case of an after-hour call or emergency. An emergency call-up roster is shown in Appendix J. An updated copy of this list should be kept at the Department of Public Works office on Heritage Court S.W., the Dispatch Service, Fire Districts, Thurston County Sheriff's Office, the Thurston County Emergency Operations Center (EOC) and other management dispatch and emergency stations. In the event of an emergency, management should request and deploy additional personnel as deemed necessary.

6.7.2 Priority Service List

A Priority Service List helps protect individuals and/or organizations that depend upon an uninterrupted supply of water and/or strict water quality requirements. Thurston County should embark on a public-information effort to inform people how to place their names on the list. Possible candidates for this service might include individuals on home-care kidney dialysis equipment or other medical facilities, and organizations that require uninterrupted water for special commercial or industrial processes.

6.7.3 WSDOH Notification

The Public Works Director, or designee, should immediately notify the WSDOH regional engineer for Thurston County at (360) 236-3046, if water is expected, or required, to be shut down for more than 24 hours, if the quality of water is unacceptable, or if a public health risk associated with the water is detected.

6.7.4 Material Supplies

Thurston County's computerized inventory of repair and replacement parts allows the county to immediately determine its readiness to respond to an emergency. The inventory is updated monthly as purchase invoices are paid and work orders are processed. If additional materials and/or equipment are needed, Exhibit 6-3 provides a list of phone numbers for relevant material and chemical suppliers and technical representative.

6.7.5 Priorities

All drinking water served by Thurston County should meet all applicable state and federal drinking water quality standards. If a full supply of water is unavailable, water should be allocated based upon the following priorities (from highest to lowest):

- Fire fighting (life threatening)
- Life sustaining
- Medical
- General drinking water needs
- Fire fighting (property threatening)
- Sanitary
- Industrial
- Commercial

6.7.6 Earthquake Response

Description - A major earthquake of 5.0 or greater on the Richter scale, and an intensity of 9 or greater on the Modified Mercalli scale could disrupt source, transmission, pumping, and storage and distribution components. Power failures and the disruption of conventional transportation and communication systems (roads and phones) may also occur.

Response – Water system personnel should anticipate the water needs of fire fighters and medical responders in the event of an earthquake. These functions should be given due priority when assessing the emergency, preparing damage reports, and organizing repair efforts. Pipelines and other buried facilities require close attention after an earthquake, because they are hidden from view and are at least as susceptible to ground movement as aboveground structures.

The system should be checked thoroughly for unexplained drop in line pressure, reduction in flow rate, pump failure, leakage, or other signs of damage. Crews should be equipped to remain in constant contact with the Utility Operations Manager at the Department of Public Works office in Olympia, and other field personnel. Water operators must be prepared to barricade hazardous areas shut off valves to isolate broken mains, turn off water services and make repairs. They should also be prepared to help residents secure a safe supply of drinking water.

6.7.7 Power Failure Response

Description – Short-term and long-term interruptions in power can occur for a variety of reasons and may or may not be associated with emergencies. Power outages may affect only a few blocks, or the entire region. Facilities most affected by this type of emergency include Well # 2 and communication systems.

Response – In addition to their field response, water personnel should immediately contact Puget Sound Energy to determine the nature, extent and expected duration of the power outage. Well # 1 has an onsite auxiliary power unit, and Well # 2 has connections for portable auxiliary power units. The auxiliary power source should be brought on-line and maintained until power is restored. The auxiliary power source should be maintained, and a schedule of operations and maintenance tasks developed, to ensure continued service in an emergency.

6.7.8 Contamination of Source of Supply Response

Description – Contamination can occur at the sources as a result of man-made practices or natural occurrences. Additional sources of contamination include effluent from septic tank drain fields, urban storm runoff, pesticide leachate, landfill leachate, petroleum storage leakage, chemical or petroleum spills, animal wastes, and vandalism. Contamination in the distribution system could also be caused by a cross-connection or back siphoning.

Response – The contaminated facility should be immediately isolated from the rest of the system. Other appropriate measures will be determined by the type, location, nature and entry path of the contaminant. The area of contamination and specific cause should be determined as quickly as possible and removed if feasible. This may be a simple matter such as a minor spill, or a more complicated problem requiring significant resources and specialized assistance.

In addition to their field response, county personnel should contact appropriate health authorities. At a minimum, this includes the DOH Regional Engineer and the Thurston County Environmental Health Director. Staff will then work jointly to determine, if possible, the extent of the contamination and prepare the appropriate public-information program.

6.7.9 Water Transmission Line Failure Response

Description – The transmission line could rupture or leak as a result of an earthquake, pressure surge, vandalism, bomb blast, construction, soil scour, corrosion, or material failure. A major break could interrupt the source and cause flooding and erosion on adjacent lands.

Response – Such an event requires county staff to quickly isolate the damaged section and minimize damage to the rest of the system. The size and nature of the rupture must be evaluated promptly to ensure the efficient deployment of materials, excavation equipment, dewatering facilities, and personnel.

<u>Distribution Line Break Response</u>

Description – Water distribution lines may break as a result of an earthquake, pressure surge, vandalism, bomb blast, construction, soil scour, and corrosion or material failure. In the Grand Mound Public Water System, most line breaks could be easily isolated thanks to strategically placed valves and looped systems. As a result, line breaks would likely cause minimal service disruptions.

Response – Such an event requires county staff to act quickly to isolate the damaged section and minimize the impacts to the rest of the system. The size and nature of the break must be evaluated promptly to ensure the efficient deployment of materials, excavation equipment, dewatering facilities, and personnel. In most cases, the initial response person is capable of assessing the extent of the problem and course of action for repairs. This person is also responsible for notifying emergency departments, such as fire and police and the Utility Operations Manager if not already notified.

The repairs should be made according to standard procedures for water-line repairs. Thurston County typically has sufficient materials on hand to address line-break emergencies. Such materials include repair clamps for all types and sizes of pipe that are in the system, various sizes of water main valves, chlorine for disinfections of repairs, and service fittings.

6.7.10 Gaseous Chlorine Leak

Description – The risk of chlorine leaks is low, however, there is a remote possibility that Grand Mound's chlorine facility could experience a rupture and leak gaseous chlorine. The cause of the rupture could vary from a natural disaster, to operator error or even vandalism.

Response – Chlorine gas is highly toxic, so personnel who respond to such an emergency must wear a self-contained breathing apparatus. Fire and police should be notified immediately of the leak and its potential danger. A repair kit for the 150-lb cylinder is kept on site. After the leak is fixed, all areas affected by the leak should be fully ventilated. If large quantities of gas should leak, residents within the area may have to be notified about the presence of chlorine gas and advised to take precautionary measures.

No water should enter the Grand Mound water distribution system without receiving proper chlorination. Therefore, any failure of the chlorination facilities should be followed by a shutdown of the production wells until repairs are complete.

6.7.11 Sodium Hydroxide Leak

Description – The risk of a sodium hydroxide leak is low, however, there is a remote possibility that Grand Mound's sodium hydroxide system could experience a rupture and leak liquid sodium hydroxide. The cause of the rupture could vary from a natural disaster, to operator error or even vandalism.

Response – Sodium Hydroxide is extremely corrosive, so personnel who respond to such an emergency must wear full face-shield, chemical safety goggles, and appropriate personal protective clothing to prevent skin contact. Spills, leaks or releases: restrict access to area until completion of clean up; prevent entry into sewers or waterway by diking with inert material such as sand or earth. Solution can be recovered or carefully diluted with water and cautiously neutralized with acids such as acetic acid or hydrochloric acid. After the leak is fixed, all areas affected by the leak should be fully flushed.

6.7.12 Water System Personnel / Emergency Call-up List

An emergency call-up roster is shown in Appendix J. An updated copy of this list with phone numbers should be kept at the Ground Mound Wastewater Treatment Plant, the Department of Public Works Office on Heritage Court S.W., Central Dispatch, the Thurston County Emergency Operations Center, and other management, dispatch and emergency stations. During non-working hours, calls from the public are received at Dispatch Service. Depending on the nature of the complaint, Dispatch Service contacts the appropriate on-call personnel. Alarms triggered at any of the Grand Mound water facilities (well sites, reservoir, and chlorination equipment) are sent to the Grand Mound Wastewater Treatment Plant during and after normal working hours and on weekends. Alarms that occur on weekends or after business hours are retrieved by a private alarm center (Custom Security). The alarm center then contacts Dispatch Services, which pages on-call personnel.

6.8 Safety Procedures

Thurston County has an overall safety program that covers all county employees. This program is divided into several areas and/or procedures. Such safety programs are needed to meet Washington State Laws and regulations. Thurston County assures all employees are aware and have knowledge of this safety program. The water operators for the Grand Mound Water System abide by the County Safety Policy (Doc. # 012.2000) and participate in bi-monthly tailgate safety talks.

Thurston County provides the following programs and safety procedures to employees:

- Blood-borne pathogens
- Employee accident and illness
- Hazard
- Industrial safety
- Non-employee incident
- Vehicle accident
- Violence in the workplace
- Accident management and incident reporting
- Emergency response
- Field safety
- Industrial safety
- Occupational health

6.9 Cross-Connection Control Program

The Cross-Connection Control Program helps protect the Grand Mound water distribution system from contamination caused by existing or potential cross-connections. The Department of Public Works jointly works with Thurston County Building Officials to ensure cross-connection control is managed at the premises and in-premises. The Cross-Connection Control Program is in Appendix I.

6.10 Customer Complaint Response Program

When a customer complaint or concern is received, office staff records information in a computerized database. The complaint or concern is then forwarded to the field crew for investigation. Issues typically involve the amount of water used, a possible leak or faulty meter, or the odor, taste or appearance of water. Once the matter is checked, the customer is notified, corrective action taken if appropriate, and the follow up actions recorded in the database.

6.11 Record Keeping and Reporting

The Grand Mound Public Water System is a municipal corporation and subject to thorough audits by the Washington State Auditor. Its financial and administrative records are on file at the Public Works Department at 2404-A Heritage Court S.W. Backup copies of computer records are made daily and kept on site.

Water quality and compliance records must be retained by the water utility. Some data is required, while some is operational, maintenance or complaint response in nature. Record keeping requirements for the county are described in WAC 246-290-480.

6.12 O&M Improvements

The Grand Mound Public Water System performs operational and maintenance improvements year-round. This includes route maintenance procedures, such as flushing the distribution system, maintaining hydrants, servicing upgrades, maintaining security around key facilities, upgrading and replacing components with the SCADA system, and repairing and maintaining well houses.

Needed improvements are identified throughout the year and are typically funded during the budget process. Typical shortcomings and improvements include:

- Communication errors between the sources and Wonder Ware software program;
- Low reservoir turn over.

Chapter 7

7.0 DISTRIBUTION FACILITIES DESIGN AND CONSTRUCTION STANDARDS

The objective of this chapter is to describe the design and construction standards applicable to the Grand Mound Public Water System.

The Grand Mound Public water system is subject to the "Development Standards for Water and Sewer Systems, Thurston county Washington, January 2007" and "WSDOT Standards for Roads and Municipal Construction, current edition", Thurston County Code 15.04.

The standards are displayed in Appendix K and at http://www.co.thurston.wa.us/wwm/Engineering_Standards/Water_Sewer_Standards/Water_Sewer_Standards.htm.

7.1 Project Review Procedures

This section identifies the system's process for reviewing project reports and construction documents. Review procedures are consistent with state drinking water regulations and county ordinances.

Anyone requesting permission to develop land, make improvements on land, or change a permitted use or occupancy in Thurston County must submit plans and complete applications to Thurston County's Permit Assistance Center (PAC). In turn, the PAC coordinates review of the application and plans to ensure they are consistent with County standards.

For applications for water service within the Grand Mound Public Water System service area, the application and plans are routed to the Department of Public Works for consistency with the Water Development Standards for Grand Mound (Appendix K).

The Department of Public Works retains on staff a professional engineer, registered in the State of Washington, to review all designs prepared by consulting engineering firms or completed in-house. This review is based on established fees. Fees are shown in Appendix K, and include costs for the concurrency review by a planner and an engineer, latecomer agreements, inspections, and other connection actions.

7.2 Policies and Requirements for Outside Parties

The Thurston County Board of County Commissioners has adopted policies and requirements in Chapter 15 of the Thurston County Code (Appendix M) for outside parties who are interested in connecting to the Grand Mound Public Water System. These include granting of right-of-way and/or easements where new water mains are placed on private property, extensions of water mains across parcels to opposite property lines, and repayment of capital improvements based on latecomer agreements.

Additional policies and requirements for outside parties are found in the development standards, Appendix K. A summary of the additional policies and requirements for outside parties are contained below.

1. Residential fire flow requirements: minimum of 1000 gpm at 20 psi.
2. Commercial/Industrial fire flow requirements: minimum of 2000 gpm at 20 psi.
3. Looped water main size: minimum 6".

4. Dead end water main size: minimum 8”.

7.3 Design Standards (Performance Standards and Sizing Criteria)

The Grand Mound Public Water System is based on standard engineering practices and incorporates guidelines established by the Washington State Department of Health, including the guidelines described in their “Water System Design Manual.” The standard specifications for construction will be the latest edition of the “WSDOT Standard Specifications for Road, Bridge, and Municipal Construction.”

All extensions to the water system must conform to design standards of the “Water System Development Standards for Grand Mound” and shall meet the requirements of the Thurston County Fire Marshall. The water system must provide adequate domestic and fire supply for the Fire Protection Zone in which it is located. The system must be capable of future expansion and be constructed of permanent materials.

Where additional water mains are proposed for installation to the existing water system, the proposer shall perform hydraulic modeling corresponding to the proposed improvements shown on submitted plans and specifications. This modeling shall be based on the existing infrastructure shown in Figure 3-1, until otherwise expanded. The modeling shall contain the limits as follows:

1. Maximum pipe velocity: not to exceed 10 ft/sec
2. Minimum distribution system pressure: 30 psi
3. Maximum distribution system pressure: 80 psi
4. Storage tank sizing:

Volume:	218,000 gal
Base elevation:	270.5
Minimum elevation:	294.3
Initial height:	308.0
Maximum elevation:	315.5

Additional design standards are found in the Development Standards, Water Systems, Grand Mound, and Appendix K. A summary of these design standards are contained below.

1. Pressure reducing devices required where pressure is greater than 80 psi.
2. Hydrostatic pressure testing of all lines, valves, backflow assemblies: 225 psi for 15 minutes without leaks.
3. Sterilization and flushing: meet the requirements of the DOH and in a manner satisfactory to Thurston County. This includes the addition of highly chlorinated water that is left undisturbed for a minimum of 24 hrs. The line shall be thoroughly flushed and water samples taken within 24 hrs after flushing.

5\. Looped water main size: minimum 6”.

4\. Dead end water main size: minimum 8”.

7.4 Construction Standards (Materials and Methods)

A complete description of the construction standards is found in the Interim Development Standards, Water and Sewer Systems, Grand Mound, Appendix K. A summary of the construction standards is provided below.

1. Piping shall be HDPE, PVC or ductile iron. PVC shall meet AWWA C900 ASTM 2241 class 305 for size 4-12 inch. For PVC pipe sized 14 -20 inches, the pipe shall meet AWWA C905 class 305. HDPE pipe shall meet ANSI/AWWA C906and materials shall meet shall meet class 345464 C, D, or E per ASTM 3350. Ductile iron shall meet AWWA C151 class 52.
2. All fittings shall be connected by flanges or mechanical joints. Where required, Mega-Lug series 1100 retainer glands will be used.
3. Sleeve couplings shall be mechanical joint made of ductile iron in accordance with AWWA C110, except the minimum sleeve length shall be 6 inches.
4. Transition couplings shall be Romac Industries Style 501 or equal. Flanged coupling adapters shall be Rockwell Style 912 or equal.
5. Fittings shall be made of PVC or ductile iron lined with cement mortar. PVC shall meet AWWA C153. Cement mortar-lined shall meet AWWA C104.
6. All pipe and services shall be installed with 12 gauge coated copper wire taped to the top of the pipe, brought up and tied off at the top of the valve box. Marking tape shall be installed 12 inches above the top of all water lines and extend its entire length.
7. Minimum cover from the top of pipe to finish grade shall be 42 inches unless otherwise approved.
8. Fire hydrants shall be Mueller Centurion, Clow F2500, or approved equal with two 2-1/2” and one 4-1/2” pumper port with Storz fitting and national standard thread. Fire hydrants shall be painted sun yellow high grade enamel.
9. Valves shall be placed at a distance not to exceed 1,000 linear feet. There shall be at least two valves at each tee. There shall be at least three valves at each cross. Gate valves shall be placed on all pipes. Valve boxes shall be Buffalo style and have cast iron risers
10. Minimum backflow prevention is required in accordance with DOH and Thurston County’s cross connection program.
11. Thrust blocking and joint restraints shall be placed at all fittings and valves.
12. Hydrostatic pressure testing and bacteriological tests shall be performed prior to the acceptance of work.

7.5 Construction Certification and Follow-up Procedures

All materials and completed work are inspected by Public Works Department technical staff. This includes excavation, placement of piping, fittings, and valves, verification of thrust blocking calculations, backfilling, pressure testing, disinfection procedures, and water quality sampling. No work shall be accepted until all other utilities are completed, and all services, valves, hydrants, and other appurtenances located, brought to proper grade, and deemed operable. The Department reserves the right to retest any or all portions of the completed system prior to final acceptance.

All information provided by the engineer for the outside party for the construction designs, modeling documentation, and construction record drawings will be kept with the Department of Public Works for the required time. As part of the construction certification, the engineer for the outside party shall provide a Construction Report for Public Water System Projects as required by WAC 246-290-040.

Chapter 8

8.0 IMPROVEMENT PROGRAM

Thurston County is required by the State Growth Management Act to develop a Capital Facilities Program (CFP) and adopt the CFP as a section of the County's Comprehensive Plan. The Growth Management Act requires the CFP to identify specific facilities, include a realistic financing plan, and make adjustments to the plan if funding is inadequate. The CFP assumes receipt of outside grant resources, and if grants are not received, projects may be delayed or removed. The CFP is a planning document; not a budget for expenditures, nor a guarantee that the projects will be implemented. Each capital project listed in the CFP will need to go through a separate future approval process.

The Grand Mound utilities, both sewer and water, were constructed and put into operation in 1999. A Utility Local Improvement District was passed by the Board of County Commissioners to fund the project, based on revenue plans that staff developed, as a result of a development study done by professional I-5 real estate developer representative. Substantial Long Term General Obligation Bond (LTGO) financing was required to fund the Local Improvement District that was established to construct all associated facilities. The project completion date nearly coincided with a period of relative national and state prosperity. Development in Grand Mound fell far short of expected values. This result was exceptional detrimental to bond reimbursements, and so the then Board of County Commissioners reluctantly agreed to Reel Estate Excise Tax (RCW 82.46.010) to pay that portion of the debt which could not be collected from water (and sewer) rates.

In municipal governments, the Capital Facilities Plan (CFP) represents a listing of projects that are needed to support utility maintenance and growth. Projects must be in the CFP to insure they can be built (see RCW 36.70A.070). The department does hope to be successful in garnering grants for some of these projects. We ensure their possible construction by putting them in our CFP. Therefore, in Worksheet 1, the Six Year Operating Budget (lines 31 and 36), we have deleted the grant-funded projects from the CFP, and left only the utility funded maintenance projects. In Worksheet 5

All indebtedness is scheduled to be refunded by mid 2017, after which the utilities will have more than $1million annually to invest in capital projects or to use for supporting projects revenue bonds. A complete rate study and realignment of the rates targeted to reduce consumption will be done during the course of this Water System Plan.

In the event that grants and loans are not forthcoming, the projects will either be constructed by customers or will be pushed back until funding becomes available. System operation is not put in peril by this approach.

A comparison of local rates follows.

2012 Water Rates	Monthly	Commodity [1.]	Total
Tumwater - 3/4 meter	$6.02	$16.20	$22.22
Chehalis - 3/4 meter	$18.30	$31.07	$49.37
Chehalis Port Authority	$18.30	$31.07	$49.37
Grand Mound	$31.17	$18.61	$49.78
1. based on 263 gal/day for 365.25 days/year divided by 12 months=8,096 gallons: 1082 cf/mo			

Table 8-1 Local Rate Comparison

The Department prioritizes projects based on the following criteria: The project will:

a. Address existing or emerging public health and/or safety issues;
b. Address compliance with local, state and federal regulatory requirements;
c. Meet goals and objectives of the adopted water system plan;
d. Improve system reliability and/or reduce dependency on critical facilities;
e. Maintain the current level of service by removing and replacing degraded or aged facilities;
f. Have potential funding available (e.g. ULID, rates and charges, grants, loans, etc);
g. Improve or enhance the utility's current level of service; and
h. Acquire existing private utilities or develop new utilities.

A. Identification of System Improvements and B. Assessment of Alternatives

Grand Mound is a relatively new and developing water system that experienced minimal expansion during its first twelve years of operation. Consequently, significant capital project requirements due to operations and maintenance have not emerged. For growth purposes, utility expansion is accomplished primarily through new development. As a result of limited operations and minimal growth, the projects identified for the six-year CFP are to protect public health; meet regulatory requirements and provide redundancy in the transmission system. The following described projects are directly from the County's Capital Facilities Plan and serve to answer the State's Water System Planning Handbook requirement for *Identification of System Improvements and Assessment of Alternatives.*

The Department recognizes that twenty years worth of projects are not identified in the county's CFP at this time. However, during the deficiency assessment for the WSP, the Department identified additional deficiencies which will be added to the County's CFP during the next annual CFP cycle in 2012 through 2017.

Table 8-1
Thurston County
Grand Mound Capital Projects
2012-2017

REVENUE:	2012	2013	2014	2015	2016	2017	6 YR TOTAL
Utility Revenue		$30,600	$12,200	$10,200	$30,000	$27,200	$110,200
Grants/Loans/Other		$220,000	$1,080,000	$700,000	$1,012,500	$1,012,500	$4,025,000
REVENUE TOTAL:	**$0**	**$250,600**	**$1,092,200**	**$710,200**	**$1,042,500**	**$1,039,700**	**$4,135,200**

PROJECT EXPENDITURES	Funding Source	2012	2013	2014	2015	2016	2017	6 YR TOTAL
Grand Mound Water System Upgrades	Utility Revenue		$30,600	$12,200	$10,200	$30,000	$27,200	$110,200
Grand Mound Way Watermain Loop	Grant/Loans/Other[1]		$220,000	$780,000				$1,000,000
Second Grand Mound Reservior and Booster Station	Grants/Loans/Other					$1,012,500	$1,012,500	$2,025,000
Land Aquistiion for Well # 3	Grants/Loans/Other			$150,000				$150,000
Grand Mound Well and Pump # 3	Grants/Loans/Other				$350,000			$350,000
Land Aquistion for Well # 4	Grants/Loans/Other			$150,000				$150,000
Grand Mound Well and Pump # 4	Grants/Loans/Other				$350,000			$350,000
EXPENDITURE TOTAL		**$0**	**$250,600**	**$1,092,200**	**$710,200**	**$1,042,500**	**$1,039,700**	**$4,135,200**

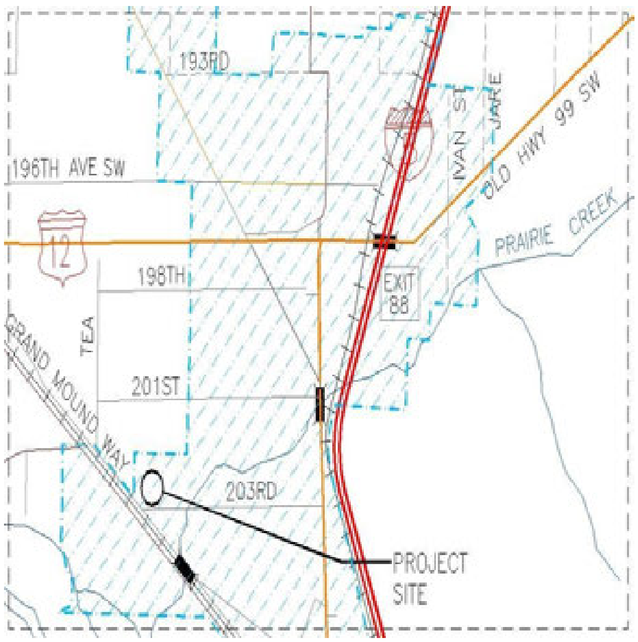
Key: [1]A specific grant or loan is not identifed. The county will seek revenues through a variety of federal and state grants and loans as funds become available. These sources could include local, state or federal sources.

Table 8-2 Grand Mound Capital Projects

8.1 Grand Mound Water System Upgrades

DESCRIPTION: Installation of well drains for wells #1 and #2, Water treatment system upgrades, water distribution upgrades, eliminated butter fly valves, service and upgrade chlorination equipment and add new and upgrade water quality sample stations..

LOCATION: Throughout the Grand Mound Water Distribution System.



JUSIFICATION (Need/Demand): Provide unimpeded potable water supply and reduce malfunctions within the existing water supply system.

IMPLICATION OF NOT DOING THE PROJECT(S): The upgrades are necessary to improve and maintain the existing water system functions. With wells out of commission the supply of potable water as well as fire flow to the community of Grand Mound would be compromised. Public Health notice of compromised well head would reduce the confidence of the community.

LINKS TO OTHER PROJECTS OR FACILITIES: None.

COMPREHENSIVE PLAN AND FUNCTIONAL PLAN(S) CITATIONS:

<u>Grand Mound Comprehensive Water System Plan (Amended 2007)</u>: Chapter 5- Water System Evaluation. Thurston County Comprehensive Plan; Appendix C.B.9;

Grand Mound Water System Upgrades

LEVEL OF SERVICE (LOS): Urban Service Level in terms of cubic feet per month of water consumed for residential, commercial and industrial uses.

Capital Costs:

Prior Years	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**6 YR. TOTAL**
Floor Drains Wells #1 & #2		$6,000					$6,000
Water Treatment System Upgrades		$6,200 (1a) (1b)	$2,500 (1c)				$8,700
Water Distribution System Upgrades		$6,0 00 (2a) (2b)	$4,000 (2c)	$3,000 (2d)		$5,000 (2e)	$18,000
Water Distribution System Upgrades Isolation Valves		$4,000	$4,500		$15,000	$15,000	$38,500
Chlorination Equipment Service/Upgrade _ Professional Services		$2,400	$1,200	$1,200	$15,000	$1,200	$21,000
Wells # 1 & #2 Surveillance Equipment							
New or Upgraded Water Quality Sampling Stations		$6,000		$6,000		$6,000	$18,000
None		$30,600	$12,200	$10,200	$30,000	$27,200	$110,200

(1a) Engineer evaluation $5,000 (1b) New mixer, misc. parts $1,200 (1c) Caustic pump upgrade - $2,500

(2a) Portable genset for SCADA reservoir site - $2,500 (2b) Video surveillance equipment Well #2 $3,500
(2c) Video surveillance equipment Well #1 $4,000 (2d) Fire hydrant Maintenance $3,000

(2e) Reservoir Cleaning and Inspection $5,000

ANNUAL OPERATIONS AND MAINTENANCE:

Estimated Costs - $115,200

Estimated Revenues – Water Utility Rates and Charges

Anticipated Savings Due to Project - Not identified

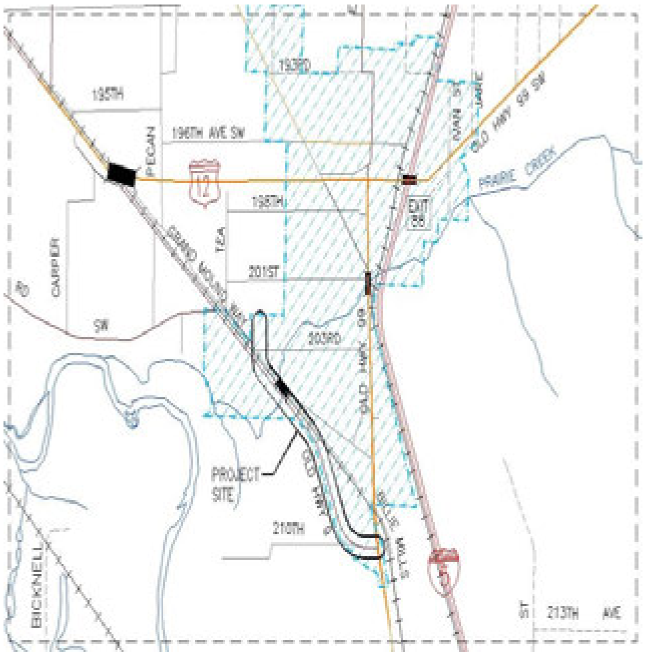
Department Responsible for Operations – Public Works Department

QUADRANT LOCATION:

☐ Rural NW	☐ Rural NE	☐ Rural SW
☐ Rural SE	☐ Olympia UGA	☐ Tumwater UGA
☐ Lacey UGA	☐ Yelm UGA	☐ Rainier UGA
☐ Tenino UGA	**X Grand Mound UGA**	

Grand Mound Way Watermain Loop

DESCRIPTION: Installation of a new water main from on Grand Mound Way to existing treatment plan.



LOCATION: The project would install a new water main adjacent to Grand Mound Way from Old Highway 99 to the existing water treatment plant.

JUSIFICATION (Need/Demand): This would improve water flow reliability and improve water quality. In addition will improve fire flows within the service area.

IMPLICATION OF NOT DOING THE PROJECT(S): Reduces water circulation, water quality and impacts fire flows.

LINKS TO OTHER PROJECTS OR FACILITIES: n/a.

COMPREHENSIVE PLAN AND FUNCTIONAL PLAN(S) CITATIONS: Grand Mound Subarea Plan, 1996, 1996 Grand Mound Water System Plan (Amended 2007).

<u>Comprehensive Plan</u>: Chapter 2, Goal 1, Objective B, Policies 5, and 6; Chapter 2, Goal 2, Objective A, Policies 2 and 7; Chapter 2, Objective C, Policies 1, 8 , 9 and 11; Chapter 2, Goal 3, Objective B, Policy 4; Chapter 8, Goal 1, Objective B; Policy 2; Chapter 8, Goal 1, Objective C, Policies 1 and 2, Appendix C.B.9.;

Grand Mound Way Water Loop System

LEVEL OF SERVICE (LOS): Urban Service Level in terms of cubic feet per month of water consumed for residential, commercial and industrial uses.

Capital Costs:

Prior Years	2012	2013	2014	2015	2016	2017	6 YR. TOTAL
$0		$220,000	$780,000				$1,000,000

FUNDING SOURCES	2012	2013	2014	2015	2016	2017	6 YR. TOTAL
Grant/Loan/Other		$220,000	$780,000				$1,000,000

ANNUAL OPERATIONS AND MAINTENANCE:

Estimated Costs - $ 1,000,000 (approximately)

Estimated Revenues – Water Utility Rates and Charges

Anticipated Savings Due to Project - Not identified

Department Responsible for Operations – Public Works Department

QUADRANT LOCATION:

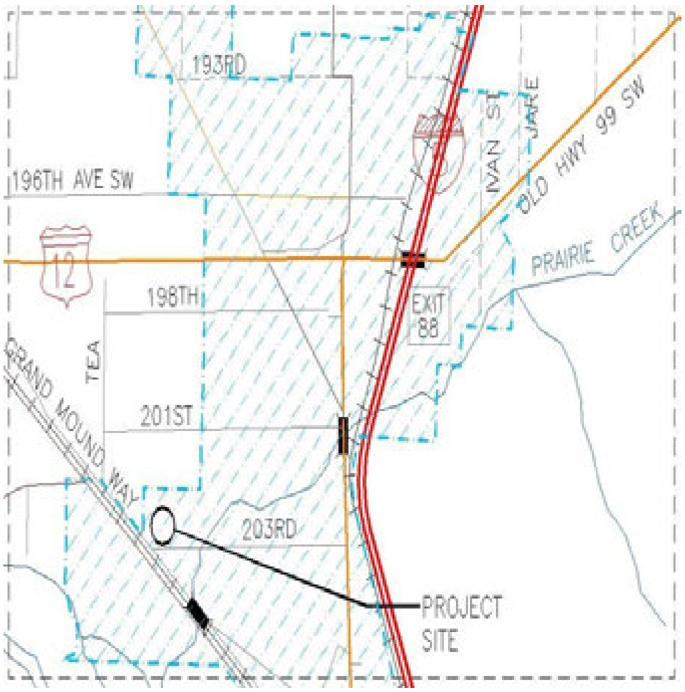
☐ Rural NW ☐ Rural NE ☐ Rural SW

☐ Rural SE ☐ Olympia UGA ☐ Tumwater UGA

☐ Lacey UGA ☐ Yelm UGA ☐ Rainier UGA

☐ Tenino UGA **X Grand Mound UGA**

Second Grand Mound Reservoir and Booster Station



DESCRIPTION: Siting, Design and construct of a second reservoir and booster station to meet future development and fire flows for emergency services.

LOCATION: Unknown

JUSIFICATION (Need/Demand): Increased demand for water service based on urban Development and to improve and meet fire flow demands.

IMPLICATION OF NOT DOING THE PROJECT(S): Inability of utility to provide water connections to new customer and to provide adequate water pressure needed to meet fire protection needs.

LINKS TO OTHER PROJECTS OR FACILITIES*:*

COMPREHENSIVE PLAN AND FUNCTIONAL PLAN(S) CITATIONS:

Comprehensive Plan: Chapter 2, Goal 1, Objective B, Policies 5, and 6; Chapter 2, Goal 2, Objective A, Policies 2 and 7; Chapter 2, Objective C, Policies 1, 8 , 9 and 11; Chapter 2, Goal 3, Objective B, Policy 4; Chapter 8, Goal 1, Objective B; Policy 2; Chapter 8, Goal 1, Objective C, Policies 1 and 2, Appendix C.B.9.;

Second Grand Mound Reservoir and Booster Station

LEVEL OF SERVICE (LOS):

Capital Costs:

Prior Years	2012	2013	2014	2015	2016	2017	6 YR. TOTAL
					$1,012,500	$1,012,500	$2,025,000

FUNDING SOURCES	2012	2013	2014	2015	2016	2017	6 YR. TOTAL
Grants/Loans/ Other					$1,012,500	$1,012,500	$2,025,000

ANNUAL OPERATIONS AND MAINTENANCE:

Estimated Costs - $ 2,025,000 (approximately)

Estimated Revenues – Sewer Utility Rates and Charges

Anticipated Savings Due to Project - Not identified

Department Responsible for Operations – Public Works

QUADRANT LOCATION:

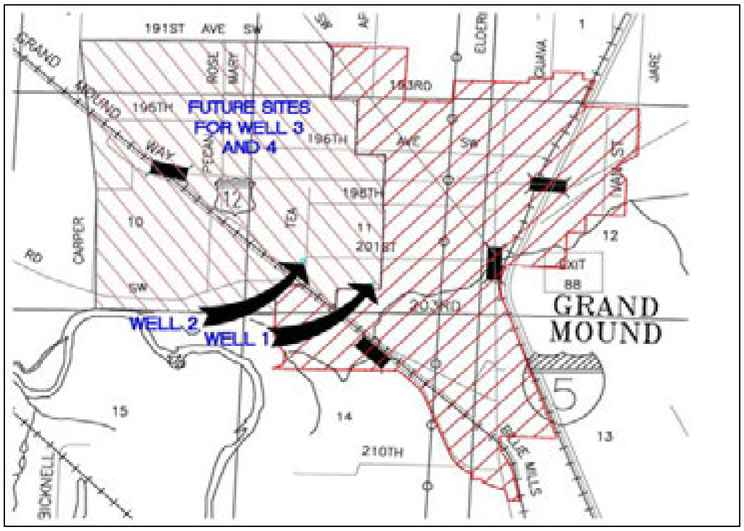
☐ Rural NW ☐ Rural NE ☐ Rural SW

☐ Rural SE ☐ Olympia UGA ☐ Tumwater UGA

☐ Lacey UGA ☐ Yelm UGA ☐ Rainier UGA

☐ Tenino UGA **X Grand Mound UGA**

Grand Mound – Land Acquisition for Well #3



DESCRIPTION: Purchase of property for future Well #3.

LOCATION: The project is located within or outside the existing Grand Mound Water/Sewer Facility.

JUSIFICATION (Need/Demand): This well site may be required to meet water system demand for the twenty- year planning horizon.

IMPLICATION OF NOT DOING THE PROJECT(S): Inadequate pump capacity to meet demand. Reduced economic activity in the Grand Mound Urban Growth Area

LINKS TO OTHER PROJECTS OR FACILITIES: Grand Mound Highway 99 to Highway 9 Sewer main extension/Grand Mound Water Main Extension.

COMPREHENSIVE PLAN AND FUNCTIONAL PLAN(S) CITATIONS: Grand Mound Subarea Plan, 1996, 1996 Grand Mound Water System Plan (Amended 2007). Thurston County Comprehensive Plan Appendix C.B.9.

Grand Mound – Land Acquisition for Well #3

LEVEL OF SERVICE (LOS): Urban Service Level in terms of cubic feet per month of water consumed for residential, commercial and industrial uses.

Capital Costs:

Prior Years	2012	2032	2014	2015	2016	2017	6 YR. TOTAL
$20,000			$150,000				$150,000

FUNDING SOURCES	2012	2032	2014	2015	2016	2017	6 YR. TOTAL
Grants/Loans/Other			$150,000				$150,000

ANNUAL OPERATIONS AND MAINTENANCE:

Estimated Costs - $150,000 (approximately)

Estimated Revenues – Water Utility Rates and Charges

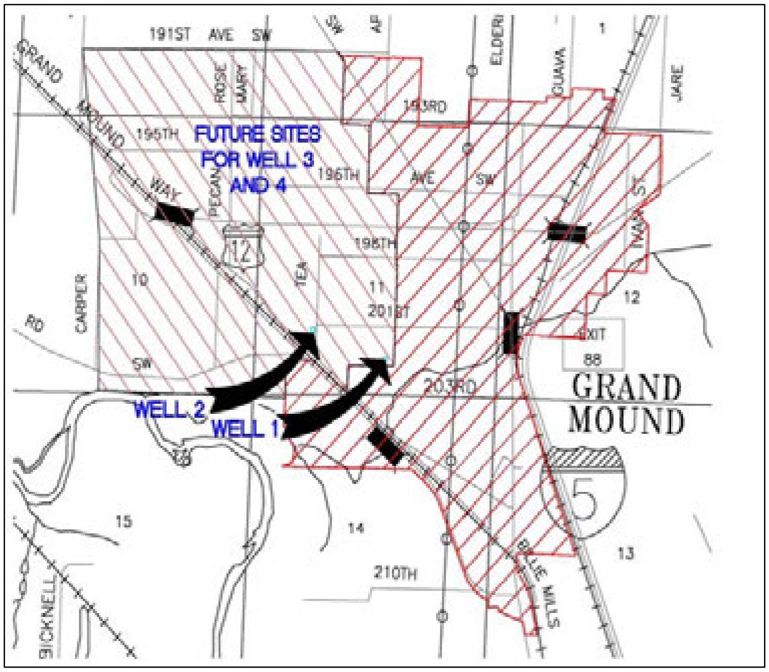
Anticipated Savings Due to Project - Not identified

Department Responsible for Operations – Public Works

QUADRANT LOCATION:

	Rural NW	☐	Rural NE	X	**Rural SW**
☐	Rural SE	☐	Olympia UGA	☐	Tumwater UGA
☐	Lacey UGA	☐	Yelm UGA	☐	Rainier UGA
☐	Tenino UGA	X	**Grand Mound UGA**		

Grand Mound – Well and Pump #3



DESCRIPTION: Development of the 3rd Grand Mound well site and pump.

LOCATION: The project is located within the existing Grand Mound Water/Sewer Facility.

JUSIFICATION (Need/Demand): This well site may be required to meet water system demand for the twenty- year planning horizon.

IMPLICATION OF NOT DOING THE PROJECT(S): Inadequate pump capacity to meet demand. Reduced economic activity in the Grand Mound Urban Growth Area

LINKS TO OTHER PROJECTS OR FACILITIES: Grand Mound Highway 99 to Highway 9 Sewer main extension/Grand Mound Water Main Extension.

COMPREHENSIVE PLAN AND FUNCTIONAL PLAN(S) CITATIONS: Grand Mound Subarea Plan, 1996, 1996 Grand Mound Water System Plan (Amended 2007). Thurston County Comprehensive Plan Appendix C.B.9.;

Well and Pump #3

LEVEL OF SERVICE (LOS): Urban Service Level in terms of cubic feet per month of water consumed for residential, commercial and industrial uses.

Capital Costs:

Prior Years	2012	2013	2014	2015	2016	2017	**6 YR. TOTAL**
$20,000				$350,000			$350,000

FUNDING SOURCES	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**6 YR. TOTAL**
Utility Revenue				$350,000			$350,000

ANNUAL OPERATIONS AND MAINTENANCE:

Estimated Costs - $350,000 (approximately)

Estimated Revenues – Water Utility Rates and Charges

Anticipated Savings Due to Project - Not identified

Department Responsible for Operations – Public Works

QUADRANT LOCATION:

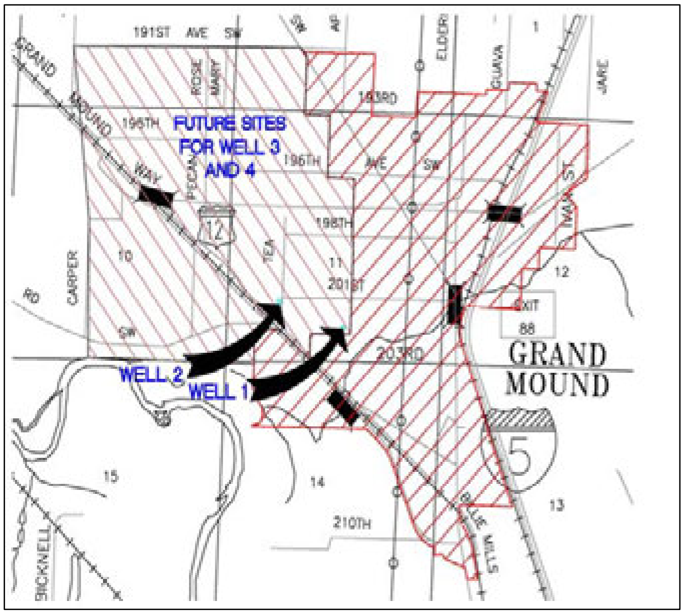
☐ Rural NW ☐ Rural NE x **Rural SW**

☐ Rural SE ☐ Olympia UGA ☐ Tumwater UGA

☐ Lacey UGA ☐ Yelm UGA ☐ Rainier UGA

☐ Tenino UGA X **Grand Mound UGA**

Grand Mound – Land Acquisition for Well #4



DESCRIPTION: Purchase of land for Well # 4.

LOCATION: The project is located within or outside the existing Grand Mound Water/Sewer Facility area.

JUSIFICATION (Need/Demand): This well site may be required to meet water system demand for the twenty- year planning horizon.

IMPLICATION OF NOT DOING THE PROJECT(S): Inadequate pump capacity to meet demand- Reduced economic activity in the Grand Mound Urban Growth Area

LINKS TO OTHER PROJECTS OR FACILITIES: Grand Mound Highway 99 to Highway 9 Sewer main extension/Grand Mound Water Main Extension.

COMPREHENSIVE PLAN AND FUNCTIONAL PLAN(S) CITATIONS: Grand Mound Subarea Plan, 1996, 1996 Grand Mound Water System Plan (Amended 2007). Thurston County Comprehensive Plan C.B.9.;

Grand Mound – Land Acquisition for Well #4

LEVEL OF SERVICE (LOS): Urban Service Level in terms of cubic feet per month of water consumed for residential, commercial and industrial uses.

Capital Costs:

Prior Years	2012	2013	2014	2015	2016	2017	**6 YR. TOTAL**
$20,000			$150,000				$150,000

FUNDING SOURCES	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**6 YR. TOTAL**
Grants/Loans/Other			$150,000				$150,000

ANNUAL OPERATIONS AND MAINTENANCE:

Estimated Costs - $ 150,000 (approximately)

Estimated Revenues – Water Utility Rates and Charges

Anticipated Savings Due to Project - Not identified

Department Responsible for Operations – Public Works

QUADRANT LOCATION:

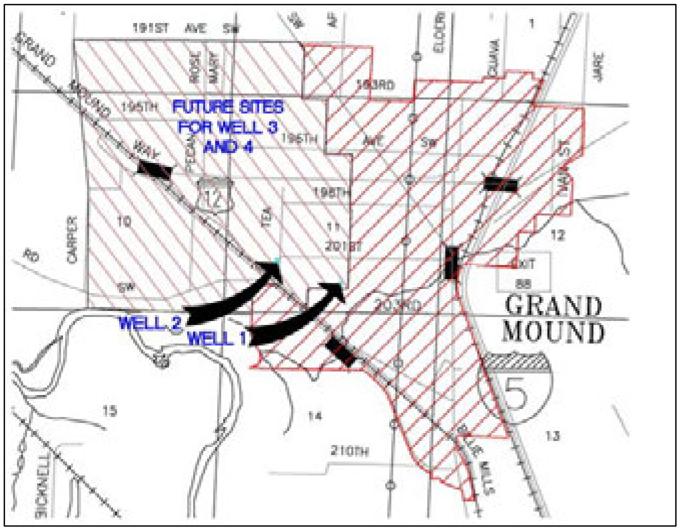
☐ Rural NW ☐ Rural NE X **Rural SW**

☐ Rural SE ☐ Olympia UGA ☐ Tumwater UGA

☐ Lacey UGA ☐ Yelm UGA ☐ Rainier UGA

☐ Tenino UGA X **Grand Mound UGA**

Grand Mound – Well and Pump #4



DESCRIPTION: Development of the 4th Grand Mound well site and pump.

LOCATION: The project is located within the existing Grand Mound Water/Sewer Facility.

JUSIFICATION (Need/Demand): This well site may be required to meet water system demand for the twenty- year planning horizon.

IMPLICATION OF NOT DOING THE PROJECT(S): Inadequate pump capacity to meet demand- Reduced economic activity in the Grand Mound Urban Growth Area

LINKS TO OTHER PROJECTS OR FACILITIES: Grand Mound Highway 99 to Highway 9 Sewer main extension/Grand Mound Water Main Extension.

COMPREHENSIVE PLAN AND FUNCTIONAL PLAN(S) CITATIONS: Grand Mound Subarea Plan, 1996, 1996 Grand Mound Water System Plan (Amended 2007). Thurston County Comprehensive Plan C.B.9.;

Grand Mound – Well and Pump #4

LEVEL OF SERVICE (LOS): Urban Service Level in terms of cubic feet per month of water consumed for residential, commercial and industrial uses.

Capital Costs:

Prior Years	2012	2013	2014	2015	2016	2017	6 YR. TOTAL
$20,000	$5,000					$500,000	$505,000

FUNDING SOURCES	2012	2013	2014	2015	2016	2017	6 YR. TOTAL
Utility Revenue	$5,000					$500,000	$505,000

ANNUAL OPERATIONS AND MAINTENANCE:

Estimated Costs - $ 100 (approximately)

Estimated Revenues – Water Utility Rates and Charges

Anticipated Savings Due to Project - Not identified

Department Responsible for Operations – Public Works

QUADRANT LOCATION:

☐ Rural NW ☐ Rural NE ☐ Rural SW

☐ Rural SE ☐ Olympia UGA ☐ Tumwater UGA

☐ Lacey UGA ☐ Yelm UGA ☐ Rainier UGA

☐ Tenino UGA **X Grand Mound UGA**

Chapter 9

9.1 Utility History

Grand Mound community members approached county officials in 1984, with a request that the county initiate plans for a report on the costs for municipal level sewer collection and treatment services. By spring of 1989, county staff had completed a general sewerage plan for a proposed service area shaped like a champagne glass (approximately 150 acres) along the Old Hwy 99 and Hwy 12 corridors.

By 1992, county and community leaders had concluded that sewer service by itself would not support the level of development both wished to foster. A municipal water system would be required, especially to ensure fire flow protection to properties inside the utility boundary. In the summer of 1993, an early Utility Local Improvement District (ULID) proposal was unsuccessful because its costs were higher than the sum of benefits to properties.

In July of 1995, the Board of County Commissioners directed staff to develop a project that was acceptable to the community in both scope and cost – one that met the benefit test prescribed by ULID laws. The County engaged the professional services of Robert Chase, an expert in evaluating development potential along the I-5 corridor. Chase prepared a report that evaluated two scenarios: one with no water and sewer systems in the Grand Mound area; and, a second with full water and sewer.

The purpose of the Chase Report was to, Characterize current economic base;

- **Profile the Grand Mound Urban Growth Area;**
- **Inventory the local economy;**
- **Develop a Grand Mound business mix and local employment patterns along with targeted industry analysis;**
- **Forecast economic, demographic, and housing changes under two principal development scenarios: one with and another without sewer and water service; and,**
- **Present short-term (5-10-year) and medium-term (15-20-year) economic forecasts of changes in market conditions and economic activity arising from the two development scenarios.**

Chase concluded, "Grand Mound is ideally situated for future development. These forecasts, however, are conditional based upon the level of local initiative and local preparedness for further economic development. Attracting new investment will require significant local efforts in Grand Mound." He went on to conclude, "In sum, these forecast scenarios are highly dependent upon local initiative and local preparedness for economic development. These development scenarios range from a "status quo" level of local initiative (low growth scenario) to a highly active local development group (high growth scenario). The industrial targets represent a realistic set of development opportunities for Grand Mound, based on industry level growth forecasts, industry requirements, and current county-wide business recruitment efforts."

In 1995, based on Chase's findings, and to ensure that the Grand Mound area could be legitimately developed to levels that warranted municipal water and sewer systems, the county completed a process that defined an Urban Growth Area (UGA) of about 900 acres. The UGA that resulted from the Chase report and following community meetings, was considerably larger that the originally conceived “champagne glass” area. The new UGA was apportioned in such a way as to provide sufficient area to fulfill all segments of growth conceived in the Chase Report. Development Standards and a Preliminary Transportation Plan rounded out the character of this new south Thurston County UGA.

Next, the County engaged an engineering consultant (Earth Tech) to prepare plans and specifications for all elements of both the water and sewer systems. Both were eventually approved by Washington State Departments of Health and Ecology respectively. In 1996, county staff developed a second, preliminary ULID proposal that included about 350 acres of the total 900-acre UGA. With estimated constructed costs for both systems in hand, preliminary assessments represented 61% of the increased special benefit value to all properties in the ULID area. A summary of construction costs follows in Table 9-1 below.

In developing initial ULID assessment and cost distribution methods, staff assigned the $2,576,428 directly to ULID assessments against properties within the ULID boundary. The $1,128,320 for reservoirs and wells as considered to be payable from future connections with a starting value of about $1,025 per connection ($1,128,320/1000 connections). The county sold Long Term General Obligations (LTGO) bonds to finance its share of the water and sewer system capital. Project cost savings returned all original REET project financing. Initial operating rates we set to cover operations only. When the system was new, cash was short; a decision was made to accumulate replacement funds later in the utility’s life as additional customers connected.

9.2 Past Financial Status

The sewer utility was originally developed around a residential wastewater flow of 700 cubic feet per month as shown in TCC 15.12.012(E.). A value of 215 gal/day for residents with average1ERU = 700 cubic feet of water consumed per month. Residential customers initiated their service with a connection charge of one (1) ERU. Commercial customers initiated their service based on guide values in Thurston County Code. Their connection charges are reviewed annually thereafter to ensure accuracy. Customers (other than residential customers) who used more than originally estimated ERU(s) were charged an additional connection charge for their overuse. Credits are available for under users.

After initial water service was made available in 1999, far fewer than expected customers rushed to connect to the new water and sewer systems. To develop potential alternatives to stimulate growth, the county, in concert with the Thurston County Economic Development Council, engaged financial consultant Eric Hovee. Mr. Hovee reviewed development trends, interviewed local residents, property owners, and business community members. From this experience, Mr. Hovee developed a list of obstacles and an action plan for making the area more attractive. Several Hovee proposals were implemented in the Grand Mound area.

Grand Mound Water System - Financial History

	2005	2006	2007	2008	2009	2010
Beginning Fund Bal	$52,204	$121,602	$80,157	$37,730	$787,729	$696,307
Revenues	$64,510	$78,610	$104,720	$391,616	$518,913	$523,804
Connection Charges	$187,092	$73,400	$88,686	$761,913	$47,250	$17,920
Expenditures	$190,296	$202,060	$223,217	$429,914	$665,576	$416,127
EFB	$121,602	$80,157	$37,730	$787,729	$696,307	$821,904

Water System Reserves

Beginning Balance			$117,731	$102,520	$93,672	$95,456
Reserve Cash In		$117,731	$62,128	$1,573,008	$154,146	$651,930
Reserves Spent			$77,339	$1,581,856	$152,362	$650,000
Net Reserves	0	$117,731	$102,520	$93,672	$95,456	$97,386

Table 9-1

9.3 Improvement Program Financing

In 2008, the Great Wolf Resort was open for business. Because the built Resort was much larger than that proposed in the business's original proposal, its usage has far outstripped the proposer's original demand forecasts. By 2010, Great Wolf was using 2.8 times the water used by residential customers; and 4.8 times the volume of the region's commercial accounts (Table 9-6, 2010).

Other than a boom in residential construction during the growth period 2006-2008, residential growth has been significantly diminished. The forecast values for new ERUs can be seen in Table 9-6, on the line called "Change in ERUs"

It is also important to note that the Chehalis Tribes have engaged their own professional planning firm to develop a revised commercial center near the intersection of Hwy 12 and Old 99. The existing zoning and related water use will cover any ultimate change that may result from this work. Those zoning and use plans have not matured as of this writing (mid July 2011).

9.4 Financial Vitality Test

The Financial Viability Test shown in Appendix E is based on the number of ERUs in early 2012 at 676 ERUs. (see Table 2-10). All tests on Worksheet 5 are met except the one for Emergency Reserve. Growth in the Grand Mound ULID area has not kept up the early predictions of Chase. Moreover, Chase assumed that residents would come together to make larger properties available as the need arose. This circumstance, combined with two subsequent downturns in economic growth, and observed multiple families occupying single family homes, all have resulted in revenues far less than those expected. While this Plan covers the period 2012 to 2017, it is vital the readers know that all debt will be paid off by 2019, meaning more funds available for reserves and construction after that date.

9.5 Rate Structure Analysis

Since the first WSP, residential use has grown to an average 282 gal/day, possibly because of multiple occupancy of single family homes. The current water system rate structure and charges has become too burdensome. The utility plans to engage the services of a professional firm to assist with changing the current ERU system to a more conventional meter size system This will cover not only connection charges but facilitate monthly billings as well. This new water charging and billing system will be in place before the next required WSP.

Chapter 10

10.0 Submittal of the Draft Plan

10.0.1 Cover Letter

10.0.2 Water System Plan Submittal Form

10.1 Adjacent Water Purveyors

10.1.1 For Review of the Draft Plan

10.2 Water Use Efficiency

10.2.1 Handbills Sent to Customers

10.2.2 Posters

10.2.3 Sign In Sheets

10.2.4 Agenda

10.2.5 Meeting Minutes

10.3 Local Government Consistency Review

10.3.1 Application Checklist

10.3.2 Approval Letter from Thurston County Resource Stewardship Department

THURSTON COUNTY
WASHINGTON

COUNTY COMMISSIONERS
Cathy Wolfe
District One
Sandra Romero
District Two
Karen Valenzuela
District Three

PUBLIC WORKS
An Accredited Agency of the
American Public Works Association

Lester Olson
Director

September 15, 2011

Darin Klein, Regional Planner
SW Drinking Water Operations
Washington State Department of Health
2411 Pacific Avenue
PO Box 47823
Olympia WA

Dear Mr. Klein:

SUBJECT: Grand Mound Water System Plan, Six Year Review

Please find the attached Grand Mound Water System Plan. Thurston County's Public Works Department respectfully requests the State Department of Health's review and comment on this plan. The Department has taken great care in developing this plan to ensure a safe and plentiful supply of drinking water for Grand Mound Public Water System customers. Please forward this Plan to the appropriate staff at the State Department of Ecology for their review.

Please call or e-mail if you have questions or issues.

Sincerely,

Roger Giebelhaus, AICP
Utility Planner

Attachment

2404-A Heritage Ct. SW – Olympia, WA 98502 – (360) 754-4580 – FAX (360) 786-5582

10.0.1 Cover Letter

Water System Plan Submittal Form

This form is required to be submitted along with the Water System Plan (WSP). It will serve to expedite review and approval of your WSP. WSPs will not be reviewed until submittal form and checklist are completed.

Grand Mound Water System 1. Water System Name	**07158-0** 2. PWS ID# or Owner ID#	**Thurston County** 3. System Owner Name
Roger Giebelhaus, AICP 4. Contact Name for Utility	**(360) 754-3355 Ext. 7809** Phone Number	**Utility Planner** Title
Thurston County Public Works Department, 2404-"A" Heritage Court SW. Contact Address	**Olympia** City	**WA** State / **98502-6045** Zip
Scott Lindblom, PE. 5. Project Engineer	**(360) 786-5153** Phone Number	**Engineering Section Manager** Title
Same as above Project Engineer Address	**Same as above** City	**Same as above** State / Zip
Dennis Velthuysen 6. Billing Contact Name (required if not the same as #4)	**(360) 709-3077** Billing Phone Number	**(360) 786-5582** Billing Fax Number
Thurston County Public Works Department, 2404-"A" Heritage Court SW. Billing Address	**Olympia** City	**WA** State / **98502-6045** Zip

6. How many services are presently connected to the system? **248**
7. Is the system expanding? (seeking to extend service area or increase number of approved connections) X Yes ☐ No
8. If number of services is expected to increase, how many new connections are proposed in the next six years? ____
9. If the system is private-for-profit, is it regulated by the State Utilities and Transportation Commission? ☐ Yes X No
10. Is the system located in a Critical Water Supply Service Area (i.e., have a Coordinated Water System Plan)? X Yes ☐ No
11. Is the system a customer of a wholesale water purveyor? ☐ Yes X No
12. Will the system be pursuing additional water rights from the State Department of Ecology in the next twenty years? ☐ Yes X No
13. Is the system proposing a new intertie? ☐ Yes X No
14. Do you have projects currently under review by the Department of Health? ☐ Yes X No
15. Are you requesting distribution main project report and construction document submittal exception, and if so, does the WSP contain standard construction specifications for distribution mains? X Yes ☐ No
16. Are you requesting distribution related project report and construction document submittal exception, and if so, does the WSP contain distribution facilities design and construction standards, including internal engineering review procedures? X Yes ☐ No
17. Have you sent copies of the draft WSP or notice to adjacent purveyors for their review? X Yes ☐ No
18. Have you sent copies of the draft WSP to local governments with jurisdiction within your service area for their review? X Yes ☐ No
19. Are you proposing a change in the place of use of your water right? ☐ Yes X No

If answer to questions 17 and 18 is yes, list adjacent utilities/entities that have received a copy of the draft WSP: **Rochester Water Association and Maple Lane School Water System.**

Is this plan: X an Initial Submittal ☐ a Revised Submittal

Please enclose the following number of copies of the WSP:

2 copies for Department of Health
1 copy for Department of Ecology
1 additional copy if you answered "yes" to question 9

3 Total copies attached

Please return completed form to the Office of Drinking Water regional office checked below.

☐ **Northwest Drinking Water Office** **Department of Health** **20435 72nd Ave S, Suite 200** **Kent, WA 98032-2358** **Phone: (253) 395-6750** **Fax: (253) 395-6760**	☐ **Southwest Drinking Water Office** **Department of Health** **PO Box 47823** **Olympia, WA 98504-7823** **Phone: (360) 236-3030** **Fax: (360) 664-8058**	☐ **Eastern Drinking Water Office** **Department of Health** **16201 E Indiana Ave, Suite 1500** **Spokane Valley, WA 99216** **Phone: (509) 329-2100** **Fax: (509) 329-2104**

If you need this publication in an alternate format, call (800) 525-0127. For TTY/TDD call (800) 833-6388.

DOH Form 331-397 (Updated 08/10)

10.0.2 Water System Plan Submittal Form

THURSTON COUNTY
WASHINGTON
SINCE 1852

COUNTY COMMISSIONERS
Cathy Wolfe
District One
Sandra Romero
District Two
Karen Valenzuela
District Three

PUBLIC WORKS

Lester Olson
Director

August 18, 2011

Mr. Lowell Deguise, Manager
Rochester Water Association
10110 Hwy. 12 SW
Rochester, WA 98579

Dear Mr. Deguise:

SUBJECT: Grand Mound Water System Plan Update – ID# 7158-0

Pursuant to WAC Chapter 246-292-100, Chapter 246-293-250, and Chapter 246-295, the Thurston County Department of Public Works is pleased to invite your review of the enclosed draft update to the 2006 Grand Mound Public Water System Plan. We recognize that the Rochester Water Association shares a common goal of providing residents with healthy drinking water and attentive, dependable service.

We look forward to hearing your views and working with you as the planning process continues.

Please feel free to contact me at (360) 754-3355, ext. 7809 or Giebelr@co.thurston.wa.us

Sincerely,

Roger Giebelhaus, AICP
Thurston County Utility Planner

Enclosed: Grand Mound Water System Plan
Grand Mound Service Area
I.D. #7158-0

RG:rp\O:\ENGINEERING_SERVICES\A_PW_DESIGN\Grand Mound Water System Plan 2012\Chapter 1 System Description\Invitation Cover Letter_Rochesterwater.doc

2404-A Heritage Ct. SW • Olympia, WA 98502 • (360) 754-4580 • FAX (360) 786-5582

Recycled Paper

10.1.1 Adjacent Water Purveyors Review Letter

THURSTON COUNTY
WASHINGTON
SINCE 1852

COUNTY COMMISSIONERS
Cathy Wolfe
District One
Sandra Romero
District Two
Karen Valenzuela
District Three

PUBLIC WORKS

Lester Olson
Director

August 18, 2011

Dan McNamara, Utility Manager
Department of Social and Health Services/ Juvenile Rehabilitation Administration
375 SW 11th Street
Chehalis, WA 98532

SUBJECT: Grand Mound Water System Plan Update – ID#-7158-0

Dear Mr. McNamara:

Pursuant to WAC Chapter 246-292-100, Chapter 246-293-250, and Chapter 246-295, the Thurston County Department of Public Works is pleased to invite your review of the enclosed draft update to the 2006 Grand Mound Public Water System Plan. We recognize that The Water Company shares a common goal of providing residents with healthy drinking water and attentive, dependable service.

We look forward to hearing your views, and working with you as the planning process continues.

Please feel free to contact me at (360) 754-3355, ext. 7809 or giebelr@co.thurston.wa.us.

Sincerely,

Roger Giebelhaus

Roger Giebelhaus, AICP
Thurston County Utility Planner

Enclosed: Grand Mound Water System Plan
Grand Mound Service Area
I.D. #7158-0

O:\ENGINEERING_SERVICES\A_PW_DESIGN\Grand Mound Water System Plan 2012\Chapter 1 System Description\Invitation to review DSHS.JRA.doc

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Recycled Paper

10.1.1

Water Conservation Forum
for the Grand Mound Water System

WHAT: Public Forum: Water Savings Goals for Grand Mound Water System

WHO: Water Customers, Public Works Staff

WHEN: Monday, May 23, 2011; 6:30 pm – 7:30 pm

WHERE: Rochester High School Library, 19800 Carper Road SW

More Information: Roger Giebelhaus, 360-754-3355 ext. 7809

THURSTON COUNTY

Water Conservation Forum
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THURSTON COUNTY

10.2.1 Handbills Sent to Customers

Water Conservation Forum for the Grand Mound Water System

WHAT: Public Forum: Water Savings Goals for Grand Mound Water System

WHO: Water Customers, Public Works Staff

DATE: Monday, May 23

TIME: 6:30 pm – 7:30 pm

WHERE: Rochester High School Library, 19800 Carper Road SW

More Information: Roger Giebelhaus 360-754-3355 ext. 7809

THURSTON COUNTY
WASHINGTON
SINCE 1852

10.2.2 Posters

WATER CONSERVATION FORUM FOR GRAND MOUND WATER SYSTEM
MAY 23, 2011

SIGN IN SHEET

NAME	ADDRESS	PHONE #	E-MAIL
Tom Cleary	[redacted]		
[illegible] Cleary			
Larry Quarnstrom			

10.2.3 Sign In Sheets

WATER CONSERVATION FORUM
GRAND MOUND WATER SYSTEM
May 23, 2011
6:30 pm, Rochester High School

6:30 pm a) Introductions

Keith Eisner, Public Information Officer, Thurston County Public Works
(phone no. 360-786-5145)

Roger Giebelhaus, Utility Planner, Thurston County Public Works
(phone no. 360-754-3355, ext. 7829)

Keith Harris , Senior Civil Engineer, Thurston County Public Works
(phone no. 360-754-3355, ext. 6655)

6:35 pm b) Background: History

Required Comprehensive Plan

6:45 pm c) Water Use Efficiency Requirements: more water allocated than exists

Saving money and the environment

6:55 pm Typical Goals: reduce total production from wells

Leak detection

Low flow toilets

Low flow shower heads

Plant only drought tolerant landscaping

Rate structure that is tiered

7:10 pm What is cost effective and can be implemented?

7:20 pm Meeting adjourned

10.2.4 Agenda

WATER CONSERVATION FORUM
GRAND MOUND WATER SYSTEM
May 23, 2011
6:30 pm, Rochester High School

6:30 pm a) Introductions

Keith Eisner, Public Information Officer, Thurston County Public Works
(phone no. 360-786-5145)

Roger Giebelhaus, Utility Planner, Thurston County Public Works
(phone no. 360-754-3355, ext. 7829)

Keith Harris , Senior Civil Engineer, Thurston County Public Works
(phone no. 360-754-3355, ext. 6655)

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Rate structure that is tiered

7:10 pm What is cost effective and can be implemented?

7:20 pm Meeting adjourned

10.2.4 Agenda con't

THURSTON COUNTY
WASHINGTON
SINCE 1852

COUNTY COMMISSIONERS
Cathy Wolfe
District One
Sandra Romero
District Two
Karen Valenzuela
District Three

PUBLIC WORKS
Lester Olson
Director

Minutes: Water Conservation Forum for Grand Mound Water System
May 23, 2011; 6:30 p.m.
Rochester High School

Attendees:

Public—Trieta Cleary, Tom Cleary (City of Centralia), Larry Quanstrum (Rochester School District)
Thurston County Public Works —Keith Harris, Roger Giebelhaus, Keith Eisner

I. History: Mr. Harris outlined the history of the Grand Mound Public Water System Plan, and that the state Department of Health requires periodic updates.

II. Water Use Requirements: Mr. Harris also explained the need to conserve water as more water has been allocated for public use then exists. The goal of efficiency requirements is to save water~~money~~ as well as protect the environment.

III. Discussion: Water Conservation Methods: Mr. Harris and Mr. Giebelhaus outlined five popular conservation methods:

a. Leak Detection: While leak detection is a viable strategy for many systems, the low leakage rate of 4% or less at the Grand Mound system doesn't warrant additional studies.
b. Low Flow Toilets: Responding to comments about inefficiencies of low-flow toilets, MR. Harris explained that recent models have made significant improvements over earlier products.
c. Low Flow Shower Heads: While this product can also reduce water use, it's unclear if funds are available for purchase of shower heads. Low-flow shower heads must also be accompanied by education that promotes shorter showers.
d. Drought-resistant Landscapes: Using drought-resistant plants is also another good strategy to conserve water by limiting the amount of watering needed during drought months.
e. Tiered Rate Structure: A good strategy when water use is high. Attendees agreed that giving users an opportunity to save money is an effective way to promote conservation. Mr. Giebelhaus spoke of various tier strategies such as higher rates for certain times of day or basing a tier system on odd and even calendar days. Conserving water not only reduces costs, but maintains stream flows.

Conclusion: Attendees agreed that a tiered rate structure is the most cost effective incentive for water conservation.

2404-A Heritage Ct. SW – Olympia, WA 98502 – (360) 754-4580 – FAX (360) 786-5582

10.2.5 Meeting Minutes con't

Health

Local Government Consistency Review Checklist

A consistency review between DOH planning and engineering documents and adopted comprehensive plans and development regulations is required in certain situations. This checklist may be used to document the consistency review as required in WAC 246-290-108. A consistency review is required for each local government with jurisdiction over the applicable service area.

Water System Name: Grand Mound Water System PWS ID: # 07156-0

Planning Document Title: GM Water System Plan Update Plan Date: January, 2012

Local Government with Jurisdiction: Thurston County

Consistency Statement	Page(s) in Planning Document	Yes – No – Not Applicable
The applicable service area is consistent with the land use and zoning in the adopted comprehensive plan and adopted development regulations.		yes
For Water System Plans: The six-year growth projection used to forecast water demand is consistent with the adopted city/county's population growth projections. If a different growth projection was used, the alternative growth projection and methodology proposed is acceptable based on explanation given.		yes
For Water System Plans: Provisions of water service for new service connections are consistent with the adopted comprehensive plan and adopted development regulations.		yes
For city-owned systems only: All utility service extension ordinances regarding water service are included in the plan. These policies are consistent with the adopted comprehensive plan and adopted development regulations.		yes
Other relevant elements related to water supply (as determined by DOH) is consistent with the adopted comprehensive plan and adopted development regulations.		
Where the local government with jurisdiction did not provide a Consistency Review: Provide documentation of efforts taken and amount of time provided. Include: name of contact, date, type of effort attempted, and response from local agency.		

I certify that the above statements are true to the best of my knowledge and that these statements support the conclusion that the subject-planning document is consistent with adopted comprehensive plans, development regulations, and other policies.

Signature ____________________ Date 6/21/11

Robert Smith, Senior Planner, Thurston County Resource Stewardship Dept.

Printed Name, Title, & Jurisdiction

****For any issues of inconsistency, please document the inconsistency, including the citation from the comprehensive plan or development regulation. Provide direction on how this inconsistency can be resolved.****

1

10.3.1 Application Checklist

THURSTON COUNTY
WASHINGTON
SINCE 1852

COUNTY COMMISSIONERS

Cathy Wolfe
District One
Sandra Romero
District Two
Karen Valenzuela
District Three

RESOURCE STEWARDSHIP DEPARTMENT

Creating Solutions for Our Future

Cliff Moore
Director

June 23, 2011

Roger Giebelhaus
Thurston County Public Works Department
2404 "A" Heritage Court SW
Olympia, WA 98502

SUBJECT: Project #2011101170, Folder #11 103598 XD Other Administrative Action for the Grand Mound Water System, Determination Letter

Dear Mr. Giebelhaus:

I have reviewed your request for a Local Government Consistency Review for the Washington State Department of Health. Based on my review of the excerpts from the Grand Mound Water System Plan and the County Comprehensive Plan, I believe that the water system plan is consistent with the Thurston County Comprehensive Plan. With this letter I am including the signed Local Government Consistency Review Checklist.

If you have any questions, please call me at (360) 754-4023.

Sincerely,

Robert Smith, Senior Planner

RS:O:\Amt1\Data\DevServ\Task\Planning\Amanda Scan File\Other Administrative Actions\Decisions\2011101170 TC GrandMoundWater.RS.doc

2000 Lakeridge Drive SW, Olympia, Washington 98502 (360) 786-5490/FAX (360) 754-2939
TDD (360) 754-2933 Website: www.co.thurston.wa.us/permitting

10.3.2 Approval Letter from Thurston County Resource Stewardship Dept.

THURSTON COUNTY
WASHINGTON
SINCE 1852

Appendix A

Water Facilities Inventory

Grand Mound Groundwater Utility Feasibility Assessment

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

WATER FACILITIES INVENTORY (WFI) FORM

ONE FORM PER SYSTEM

Quarter: 1
Updated: 12/28/2009
Printed: 03/09/2011
WFI Printed For: On-Demand
Submission Reason: Contact Update

RETURN TO: Southwest Regional Office, PO Box 47823, Olympia, WA, 98504

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
07158 0	GRAND MOUND	THURSTON	A	Comm

6. PRIMARY CONTACT NAME & MAILING ADDRESS

SCOTT SCHIMELFENIG
UTILITY SERVICES MANAGER
2404 HERITAGE CT SW
OLYMPIA, WA 98502

STREET ADDRESS IF DIFFERENT FROM ABOVE
ATTN
ADDRESS 2404 HERITAGE CT SW
CITY OLYMPIA STATE WA ZIP 98502

7. OWNER NAME & MAILING ADDRESS — **8. Owner Number** 000592

THURSTON COUNTY PUBLIC WORKS
SCOTT SCHIEMELFENIG TITLE: UTILITY SERVICES MGR
2404 HERITAGE CT SW
OLYMPIA, WA 98502

STREET ADDRESS IF DIFFERENT FROM ABOVE
ATTN
ADDRESS
CITY STATE ZIP

9. 24 HOUR PRIMARY CONTACT INFORMATION

Primary Contact Daytime Phone: (360) 754-2930
Primary Contact Mobile/Cell Phone: (360) 239-4486
Primary Contact Evening Phone: (360) 352-0505
Fax: (360) 786-5582 E-mail: Petriema@co.thurston.wa.us

10. OWNER CONTACT INFORMATION

Owner Daytime Phone: (360) 754-7678
Owner Mobile/Cell Phone: (360) 239-2539
Owner Evening Phone:
Fax: (360) 786-5582 E-mail: schimes@co.thurston.wa.gov

WAC 246-290-420(9) requires that water systems provide 24-hour contact information for emergencies.

11. SATELLITE MANAGEMENT AGENCY - SMA (check only one)

- [ ] Not applicable (Skip to #12)
- [x] Owned and Managed
- [ ] Managed Only
- [ ] Owned Only

SMA NAME: THURSTON COUNTY PUBLIC WORKS SMA Number: 134

12. WATER SYSTEM CHARACTERISTICS (mark ALL that apply)

- [ ] Agricultural
- [x] Commercial / Business
- [ ] Day Care
- [ ] Food Service/Food Permit
- [ ] 1,000 or more person event for 2 or more days per year
- [ ] Hospital/Clinic
- [x] Industrial
- [ ] Licensed Residential Facility
- [x] Lodging
- [ ] Recreational / RV Park
- [x] Residential
- [ ] School
- [ ] Temporary Farm Worker
- [ ] Other (church, fire station, etc.):

13. WATER SYSTEM OWNERSHIP (mark only one)

- [ ] Association
- [ ] City / Town
- [x] County
- [ ] Federal
- [ ] Investor
- [ ] Private
- [ ] Special District
- [ ] State

14. STORAGE CAPACITY (gallons) 487,000

15	16 SOURCE NAME	17 INTERTIE	18 SOURCE CATEGORY										19 USE			20	21 TREATMENT						22 DEPTH	23	24 SOURCE LOCATION			
Source Number	LIST UTILITY'S NAME FOR SOURCE AND WELL TAG ID NUMBER. Example: WELL #1 XYZ456 IF SOURCE IS PURCHASED OR INTERTIED, LIST SELLER'S NAME Example: SEATTLE	INTERTIE SYSTEM ID NUMBER	WELL	WELL FIELD	WELL IN A WELL FIELD	SPRING	SPRING FIELD	SPRING IN SPRINGFIELD	SEA WATER	SURFACE WATER	RANNEY / INF. GALLERY	OTHER	PERMANENT	SEASONAL	EMERGENCY	SOURCE METERED	NONE	CHLORINATION	FILTRATION	FLUORIDATION	IRRADIATION (UV)	OTHER	DEPTH TO FIRST OPEN INTERVAL IN FEET	CAPACITY (GALLONS PER MINUTE)	1/4, 1/4 SECTION	SECTION NUMBER	TOWNSHIP	RANGE
S01	Well #1 ACK136		X										X			Y		X				X	62	425	SW SE	11	15N	03W
S02	Well #2 ACT016 TCGM		X										X			Y		X				X	60	425	SW SE	11	15N	03W
S03																												
S04																												
S05																												

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
07158 0	GRAND MOUND	THURSTON	A	Comm

	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS	DOH USE ONLY! APPROVED CONNECTIONS
25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)	0	160	Unspecified
A. Full Time Single Family Residences (Occupied 180 days or *more* per year)	~~160~~ 224		
B. Part Time Single Family Residences (Occupied *less than* 180 days per year)	0		
26. MULTI-FAMILY RESIDENTIAL BUILDINGS (How many of the following do you have?)			
A. Apartment Buildings, condos, duplexes, barracks, dorms	0		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied *more than* 180 days/year	0		
C. Part Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied *less than* 180 days/year	0		
27. NON-RESIDENTIAL CONNECTIONS (How many of the following do you have?)			
A. Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)	0	0	
B. Institutional, Commercial/Business, School, Day Care, Industrial Services, etc.	~~18~~ 89	~~18~~ 89	
28. TOTAL SERVICE CONNECTIONS		~~178~~ 313	

29. FULL-TIME RESIDENTIAL POPULATION

A. How many residents are served by this system 180 or *more* days per year? 400

30. PART-TIME RESIDENTIAL POPULATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many part-time residents are present each month?												
B. How many days per month are they present?												

31. TEMPORARY & TRANSIENT USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many total visitors, attendees, travelers, campers, patients or customers have access to the water system each month?	39000	39000	40000	40000	44000	51000	51000	51000	44000	44000	40000	40000
B. How many days per month is water accessible to the public?	30	30	30	30	30	30	30	30	30	30	30	30

32. REGULAR NON-RESIDENTIAL USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. If you have schools, daycares, or businesses connected to your water system, how many students daycare children and/or employees are present each month?	50	50	50	50	50	60	60	60	60	50	50	50
B. How many days per month are they present?	31	28	31	30	31	30	31	31	30	31	30	31

33. ROUTINE COLIFORM SCHEDULE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	2	2	2	2	2	2	2	2	2	2	2	2

35. Reason for Submitting WFI:

☑ Update - Change ☐ Update - No Change ☐ Inactivate ☐ Re-Activate ☐ Name Change ☐ New System ☐ Other ______

36. I certify that the information stated on this WFI form is correct to the best of my knowledge.

SIGNATURE: [signature] DATE: 3/21/11

PRINT NAME: MARK A. PETRIE TITLE: UTILITY OPS. MGR.

APPENDIX A

Grand Mound Groundwater Feasibility Assessment

Grand Mound Utility Improvements
Preliminary Permit to Drill and Test Wells

GRAND MOUND
GROUNDWATER FEASIBILITY ASSESSMENT

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GRAND MOUND
GROUNDWATER FEASIBILITY ASSESSMENT

I. INTRODUCTION

This report summarizes our analysis of groundwater conditions and availability within vicinity of Grand Mound, Washington. The purpose of the study was to investigate the feasibility of developing a community groundwater supply for the Grand Mound area as part of water system and sewage treatment facility improvements. The estimated peak demand for the system at full build out is 730 gallons per minute (gpm).

This report includes a background discussion of the area hydrogeology including geologic setting, principal aquifers, water levels and groundwater flow patterns; an evaluation of water quality conditions; and an assessment of groundwater development potential and other related considerations that may affect feasibility.

Data sources for the investigation included:

- o Washington Department of Ecology (WDOE) drillers logs,
- o Maps and related information contained in Water Supply Bulletin No. 10 (1966, Volumes I and II),
- o Water quality data from WDOE and Thurston County Health Department (TCHD) files,
- o Published stream flow and water level data (WDOE, 1990)

This work was performed and this report was prepared in accordance with generally accepted hydrogeologic practices at this time and in this area for the exclusive use of PEI/Barrett and their client Thurston County Public Works. No other warranty, expressed or implied, is made.

II. FINDINGS AND RECOMMENDATIONS

- o A shallow highly productive aquifer occurs within the unconsolidated deposits that lie within the Scatter Creek and Chehalis River valleys.
- o The aquifer is unconfined and extremely susceptible to land use impacts. The water table typically lies within 30 feet of the land surface. The are no significant confining units which can serve to protect the aquifer from land use impacts.

- o Recharge to the valley aquifer system is relatively high. Adequate supplies of groundwater are available within the Ground Mound area to support the required system demand.

- o Stream flow regulations exist for both Scatter Creek and the Chehalis River. Scatter Creek is currently closed to further appropriations whereas the Chehalis River is regulated by minimum instream flows requirements.

- o Water quality within the project vicinity is generally very good with the exception of nitrate levels which exceed State Drinking Water standards in localized areas.

- o A series of properly designed and developed wells (i.e. approximately three to four wells, 8-inch diameter completed to a depth of approximately 100 feet) should be capable of producing the required long-term peak demand of 730 gpm. The wells could be installed sequentially as water demand increases over time. Data obtained from the installation of each well could be used to locate, design, and develop subsequent wells.

- o The preferred area for development lies just east of the I-5 corridor near the southeast portion of the proposed service area. Adequate supplies should be available from this area. In addition, the site lies upgradient of most of the land use concerns which could act to degrade water quality over time. A secondary area to consider for development lies on the southern portion of the proposed service area.

- o Relatively limited water quality and quantity data are available within the preferred areas of development. We recommend that existing wells within these areas be identified through field surveys and tested. The testing should include short-term (4 hour) drawdown tests to evaluate potential well yields and water quality sampling to evaluate public drinking water system parameters.

- o Selection of well site(s) should consider floodplain hazards. In addition, sites should be selected based on discussions with the Department of Ecology regarding stream/aquifer continuity and other water rights issues and the Department of Health regarding well head protection issues.

III. HYDROGEOLOGY

A. Physiography and Surface Drainage

The Grand Mound vicinity lies within the Scatter Creek and Chehalis River valleys of southwestern Thurston County. Scatter Creek provides drainage to areas that lie north and east of Grand Mound, whereas the Chehalis River and other small drainages (Prairie Creek) provide drainage to the areas that lies south and west. Scatter Creek discharges to the Chehalis River approximately four to five miles west of Grand Mound.

Perennial flows are maintained within the lower portions of Scatter Creek by natural groundwater discharge. Perennial flows are also maintained locally within other reaches of the stream by discharge of return water from fish propagation facilities. Intermittent flows occur within other reaches of the stream during high runoff periods.

The floor of the Scatter Creek valley occurs at elevation of approximately 160 feet mean sea level (MSL) and slopes gently from east to west. The hills which surround the valley rise to elevations of between 400 and 600 feet MSL.

B. Geology

The geology of the project vicinity is comprised of four principal geologic units. From oldest to youngest these include:

- Bedrock deposits,
- Older glacial deposits,
- Vashon recession outwash deposits, and
- Recent alluvium.

The occurrence of these deposits is shown on Figure 1.

Bedrock deposits crop out in the hills surrounding the Grand Mound area and underlie the younger unconsolidated deposits that occur within the Scatter Creek, Black River and Chehalis River Valleys. Bedrock deposits are also exposed within a topographic high (Grand Mound) that occurs just south of the Burlington Northern Railroad tracks in Sections 10 and 11 of Township 15 North, Range 3 West (Figure 1 and Figure 2, profile B-B'). The bedrock deposits include siltstones, claystones, sandstones and conglomerates of Tertiary age. The bedrock deposits have very low permeability and consequently do not serve as an important source of water.

Older glacial deposits crop out along the margins of the foothills and within the upland area that separates Scatter Creek and the Black River valley. The older glacial deposits may also occur extensively within the valley lowlands beneath Vashon Drift and Recent alluvial deposits. The older glacial deposits include stratified sand and gravel as well as glacial till (i.e. a poorly sorted mixture of silt, sand, gravel, and cobbles). The stratified drift of the older glacial deposits is very similar in appearance to the Vashon recessional outwash deposits, making stratigraphic correlation problematic.

Vashon recessional outwash deposits mantle most portions of the Scatter Creek valley. The deposits consist of coarse sand and gravel that was deposited by meltwater streams during the wasting of the Vashon ice sheet. The recessional outwash deposits are very permeable which allows rapid transfer of water.

The recent alluvial deposits crop out near the Chehalis and Black Rivers and locally along the portions of Scatter Creek and other small drainages such as Prairie Creek. The alluvium consists of primarily of silt, sand with some gravel and peat deposits. Sand and gravel deposits are most extensive in vicinity of the Chehalis River where the deposits serve as a important aquifer.

C. Aquifer Occurrence and Properties

The principal aquifer within the Grand Mound area occurs within the older glacial and the Vashon recessional outwash deposits that lie within the Scatter Creek and Chehalis River Valleys. Figure 2 presents three profiles which depicts the occurrence of the aquifer in the Grand Mound area. The location of the profile alignments and wells used to construct the profiles are presented in Figure 3

The aquifer is very permeable and consequently one of the most productive systems in the County. The water table occurs typically within 30 feet of the land surface and the thickness of the aquifer usually ranges between 50 and 60 feet. Most wells are completed at depths of 40 to 70 feet within clean sand and gravel zones. A "hardpan" or low permeability till unit may occur near the water table in some areas. The till unit is likely associated with the older glacial deposits.

Pumping tests have been performed on several wells which occur in vicinity of Scatter Creek (e.g. Sea Farm 16N/03W-32E). The aquifer transmissivity within this areas was estimated to be approximately 3×10^5 to 4×10^5 gpd/ft (Kirk Sinclair, WDOE, oral communication). Specific capacities for many wells exceed 10 gpm/ft. Specific capacities are generally higher for wells completed with screens or perforations as opposed to wells completed with open holes. The long-term storage coefficient for the water table aquifer is estimated to be between 0.1 and 0.2.

D. Water Levels and Groundwater Movement

Water levels and groundwater flow directions within the principal are presented in Figure 4. The water level contour map was digitized from Plate 4 of Water Supply Bulletin No. 10 (Nobel and Wallace, 1966). Water levels elevations (as is depicted by the contour lines) range from approximately 190 feet above mean sea level (MSL) in the eastern portion of the study area to approximately 100 feet (MSL) in vicinity of the Chehalis and Black Rivers. Groundwater movement is generally perpendicular to the water level contours extending from areas of high water level to areas of low water level. The hydraulic gradient averages approximately 0.0025.

Groundwater levels are generally below the streambed elevation of Scatter Creek in the project vicinity. Therefore, stream flow is infiltrated to the groundwater system along most reaches of the stream. Groundwater recharge also occurs along a number of other small drainages which are tributary to Scatter Creek as runoff is quickly infiltrated when it enters areas with permeable recessional outwash soils.

Water levels fluctuate in response to seasonal changes in precipitation patterns. Between seven and 15 feet of seasonal fluctuation (Figure 5) has been observed in monitoring wells (e.g. WDOE Well THR003). Minimum water level elevations typically occur in October and November and maximum water level elevation occur in April and May. Groundwater response generally lags four to six months behind precipitation patterns in the Grand Mound area (Figure 5).

E. Climatic Water Budget

A climatic water budget provides a breakdown of the major components of the hydrologic cycle. The water balance is based on the mass-balance principal: water going into the system is equal to water flowing out of the system plus or minus the change in storage of water within the system. In the natural system, groundwater storage changes seasonally and with wet/dry year cycles. Pumping of groundwater also changes the amount of storage in the system. In our analysis we have assumed that long-term (multi-year) changes in the system are zero and that the water budget represents an average year.

With the assumption that the change in storage is zero the mass balance equation becomes:

Recharge = Discharge

where: Recharge = Precipitation - Evapotranspiration - Runoff

and: Discharge = Consumption + Natural Discharge

The range in possible values of each of the hydrologic components in the mass balance analysis is high, often greater than the value of some of the other components. For example, estimated evapotranspiration for an area cannot be accurately measured and is typically estimated. The estimate has an uncertainty of two to three inches per year. The actual value of evapotranspiration is likely to lie somewhere within this range of uncertainty. Average annual precipitation is estimated based on interpolation between widely scattered measuring points, using best meteorological judgement. Different methods of assessing average annual precipitation produce different results with a calculated average that may vary by several inches from the "true" average precipitation for the area. The uncertainty in both precipitation and evapotranspiration require that the analysis be done using a range of values. Together the combined ranges in precipitation and evapotranspiration may be larger than the total amount of recharge to the groundwater system.

A conservative analysis of recharge would require using the higher end of the evapotranspiration range, the higher end of the runoff range, and the lower end of the precipitation range. This approach would be misleading and often indicate that groundwater is not recharged, a situation contradicted by water level data that show flow within the system and on-going recharge. We have used a more "middle of the road" approach and used values closer to the center of the range of estimated values.

The water budget is typically based upon average conditions. Long-term averages for the various components of the hydrologic system are used in the analysis. Our assessment follows this convention.

The following summarizes the water budget components for the Scatter Creek basin.

Precipitation - Precipitation was estimated from an isohyetal (equal depth of rainfall) maps prepared by the National Weather Service (1957). Long-term average precipitation within the Scatter Creek basin is estimated to be approximately 46 inches/year.

Runoff - Runoff within the Scatter Creek basin is quite limited given the permeable nature of the near surface soils. Although some runoff is generated within lower permeability soils of the surrounding uplands, the runoff is mostly infiltrated as it reaches permeable soils of the valley floor (Sinclair, WDOE, oral communication). Runoff for the basin is estimated to be no more than ten percent of total precipitation or approximately four to five inches per year.

Evapotranspiration - Evapotranspiration (water evaporated by soil and transpired by plants) was estimated using the Blaney-Criddle method (USSCS, 1970). This method uses crop type, latitude and temperature to calculate potential evapotranspiration. A simple water balance within the soil based on rainfall and potential evapotranspiration was then used to relate potential to actual evapotranspiration. In this balance, actual evapotranspiration equals potential as long as rainfall is sufficient to keep the soil moist enough to provide plants with enough water. When the soil is drier, the actual rate decreases below the potential rate. In this analysis we have computerized the soil mass balance procedure to calculate the actual evapotranspiration rate on a weekly basis. Where data are reported on a monthly basis (rainfall and temperature), they are distributed evenly over four "weeks" of the month. The analytical method is detailed below.

When precipitation was equal to or greater than potential evapotranspiration:

$$AET = PET$$

When precipitation was less than potential evapotranspiration:

$$AET = PET \quad (\text{when } SM/SMC >= 0.75)$$

or

$$AET = PET * 1.333 * (SM/SMC) \quad (\text{when } SM/SMC < 0.75)$$

Where:

AET = Actual evapotranspiration (in/yr)

PET = Potential evapotranspiration (in/yr), calculated by the Blaney-Criddle method

SM = Soil moisture content from the previous week (in)

SMC = Soil moisture holding capacity (in)

This linear function of the ratio of actual water content to soil moisture holding capacity is one of at least five methods used to relate actual to potential evapotranspiration reported in Dunne and Leopold (1978).

Total soil moisture holding capacity is equal to soil moisture holding capacity per foot of soil times total depth of soil, generally about 3 feet. Grass crop factors were also used in the analysis.

The actual evapotranspiration rate estimated from the analysis was approximately 17 inches/year.

Groundwater Recharge - Groundwater recharge was calculated using the precipitation, evapotranspiration and runoff values calculated using the methods discussed above. Recharge was calculated using the mass balance equation listed above. This equation calculates a rate (in/yr). The rate was converted to a volume per year by multiplying the rate by the recharge area or Scatter Creek drainage basin area.

The long-term average rate of recharge to the basin is estimated to be approximately 24 inches/year. The recharge area for the drainage basin (i.e. basin area) is difficult to determine because of the hummocky topography and a lack of a clear drainage divide on the north side of the Scatter Creek. Noble (1966) estimates the total drainage area for the basin to be approximately 37 square miles. Sinclair (oral communication, WDOE) estimates that the total drainage basin area may be between 50 and 70 square miles. For the purposes of this report, we have assumed a total drainage area of approximately 50 square miles. Based on this assumption, the annual recharge volume for the basin is approximately 64,000 acre-ft/year.

Consumption - Consumption was based on water rights data that have been summarized by WDOE (Sinclair, oral communication). Water rights allocation for the Scatter Creek basin can be broken down as follows:

Fish Propagation	24,000 ac-ft/year
Irrigation	9,000 ac-ft/year
Public Water Supply	900 ac-ft/year
Stock and Other	350 ac-ft/year
Domestic	100 ac-ft/year
Total	34,350 ac-ft/year

Water rights as the sole basis for water use may underestimate existing use, as those with rights pending or those who have never applied are not considered. These uncounted users may be off set, however. Our experience in other counties indicates that many water rights are not fully used. The differences between non-used rights and unaccounted users without rights may be self-canceling. In addition, a large portion of the allocation for fish propagation and irrigation may not be consumptively used (i.e. a large percentage of these groundwater withdrawals are returned to the system as groundwater recharge). Therefore net consumption of groundwater within the basin may be considerable less than shown above.

Natural Discharge - Natural Discharge is the portion of total discharge that is not used by wells and springs. In Scatter Creek basin, most groundwater discharges to the Chehalis River.

The usual method for quantifying natural discharge is by difference. Groundwater consumption (wells and springs) is quantified and subtracted from the total amount of discharge (which under equilibrium conditions is equal to recharge). The difference is equal to natural discharge.

Comparison of natural recharge to the basin (64,000 acre-ft/year) with consumption (34,350 acre-ft/year) indicates that approximately 29,650 acre-ft/year of groundwater discharges from the basin. The natural discharge from the system may be significantly higher given the nonconsumptive nature of many of the existing water use allocations.

IV. WATER QUALITY

WDOE and TCHD has collected and compiled water quality data for the Ground Mound area. The water quality data are summarized in Table 1.

Water quality within the project vicinity is generally very good with the exception of nitrate levels. Elevated nitrate levels occur within many areas of the Scatter Creek Valley. Nitrate concentrations exceed State Drinking Water Standards (10.0 mg/l) in some localized areas (16N/02W-29L, 15N/03W-02R, 15N/03W-03A, and 16N/04W-36M). Background levels of nitrate appear to be approximately 1.0 to 2.0 mg/l within the valley aquifer.

The distribution of nitrate and nitrite concentrations in groundwater within the Grand Mound area is presented in Figure 6. Elevated nitrate and nitrite levels occur generally within the north and northeast portions of the project vicinity. Lower nitrate and nitrite levels more typically occur in the western and southern portions of the project vicinity. Relatively limited nitrate data are available within the preferred areas for development (see section V.A).

The elevated nitrate levels are likely a result of local land use practices which include dairy farms, fish farms, and on-site septic systems.

Iron concentrations within the Grand Mound shallow aquifer relative to many other aquifer systems in the Puget Lowland, are quite low. Iron concentrations for most of the wells that were tested (Table 1) are below 0.01 mg/l. The state drinking water limit for iron is 0.30 mg/l. The distribution of manganese could not be evaluated with the available data (i.e. laboratory analysis was not performed for manganese as part of WDOE and TCHD sampling effort).

V. GROUNDWATER DEVELOPMENT CONSIDERATIONS

A. Potential Well Yields

Potential well yields within the Scatter Creek/Chehalis River Valley area are generally quite high given the permeable nature of the stratified sand and gravel deposits. In most areas, well capacities are only limited by their design. Many high capacity wells with yields in excess of 1,000 gpm have been developed in the valley to provide water supply for fish farm operations (e.g. Sea Farm 16N/02W-32E; Domsea Farms 16N/02W-36J). Most of these wells occur north of the proposed service area. Existing wells in proximity to the proposed service area are typically used for domestic purposes. Well yield data for these sources are generally quite limited (i.e. mostly short-term bailer or air lift tests at relatively low pumping rates).

Most wells exhibit relatively high specific capacities (pumping rate per foot of drawdown), particularly those wells which have been completed with perforations or well screen. The wells which have low specific capacities generally have open hole completions.

B. Instream Flow Regulations

Stream flow regulations exist for both Scatter Creek and the Chehalis River. Scatter Creek is currently closed to further appropriations whereas the Chehalis River is regulated by minimum instream flow requirements.

A stream closure has historically meant that no additional surface water diversions would be allowed from the stream during the closure period. Likewise, where minimum instream flow regulations exist, it has historically meant that surface water diversions must cease, on a priority basis, when flows decrease to below the stipulated quantity. More recently, WDOE has extended the closure and minimum instream flow concept to groundwater withdrawal impacts to surface water. WDOE is currently in the process of developing a new stream-aquifer continuity policy which will provide details on water rights allocation within closed or restricted areas.

Although a regulatory closure exists, groundwater development in the Grand Mound area will not adversely impact Scatter Creek flows. The water table lies below the streambed elevation and any further lowering of the water table associated with pumpage should not induce additional flow from the stream (i.e. hydraulic gradients cannot be increased by pumping, therefore streamflow loses cannot be increased).

Groundwater water development within the valley area will result in minor (unmeasurable) impact to the Chehalis River since all groundwater discharge to the area is ultimately tributary to this system. Minimum stream flow have been established for the Chehalis River under WAC 173-522. The minimum flows regulations are summarized in Table 2.

Impacts can be delayed by positioning the pumpage stress at greater distance from the stream (time lag effects). Thus, the effects of higher levels of pumping during the dry season can in many cases be delayed until the wet season when higher flows usually exist in the stream.

C. Land Use

The Scatter Creek aquifer is highly susceptible to land use impacts given its shallow occurrence and the absence of any significant confining layer. Land use needs to be considered in selection of well sites in order to avoid existing or future problems with water quality.

The major land use concerns are briefly summarized below:

Fish Farms - Two fish farm facilities occur along Scatter Creek north of the proposed water service area. The facilities withdrawal large quantities of groundwater for rearing fish and then return this water to the Scatter Creek. The return water is elevated in nitrogen and phosphate. Infiltration of the surface return flow to the groundwater system downstream of the facilities adversely impacts groundwater quality.

Dairy Farms - A large number of dairy farms occur within the Scatter Creek Valley, particularly east of the I-5 corridor. Animal wastes which are broadly applied to many of the pasture lands results in nitrate and bacterial loading to the underlying aquifer system.

Service Stations and Automotive Repair - Service stations in vicinity of the I-5 interchange as well as other automotive repair and fuel storage facilities pose a threat to groundwater quality within the Grand Mound area.

I-5/Burlington Northern Railroad - Vehicles transporting hazardous materials can be the source of groundwater contamination because of accidents and the resultant spill of materials.

On-Site Septic Systems - The Grand Mound area is currently not sewered and homes and other commercial facilities are served by on-site septic systems. Septic systems can be a significant source of nitrogen and bacteria to the groundwater system. In addition, septic systems may also be a source of toxic materials, in the form of household wastes.

V. GROUNDWATER DEVELOPMENT RECOMMENDATIONS

A. Well Location

A properly designed and developed well located within most areas of the Scatter Creek valley could produce in excess of 300 to 500 gpm. The primary consideration regarding siting of a well should be water quality.

Recommended areas for well development are presented in Figure 7 (note that areas are only approximately shown with hatch pattern). The preferred area would be east of I-5 within Section 13 of Township 15 North, Range 3 West. This area lies upgradient of most of the land use concerns discussed above. Nitrate data are not available for this specific area. In addition, well yield data are quite limited.

A secondary area to consider for development lies on the southern portion of the proposed service area (Figure 7). Adequate well yields to meet the proposed water system needs would appear to be available from this area. Nitrate levels also appear to be somewhat lower than in the northern portions of the service area. Potential land use impacts to groundwater may be somewhat greater that the area east of I-5, but significantly less than the north end of the proposed service area (i.e. more commercial activity occurs in the northern portion of the proposed service area than the southern).

Well sites should be set back at least 200 to 300 feet from the Freeway corridor to allow adequate response time for spill remediation. Floodplain hazards should also be considered as part of final site selection.

An inventory of existing water users should be completed in advance of final well site selection. Water quality samples should be collected in selected wells to confirm ambient water chemistry relative to public drinking water standards. Short-term (4 hour) drawdown tests should be performed on selected wells which have access for water level measurements and metering devices for monitoring pumping rates.

B. Well Design and Construction Costs

The recommended well design is presented in Figure 8. The design includes 8-inch steel casing that would be drilled to a depth of approximately 100 feet (bedrock) and stainless steel well screen set in a deeper permeable water bearing zone which would maximize the available drawdown.

Several wells could be installed in a relatively small area (minimum well offset of 50 to 200 feet) to provide a well field supply to the community. Multiple well sources could be used to minimize storage requirements. In addition, well field development could be staged in a manner that allowed source capacity to increase as water demand increased over time. If a well field concept is used, well installation should proceed sequentially whereby one source is installed and tested to determine the placement and design of subsequent wells. A total of three to four wells with individual capacities of 200 to 250 gpm may be required to meet the long-term peak system capacity of 730 gpm.

Permits to drill and test wells should be secured from Washington Department of Ecology and Washington Department of Health. A geologist should assist with development of technical specifications, observation of drilling, collection of pumping test data, and preparation of a well report.

We recommend that wells be installed using a cable tool drilling rig. This method provides superior hydrogeologic information and representative samples with which to determine optimum screen design.

Construction costs for a new well will include subcontract drilling and engineering as well as miscellaneous costs associated with laboratory analysis of water samples, grain size analysis, etc. The total construction costs would be between $25,000 and $30,000 for a single well. If multiple wells were constructed, economies of scale would reduce the cost by 10 to 15 percent. Costs associated with land acquisition, pump and pump house facilities, transmission main, etc. are not included in this estimate.

VI. REFERENCES

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Table 1 – Water Quality Summary
Grand Mound Groundwater Development Feasibility Assessment

LOCAL WELL NUMBER	WDOE WELL NUMBER	SAMPLING DATE	VOLUME PURGED	TEMP (oC)	COND (umhos/cm)	pH	TDS (mg/l)	SULFATE (mg/l)	TOTAL-P (mg/l)	NO3 (mg/l)	NO3+NO2 (mg/l)	CHLORINE (mg/l)	TOTAL-ALK (mg/l)	CALCIUM (mg/l)	IRON (mg/l)	MAGNESIUM (mg/l)	POTASSIUM (mg/l)	SiO2 (mg/l)	SODIUM (mg/l)
16/2-27R3	THR001	12/11/89	72	9.8	69	6.4					0.97								
15/3-2R1	THR003	03/01/89	38	10	129	6.5		4.7		.9		4.7	46	10.7		3.983	1.34		6.3
16/2-29L2	THR004	03/01/89	100	10.4	139	6.4		4.9		11.2		4.3	42.5	12.56		4.59	1.57		5.96
16/2-29L3	THR005	03/01/89	75	10.4	144	6.5		6.2		11.2		4.6	42.9	12.96		4.79	1.02		6.27
16/2-29L4	THR006	03/01/89	100	11	208	6.1		7.3		11.7		7.2	44.4	19.6		5.18	1.53		7.63
15/2-6N1	THR011	12/15/89	54	10.5	132	6.2		5	0.07	1.9		2.51	46.9	11.29	.01(U	4.19	0.98	17.2	6.71
15/2-6N1	THR011	12/15/89	54	10.5	132	?					1.64								
15/3-10E2	THR013	12/14/89	80	7.7	123	?		3.76	0.016		2.51	4.62	39.5	11.1	.005(U	3.97	1.4	14.2	3.97
16/3-33M1	THR014	04/23/82					59			1.2									
16/3-33M1	THR014	03/15/83					60			1.3		5(U							
16/3-33M1	THR014	12/14/89	?	8.8	105	?		4.22	0.018			4.04	34.5	9.17	.005(U	3.12	1.1	14.4	5.61
16/3-29L1	THR021	04/23/82					61			1.6	1.48								
16/3-29L1	THR021	03/16/83					70			1.6		5(U							
16/3-29L1	THR021	12/13/89	40	9.9	103	?		3.06	0.016			3.51	32.6	9.26	.005(U	3.04	1.1	13.8	
16/3-29L1	THR021	12/13/89	40	9.9	103	?					2.1								
15/3-5P1	THR025	04/23/82					43			1.7									
15/3-5P1	THR025	03/14/83					70			1.9		5							
15/3-5P1	THR025	12/14/89	?	?	?	?		4.05	0.021		2.57	3.51	37.6	11.3	0.011	3.79	1.1	13.4	6.32
15/3-5P1	THR025	12/14/89	?	?	?	?		4.78	0.021		2.54	3.44	37.6	11.3	0.01	3.8	1.3	13.4	6.64
15/4-1D1	THR026	03/01/89	50	11.3	132	6.3		4.5		9		4.1	42.4	11.43		4.05	1.56		7.21
15/4-1D2	THR027	03/01/89	70	11.1	136	6.2		5.2	.01(U	6.9		11.38	42	11.5		3.9	0.96		6.64
15/4-1D3	THR028	03/01/89	125	9.8	120	6.1		7.3	0.02	6.8		5.1	32.4	10.4		3.47	0.85		6.06
15/4-1A1	THR029	04/23/82					89			4.3									
15/4-1A1	THR029	03/14/83					90			3.7		5(U							
15/4-1A1	THR029	12/13/89	?	10.4	148	?		3.3	0.024			4.94	29.9	13.1	0.006	4.12	1	15.1	7.42
15/4-1A1	THR029	12/13/89	?	10.4	148	?					4.7								
15/3-6P1	THR031	12/15/89	60	11.6	203	6		1(U	0.09	.5		17.7	55.4	10.42	.01(U	6.49	0.68	19.46	8.56
15/3-6P1	THR031	12/15/89	60	11.6	203	?					4.66								
15/3-8A1	THR032	04/23/82					47			1.5									
15/3-8A1	THR032	03/15/83					70			1.5		5(U							
15/3-9P1	THR035	04/23/82					67			2									
15/3-9P1	THR035	03/15/83					80			2.7		8							
15/3-9F1	THR035	12/12/89	80	10.8	138	?					2.5								
15/3-9F1	THR033	12/12/89	80	10.8	138	?					2.4								
15/3-10P1	THR039	04/23/82					92			1.7									
15/3-11F1	THR040	04/23/82					53			1.5									
15/3-11F1	THR040	03/14/83					70			0.2(U		5(U							
16/3-36J1	THR041	04/24/82					86			4									
16/3-36J1	THR041	03/15/83					110			4		5(U							
16/3-36J1	THR041	12/12/89	80	9.4	137	?					2.6								
16/3-36J1	THR041	12/12/89	80	9.4	137	?		5.71	0.016		2.78	4.76	42	12.5	.005(U	4.62	1.5	14.6	6.49
15/3-2R2	THR042	03/01/89	38	9.9	136	6.5		5.4		11.2		5.3	43.8	11.48		3.99	1.22		6.17
15/3-2R3	THR043	03/01/89	67	10.4	147	6.7		6.2		11.2		5.52	41.3	13.01		3.85	1.56		6.38
15/3-3A1	THR044	03/01/89	63	10.9	119	6.7		5.2		10.1		4.2	47	8.05		4.43	2.83		6.59
15/3-3A2	THR045	03/01/89	63	40.5	112	6.7		4.7		10		4.4	41.1	10.6		3.57	1.28		5.63
15/3-3A3	THR046	03/01/89	80	12.6	116	6.1		5.4		6.4		4.5	51.2	13.5		3.42	1.33		5.9
15/3-3F1	THR047	12/14/89	80	10.5	115	6.8		5	0.04	2.7		2	40.2	10.47	.01(U	3.2	0.44	13.16	5.3
15/3-3F1	THR047	12/14/89	80	10.5	115	?		3.66	0.017		1.92	4.5	37.7	10.9	0.006	3.48	0.9	13.2	5.54
15/4-1P1	THR049	04/23/82					63			0.2(U									
15/4-1P1	THR049	03/14/83					70			0.2(U		5							
15/4-2P1	THR053	04/23/82					50			1.2									
15/4-2P1	THR053	03/16/83					80			1.4		5							
15/4-2P1	THR053	12/12/89	40	10.3	111	?					1.9								
15/4-3O1	THR054	04/23/82					52			1.6									
15/4-3O1	THR054	03/16/83					60			1.1		5(U							
15/4-16O2	THR057	12/12/89	80	11.4	120	?		6.27	0.05		3.16	4.39	35	11.2	0.011	3.33	1.2	13.3	6.44
15/4-16O2	THR057	12/12/89	80	11.4	120	?					2.2								
16/2-27O2	THR060	12/11/89	80	9.9	88	6.5					1.9								
16/2-27O2	THR060	12/11/89	80	9.9	88	6.5					2.3								
16/2-28J1	THR064	08/24/82					48			1									
16/2-28J1	THR064	03/16/83					50			0.7		5							
16/2-28J1	THR064	12/11/89	80	10.5	87	6.6					1.5								
16/2-28J1	THR064	12/11/89	80	10.5	87	6.6		4	0.015		1.79	3.6	27	8.44	0.008	2.1	0.6	10.7	5.25
16/2-29L1	THR066	08/24/82					169			8.5									
16/2-29L1	THR066	03/14/83					120			8.5		6							
16/2-29L1	THR066	12/11/89	88	9.8	144	6.6					3.1								
16/2-30F1	THR067	12/12/89	56	9.4	132	?		3.66	0.025		15.1	4.56	44	10.8	.005(U	5.22	1.5	15	6.63
16/2-30F1	THR067	12/12/89	56	9.4	132	?					2.3								
16/2-31B1	THR070	08/24/82					100			5.2									
16/2-31B1	THR070	04/04/83					120			5.2		6							
16/2-31J1	THR071	08/24/82					85			2.4									
16/2-31J1	THR071	03/14/83					80			3.4		5							
16/2-31J1	THR071	12/11/89	75	10.3	150	?					2.6								
16/2-32B1	THR077	08/24/82					93												
16/2-32B1	THR077	03/14/83					60					5							
15	THR081	08/24/82					70												
	THI[illegible]	03/1[illegible]					10					5(U							

TABLE 2

Chapter 173–522 WAC

WATER RESOURCES PROGRAM IN THE CHEHALIS RIVER BASIN, WRIA–22 AND 23

WAC 173–522–010 General provision. These rules, including any subsequent additions and amendments, apply to waters within and contributing to the Chehalis River basin, WRIA–22 and 23 (see WAC 173–500–040). Chapter 173–500 WAC, the general rules of the department of ecology for the implementation of the comprehensive water resources program, applies to this chapter 173–522 WAC. [Order 75–31, § 173–522–010, filed 3/10/76.]

WAC 173–522–020 Establishment of base flows. (1) Base flows are established for stream management units with monitoring to take place at certain control stations as follows:

STREAM MANAGEMENT UNIT INFORMATION

Control Station No. Stream Management Unit Name	Control Station by River Mile and Section, Township and Range	Affected Stream Reach Including Tributaries
12.0200.00 Chehalis River Conf. w/Elk Creek	101.8 14–13–5W	From confluence with Elk Creek to head–waters except Elk Cr.
12.0205.00 Elk Creek	2.5 18–13–5W	From confluence with Chehalis River to head–waters.
12.0216.30 So. Fork Chehalis R.	0.3 24–13–4W	From mouth to head waters.
12.0235.00 Chehalis River	77.6 2–13–3W	From confluence with Newaukum River to con–fluence with Elk Cr., excluding Elk Creek, and Newaukum Rivers.
12.0240.00 S. Fork Newaukum R.	22.8 28–13–1E	From confluence with Lost Creek to head–waters, excluding Lost Creek.
12.0245.00 N. Fork Newaukum River	6.6 35–14–1W	From mouth to head–waters.
12.0250.00 Newaukum River	4.1 9–13–2W	From mouth to con–fluence with Lost Cr. on S. Fork Newaukum River, excluding N. Fork Newaukum River.
12.0253.00 Salzer Creek	3.8 22–14–2W	From mouth to head–waters.
12.0264.00 Skookumchuck River	6.4 12–15–2W	From mouth to head–waters.
12.0275.00 Chehalis River at Grand Mound	59.9 22–15–3W	From confluence with Newaukum River to con–fluence with Prairie Creek.
12.0292.00 Black River	4.1 33–16–4W	From mouth to head–waters.
12.0305.00 Cedar Creek	1.1 14–16–5W	From mouth to head waters.
12.0309.00 Porter Creek	1.3 22–17–5W	From mouth to head–waters.
12.0310.00 Chehalis River at Porter	33.3 28–17–5W	From confluence with Prairie Creek near Grand Mound to con–fluence with Porter Creek including Prairie Creek.
12.0325.00 Cloquallum Creek	1.9 36–18–6W	From mouth to head–waters.
12.0342.00 East Fk. Satsop R.	15.9 15–19–6W	From confluence with Dry Run Cr. to head–waters excluding Dry Run Cr.
12.0343.00 Decker Creek	0.3 31–19–6W	From mouth to head waters.
12.0345.00 Middle Fk. Satsop R.	0.4 36–19–7W	From mouth to head waters.
12.0350.00 Satsop River	2.3 36–18–7W	From mouth to confl. with Dry Run Cr. on East Fk. Satsop R.
12.0350.02 Chehalis R. below confl. w/Satsop R.	20.0 7–17–6W	From confluence with Porter Ck. to just below confl. with Satsop River.
12.0374.00 Wynoochee River	5.9 27–18–8W	From mouth to head–waters.

(3) Base flow hydrographs. Appendix 1, pages 19–23 in the document entitled "water resources management program in the Chehalis River basin" dated November, 1975 shall be used for definition of base flows on those days not specifically identified in WAC 173-522-020(2).

(4) All rights hereafter established shall be expressly subject to the base flows established in WAC 173-522-020 (1) through (3).

(5) At such time as the departments of fisheries and/or wildlife provide specific information substantiating the need for flows higher than the flows set forth in WAC 173-522-020(2), the department of ecology agrees to proceed with setting minimum flows as provided under chapter 90.22 RCW within one year from the time of said request, unless agreement to another time frame is reached between parties. [Statutory Authority: Chapters 43.21B, 43.27A, 90.22 and 90.54 RCW. 88-13-037 (Order 88-11), § 173-522-020, filed 6/9/88; Order 75-31, § 173-522-020, filed 3/10/76.]

WAC 173-522-030 Future allocation of surface water for beneficial uses. The department has determined that there are public waters available, subject to base flow, for allocation to beneficial uses from all streams within the Chehalis basin; except for those streams and times declared closed in WAC 173-522-050. The department shall maintain a current tabulation of the amount of water that is available for appropriation at each stream management unit specified under WAC 173-522-020(1). [Order 75-31, § 173-522-030, filed 3/10/76.]

WAC 173-522-040 Priority of future rights during times of water shortage. (1) Rights established in the future pertaining to waters available for allocation in WAC 173-522-030 shall be subject to a priority of use. Rights for domestic use, including irrigation of lawn and noncommercial garden not to exceed one-half acre, and livestock use excluding feedlot operation, shall be superior to all other consumptive and nonconsumptive uses.

(2) As between rights established in the future within a priority of use, the date of priority shall control with an earlier-dated right being superior to those rights with later dates.

(3) Additional water use priorities may be promulgated, when required, in the future. [Order 75-31, § 173-522-040, filed 3/10/76.]

WAC 173-522-050 Streams closed to further consumptive appropriations. The department, having determined there are no waters available for further appropriation through the establishment of rights to use water consumptively, closes the following streams to further consumptive appropriation. An exception is made for domestic and normal stockwatering where there is no alternative source of water supply.

Surface Water Closures

STREAM	DATE OF CLOSURE	PERI[illegible] CLO[illegible]
Beaver Creek, tributary to S. Fk., Newaukum River	12 5-52	1 May
Beaver Creek, tributary to Black River	10-28-52	• •
Bunker Creek	1-17 50	• •
Dempsey Creek	11-15 74	• •
Dillenbaugh Creek	8 21 72	• •
Hanaford Creek	5 7 52	• •
Hope Creek & Garrard Creek	8 28 73	• •
Kearney Creek	10-27 52	• •
Lincoln Creek	11-5-48	• •
Middle Fork, Newaukum R.	4-7-50	• •
Mill Creek	3-21-52	• •
Mox Chehalis	4-25-57	• •
Salmon Creek	12-18-56	• •
Rock Creek	4-11-73	• •
Scatter Creek	7-20-50	• •
Stearns Creek	4-28-53	• •
Wildcat Creek	10-28-52	• •
Williams Creek	5-6-52	• •
Wynoochee River	3 9 62	• •
Black River	Date of Adoption	1 July 30 Sept.
Skookumchuck River	• •	• •
S. Fk. Chehalis River	• •	• •
Salzer Creek	• •	1 June-30 Sept.

Note: Affected reach is from mouth to headwaters and includes tributaries in the contributing drainage area unless specific[illegible] excluded.

[Order 75-31, § 173-522-050, filed 3/10/76.]

WAC 173-522-060 Effect on prior rights. Nothi[illegible] in this chapter shall be construed to lessen, enl[illegible] modify the existing rights acquired by appropria[illegible] otherwise. [Order 75-31, § 173-522-060, 3/10/76.]

WAC 173-522-070 Enforcement. In enforcement of this chapter, the department of ecology may impose suc[illegible] sanctions as are appropriate under authorities vested [illegible] it, including but not limited to the issuance of regulator[illegible] orders under RCW 43.27A.190 and civil penalties under RCW 90.03.600. [Statutory Authority: Chapters 4[illegible] .21B, 43.27A, 90.22 and 90.54 RCW. 88-13-037 (O[illegible] der 88-11), § 173-522-070, filed 6/9/88.]

WAC 173-522-080 Appeals. All final written dec[illegible] sions of the department of ecology pertaining to permit[illegible], regulatory orders, and related decisions made pursuant to this chapter shall be subject to review by the pollutio[illegible] control hearings board in accordance with chapter 43 .21B RCW. [Statutory Authority: Chapters 43.21B, 43-.27A, 90.22 and 90.54 RCW. 88-13-037 (Order 88-11). § 173-522-080, filed 6/9/88.]

WAC 173-522-090 Regulation review. The department of ecology shall initiate a review of the rules established in this chapter whenever new information changing conditions, or statutory modifications make i[illegible] necessary to consider revisions. [Statutory Authority: Chapters 43.21B, 43.27A, 90.22 and 90.54 RCW. 88-13-037 (Order 88-11), § 173-522-090, filed 6/9/8[illegible]

– …ater Quality Summary

Grand Mound Groundwater Development Feasibility Assessment

LOCAL WELL NUMBER	WDOE WELL NUMBER	SAMPLING DATE	VOLUME PURGED	TEMP (°C)	COND (umhos/cm)	pH	TDS (mg/l)	SULPATE (mg/l)	TOTAL-P (mg/l)	NO3 (mg/l)	NO3+NO2 (mg/l)	CHLORINE (mg/l)	TOTAL-ALK (mg/l)	CALCIUM (mg/l)	IRON (mg/l)	MAGNESIUM (mg/l)	POTASSIUM (mg/l)	SIO2 (mg/l)	SODIUM (mg/l)
15/3-14F1	THR084	04/23/82					88			3.9									
15/3-14F1	THR084	12/15/89	60	11.6	174	7					2.86								
15/3-14F1	THR084	12/15/89	60	11.6	174	6.2		7	0.1	3.2		10.7	44.46	13.64	.01(U)	6.79	0.6	16.63	7.77
16/3-36L3	THR085	04/24/82					62			0.8									
16/3-36L3	THR085	03/15/83					60			1.2		5(U)							
16/3-36L3	THR085	12/12/89	60	10	106	7					1.8								
16/3-36L3	THR085	12/12/89	60	10	106	6		4	0.04	2		3.4	28.25	8.76	0.01	2.99	0.64	11.18	5.6
16/3-16K3	THR089	04/23/82					77			2.1									
16/3-16K3	THR089	03/14/83					70			2.4		7							
16/3-21F1	THR091	04/23/82					87			3.3									
16/3-21F1	THR091	03/16/83					90			3.1		5(U)							
16/3-27D1	THR092	12/15/89	60	9.8	127	7					1.63								
16/3-28F1	THR094	04/23/82					67			1									
16/3-28F1	THR094	03/16/83					70			1.7		13							
16/3-28F1	THR094	12/14/89	96	9.9	115	7		4.43	0.019		1.44	4.61	38.9	10.8	.005(U)	3.226	1.1	13.7	6.08
16/3-29M1	THR095	12/13/89	136	8.4	124	7					2.9								
16/3-31B1	THR098	04/23/82					72			1.9									
16/3-31B1	THR098	03/16/83					70			1.8		5(U)							
16/3-31B1	THR098	12/13/89	12	10.2	126	6		5	0.05	2.5		2	33.26	11.05	0.01	3.94	1.14	15	6.11
16/3-31B1	THR098	12/13/89	12	10.2	126	7					2.7								
16/3-31Q2	THR100	12/13/89	80	10.7	134	7					3.8								
16/3-32Q1	THR103	04/23/82					45			1.7									
16/3-32Q1	THR103	03/15/83					90			3		15							
16/3-33C1	THR104	12/15/89	60	10	104	7					1.4								
16/3-33Q3	THR105	04/23/82					53			0.9									
16/3-33Q3	THR105	03/15/83					70			1.1		5(U)							
16/3-34D1	THR106	04/23/82					50			0.4									
16/3-34D1	THR106	03/15/83					80			0.7		5							
16/3-34M1	THR107	12/15/89	60	9.7	100	7					1.57								
16/3-35N1	THR109	04/23/82					55			0.6									
16/3-35N1	THR109	03/15/83					60			0.7		5(U)							
16/3-35N1	THR109	12/15/89	100	9.8	114	6.1		5	0.05	1.4		3.7	34.11	9.44	.01(U)	4.15	0.02	13.68	5.54
16/3-35N1	THR109	12/15/89	100	9.8	114	7					1.11								
16/3-9B1	THR123	04/23/82					54			0.5									
16/3-9B1	THR123	03/14/83					54			0.6		5(U)							
16/3-10L1	THR124	04/23/82					58			.2(U)									
16/3-10L1	THR124	03/14/83					50			0.3		5(U)							
16/3-36P1	THR125	12/15/89	52	10.2	130	7					16.2								
16/4-26K1	THR137	12/13/89		10.2	106	7					0.97								
16/4-34K1	THR140	04/23/82					87			0.5									
16/4-34K1	THR140	03/14/83					90			1.6		5							
16/4-34K1	THR140	12/13/89	60	10.6	106	7		3.89	0.01			4.28	35.8	9.49	0.006	3.47	0.9	16.5	5.89
16/4-34K1	THR140	12/13/89	60	10.6	106	7					1.9								
16/4-35L1	THR141	12/13/89	40	11.1	154	5.8		5	0.06	4.3		5	39.64	14.09	.01(U)	4.37	0.89	10.05	7.52
16/4-35L1	THR141	12/13/89	40	11.1	154	7					4								
16/4-36Q1	THR143	04/23/82					102			0.8									
16/4-36Q1	THR143	03/14/83					90			1.1		5							
16/4-36Q1	THR143	12/14/89	30	10.1	124	7					0.65								
16/4-36M1	THR144	04/23/82					154			7.3									
16/4-36M1	THR144	03/14/83					105			10		6							
16/4-36M1	THR144	12/14/89	40	11.4	146	7					6								
15/3-2Q1	THR162	04/24/82					103			1.2									
16/3-11D1	THR163	04/23/82					55			0.3									
16/3-11D1	THR163	03/14/83					60			0.3		5(U)							
15/2-6B1	THR164	12/15/89	60	10.1	102	7					1.85								
15/2-6B1	THR164	12/15/89	60	10.1	102	6		3	0.05	2.3		1.8	23.07	9	.01(U)	2.64	0.56	12.33	3.07
15/2-6H1	THR165	04/24/82					71			3.5									
15/2-6H1	THR165	03/14/83					90			2.9		7							
15/2-6H1	THR165	12/11/89	80	10.2	155	7					3.4								
15/2-6H1	THR165	12/11/89	80	10.2	155	7		5.03	0.021		5.33	6.24	44	15	.005(U)	4.3	1.3	16.1	7.6
15/3-1K1	THR167	04/24/82					45			1.5									
15/3-1K1	THR167	03/14/83					70			1.5		5(U)							
15/3-6Q1	THR171	04/23/82					71			2.3									
15/3-6Q1	THR171	03/14/83					90			3		5							
15/3-3R1	THR173	04/23/82					63			1.1									
15/3-3R1	THR173	03/15/83					80			1.6		5(U)							
15/3-3R1	THR173	12/15/89	7	11.2	122	7					6.02								
15/4-4B1	THR174	04/23/82					73			0.9									
15/4-4B1	THR174	03/15/83					60			1.5		5(U)							
15/3-6A2	THR175	03/15/83					80			3.1		6							
15/3-6A2	THR175	12/14/89	60	9	120	6.7		3	0.07	3.7		3.1	36.79	10.54	.01(U)	2.74	0.43	12.21	4.2
15/3-6A2	THR175	12/14/89	60	9	120	7		3.84	0.019		2.59	3.69	34.2	11	.005(U)	3.04	1.1	12.6	4.52
15/3-4K1	THR176	04/23/82					70			4.8									
15/3-4K1	THR176	03/16/83					70			0.8		5(U)							
15/3-4K1	THR176	12/14/89	80	9.8	109	7					1.1								
16/2-29A1	THR180	04/23/82					51			3.3									

Control Station No. Stream Management Unit Name	Control Station by River Mile and Section, Township and Range	Affected Stream Reach Including Tributaries
12.0380.00 Wishkah River	16.2 22–19–9W	From influence of mean annual high tide at low base flow levels to headwaters. Excluding E. Fk. Wishkah River.
12.0382.90 E. Fk., Wishkah R.	0.9 36–19–9W	From mouth to headwaters.
12.0385.00 W. Fk. Hoquiam River	9.4 14–18–10W	From mouth to headwaters.
12.0385.80 Middle Fk. Hoquiam R.	1.6 4–18–10W	From mouth to headwaters.
12.0386.60 East Fork Hoquiam	7.1 8–18–9W	From mouth to headwaters.
12.0390.00 Humptulips River	24.8 17–20–10W	From influence of mean annual high tide at low base flow levels to headwaters.
12.0174.00 Elk River	3.0 3–16–11W	From influence of mean annual high tide at low base flow levels to headwaters.
12.0175.00 Johns River	6.0 21–16–10W	From influence of mean annual high tide at low base flow levels to headwaters.
12.0180.00 Newskah Creek	3.5 32–17–9W	From influence of mean annual high tide at low base flow levels to headwaters.
12.0185.00 Charley Creek	2.0 21–17–9W	From influence of mean annual high tide at low base flow levels to headwaters.

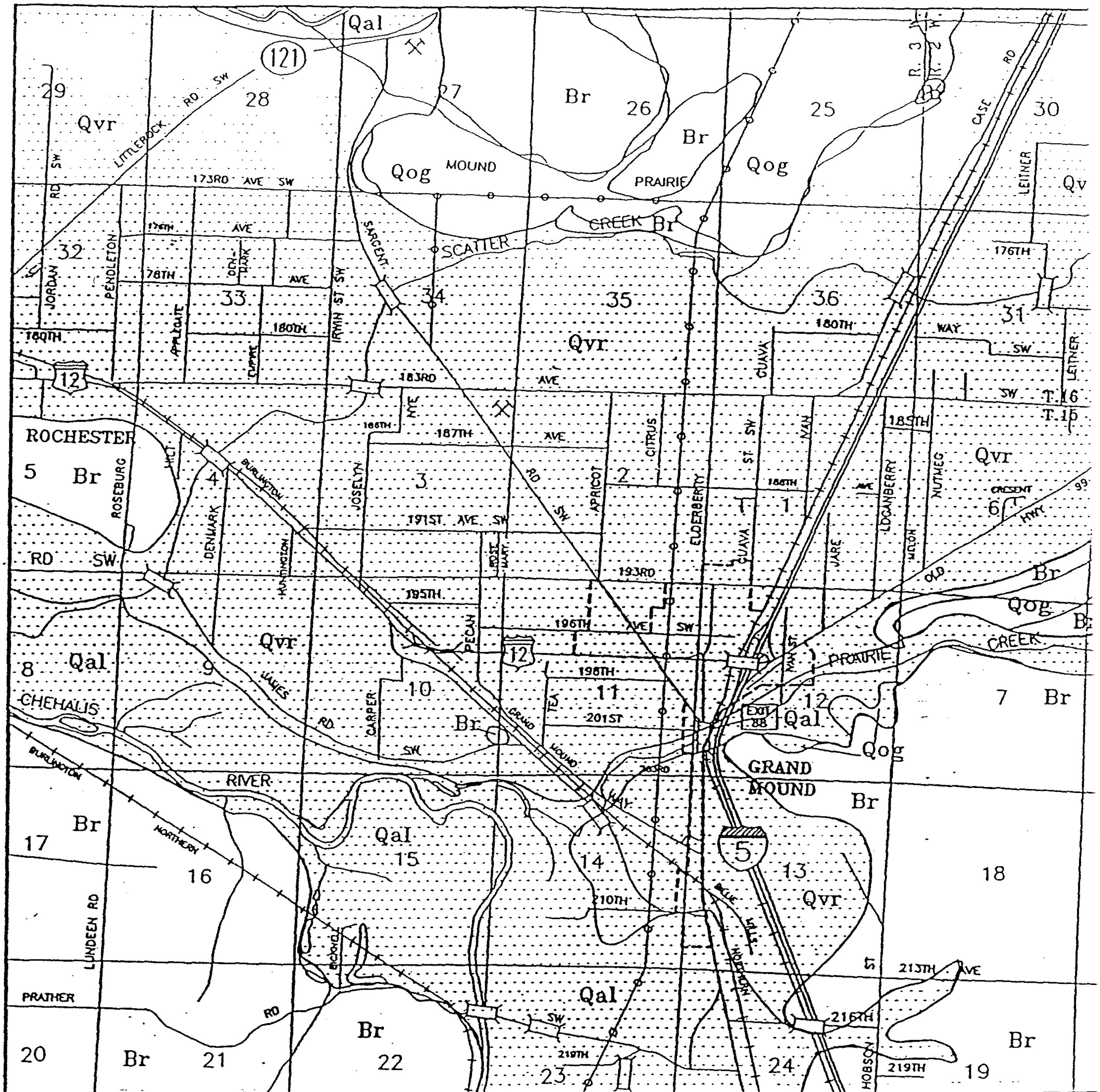
(2) Base flows established for the stream management units in WAC 173-522-020(1) are as follows:

BASE FLOWS IN THE CHEHALIS RIVER BASIN
(In Cubic Feet per Second)

Month	Day	12.0200.00 Chehalis R. nr. Elk Cr.	12.0205.00 Elk Cr.	12.0216.30 So. Fk. Chehalis R.	12.0235.00 Chehalis R.
Jan.	1	260	100	200	700
	15	260	100	200	700
Feb.	1	260	100	200	700
	15	260	100	200	700
Mar.	1	260	100	200	700
	15	260	100	200	700
Apr.	1	260	100	200	700
	15	260	100	200	700
May	1	195	76	145	525
	15	146	57	105	400
June	1	108	43	75	300
	15	82	32	55	230
July	1	62	25	40	175
	15	46	19	29	130
Aug.	1	37	16	21	98
	15	31	14	15	75
Sep.	1	31	14	15	75
	15	31	14	15	75
Oct.	1	39	15	21	92
	15	49	17	28	115
Nov.	1	88	31	56	215
	15	150	56	105	390
Dec.	1	260	100	200	700
	15	260	100	200	700

Month	Day	12.0240.00 Newaukum R. S. Fork	12.0245.00 Newaukum R. N. Fork	12.0250.00 Newaukum R.	12.0253.00 Salzer Cr.
Jan.	1	125	62	250	11
	15	125	62	250	11
Feb.	1	125	62	250	11
	15	125	62	250	11
Mar.	1	125	62	250	11
	15	125	62	250	11
Apr.	1	125	62	250	11
	15	125	62	250	11
May	1	110	47	210	5.8
	15	88	36	160	2.8
June	1	70	27	118	1.4
	15	56	21	90	.73
July	1	45	16	68	.38
	15	36	12	52	.20
Aug.	1	29	9	38	.10
	15	27	7	35	.05
Sep.	1	27	7	35	.05
	15	27	7	35	.05
Oct.	1	33	8.4	43	.14
	15	40	10	54	.40
Nov.	1	58	19	91	1.35
	15	85	34	150	3.9
Dec.	1	125	62	250	11
	15	125	62	250	11

Month	Day	12.0264.00 Skookumchuck River	12.0275.00 Chehalis R. at Grand M.	12.0292.00 Black R.	12.0305.00 Cedar Cr.
Jan.	1	160	1300	200	90
	15	160	1300	200	90
Feb.	1	160	1300	200	90
	15	160	1300	200	90
Mar.	1	160	1300	200	90
	15	160	1300	200	90
Apr.	1	160	1300	200	90
	15	160	1300	200	90
May	1	160	1000	170	70
	15	130	780	145	54
June	1	103	600	120	40
	15	83	460	104	31
July	1	67	355	88	24
	15	54	275	75	19
Aug.	1	43	210	70	14
	15	35	165	66	11
Sep.	1	35	165	66	11
	15	35	165	66	11
Oct.	1	35	200	68	13.8
	15	35	250	70	17
Nov.	1	59	440	100	30
	15	96	760	140	52
Dec.	1	160	1300	200	90
	15	160	1300	200	90

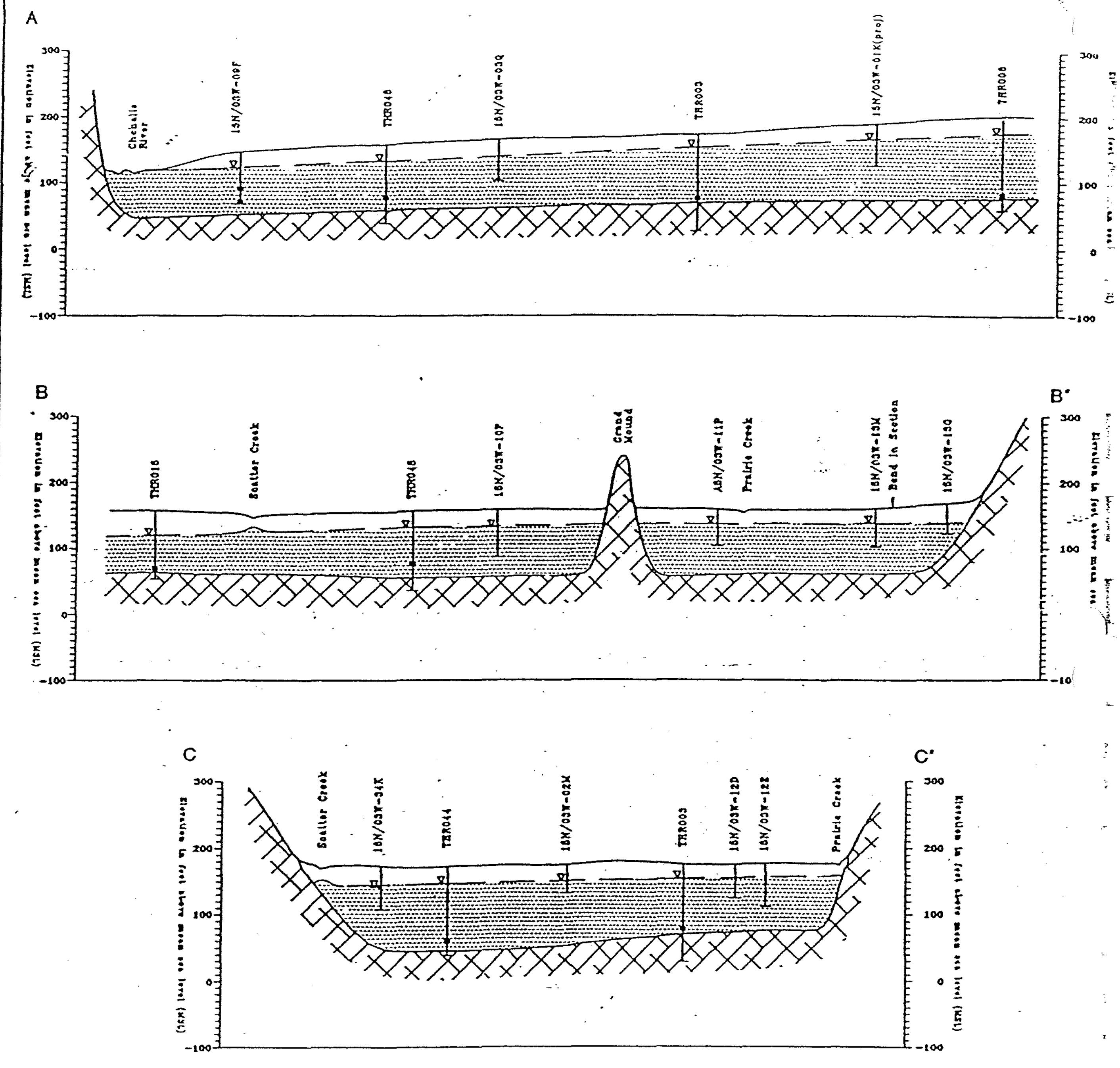


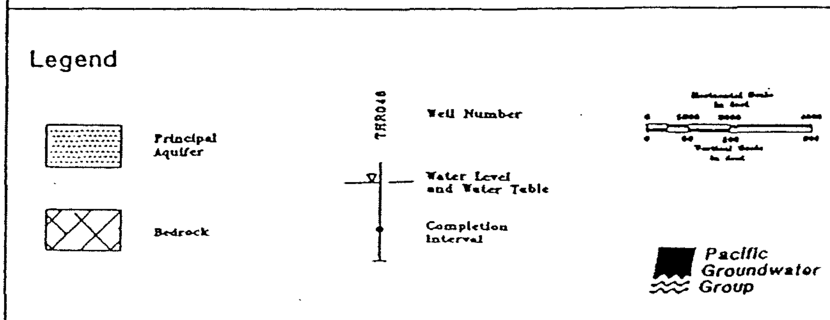
Legend

Qal	Recent Alluvial Deposits
Qvr	Vashon Recessional Outwash
Qog	Older Glacial Deposits
Br	Bedrock Deposits
(dotted box)	Principal Aquifer
-----	Service Area Boundary

Grand Mound
Groundwater Feasibility Assessment

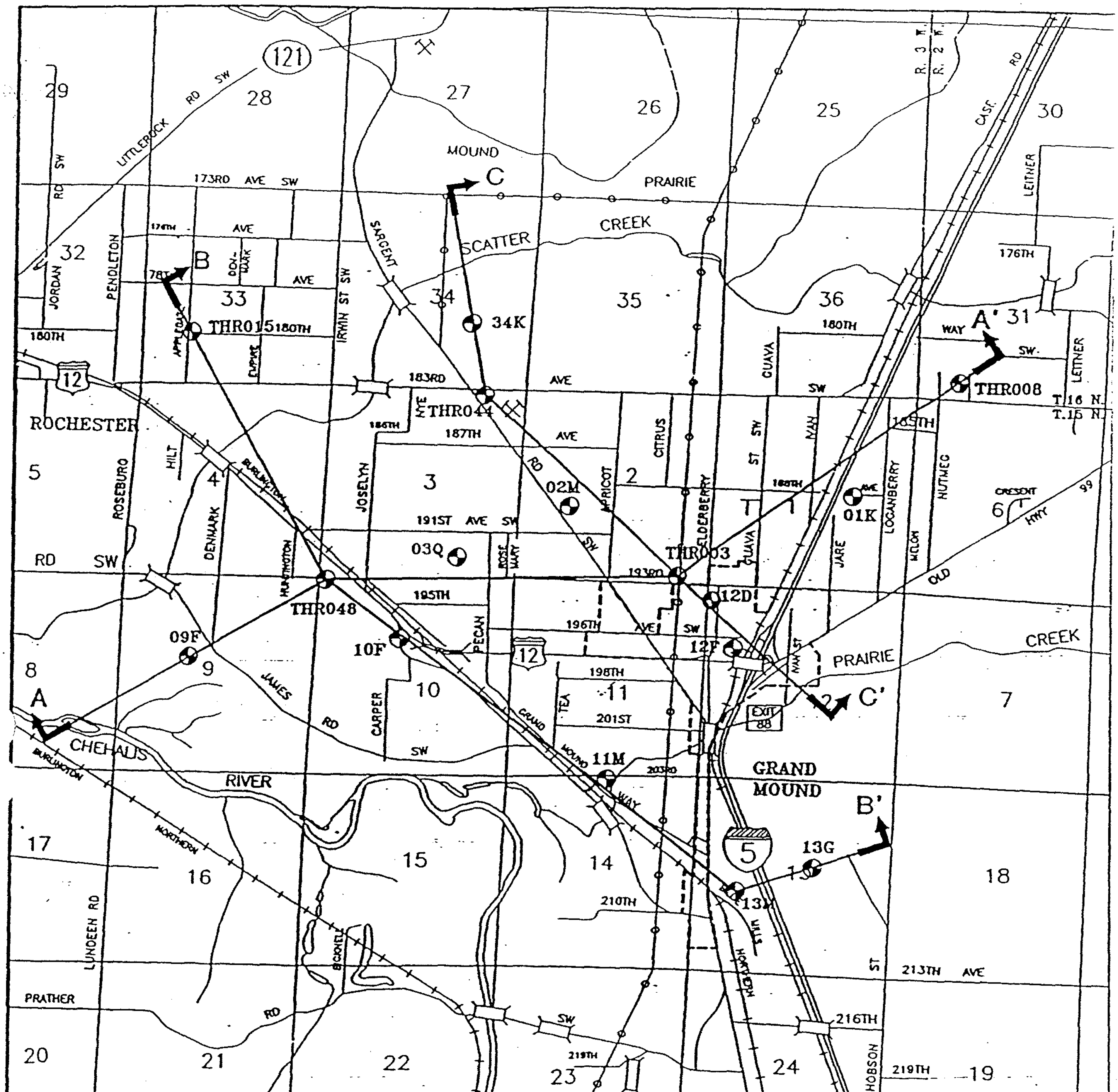
Figure 1
Surficial Geology and Location of Principal Aquifer





Grand Mound
Groundwater Feasibility Assessment

Figure 2
Hydrogeologic Profiles



Legend

THR015 Well Location and Number

Hydrogeologic Profile Alignment

----- Service Area Boundary

Scale in Feet 0 1000 2000 4000

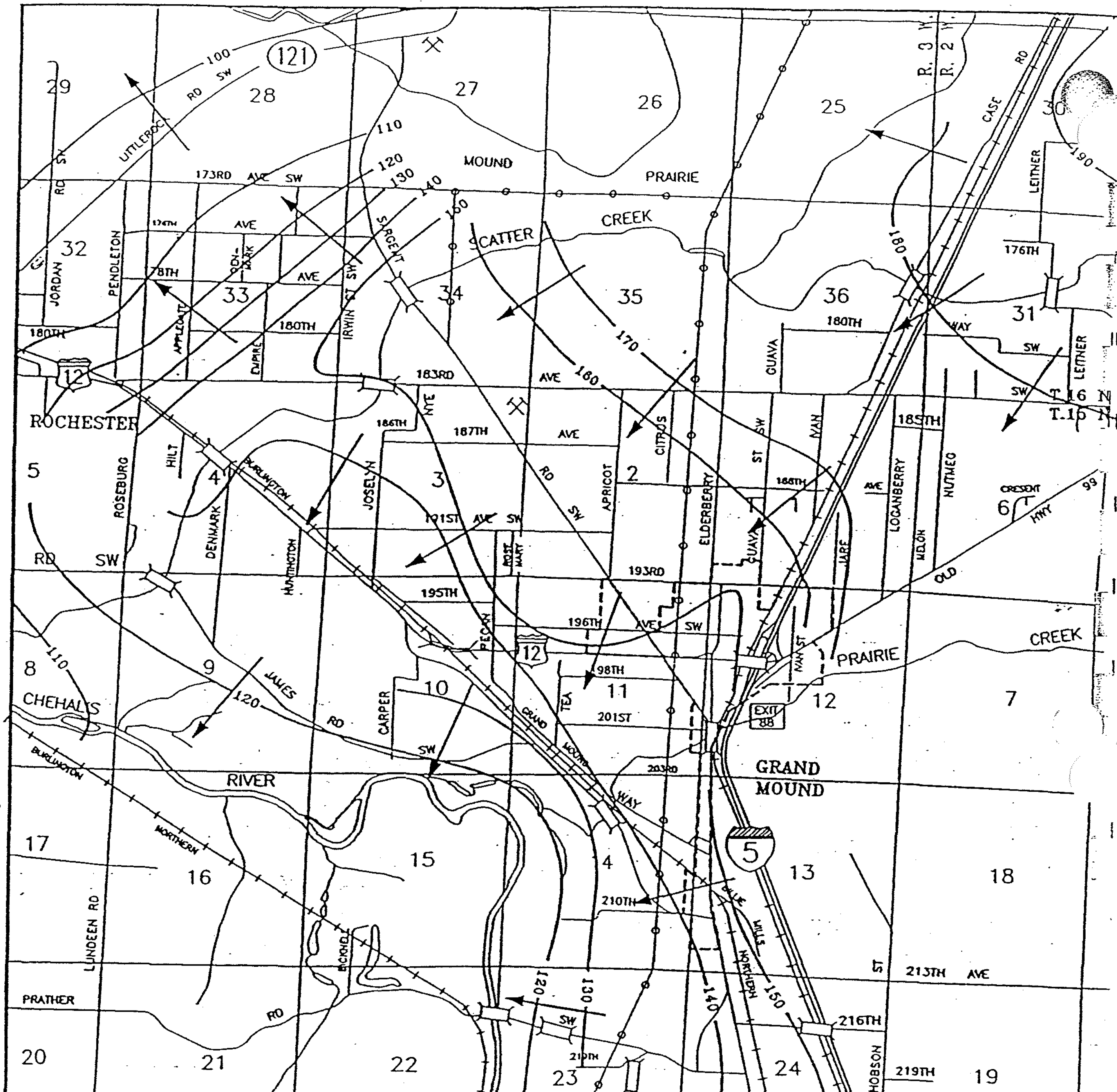
Map Provided by Thurston County Geographic Information Facility

Grand Mound

Groundwater Feasibility Assessment

Figure 3

Well Locations and Hydrogeologic Profile Alignments



Legend

— 100 — Water Level Contour in Feet above Mean Sea Level (data source: WSB #10)

Groundwater Flow Direction

----- Service Area Boundary

N

Scale in Feet

0 1000 2000 4000

Base Map Provided by Thurston County Geographic Information Facility

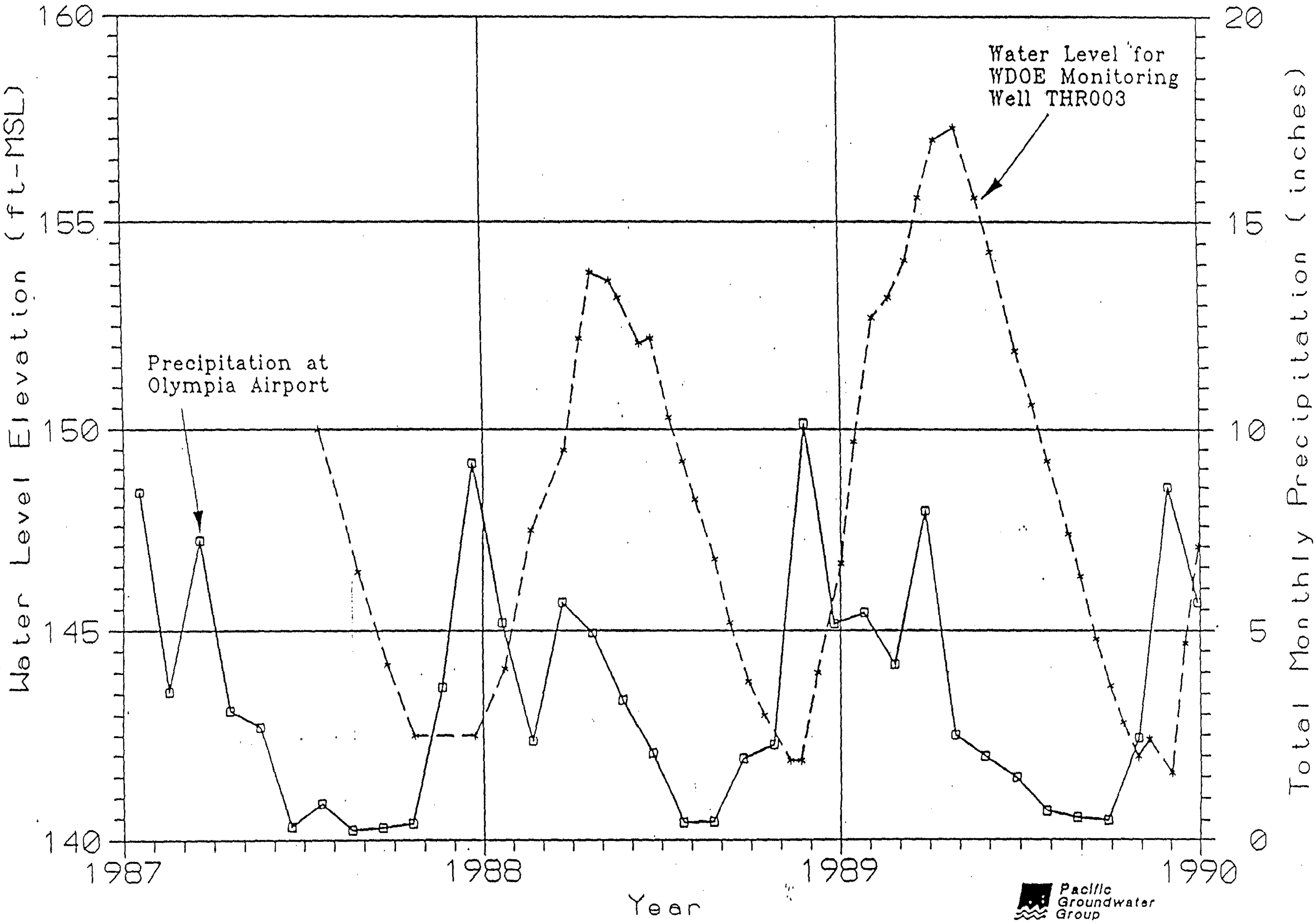
Grand Mound

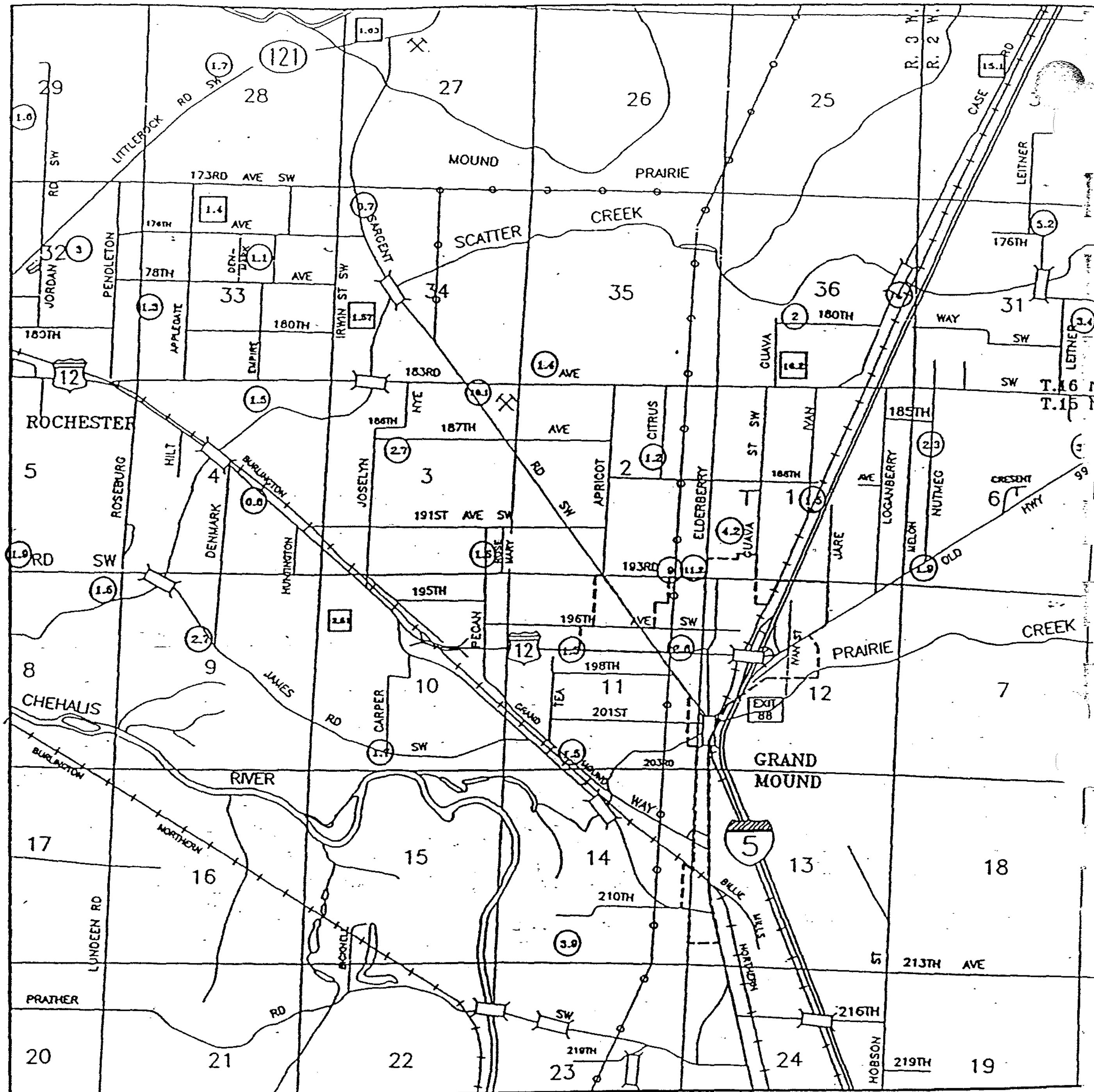
Groundwater Feasibility Assessment

Figure 4

Water Level Contours and Groundwater Flow Directio

Figure 5 - Comparison of Precipitation and Water Level Trends, Grand Mound Area





Legend

(0.6) Groundwater Sampling Site and Nitrate Concentration (mg/l)

[2.61] Groundwater Sampling Site and Nitrate + Nitrite Concentrations (mg/l)

----- Service Area Boundary

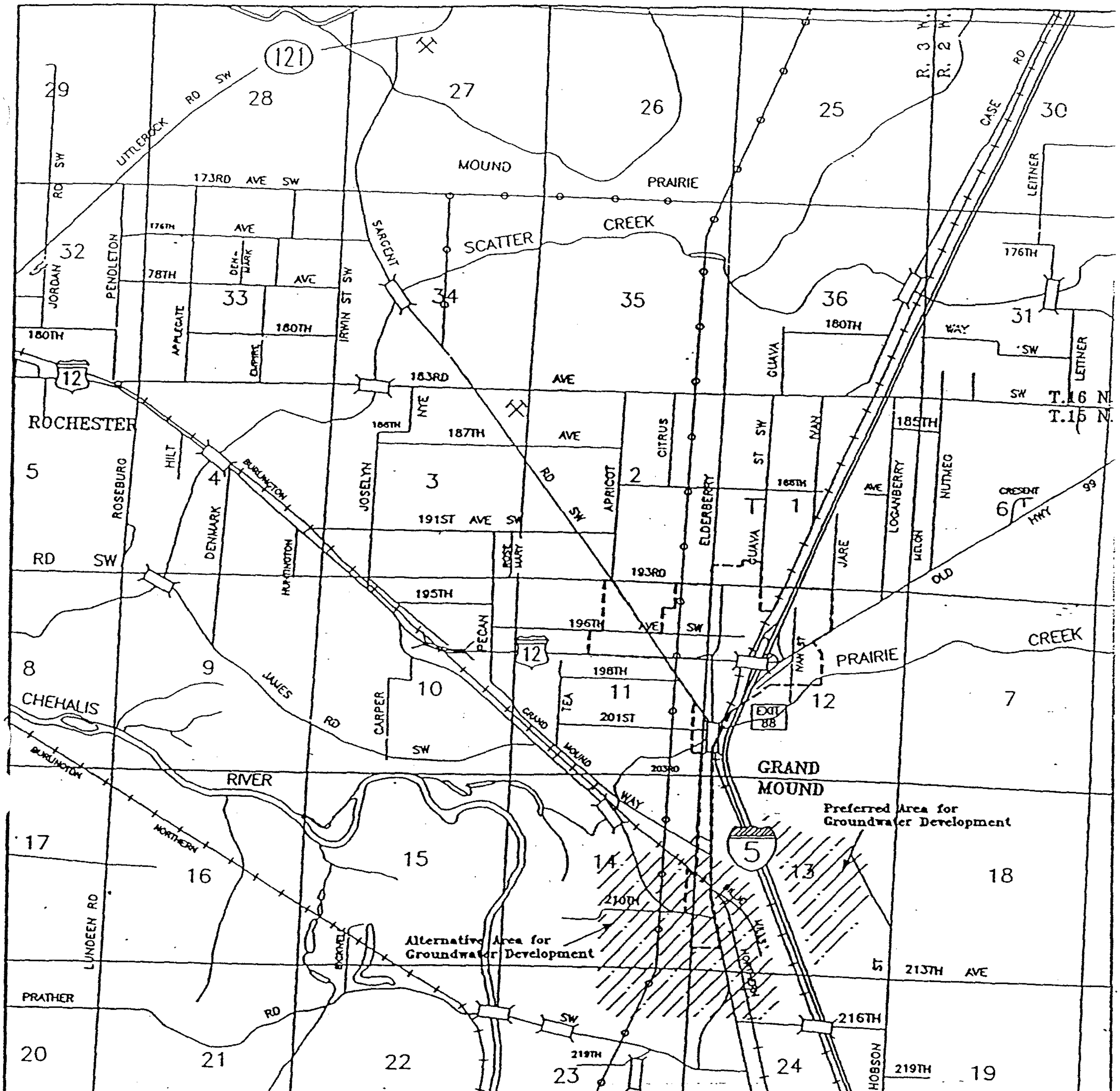
Scale in Feet
0 1000 2000 4000

Water Quality Data Obtained from WDOE
Base Map Provided by Thurston County Geographic Information Facility

Grand Mound
Groundwater Feasibility Assessment

Figure 6

Distribution of Nitrate and Nitrite in Groundwater



Legend

Recommended Areas for Groundwater Development

Service Area Boundary

Scale in Feet

0 1000 2000 4000

Map Provided by Thurston County Geographic Information Facility

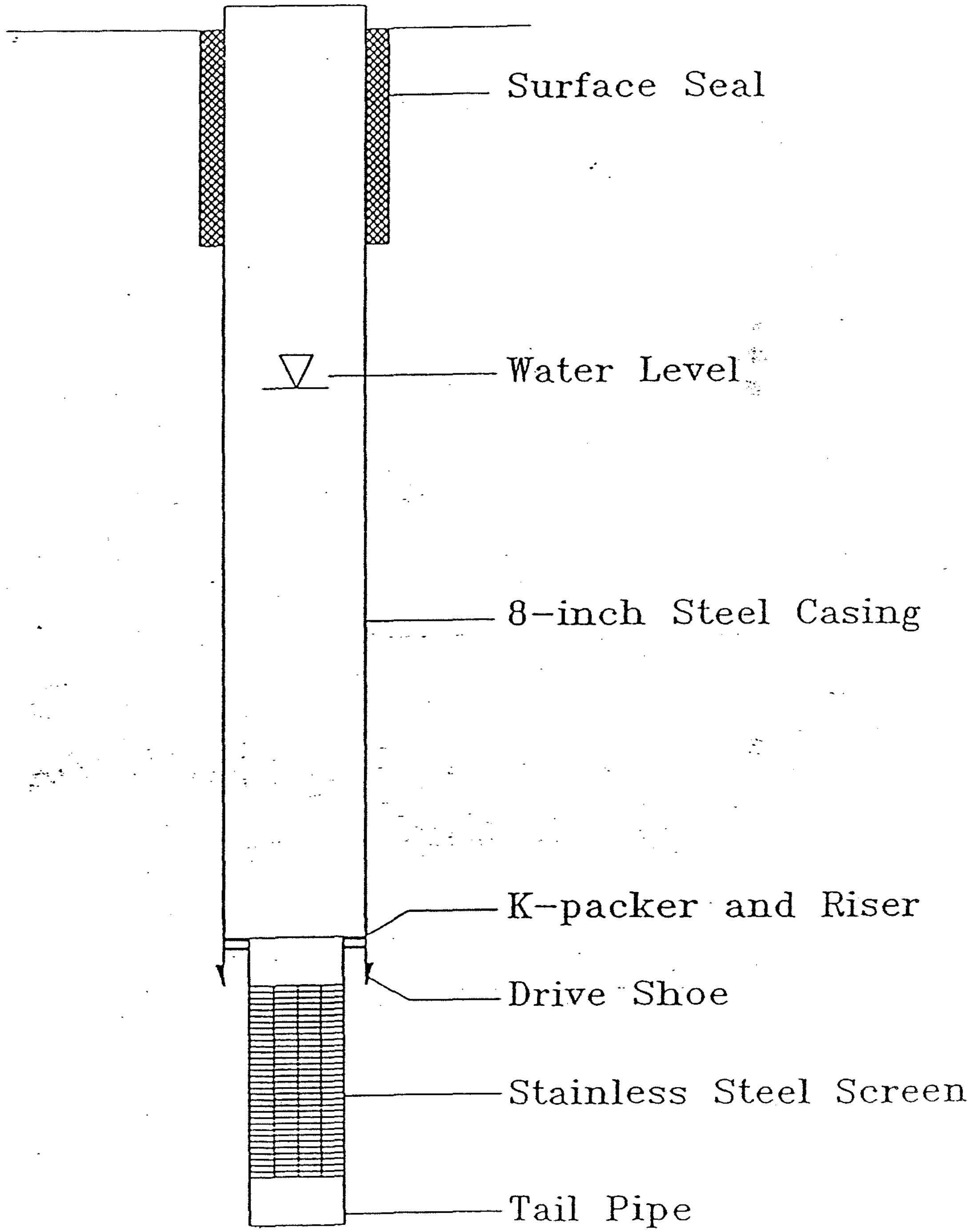
Grand Mound

Groundwater Feasibility Assessment

Figure 7

Recommended Areas for Groundwater Development

Figure 8 - Recommended Well Design
Grand Mound Water Supply



Pacific Groundwate Group

APPENDIX A - DEFINITION OF TERMS AND WELL NUMBERING SYSTEM

Definition of Selected Terms

Aquifer - An aquifer is a formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.

Hydraulic Conductivity - The hydraulic conductivity is the rate of flow of water through porous media under a unit gradient per unit of time.

Hydraulic Gradient - The hydraulic gradient is the change in static head per unit of distance in a given direction. The direction generally is understood to be that of the maximum rate of decrease in head.

Specific Capacity - The specific capacity of a well is the rate of discharge of water from the well divided by the drawdown of water within the well. It varies slowly with the duration of discharge (i.e. decreasing with time). The relation between discharge and drawdown is affected by the construction of the well, its development, the character of the screen or casing perforation and the velocity and length of flow up the casing.

Storage Coefficient - The storage coefficient is the volume of water an aquifer releases from or takes into storage per unit surface area of aquifer per unit change in head. In a confined aquifer, the water derived from storage comes from expansion of the water and compression of the aquifer. In an unconfined or water table aquifer, the water derived from storage is due to gravity drainage of the pore space.

Stream, Gaining - A gaining stream is a stream or reach of a stream whose flow is being increased by inflow of groundwater.

Stream, Losing - A losing stream is a stream or reach of stream that is losing water to the ground.

Transmissivity - Transmissivity is the rate at which water is transmitted through a unit width of aquifer under a unit hydraulic gradient. The transmissivity is the product of aquifer permeability (hydraulic conductivity) and saturated thickness.

Water Table - The water table is that surface in a groundwater body at which the water pressure ia atmospheric. It is defined by the levels at which water stands in a well that penetrates the water body just far enough to hold standing water.

Well Numbering System

Within this report, a numbering system for wells was used that indicates their location according to the rectangular system for subdivision of public land, which references locations by township, range, section, and 40 acre tract within the section. By using this system, the reader can quickly located any area of 40 acres or more in size.

For example in the area designated by 15N/03W-11B, the part of the designation preceding the hyphen indicates successively the township and range (T. 15 N., R. 3 W.) north and west of the Willamette baseline and meridian. The number following the hyphen indicates the section (Section 11) and the letter (B) indicates the 40-acre subdivision of the section as shown in the diagram below.

R. 3 W.

T.	D	C	B	A
	E	F	G	H
15	M	L	K	J
N.	N	P	Q	R

Section 11

A sequential well number is some cases appended to the numbering system to allow differentiation of multiple occurrences of wells within a 40-acre tract.

THURSTON COUNTY
WASHINGTON
SINCE 1852

Appendix B

Service Area Agreements

AGREEMENT

This Agreement is entered into between THURSTON COUNTY, Washington, hereafter referred to as "COUNTY" and THURSTON COUNTY FIRE DISTRICT NUMBER 1, hereafter referred to as "FIRE DISTRICT".

The FIRE DISTRICT and the COUNTY provide services in the area known as Fire District Number 1, located in Thurston County, Washington. It is essential, in order to assure that adequate fire suppression services are available in this area, that the two parties cooperate and coordinate their activities. The parties recognize that an adequate water supply is necessary for effective fire suppression capabilities. The Grand Mound water system consists of two wells, an elevated steel reservoir, and water distribution system designed to deliver a minimum 1500 gallons per minute for up to two hours.

To assure that such water supply facilities are available and in operable condition at all times, the parties agree that each shall be responsible for the following:

The COUNTY will:

1. Perform all necessary repairs to maintain hydrants in proper working order, including responding to repair notices prepared by the FIRE DISTRICT, and replacement as appropriate. Verification of repairs, requested by the FIRE DISTRICT, will be sent to the FIRE DISTRICT upon completion.
2. Notify the FIRE DISTRICT when a hydrant is out of service and when returned to serve.
3. Maintain records concerning hydrant location, type, size and maintenance history.
4. Re-paint hydrants as necessary to maintain neat appearance and color code.
5. Annually inspect fire hydrants for proper operation, lubricate port caps and operate drain valve.
6. Apply approved vegetation management techniques in and around hydrants as necessary where needed for control of vegetation growth.
7. Purchase hydrant flow test equipment. Make this equipment available to the FIRE DISTRICT as needed.

The FIRE DISTIRCT will:

1. Annually flow test all hydrants and any additional hydrants which may be installed.
2. Maintain flow test records for each hydrant.
3. Notify the COUNTY 48 hours prior to flow testing, flushing, or using any water from a hydrant that is not being used in an emergency to fight fires. Flow rates and quantity used will be reported to the COUNTY after use.
4. Notify the COUNTY of the results of the flow tests, and inform the COUTNY of any known repairs which may be necessary to the hydrants, including repairs based on the results of the flow tests.

Each party shall, at all times, be solely responsible and liable for the acts or the failure to act of its employees that occur or arise in any way out of the performance of this Agreement, and shall save and hold the other party and its employees and officials harmless from any and all costs, expenses, losses and damages, including costs of defense, incurred as a result of any acts or omissions of such employees relating to the performance of the Agreement.

This Agreement will remain in force until terminated by either party giving thirty (30) days written notice, or until it is amended by both parties.

This Agreement is entered into for the benefit of the parties to the agreement only and shall confer no benefits, direct or implied, on any other third persons or entities.

Dated this 9 day of May, 2005

THURSTON COUNTY
BOARD OF COUNTY COMMISSIONERS

Excused absence
Chairman

Cal MacLeod
Vice Chairman

Cathy Wolfe
Commissioner

ATTEST

Clerk of the Board

APPROVED AS TO FORM:
EDWARD G. HOLM
PROSECUTING ATTORNEY

By: Kirsten Van Wolf
Deputy Prosecuting Attorney

FIRE DISTRICT NO. 1

Robert W
Fire Chief

ss\O:\USERS\TC032a\DATA\Admin Team\General Info\Blinn docs\Utility Ops\FIRE DISTRICT NO 1 AGREEMENT 042505.doc

THURSTON COUNTY

WASHINGTON

SINCE 1852

Appendix C

Water Quality Monitoring Report

Grand Mound 2010 Confidence Report

Washington State Department of
Health

Water Quality Monitoring Report for the Year 2011

System: GRAND MOUND PWSID: 07158 0 Report Date: 03/17/2011

Contact: MARK A. PETRIE Group: A - Comm County: THURSTON Region: SOUTHWEST

SMA Id: 134 SMA Name: THURSTON COUNTY PUBLIC WORKS

Part 1: List of Active Sources with Water Quality Monitoring Requirements

DOH Source#	Name	Type	Use	Susceptibility Rating
S01	Well #1 ACK136	Well	Permanent	High
S02	Well #2 ACT016 TCGM	Well	Permanent	Unknown

Part 2: Sampling Schedule for the Year 2011

Coliform Sampling (Routine)	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
	2	2	2	2	2	2	2	2	2	2	2	2

* Indicates the requirement is an exception from WAC 246-290.

- If the coliform (bacteriological) sampling schedule listed at the bottom of the current Water Facilities Inventory (WFI) form for your system is different from the schedule listed above, follow the schedule on the current WFI.
- Samples must be collected from representative points throughout the distribution system.
- Repeat samples are required following an unsatisfactor y sample. In addition, collect a sample from each operating groundwater source.
- A minimum of 5 routine samples are required the month following one or more unsatisfactory samples in accordance with your system's Coliform Monitoring Plan.

Lead and Copper Distribution Sampling

- Lead and copper samples must be collected from indoor faucets within the distribution system after the water has sat unused in the pipes for at least 6 hours but no more than 12 hours.
- Sample faucets should be flushed with cold water the evening prior to collecting the sample.
- Part 2 indicates the month in which samples should be collected. Part 4 indicates the total number of sample required.
- If you are required to sample annually or once every 3 years, samples must be collected between June and September.

Chlorine Residual Sampling

- Systems that use continuous chlorination must take chlorine residual measurements daily (or at a reduced frequency approved by the department), and at the same time and location as routine and repeat coliform samples.

Disinfection Byproducts Sampling

- Systems that use continuous chlorination treatment must collect samples for total trihalomethanes (TTHM) and for haloacetic acids (HAA5) for each chlorination treatment facility identified in your individual disinfection byproducts (DBP) monitoring plan. Collect the samples from the distribution system at the frequency and locations identified in your DBP monitoring plan.

Chemical Sampling Requirements

- Source water chemical samples must be taken from a location as near to the source as possible, but after all treatment, and before entering the distribution system.
- Nitrate, nitrite and arsenic are included as part of a complete IOC.

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Water Quality Monitoring Report for the Year 2011

Month	Source	Monitoring Requirement	Test Panel
January		*No source chemical sampling required this month*	
February		*No source chemical sampling required this month*	
March		*No source chemical sampling required this month*	
April		*No source chemical sampling required this month*	
May		LEAD / COPPER	LCR
June	S02	NITRATE	NITRATE
July	S01	NITRATE	NITRATE
August		*No source chemical sampling required this month*	
September		LEAD / COPPER	LCR
October		*No source chemical sampling required this month*	
November		*No source chemical sampling required this month*	
December		*No source chemical sampling required this month*	

Part 3: State Waivers

- Automatic ally granted to all sources based on DOH assessment of conditions within the state.
- No waiver application, or fee required.
- State waivers granted for the 2011 - 2013 compliance period are listed in Part 4.

Part 4: Water Quality Monitoring Frequency

- Although waivers may be granted for your system, there may be some monitoring required as a condition of the waiver your system was granted.

Monitoring Group	Test Panel	Sample Location	Schedule /Status
Asbestos	ASB	Distribution	State Waiver Thru Dec 2019
Bacteriologi cal	Coli	Distribut ion	See routine sample schedule in part 2
Dioxin	Dioxin	All sources	State Waiver Thru Dec 2013
Endothall	Endo	All sources	State Waiver Thru Dec 2013
EDB and other soil fumigants	Fumigant	S01	State Waiver Thru Dec 2013
EDB and other soil fumigants	Fumigant	S02	State Waiver Thru Dec 2013
Glyphosphate	Glyphs	All sources	State Waiver Thru Dec 2013
Halo-Acetic Acids	HAA5	Distrib ution	1 sample per treatment plant every 3 years
Herbicide s	Herbs	S01	1 sample between Jan 2011 - Dec 2013
Herbicides	Herbs	S02	1 sample between Jan 2011 - Dec 2013
Insecticides	Insect	S01	1 sample between Jan 2011 - Dec 2013
Insecticides	Insect	S02	1 sample between Jan 2011 - Dec 2013
Inorganic Contaminants	IOC	S01	1 sample between Jan 2011 - Dec 2013

Washington State Department of
Health
Division of Environmental Health
Office of Drinking Water

Water Quality Monitoring Report for the Year 2011

Monitoring Group	Test Panel	Sample Location	Schedule /Status
Inorganic Contaminants	IOC	S02	1 sample between Jan 2011 - Dec 2013
Lead/Copper *	LCR	Distribution	LCR 1 Set of 10 samples between Jan 2011 - Jun 2011
Lead/Copper *	LCR	Distribution	LCR 1 Set of 10 samples between Jul 2011 - Dec 2011
Nitrate *	NIT	S01	Collect 1 sample(s) every 1 year
Nitrate *	NIT	S02	Collect 1 sample(s) every 1 year
General Pesticides	Pest1	S01	1 sample between Jan 2011 - Dec 2013
General Pesticides	Pest1	S02	1 sample between Jan 2011 - Dec 2013
Diquat	Diquat	All sources	State Waiver Thru Dec 2013
Total Trihalomethane	THM	Distribution	1 sample per treatment plant every 3 years
Volatile Organic Contaminants	VOC	S01	1 sample between Jan 2011 - Dec 2013
Volatile Organic Contaminants	VOC	S02	1 sample between Jan 2011 - Dec 2013

** These contaminant monitoring groups do not have waiver options under the SDWA*

Washington State Department of Health

Water Quality Monitoring Report for the Year 2011

Part 5: RegionaWater Quality MonitoringContact

Southwest Regional Office

For Further informationcall the Southwest Regional Office Sophia Petro

Phone: (360) 236-3046

For questions regarding Disinfection ByProducts (DBP) monitoring, contact: Regina Grimm, p.e. (360) 236-3035

Special Note

For Group A Community Systems Only: Your Consumer Confidence Report, summarizing the results of your 2010 water quality monitoring requirements is due before July 1, 2011 . For further information visit www.doh.wa. gov/ehp/dw/Our_Main_Pages/consum er.htm or contact the CCR Coordinator at your Regional Office.

MARK A. PETRIE
GRANDMOUND
2404 HERITAGE CT SW
OLYMPIA WA 98502

Washington State Department of Health

Water Quality Monitoring Report for the Year 2011

System: GRAND MOUND PWSI D: 07158 0 Report Date: 03/17/2011
Contact: MARK A. PETRIE Group: A - Comm County: THURSTON Region: SOUTHWEST
SMA Id: 134 SMA Name: THURSTON COUNTY PUBLIC WORKS

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May		LEAD / COPPER	LCR
June	S02	NITRATE	NITRATE
July	S01	NITRATE	NITRATE
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Halo-Acetic Acids	HAA5	Distribution	1 sample per treatment plant every 3 years
Herbicides	Herbs	S01	1 sample between Jan 2011 - Dec 2013
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Insecticides	Insect	S01	1 sample between Jan 2011 - Dec 2013
Insecticides	Insect	S02	1 sample between Jan 2011 - Dec 2013
Inorganic Contaminants	IOC	S01	1 sample between Jan 2011 - Dec 2013

Washington State Department of
Health

Water Quality Monitoring Report for the Year 2011

Monitoring Group	Test Panel	Sample Location	Schedule /Status
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Washington State Department of
Health

Water Quality Monitoring Report for the Year 2011

Part 5: RegionalWater Quality MonitoringContact

SouthwestRegionalOffice

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MARK A. PETRIE
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2404 HERITAGE CT SW
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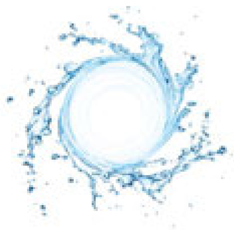
THURSTON COUNTY
WASHINGTON
SINCE 1852



Thurston County
Public Works Department
2404 A1 Heritage Ct. SW
Olympia, WA 98502

Drinking Water and Your Health

All drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants.

The presence of contaminants does not necessarily indicate that the water poses a health risk. For more information about contaminants and potential health effects, call the Environmental Protection Agency's Safe Drinking Water Hotline at 1-800-426-4791.

Some people, however, may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly people, and infants can be particularly at risk of infections. These people should seek advice about drinking water from their health care providers.

EPA/CDC guidelines on appropriate means to lessen the risk of infection by cryptosporidium and other microbiological contaminants are also available from the EPA hotline.

Indoor Drought Busters!
10 Tips to Conserve Your Water

Despite moderate to heavy rainfall this spring, the Northwest faces a serious threat of drought this summer and fall due to low snowpacks. As reported in the National Drought Mitigation Center's spring newsletter, "The Pacific Northwest and the Rocky Mountains are expected to see drought expand and intensify through the next several months."

Here are 10 simple actions you can take to conserve one of our most precious resources.

1. Wash full loads of laundry and dishes. You'll save time, energy and water—as much as 2,000 gallons a year.

2. Waiting for the shower to get hot? Collect the water while you wait. Use it to water plants or rinse vegetables.

3. When washing dishes by hand, turn the water off. Use one sink for washing and a second for rinsing.

4. Boiling eggs, steaming vegetables? Reuse the water. Plants love the nutrients in water used to steam broccoli, asparagus and other vegetables.

5. Don't pre-rinse dishes. Newer dishwashers don't require it.

6. Replace older faucet nozzles or aerators with new ones rated at two gallons per minute or less. Cost: a few dollars.

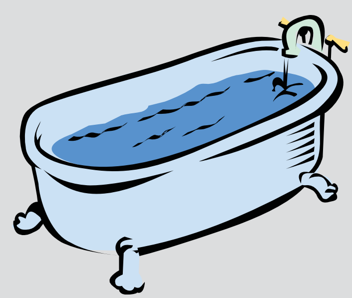
7. Turn the water off while shaving and brushing your teeth.

8. Got a pre-1994 toilet? Replace it and save up to 10,500 gallons of water and between \$50 and \$125 a year!

9. Install a water-saving showerhead that uses less than 2 .5 gallons per minute. You'll save water and energy.

10. Time your showers for a week; then see if you can cut a minute off each shower.

Data courtesy of www.savingwater.org



It's Your Water!

Thurston County Water Quality Report Grand Mound 2010

#071580

If you are a Grand Mound property manager, please pass this on to your tenant or guest.
Thank you!

Dear Water Customer,

Thurston County is pleased to present this annual water quality report for the Grand Mound water system. This report provides detailed results from drinking water tests taken in 2009, and compares the results to federal and state standards.

Thurston County distributes monitoring results every year in accordance with the federal Safe Drinking Water Act and mandates by the Washington State Department of Health. Test results from 2010 will be reported in 2011.

We are proud to report that your water meets or exceeds all standards set for quality and safety. If you have questions about this report or your water utility, please call me at 754-2930 or e-mail petriema@co.thurston.wa.us.

Sincerely,

Mark Petrie

Supply and Treatment

The Grand Mound water source consists of two wells, each drilled in the Qva Aquifer approximately 2,200 feet apart. Well #1 is located just off 201st Avenue S.W. Well #2 is located off Tea Street.

The state Department of Health requires the Grand Mound water system, and many other water systems across Washington, to use chlorine to disinfect drinking water.

Trace amounts of sodium hydroxide are also added to balance the natural acidity of the ground water in Grand Mound. The sodium hydroxide reduces the possibility that copper and lead will dissolve into the water from household plumbing.

Summary of Results

State and federal laws set strict limits on the level of contaminants allowed in public water systems. We are proud to report your drinking water meets or exceeds all federal and state requirements. Although trace levels of nitrate, copper and lead were detected in 2009, the Environmental Protection Agency (EPA) has determined that your water is SAFE at these levels.

Water Quality Table

Most of the data in this report comes from tests taken January 1 through December 31, 2009. Some of the information is older, because certain contaminants are not tested every year.

The tables list only compounds that were detected. If you are interested in the compounds that were monitored but not detected, please call Mark Petrie, utility operations manager, at 754-2930.

Inorganic contaminants (2009 data)					
Contaminant	**Violation Y/N**	**Level Detected**	**Allowed Level (MCL)**	**Ideal Goal (MCLG)**	**Likely Source of Contamination**
Nitrate (as Nitrogen) Well #1	N	3.4 mgl	10 mgl	10 mgl	Runoff from fertilizer use; leaching from septic tanks; sewage; erosion of natural deposits
Nitrate (as Nitrogen) Well #2	Y	No sample pulled. See explanation next page. **	10 mgl	10 mgl	Runoff from fertilizer use; leaching from septic tanks; sewage; erosion of natural deposits
Copper and lead (2009 data)					
Contaminant	**Violation Y/N**	**Level Detected**	**Allowed Level (MCL)**	**Ideal Goal (MCLG)**	**Likely Source of Contamination**
Copper	N	.053 mgl	AL=1.3 mgl	1.3 mgl	Corrosion of household plumbing systems
Lead	N	.008 mgl	AL=.015 mgl	0 mgl	Corrosion of household plumbing systems
Disinfection byproducts (2009 data)					
Contaminant	**Violation Y/N**	**Level Detected**	**Allowed Level (MCL)**	**Ideal Goal (MCLG)**	**Likely Source of Contamination**
Trihalomethanes	N	0.9 ugl	80 ugl	n/a	Disinfection byproduct

Definitions

Maximum contaminant level: The "maximum allowed" (MCL) is the highest level of a contaminant allowed in drinking water. MCLs are set at very stringent levels. To understand the possible health effects described for many regulated constituents, a person would have to drink two liters of water every day at the MCL level for a lifetime to have a one-in-a-million chance of having the described health effect.

Maximum contaminant level goal: The "goal"(MCLG) is the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

Parts per million (ppm) or milligrams per liter (mg/l): One part per million corresponds to a single penny in $10,000 or one minute in two years.

Micrograms per liter (ugl): Micrograms per liter are equivalent to parts per billion (ppb). One part per billion corresponds to one second in 32 years.

Action level (AL): Action level (AL) refers to the concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

How to Reach Us

If you have questions about this report or your water utility, please call Mark Petrie, utility operations manager, at 754-2930 or Denise Velthuysen, accounting assistant, at 709-3077. E-mail addresses are petriema@co.thurston.wa.us and velthud@co.thurston.wa.us. Information is also available at: www.co.thurston.wa.us/wwm.

What We Look For in Your Water

- **Inorganic contaminants**, which are non-carbon based compounds such as metals, nitrates and asbestos. These contaminants are naturally occurring in some water, but can get into water through farming, chemical manufacturing, and other human activities. Nitrates are tested every year, however, most other inorganic contaminants are tested every four years according to a mandated timetable.

- **Copper and lead** can leach into residential water from building plumbing that contains copper plumbing, lead-based solder, brass fixtures, or some types of zinc coatings used on galvanized pipes and fittings. Test results are summarized on page 2.

- **Microbiological contaminants,** which include viruses and bacteria. These contaminants may come from wastewater treatment plants, septic systems, agricultural livestock operations and wildlife. Of the 24 bacteria samples taken in the Grand Mound distribution system in 2009, none came back positive.

- **Synthetic organic chemicals** include pesticides and herbicides, and they may come from agriculture, urban stormwater and residential uses. The latest test results from 2007 showed no detections.

- **Organic chemical contaminants,** including synthetic and volatile organic chemicals, are byproducts of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, and septic systems. No organic chemicals were detected in 2008. the last year tests were conducted.

- **Radionuclides** are radioactive compounds that can occur naturally or result from oil and gas production. The Grand Mound water system is tested for Radium 228. The test results from 2009 show no detections.

- **Disinfection byproducts** form when chlorine or other disinfectants used to treat drinking water react with naturally occurring materials in the water. The Grand Mound water system samples for disinfection byproducts in locations throughout the water distribution system. See page 2 for test results.

Explanation of Violation

We, Thurston County Grand Mound Water System, I.D. 071580, located in Thurston County, are required to monitor your drinking water for specific contaminants on a regular basis. Results of regular monitoring are an indicator of whether or not your drinking water meets health standards. During 2009, we did not monitor or test for nitrate, and therefore cannot be sure of the quality of your drinking water during that time.

Although we did not sample for nitrates from Well #2 in 2009, the utility did sample for nitrates from Well #1. Those results came back below the allowable level as seen in the Water Quality Table on page 2. The oversight was an administrative error, and the utility wants to ensure our customers we have followed up with the Department of Health to sample Well #2 in 2010. The results from both Well #1 and Well #2 have come back below the MCL (allowed level).

Explicación de Infracción

Nosotros, el Sistema de Acueductos de Grand Mound y del Condado de Thurston, con identificación 07158O, ubicado en el Condado de Thurston, tenemos la responsabilidad de vigilar regularmente su agua potable, para detectar la presencia de ciertos contaminantes específicos. Los resultados de esta vigilancia regular indican si su agua potable cumple o no con las normas sanitarias. Durante el año 2009, no vigilamos los nitratos ni hicimos la prueba de detección de nitratos; así que no podemos estar seguros de la calidad de su agua potable durante ese período.

Aunque no tomamos muestras para detectar nitratos en el Pozo N.º 2 en 2009, el servicio público sí sacó muestras para detectar nitratos del Pozo N.º 1. Estos resultados salieron por debajo del nivel permitido, como se puede ver en la "Tabla de calidad del agua" en la página 2. Este lapso fue un error administrativo y el servicio público quiere asegurar a nuestros clientes que hicimos los arreglos necesarios con el Departamento de Salud para tomar muestras del Pozo N.º 2 en 2010. Los resultados recibidos, tanto del Pozo N.º 1 como del Pozo N.º 2, salieron por debajo del nivel permitido (MCL, nivel máximo de contaminación).

Para nuestros clientes hispanohablantes: Esteinforme resume los resultados de los análisis hechos al agua potable durante el 2009. Los resultados demostraron que su agua potable cumplió con todas lasnormas de seguridad estatales y federales. En cumplimiento con los requisitosen materia de informes, los resultados para 2010 serán enviados por correo en 2011.

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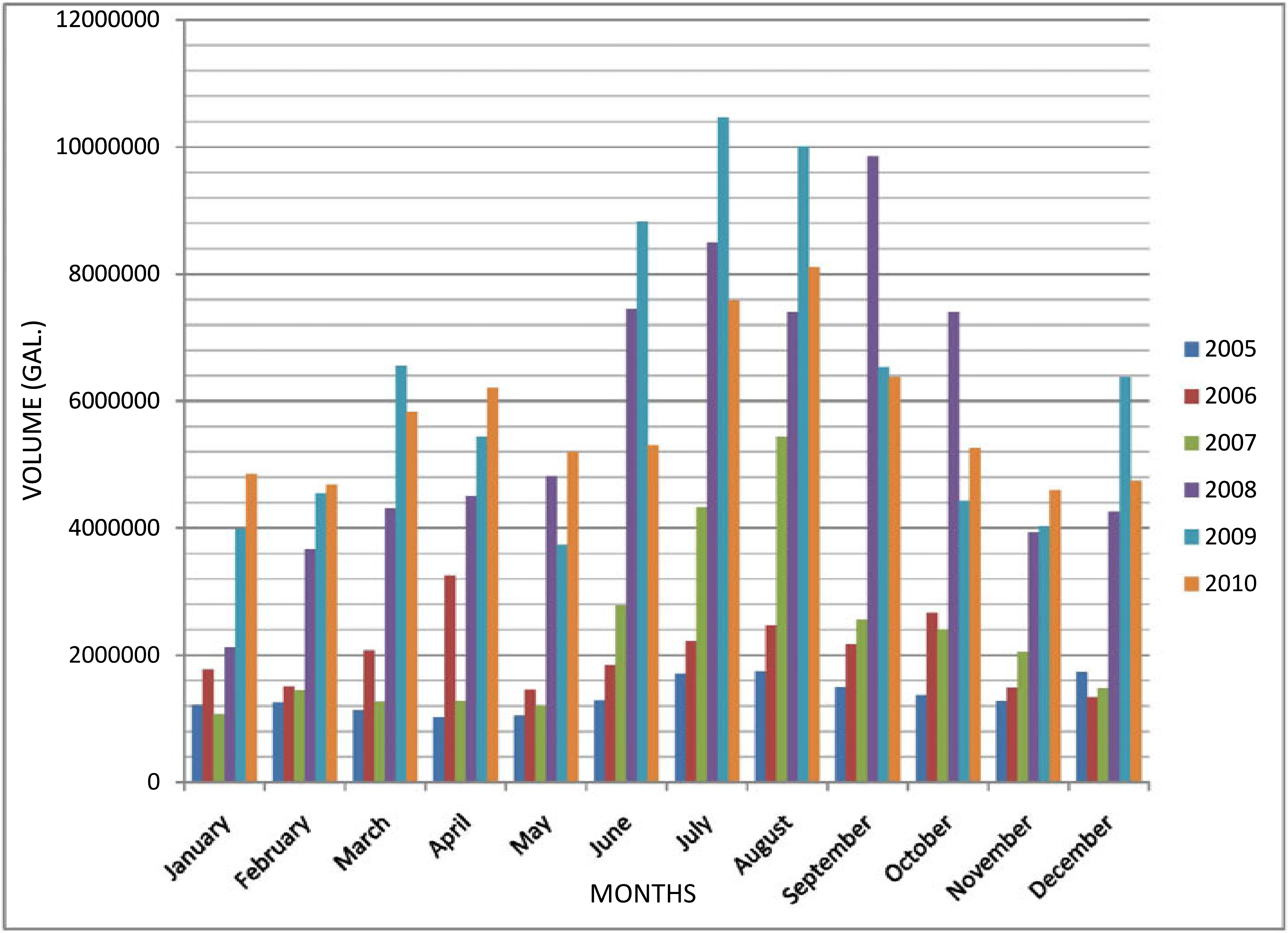
Appendix D

Grand Mound Water Production For Wells 1 & 2 (2005 – 2010)

Grand Mound Water System Production

Grand Mound Water Consumption For 2010

GRAND MOUND WATER SYSTEM PRODUCTION
2005-2010



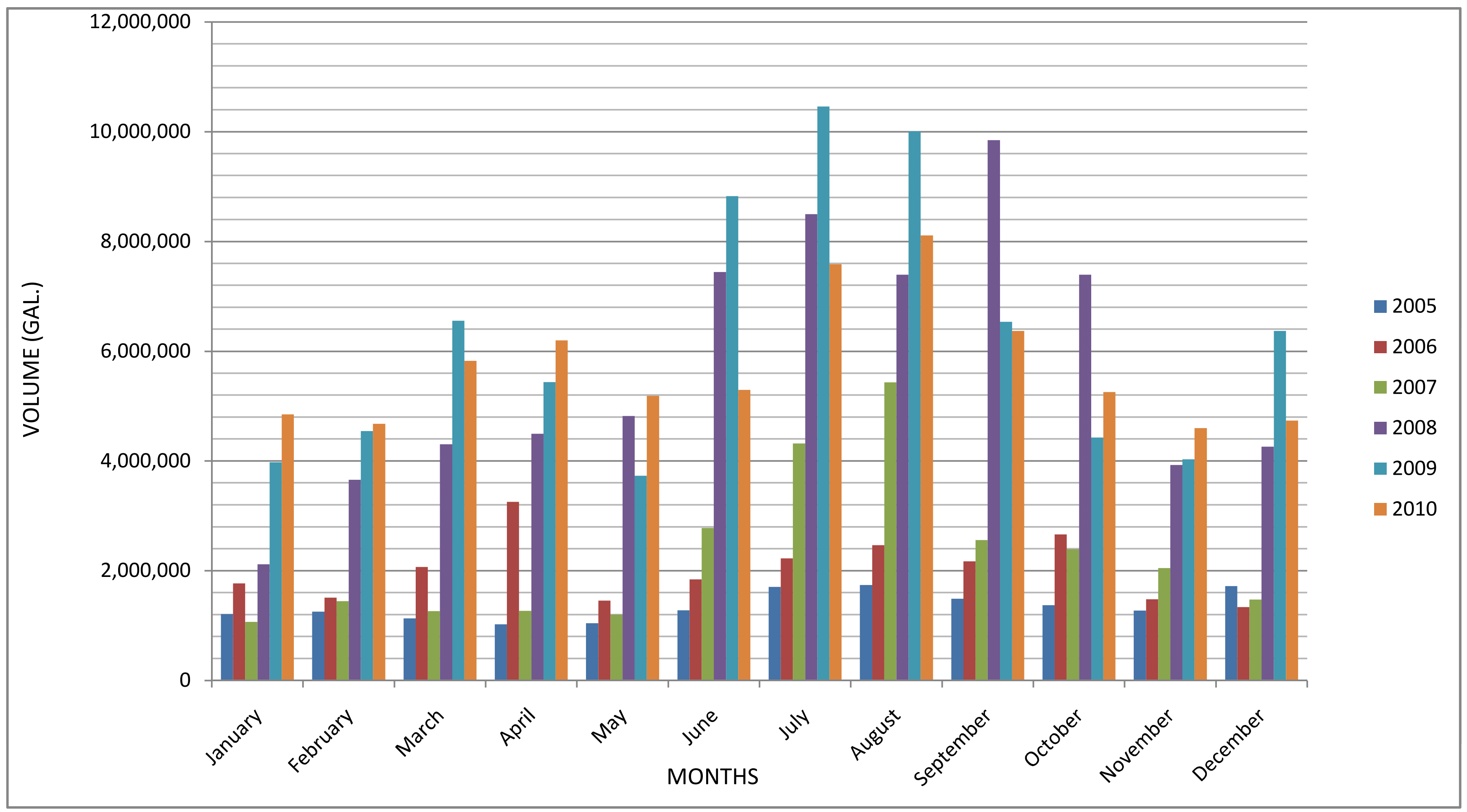
Thurston County

Public Works Department

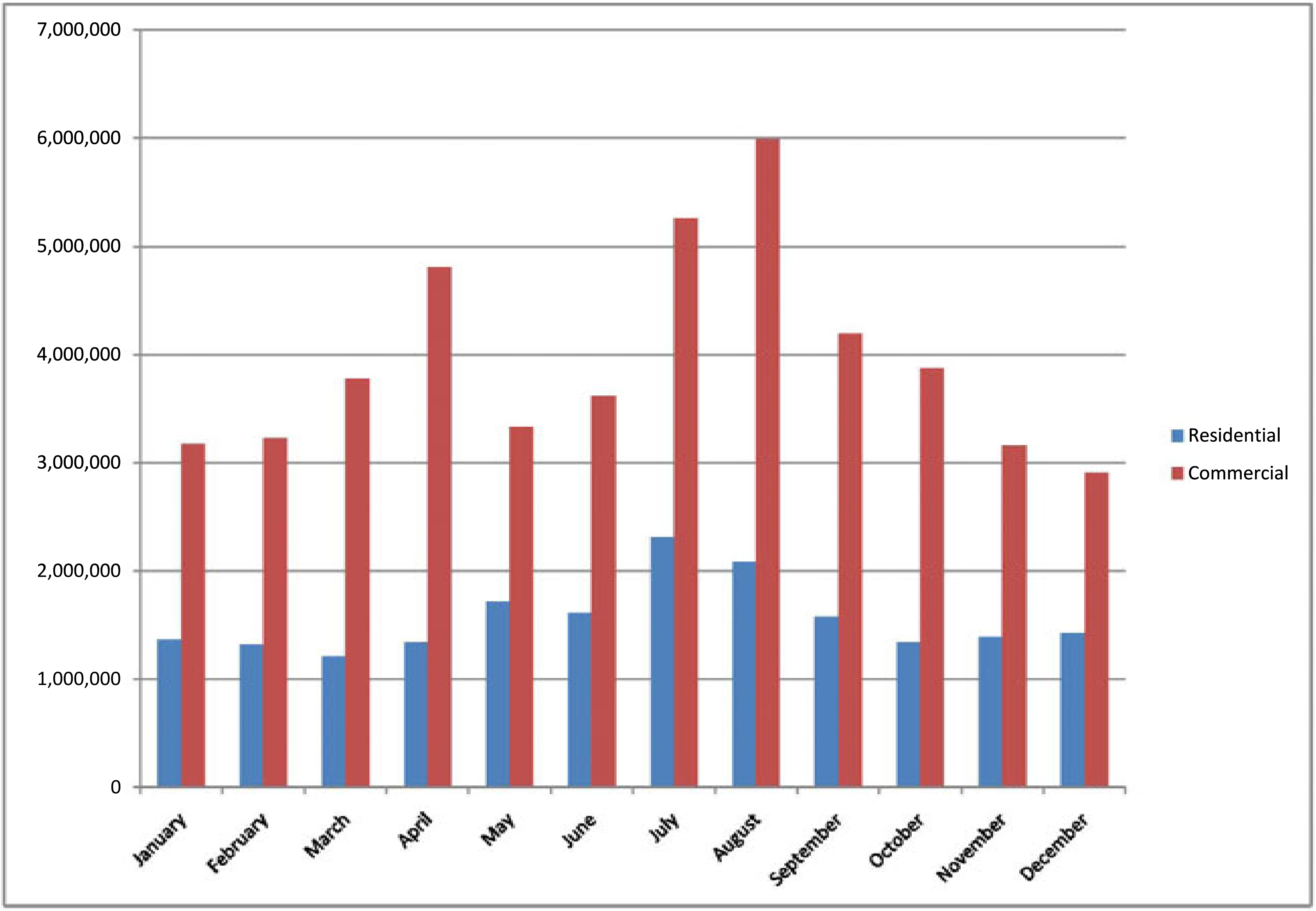
Grand Mound Water System Plan

Pumped Water during 2006 - 2010

Year	January	February	March	April	May	June	July	August	September	October	November	December	Totals
2005	1,209,400	1,253,600	1,130,500	1,024,100	1,042,700	1,281,900	1,705,200	1,743,000	1,492,300	1,374,500	1,275,200	1,723,600	16,256,000
2006	1,770,600	1,511,100	2,070,100	3,255,300	1,457,300	1,843,200	2,224,600	2,467,100	2,171,100	2,665,100	1,480,300	1,340,600	24,256,400
2007	1,067,700	1,448,200	1,265,200	1,270,500	1,200,500	2,781,500	4,320,400	5,434,900	2,560,200	2,394,800	2,048,700	1,478,400	27,271,000
2008	2,119,400	3,656,900	4,306,400	4,497,500	4,819,100	7,444,200	8,498,500	7,395,033	9,847,233	7,395,034	3,929,900	4,259,300	68,168,500
2009	3,976,900	4,548,200	6,556,400	5,439,600	3,732,900	8,826,500	10,461,900	10,007,000	6,534,600	4,430,200	4,030,700	6,372,200	74,917,100
2010	4,849,400	4,677,600	5,825,400	6,200,000	5,190,800	5,297,200	7,585,400	8,111,400	6,372,400	5,255,900	4,597,800	4,738,800	68,702,100



GRAND MOUND WATER SYSTEM CONSUMPTION 2010



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Appendix E

Six Year Operating Budget (2012-2017)

Thurston County
Public Works Department
Grand Mound Water System Plan 2012 - 2017
Six Year Operating Budget (Worksheet 1)

Line No.		2012	2013	2014	2015	2016	2017
1	REVENUES						
2a	*Beginning Fund Balance*	$791,000	$637,045	$398,680	$154,905	$11,271	
2	Water Rates	$474,363	$507,909	$543,826	$598,929	$659,614	$726,447
3	Fees and Services	$22,927	$25,277	$27,805	$60,058	$72,069	$86,483
4	other Revenue	$175,052	$84,200	$78,000	$68,500	$120,679	$128,400
5	TOTAL REVENUES (Add 2-4)	$1,463,342	$1,254,431	$1,048,311	$882,392	$863,633	$941,330
6	EXPENSES						
7	Operations and Maintenance Expenses						
8	Salaries & Other Benefits (Operator)	$68,586	$72,015	$75,616	$79,397	$83,367	$87,535
9	Power & Other Utilities	$4,841	$4,986	$5,136	$5,290	$5,449	$5,612
10	Chemical Treatment	$7,514	$7,739	$7,971	$8,211	$8,457	$8,711
11	Monitoring	$422	$435	$448	$461	$475	$490
12	Materials, Supplies & Parts	$79,144	$83,101	$87,256	$91,619	$96,200	$101,010
13	Transportation Expenses	$1,030	$1,061	$1,093	$1,126	$1,159	$1,194
14	Miscellaneous Expenses	$721	$743	$765	$788	$811	$836
15	Total Operations & Maintenance Expenses (Add 8-14)	$162,258	$170,080	$178,285	$186,891	$195,918	$205,387
16	General and Administration Expenses						
17	Salaries & Other Benefits (Operator)	$64,431	$67,653	$71,035	$74,587	$78,316	$82,232
18	Office Supplies and Postage	$2,575	$2,652	$2,732	$2,814	$2,898	$2,985
19	Insurance - Vehicle-, Liability, Workers comp	$17,618	$18,147	$18,691	$19,252	$19,829	$20,424
20	Legal & Accounting	$38,427	$42,270	$46,497	$51,147	$56,262	$61,888
21	Engineering & Professional Services	$72,401	$76,021	$79,822	$83,813	$88,003	$92,404
22	Fees	$100	$100	$121	$120	$110	$115
23	Misc. Expenses (e.g. Training)	$991	$1,021	$1,051	$1,083	$1,115	$1,149
24	Total General Administration Expenses (Add 17-23)	$196,543	$207,863	$219,949	$232,815	$246,534	$261,197
25	Depreciation Expenses (If Applicable)						
26	TOTAL EXPENSES (Add 15+24+25)	$358,801	$377,943	$398,234	$419,706	$442,452	$466,584
27	Taxes (Property, B&O)	$22,266	$22,933	$23,621	$24,330	$25,060	$25,812
28	Annual Debt Payment - Loans/Bonds (P&I)	$365,964	$371,085	$397,584	$365,937	$348,348	$377,190
29	Total Outstanding Debt - Loans/Bonds (P&I)	$2,414,898	$2,077,545	$1,716,105	$1,371,375	$1,038,705	$722,025
30	Capital Improvement Program Expenditures						
31	New CIP Facilities						
32	Renewal & Replacement Facilities	$18,700	$11,900	$12,500	$12,500	$2,500	$2,500
33	Safe Drinking Water Act Facilities						
34	Non-Facility Costs (e.g. conservation programs)						
35	Capital Sources						
36	Loans/Bonds Funds						
37	Grants						
38	Special Charges						
39	Withdrawal From Existing Reserves	$18,700	$11,900	$12,500	$12,500	$2,500	$2,500
40	Net CIP (31+32+33+34)-(36+37+38+39)	$ -	$ -	$ -	$ -	$ -	$ -
41	Operating Cash Reserve						
42	Minimum Balance (1/8 Line(15+24))	$69,418	$73,226	$77,273	$81,565	$86,123	$90,973
43	Annual Installment	$29,267	$25,089	$20,966	$17,648	$17,273	$18,827
44	Running Balance	$12,000	$37,089	$58,055	$75,703	$92,975	$111,802
45	Emergency Reserve						
46	Minimum Balance (cost of Most Vulnerable Facility)	$200,000	$206,000	$212,180	$218,545	$225,102	$231,855
47	Annual Installment	$50,000	$58,700	$53,000	$43,500	$30,500	$52,500
48	Running Balance (May be Alternatively Financed)	$50,000	$108,700	$161,700	$205,200	$235,700	$288,200
49	Replacement Reserves (VOLUNTARY)						
50	Target Balance (System Replacement Cost)						
51	Annual Installment						
52	Running Balance						
53	TOTAL REV. REQ. (26+27+28+40+43+47+51)	$826,297	$855,750	$893,406	$871,121	$863,633	$940,912
54	BUDGET SURPLUS (DEFICIT) (Subtract 5-53)	$637,045	$398,680	$154,905	$11,271	$0	$418
55	1.5% of Annual Household Income*	$639	$658	$678	$698	$719	$741
56	Projected Annual Residential Bill (Worksheet 2)	$56	$59	$63	$69	$75	$81

Thurston County

Public Works Department

Grand Mound Water System Plan 2012 - 2017

Projection of Water Rate Revenues (Worksheet 2)

FORECASTED

Line No.		2012	2013	2014	3015	2016	2017
1	Forecasted Number of Service Connection	282	288	294	300	311	323
1.a.	ERUs [2.]	676	691	705	720	747	775
2	Meter Charges (inflated annually)	$355,316	$384,336	$415,605	$465,716	$521,901	$584,526
3	Projected Total Water Sales (1,000 Gals)	$67,632	$68,507	$69,414	$71,071	$72,728	$74,417
	Projected Total Water Sales (100CF)	5,058,873	5,124,355	5,192,176	5,316,124	5,440,073	5,566,360
4	Commodity Charge (Inflated Annually)	$97,651	$106,765	$116,196	$130,568	$147,147	$166,042
4.a.	Other Revenue (interest., etc)	$152,552	$84,200	$78,000	$68,500	$55,500	$77,500
5	Total Projected Revenue	$649,842	$617,386	$649,631	$727,487	$787,193	$890,430
6	Rate Revenue Per ERU per month [2.]	$55.84	$59.23	$62.86	$69.01	$74.64	$80.71

Notes

1. Grey Wolfe used approximately 620 ERUs
2. Great Wolf Resort skews ERU count. New billing system is proposed

Thurston County
Public Works Department
Grand Mound Water System Plan 2012 - 2017

Operating Cash Reserve Disclosure Form (Worksheet 3)

Type of account:

_______ bank checking/saving _______ escrow account _______ trustee account ___X___other (specify) X: Reserves are shown in dedicated utility reserve accounts. Other moneys may be available from interfund loads or REET for construction needs.

Name of bank or institution: ____________________________________

Thurston County
Public Works Department
Grand Mound Water System Plan 2012 - 2017

Emergency Reserve Disclosure Form (Worksheet 4)

Type of account:

_______ bank checking/saving _______ escrow account _______ trustee account _______other (specify) ______

Name of bank or institution: ____

OR

Type of commitment:

_______ surety bond _______ Letter of credit _______ guarantor ___X___other (specify) X: Emergency Reserve funds are kept in dedicated accounts attached to the utility. Other moneys may be available form general fund resources or from REET accounts for construction.

Name of bank or name and relationship of grantor:: ____

Thurston County

Public Works Department

Grand Mound Water System Plan 2012 - 2017

Financial Viability Test Summary

		2012	2017	BASIS FOR CALCULATIONS
Test 1 -	**Do you have a budget in place, and are rates sufficient to cover expences?**			
1	REVENUES			
2a	*Beginning Fund Balance*	$79,039	$0	
2	Water Rates	$474,363	$726,447	Worksheet 1, Line 2
3	Total Other Revenues (EFB and Op Bal)	$447,979	$214,883	Worksheet 1, Lines 3+4
4	TOTAL REVENUE (Add lines 2-3) + Available EFB	$1,001,381	$941,330	Should Equal Line 5 of Worksheet 1
5	EXPENCES			
6	Total O&M and A&G & Deparecication	$358,801	$466,584	Worksheet 1, Line 26
7	Taxes (Property & B&O)	$22,266	$25,812	Worksheet 1, Line 27
8	Debt Service Payments	$365,964	$377,190	Worksheet 1, Line 28
9	Net CIP From Rates	$0	$0	Worksheet 1, Line 40
10	Operation Cash Reserves (Increase)	$29,267	$18,827	Worksheet 1, Line 43
11	Emergency Reserve (Increase)	$50,000	$52,500	Worksheet 1, Line 47
12	Replacement Reserve (Voluntary Increase)	$0	$0	Worksheet 1, Line 51
13	TOTAL REVENUE REQUIRED (Add Lines 6-12)	$826,297	$940,912	
14	Required Water Rates (line 13-Line 3)	$378,318	$726,029	Total Expense Less Other Revenue
15	Is Line 4 = > Line 13?	Yes	Yes	Yes/No, If No Go Back and Raise Rates or Reduce Expenses
Test 2 -	**Is the Operating Cash Reserve = to or greater than (O&M + G&A budget subtotal x 45/365)**	Yes	Yes	
16	Current Operating Reserve (beginning of year)	$12,000	$111,802	Worksheet 1, Line 44
17	Plus: Budget Increase (Line 10)	$29,267	$18,827	
18	Total Operating Cash Res. Funds (Line 16+17)(end of year)	$41,267	$130,629	
19	Required Operating Cash Reserve (Line 6 x 0.125)	$29,267	$18,827	Worksheet 1, Line 42
20	Is Line 18 = > Line 19	Yes	Yes	(45 Days/365 Days) = 1/8=0.125 Yes or No, If No Revise Budget
Test 3 -	**Is the Emergency Reserve = to or greater than the cost of the most vulnerable facility?**			
21	Current Emergency Reserve (beginning of year)	$50,000	$288,200	Worksheet Line 48 or other Fund
22	Plus: Budget Increase (Line 11)	$50,000	$52,500	Worksheet 1 Line 47
23	Total Emergency Res. Funds (Line 21 + 22)(end of year)	$100,000	$340,700	Worksheet 1, Line 48
24	Cost of most vulnerable facility	$200,000	$231,855	Worksheet 1, Line 46
25	Is Line 23 = > Line 24	No	Yes	For Budget Year 6, Yes Or No. If No Revise Budget
Test 4 -	**Household Income Index: Is 1.5 percent of Median Household Income = or greater than Cost/ERU?**			
26	Median household Income*	$42,595	$49,379	
27	Median Household Income x .015 (Line 26 x 0.015)	$639	$741	
28	Cost/ERU (Line 14/Line 31)	$922	$937	
29	Is Line 27 = > Than Line 28	No	No	Yes or No. If No, get out of business.
	<u>Customer Data</u>			
30	Median household Income*	$42,595	$49,379	From Appendix E*
31	Total Number of ERU Method	676	775	From Customer Records/WSP

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Appendix F

Compliance with the Nonpoint Source Pollution Ordinance

Spill Plans

Doing Business in a Wellhead Protection Area

Commercial Parcel Inventory Form

Susceptibility Access Form

Agency WHPA Notification Form

Business WHPA Notification Form

Notification of Business of WPP

Notification Letter of All Regulatory Agencies

Hazardous
Waste
Factsheet

Compliance with the Nonpoint Source Pollution Ordinance

"The Health Department's approach to compliance assumes that the majority of hazardous waste generators want to 'do the right thing' and simply need to recognize how to make it happen."

This fact sheet describes the Thurston County Health Department's approach to implementing the hazardous waste sections of the Nonpoint Source Pollution Ordinance (Article VI of the Sanitary Code) and explains the procedures that govern its enforcement.

The ordinance, which took effect in May 1993, is part of the Business Pollution Prevention Program's efforts called for in the county's Hazardous Waste Plan and supported by Thurston County and its incorporated cities.

Proactive and Reactive Field Inspections

The Health Department implements the ordinance with either a proactive or reactive approach.

Proactive inspections – those in which the Health Department takes the initiative to approach businesses rather than waiting for inquiries or complaints – will be directed, within a limited time frame, at all businesses of a given type, and will be preceded by an opportunity for education about the ordinance. The process is designed to resolve all violations while avoiding inequitable or arbitrary enforcement of the ordinance among different competitors in the same field.

When the Health Department receives a complaint from the public about a violation of the ordinance, the Department reacts to the report and begins an investigation. In these cases, enforcement action may be taken if appropriate corrective actions are not taken in a timely manner.

Nonetheless, the goal is still to correct the violation rather than issue tickets, so field staff will work as constructively as possible with the violator to accomplish the required corrective actions.

Thurston County Public Health and Social Services
Environmental Health Division

412 Lilly Rd. NE
Olympia, WA 98506-5132
Hazardous Waste Hotline: 360-867-2664

TDD Line: 360-867-2603

http://www.co.thurston.wa.us.health/ehhw/index.html

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What the Ordinance Says

The following is an excerpt from Article VI, Section 4 of the Sanitary Code:

- 4.1 (a) Moderate risk waste and petroleum products including, but not limited to, oil and grease, shall be disposed of by recycling or use of a hazardous waste management facility operating under interim status or with a permit issued by EPA or an authorized state . . . No person shall, intentionally or negligently, dump or deposit, or permit the dumping or depositing of any such waste in any other manner, including onto or under the surface of the ground or into surface or ground water.

- 4.1 (b) Moderate risk waste, petroleum products, and hazardous materials shall be kept in containers and shall be stored in such a manner and location that if the container is ruptured, the contents will not discharge, flow, be washed or fall into surface water or ground water.

- 4.1 (c) Any person violating this section or owning or in possession of the premises, facility, vehicle or vessel from or on which waste is discharged or placed in violation of this section, shall notify the Department of the location and nature of the violation and shall immediately take or cause to be taken all necessary steps to prevent injury and protect waters from pollution.

If Health Department Staff Observe a Violation of Article VI . . .

Field staff are provided with three options for response to violations. The ordinance specifies that compliance officers must respond to any violation they believe has occurred or is occurring.

The three options are:

- an informal notification to the violator explaining the violation and recommended options for correcting the problem;

- a Notice of Violation, which begins formal administrative enforcement; and

- a Notice of Civil Infraction, which is similar to a traffic citation in that it carries a fine and is resolved in court.

Which option is used will depend on the type and severity of the violation and prior opportunities the violator has had to learn about and comply with the law. It is important to understand that, regardless of the initial response chosen and time frame allowed, the ordinance requires the Health Department to follow-up with increasingly stronger measures until the violation is eventually corrected.

If You Receive an Informal Notice Concerning Compliance with Article VI . . .

An informal notification offers an opportunity to comply voluntarily. The Health Department's approach to compliance assumes that the majority of hazardous waste generators want to "do the right thing" and simply need to recognize how to make it happen. The informal notification would typically consist of a letter or notice of noncompliance following a voluntary technical assistance visit during which a violation was observed. It is intended to help the business understand the reason for the violation and the options available for correcting the problem. This notification will not specify an exact time frame for compliance.

If You Receive a Formal Compliance Inspection . . .

A formal compliance inspection involves a visit to your business by a county hazardous waste specialist. The specialist will examine your facilities and practices with respect to two issues:

- management of hazardous wastes and petroleum products (all must be recycled or sent to a permitted disposal facility); and

- storage of hazardous wastes, petroleum products and hazardous products (all must be kept from reaching ground or surface water).

At the end of a compliance inspection, you will receive a Notice of Compliance, a Technical Assistance Notice of Noncompliance, or a Notice of Violation, described briefly here.

A Notice of Compliance documents your good-standing at the time of the inspection. If you are managing your hazardous wastes properly – either recycling them at your facility or sending them to another facility for disposal or recycling – you will receive a Notice of Compliance for you to file as a record of your status. If you are recycling the waste on site, the inspector will need to see the recycling methods and/or equipment used and may want to verify the proper operation of the equipment. If you are sending the waste off site, the inspector will need to see documentation of at least one recent pick-up that includes the name and phone number of the collection service.

Please note that a Notice of Compliance documents your status only with respect to the County's Nonpoint Source Pollution Ordinance and only on the day of the inspection. It does not preclude a later change in status if your practices change, or if new information indicates the inspection results were inaccurate. It also does not comment on compliance with any other laws you may be subject to, such as fire, building, zoning, licensing, and worker safety regulations.

A Technical Assistance Notice of Noncompliance identifies why the site is out of compliance. A Technical Assistance Notice of Noncompliance typically is used for lack of secondary containment or lack of waste disposal documentation. It is signed by both the violator and the inspector and includes a mutually agreeable grace period for the site to come into compliance.

A Notice of Violation is the first step in the "formal" administrative enforcement process. Field staff would typically issue a Notice of Violation (NOV) in cases where the alleged violator has already had at least one opportunity to learn about, and comply with, the ordinance. It may also be issued immediately in cases of flagrant or particularly negligent violations. The NOV can be presented to the violator in person or sent by registered or certified mail. It will state the section of the ordinance that was or is being violated, a brief description of facts supporting this finding, a list of actions that must be taken to resolve the matter, and a date by which these actions must be taken. The process for responding to an NOV and your rights under this process are described on the back of the NOV. Some important elements of this process are listed below.

- **You have the right to appeal.** You may do so by submitting a written request for an administrative hearing to the Health Officer at the Thurston County Health Department, 2000 Lakeridge Dr. SW, Olympia WA 98502-6045, within ten days of the date of issuance of the Notice of Violation.

- **Corrective actions are postponed until after the hearing.** If you file a request for a hearing, you may temporarily postpone taking corrective actions pending the hearing outcome.

- **Administrative hearings allow an opportunity to present evidence that you did not violate the ordinance.** Evidence may include testimony of witnesses, affidavits and documents, and other exhibits such as photographs.

- **You may appeal the results of an administrative hearing.** If you are unsatisfied with the results of an administrative hearing, you may appeal these findings to the Thurston County Board of Health.

If You Receive a Notice of Civil Infraction . . .

Violations of Article VI of the Sanitary Code are civil infractions enforceable by the court and subject to fines of up to $498 (including court costs). Once a Notice of Violation has been issued, the process of issuing and enforcing a civil infraction will not begin until and unless the administrative process described above runs its course without resolution. If you do not, in the specified time frame, take the actions required by a Notice of Violation, or those required by a subsequent administrative or Board of Health hearing, you will be issued a Notice of Civil Infraction (a “ticket”), which is handled similarly to a traffic citation. You may:

- Pay the penalty;

- Request a hearing to contest or explain the circumstances of the alleged violation; or

- Ignore the ticket, which would automatically result in your being found guilty and responsible for the full amount of the fine.

The Notice of Civil Infraction, when issued, explains in more detail your rights under the civil process.

If you would like a copy of the Thurston Count Nonpoint Source Pollution Ordinance or any part of the Sanitary Code, or if you have questions on this enforcement process, please call the Business Pollution Prevention Program at (360) 867-2664 or TDD (360) 867-2603, Monday through Friday from 8:00 a.m. to 5:00 p.m. or see our website: http://www.co.thurston.wa.us/health/ehhw/index.html

Other Hazardous Waste Management and Disposal Fact Sheets

- *Antifreeze, Used Oil, & Oil Filters*
- *Floor Drains*
- *Hazardous Waste Disposal for Thurston County Businesses*
- *Oil/Water Separators*
- *Residential Heating Oil Tanks*
- *Secondary Containment*
- *Solvents and Parts Cleaners*
- *Storing and Labeling Hazardous Waste*
- *Used Shop Towels*

January 2010

Hazardous Waste Factsheet

Spill Plans

Spill plans help to prepare and organize employees to deal with small spills, drips, and leaks that occur during routine operations as well as the more catastrophic, unexpected spills.

The Problem

Accidental spills of hazardous materials, hazardous waste, or petroleum products can have negative impacts on public health and the environment. Business owners that use and store dangerous substances can take steps to prevent spills from happening and should know what to do in case a spill does occur.

The Regulatory Requirements

The Thurston County Nonpoint Source Pollution Ordinance (Article VI of the Sanitary Code) provides for protection of the county's vulnerable water resources. It requires that hazardous waste, petroleum products, and hazardous materials be kept in containers and stored in such a manner and location that if the container is ruptured, the contents will not discharge, flow, be washed, or fall into surface water or ground water.

Although spill plans are not specifically required under the county ordinance, they have proven valuable in minimizing the cost and effort of cleaning up an uncontrolled release of hazardous materials to the environment. You should also be aware that the fire department or the LOTT Alliance may require a spill plan, depending on the type and quantity of materials you have.

The Options

The following outline is intended to help business owners and operators write a spill plan. The basic parts of the plan are in bold and underlined type. Below these headings are listed specific topics to be addressed. Only address those parts and topics that are applicable to your business. If you have more than one business location, you should write a spill plan specific to each location. A current copy of the plan should be made available to all employees at the site at all times.

<u>General Information</u>

A. Briefly describe the business' activities, and include a map of storage locations for hazardous materials, hazardous wastes, and petroleum products.
B. List the number, type, and size of storage tanks at all locations on site.
C. List the types and amounts of hazardous materials (product) and hazardous waste that are stored on site.
D. Show the locations of any hazardous material and petroleum product transfer areas on the map.

Thurston County Public Health and Social Services
Environmental Health Division

412 Lilly Rd. NE
Olympia, WA 98506-5132
Hazardous Waste Hotline: 360-867-2664

TDD Line: 360-867-2603

http://www.co.thurston.wa.us.health/ehhw/index.html

THURSTON COUNTY
WASHINGTON
SINCE 1852

Spill Prevention and Control

A. Describe when preventive leak maintenance and checks are conducted on equipment and how they are documented.
B. Storage tanks must be inspected regularly for leaks or damage. Describe how often storage tanks are inspected and how the inspections are documented.
C. Describe the types of spill prevention/clean up training your employees receive, when they receive it, and where training records are kept.
D. Document the location of secondary containment areas and the materials that are stored in them. Secondary containment units must be inspected regularly. Indicate when inspections take place and how they are documented. (Refer to the "Secondary Containment" fact sheet.)
E. List the type and amount of spill control equipment kept on site.
F. List the personnel that are trained in spill response procedures and dates of training.
G. Leaks and drips from mobile and stationary equipment must be cleaned up immediately. Describe how leak and drip control is accomplished.

Hazardous Waste Management

A. List the types and quantities of hazardous waste that are generated on site.
B. Describe the storage, handling and disposal procedures for hazardous waste generated on site.
C. Indicate which personnel have received hazardous waste training and dates of training.
D. Describe the management practices to be used for petroleum-contaminated soil and spill absorbents (Refer to the "Managing Used Shop Towels and Contaminated Absorbent Materials" fact sheet).

Emergency Response Plan

A. Give detailed emergency response procedures that employees will take in case of a spill or accidental release.
B. Provide, and post by phones, a list of emergency notification phone numbers and after-hours contacts.
C. Indicate the responsibilities and actions of each employee in the case of an emergency.
D. Indicate emergency local Fire, Police, Ambulance, and Hospital arrangements.

Reporting and Records

A. Indicate that all spills and leaks will be reported to the Thurston County Business Pollution Prevention Program (post contact information listed below) and the Department of Ecology (360-407-6300).
B. Include a sample copy of any on site spill prevention inspection forms.
C. Include copies of all spill or release records.
D. Include information on spill prevention, hazardous materials and waste training records and schedules.
E. Keep a current inventory of hazardous materials, hazardous waste and petroleum products on site.
F. Keep all certificates, correspondence, fact sheets, and other materials received from regulatory agencies.

Additional Information

For answers to your questions about spill plans, assistance in writing one, or reviews for completeness, please contact the Business Pollution Prevention Program at (360) 867-2664, Monday through Friday 8:00 a.m. - 5:00 p.m.; the TDD line for the hearing impaired is (360) 867-2603. We have a number of fact sheets for small businesses that can be viewed on our website **http://www.co.thurston.wa.us/health/ehhw/index.html** or by calling the office.

January 2010

Hazardous Waste Factsheet

Doing Business in a Wellhead Protection Area

Help Keep Our Drinking Water Clean

Groundwater is Thurston County's sole source of drinking water. About 98% of us drink groundwater from local aquifers. Wells for public water utilities operated by Olympia, Tumwater, Lacey, and Thurston County are located throughout the county.

To protect and ensure safe drinking water for the future, "wellhead protection areas" were designated in the areas surrounding a well that replenish the aquifer through rainfall. These recharge areas are divided into time-of-travel zones, based on estimates of how long it will take water infiltrating within the zone to reach the well.

Thurston County's drinking water and wellhead protection areas are vulnerable to contamination for three reasons:

1. Our soils are permeable; a pollutant can easily flow through our soils to contaminate local aquifers, impacting drinking water supplies.

2. Our groundwater moves rapidly. Once a pollutant reaches the groundwater, it can reach an aquifer in relatively little time. For example, if your business is located in a one-year time-of-travel zone, a spill of a hazardous material, such as gasoline, is predicted to reach a drinking water well in only one year.

3. Our public drinking water wells are shallow, usually around 200 feet or less. Most private wells are even shallower, often only 50 feet deep.

For these reasons, contamination within a wellhead protection area threatens our drinking water supply. Each resident and business needs to pay attention to avoid contamination in wellhead protection areas.

"If your business is in the one-year time-of-travel zone, a hazardous material spill may reach a drinking water well in only one year."

Doing Business in a Wellhead Protection Area - Know the Risks

A variety of materials and products threaten safe drinking water. Hazardous materials such as solvents, oil, kerosene, pesticides, and fertilizers, if handled carelessly or stored improperly, are all potential threats. Leaking underground fuel storage tanks and failing septic systems are also sources of contamination. Groundwater contamination can and has occurred here in Thurston County. Cleanup is expensive, in terms of both time and money.

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THURSTON COUNTY
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The City of Tumwater's experience with contaminated municipal wells is one example. During routine water testing, unacceptable levels of trichloroethylene, an industrial solvent, were discovered in its city wells. Three of the city's wells were immediately taken out of service – equaling approximately 25% of Tumwater's water supply. The area was declared a Superfund site by the U.S. Environmental Protection Agency (EPA). This determination spurred an investigation to determine the cause and extent of the contamination.

The researchers found that the most likely source of the hazardous materials was improper waste disposal by gas stations, a testing lab, and a dry cleaner. The chemicals moved underground to the Palermo Valley (also known as Tumwater Valley), where the city's drinking water wells are located.

Tumwater drilled two new wells to ensure an adequate water supply for residents. It has cost taxpayers, businesses, and ratepayers close to four million dollars to clean up the solvent and provide new water supplies.

An Ounce of Prevention is Worth Millions in Cure

Learn how to manage hazardous materials properly to save money, protect the health of your employees, and protect our community's drinking water supply.

1). Develop a spill prevention and response plan for your business.

A spill plan prepares you and your employees to deal with small spills and leaks during business operations. Even small spills that occur on a regular basis can turn into big problems. A spill plan will also provide a strategy for catastrophic, unexpected spills. The basic plan includes:

- Description of business activities, with a site map showing where hazardous materials are stored.
- A list of spill control equipment on the site (low-cost items include spill pads and floor dry).
- An emergency response procedure, including whom to call in an emergency.
- Training and awareness building for employees on a regular basis.

2). Keep all hazardous materials in secondary containment.

Hazardous materials, such as petroleum products and solvents, should be stored in secondary containment. Secondary containment is a liquid-tight barrier or container that prevents a hazardous material that spills or leaks from contaminating surface water or groundwater. In case of flooding, earthquake or fire, secondary containment can prevent hazardous materials from escaping into the soil or nearby waterways.

Secondary containment doesn't have to be expensive. It can be as simple as placing a gasoline container into a plastic tub. However, there are technical requirements for the capacity of any secondary containment.

3). Reduce the amount of hazardous materials you store and use.

Reduce the risk of spills by using less-toxic products. Less toxic products are less likely to contaminate groundwater if a spill or leak occurs. Consult your vendor, trade association or other businesses in your industry about less-toxic products that are available and effective alternatives.

Additional Information

Thurston County Business Pollution Prevention Program staff will answer questions, offers **FREE** on-site technical assistance, and can provide you with detailed fact sheets on the spill plans and secondary containment. Contact the Hazardous Waste Assistance Line (360) 867-2664, Monday through Friday, TDD (360) 867-2603, or visit our website at **www.co.thurston.wa.us/health/ehhw/index.html**.

January 2010

Commercial Parcel Inventory Form – Grand Mound WHPA

Visit Date: 2/22/2010 County Staff: Al Schmidt	Time On Site: Time Off Site:
Business Name/: Martin Sand & Gravel	Business Owner: Lakeside Industries
Site Contact and Title: Kevin or Monty	
Site Address: 6500 196th SW City: Rochester Zip: 98579 Phone: 360-736-2852	Mailing Address: City: State: Zip: Phone:( )
Parcel # 55700900000	EPA ID #:

1. Nature of Property: ❑ Home Business ☒ Commercial/Industrial

❑ Government Site (**Circle one:** County, City, State, Federal)

2. Is the facility: ☒ Owned ❑ Rent/Lease
3. What year did you begin conducting business at this site?

4. Exceeds SQG?: ❑ >220/2.2 lbs./month ❑ >2,200/2.2 lbs. stored

5. Have there been past environmental inspections at the facility?
   ☒ Yes, Year 2007 ❑ No ❑Unknown

6. Does the facility have Material Safety Data Sheets for chemicals on-site?
❑ No ☒ Yes

7. What is facility's means of wastewater disposal?
☒ City sewer ❑ Community septic ❑ Unknown

❑ On-site septic **(Type: Gravity, Mound, Sand filter, Pressure dist., other________________________)**

8. Which type of spill kit does the facility have? ❑ None ☒ Floor dry
☒ Pads ☒ Shop Towels ❑ Commercial Kit
☒ Other Booms Adequate Kit? ❑ No ☒ Yes

9. Does facility have floor drains? ❑ No ❑ Yes ❑ Sealed
   If yes, how many, where? Unknown

10. Where do work area floor drains discharge? ❑ Sewer: LOTT, Yelm, Grand Mound
❑ Septic system ❑ City storm drain, ditch, stream, wetland, lake, pond
❑ Sump or vault (sealed) ❑ Oil/Water Separator
❑ Drywell, leach field ☒ Unknown

11. Comments

Fact Sheets Provided:

12. Oil/water separator: ☒ None

Type: ☐ Baffle ☐ Coalesce ☐ Unknown

Size: ________________ gal.

Discharge point: ☐ Sewer ☐ Septic ☐ Stormwater
☐ Unknown ☐ Drywell/Leachfield ☐ Other___________________

Maintenance frequency: ☐ Unknown
☐ Last inspection________________ ☐ Last cleaning________________

12. Parts Washing: YES – Safety Kleen

Type of parts washer: ☐ None ☐ Chlorinated
☒ Solvent ☐ Aqueous

Solvent waste management: ☐ Sewer ☐ Septic
☐ Disposal pick-up vendor ☐ Drop-off site ☐ Used oil

☐ Distillation on site ☒ Recycle pick-up vendor ☐ Filtration

Aqueous recycle/treatment: ☐ None
☐ Filters ☐ Evaporator ☐ Pick-up Vendor

☐ Oil Skimmer ☐ Distillation

Dangerous waste tests? ☐ No ☐ Yes

Parts washer service frequency:
☐ 0-3 months ☐ 3-6 months ☐ 6-12 months ☐ >12 months

☒Vendor service ☐ Self service

Solution strength testing? ☐ No ☐ Yes

13. Used Oil Management

Management Method: ☒ Pick-up vendor ☐ Drop-off vendor
☐ Off-site heat

On-site energy recovery: ☐ None ☐ Cert. burner ☒ Non-cert. burner

14. Anti-freeze Management

Management Method: ☒ Pick-up vendor ☐ Drop-off vendor

☐ On-site recycling (vendor) ☐ On-site recycling (owned equip)

15. Floor Cleaning:

Cleaning Method: ❑ Pressure wash ❑ Wet mop

❑ Vendor ☒ Dry Sweep/pads ❑ Solvent

Cleaning Frequency (deep cleaning only-not daily cleanup):

❑ 0-3 months ☒ 3-6 months ❑ 6-12 months ❑ >12 months

Wastewater Disposal: ❑ Soil ❑ Surface water ❑ Storm drain

❑ Oil/Water separator ❑ Sewer ❑ Septic

❑ Drywell/leach field ❑ Disposal vendor ❑ Other

Dangerous waste tests? ❑ No ❑ Yes

16. Vehicle Washing: ❑ None ☒ Yes

Type: ☒ Exterior Body ❑ Engine/Underside

Location: ❑ Indoors ☒ Outdoors

Cleaners Used: ❑ None ☒ Surfactants ❑ Caustics ❑ Other

Wash Water Discharge: ☒ Soil ❑ Surface water ❑ Storm drain

❑ Oil/Water separator ❑ Sewer ❑ Septic

❑ Drywell/leach field ❑ Disposal vendor ❑ Other

HAZARDOUS MATERIAL [**L** = LIQUID] [**S** = SOLID]	QUANTITY	**P** = PRODUCT **W** = WASTE	CONTAINER LABELED?	ADEQUATE SECONDARY CONTAINMENT	WASTE DISPOSITION (VENDORS – LAST PICKUP)
Used Oil	200 Gallon	W	Yes	Yes	Reznor Burner
Oil	2 x 250 Gallon 3 x 55 Gallon	P	Yes	Yes	
Diesel	500 Gallon	P	Yes	Yes	
Hydraulic Oil	4 x 5 Gallon	P	Yes	Yes	
Trans Fluid	5 Gallon	P	Yes	Yes	
Other Lubes/Oils	4 x 55 Gallon	P	Yes	Yes	
Shop Towels	50	W	Yes	Yes	Disposable

Hazardous Waste Technical Assistance Inspection: Martin Sand & Gravel

Investigator Lead: Al Schmidt

Initial Inspection Date: 02/22/2010

Date Closed: 02/23/2010

Inspection Information

Business Name: Martin Sand & Gravel

Category: Gravel Mine

Campaign: 2010 Grand Mound WHP

Comments:

Address Information

Parcel Number	Address	City	State	Zip	Contact	Phone	Address Type
99000246800	6500 196th	Rochester	WA	98579-	Kevin or Monty	(360) 736-2852	Both
			WA				

Wellhead Protection Area: | Capture Zone: | Water Supply: | Waste Water:

Wellhead Protection Area: Grand Mound | Capture Zone: Mgmt Area | Water Supply: City Well | Waste Water: On-Site Septic

BMP Recommendations

None

Hazardous Materials Inventory

Hazardous Materials	Physical State solid or liquid	Quantity	Units (lb or gall)	Adequate Containment	Disposal Vendor	Waste Or Product
Used oil	Liquid	200	GAL	Yes	Oil Burner	Recycle
Oil	Liquid	200	GAL	Yes		Product
Other oils and lubes	Liquid	200	GAL	Yes		Product
Fuel	Liquid	500	GAL	Yes		Product

Article VI Compliance Issues

Inspection Date: 02/22/2010

Advanced Notice ☑ Follow Up ☐ NOV Issued ☐ In Compliance ☑

Observations

Observed no spills or drips on drive areas around building. All products and waste oil/antifreeze stored with adequate secondary containment. They are eliminating 55 gallon drums for product antifreeze and hydraulic oils and going to 5 gallon containers. Facility has a burner to recycle used oil, as a result very little waste oil is now generated and stored in a second tank with secondary containment.

Action

Issued Notice of Compliance.

December 15, 2011

Dear Business Owner/Operator:

The Wellhead Protection Program for the Grand Mound Water System has recently been updated as required by the Washington State Department of Health. The purpose of wellhead protection is to prevent contamination of the drinking water supply through a comprehensive management program that includes monitoring, spill response planning, land use regulation, regional coordination, and public education and notification.

As a part of the wellhead protection program, Thurston County must provide wellhead protection information to local regulatory agencies and emergency responders responsible for incident and spill response. This letter includes maps showing the updated wellhead protection area for the Grand Mound municipal water supply wells and a list of potential sources of contamination. This information can be used to evaluate incident and spill response procedures and determine if changes are needed to better protect groundwater within the wellhead protection area.

Grand Mound's water supply comes from two wells. Maps of the Grand Mound wells and wellhead protection area as well as a list of potential contaminant sources are enclosed.

If you have any questions about Grand Mound's wellhead protection program, please feel free to contact me at 754-3355 x 7809, or at giebelr@co.thurston.wa.us.

Sincerely,

Roger Giebelhaus, AICP
Utility Planner
Thurston County Public Works.
360-754-3355, ext. 7809
giebelr@co.thurston.wa.us

Enclosures: Grand Mound Wellhead Protection Area Map
Contaminant Source List

Cc: Thurston County Sheriff's Department
Fire District 1
Department of Ecology – Southwest Region Spills Response

December 15, 2011

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Grand Mound water supply comes from two wells, and each of these wells has a defined "wellhead protection area" where activities on the land surface can influence the quality of the drinking water supply. An updated map of the Grand Mound wellhead protection areas is attached, and shows wellhead protection areas for wells that are currently in use.

Our records indicate that your business is located within a wellhead protection area for one or more of the Grand Mound wells. As shown on the enclosed map, large areas within Grand Mound are within wellhead protection areas. One of the goals of this plan is to raise public awareness about the vulnerability of groundwater in our area to contamination. This letter is to serve as a reminder that, although everyone needs to be careful about the use of hazardous materials, their use within wellhead protection areas requires additional caution because spills or discharges onto the ground or in septic systems has the potential to contaminate groundwater.

To avoid contaminating groundwater, hazardous materials should only be used and disposed of according to manufacturers label instructions. General considerations on the use of hazardous materials include:

- Proper disposal of waste fuels, cleaners, paints, solvents and similar fluids. Overall, the goal is to prevent disposal of these materials onto the ground or into stormwater systems.
- Secondary containment and leak detection systems for storage tanks.
- Spill plans, spill supplies and training for staff to be able to respond to spills if they do occur.

Because everyone plays a role in the protection plan, residents and other Thurston County water customers are receiving similar information in our annual water quality report for the water system. Overall we are fortunate to have a good supply of high quality drinking water here in the Grand Mound area that we all have an interest in protecting. If you have any questions about Grand Mound's wellhead protection program, please feel free to contact me at 867-2586, or at SoderbP@co.thurston.wa.us.

Sincerely,

Patrick Soderberg
Hazardous Waste Specialist
Thurston County Health Department

THURSTON COUNTY
WASHINGTON
SINCE 1852

COUNTY COMMISSIONERS

Cathy Wolfe
District One

Sandra Romero
District Two

Karen Valenzuela
District Three

PUBLIC WORKS
An Accredited Agency of the
American Public Works Association

Lester Olson
Director

December 15, 2011

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Patrick Soderberg

Hazardous Waste Specialist

Thurston County Health Department

Cc: Thurston County Sheriff's Department
Fire District 1
Department of Ecology

THURSTON COUNTY
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Appendix G

Hydraulic Capacity Modeling

Grand Mound Hydraulics Storage Analysis (2012)

THURSTON COUNTY
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Thurston County
Water and Waste Management

Water System: **Grand Mound**

Date: **4/5/05** By: **JDL**

Hydrant Opening Size (in): **2 1/2"**

Weather: **Cool, Showers**

Location	Time (hh:mm)	Pitot Gage (psi)	Flow Rate* (gpm)	Res Elev (ft)	Pressure Well #1 (psi)	Pressure Well #2 (psi)	Operation Well #1 YES	Operation Well #1 NO	Operation Well #2 YES	Operation Well #2 NO	Observation Hydrant Pressure (psi) Start	Observation Hydrant Pressure (psi) End	Observation Hydrant Location
Prairie Pines-West (T-18)	14:40	45	1251	37.5				X		X	58	49	RED-2
Old Hwy 99 @198th (T-4)	15:00	50	1319	37.2				X		X	58	52	T-4
West of N. Vac. Sta. (T-12)	15:05	50	1319	37.1				X		X	55	52	RED-3
Sargent Rd @ 193rd (T-16)	15:10	49	1306	37.0				X		X	56	50	T-14

*Per NFPA 291 Table 2-10.1

Scenario: T-16 April 2005 Calibration
Steady State Analysis
Junction Report

Label	Elevation (ft)	Zone	Type	Base Flow (gpm)	Pattern	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
RED-1	164.00	Zone	Demand	0.00	Fixed	0.00	289.55	54.32
T-1	173.00	Zone	Demand	0.10	Fixed	0.10	289.55	50.42
T-2	169.00	Zone	Demand	6.49	Fixed	6.49	289.55	52.16
T-3	174.00	Zone	Demand	0.07	Fixed	0.07	289.55	49.99
T-5	172.00	Zone	Demand	0.00	Fixed	0.00	289.38	50.79
T-4	175.00	Zone	Demand	0.02	Fixed	0.02	289.71	49.63
T-6	175.00	Zone	Demand	1.88	Fixed	1.88	289.84	49.69
T-7	172.00	Zone	Demand	2.67	Fixed	2.67	290.09	51.09
RED-2	173.00	Zone	Demand	1.07	Fixed	1.07	289.55	50.42
RED-3	178.00	Zone	Demand	0.10	Fixed	0.10	291.63	49.16
EL-1	177.00	Zone	Demand	0.13	Fixed	0.13	292.25	49.86
T-8	182.00	Zone	Demand	0.01	Fixed	0.01	293.57	48.27
T-9	183.00	Zone	Demand	0.04	Fixed	0.04	294.31	48.16
T-10	178.00	Zone	Demand	0.35	Fixed	0.35	292.84	49.68
T-11	178.00	Zone	Demand	0.00	Fixed	0.00	292.22	49.42
T-12	177.00	Zone	Demand	0.00	Fixed	0.00	291.06	49.35
T-13	172.00	Zone	Demand	0.07	Fixed	0.07	289.05	50.64
T-14	174.00	Zone	Demand	0.14	Fixed	0.14	287.38	49.05
T-15	174.00	Zone	Demand	0.00	Fixed	0.00	287.38	49.05
T-16	172.00	Zone	Demand	1,306.00	Composite	1,306.00	281.93	47.56
T-17	178.00	Zone	Demand	0.00	Fixed	0.00	299.60	52.61
T-18	169.00	Zone	Demand	7.20	Fixed	7.20	289.55	52.15
J-1	150.00	Zone	Demand	0.10	Fixed	0.10	289.55	60.38

Scenario: [illegible]6 [illegible]il 2005 Calibration
Steady State Analysis
Pipe Report

Label	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Minor Loss Coefficient	Installation Yea	Control Status	Discharge (gpm)	Pressure Pipe Headloss (ft)	Downstream Calculated Pressure (psi)	Velocity (ft/s)
P-4	1,154.00	12.0	PVC	150.0	5.93	1998	Open	6.49	0.00	52.16	0.02
P-5	280.00	12.0	PVC	150.0	1.68	1998	Open	-14.96	0.00	49.99	0.04
P-6	953.00	12.0	PVC	150.0	10.00	1998	Open	-209.05	0.16	49.63	0.59
P-8	458.00	10.0	PVC	150.0	0.38	1998	Open	-8.37	0.00	50.42	0.03
P-11	395.00	12.0	PVC	150.0	1.63	1998	Open	-354.05	0.14	49.69	1.00
P-14	516.00	12.0	PVC	150.0	6.56	1998	Open	-915.02	1.54	49.16	2.60
P-15	664.00	14.0	PVC	150.0	2.40	1998	Open	-891.65	0.62	49.86	1.86
P-16	1,356.00	14.0	PVC	150.0	5.80	1998	Open	-891.78	1.32	48.27	1.86
P-17	325.00	14.0	PVC	150.0	1.98	1998	Open	-1,326.40	0.74	48.16	2.76
P-19	664.00	10.0	PVC	150.0	1.26	1998	Open	434.62	0.73	49.68	1.78
P-20	686.00	8.0	PVC	150.0	1.49	1998	Open	217.94	0.62	49.42	1.39
P-21	1,320.00	8.0	PVC	150.0	1.89	1998	Open	217.94	1.16	49.35	1.39
P-24	1,268.00	12.0	PVC	150.0	6.63	1998	Open	1,306.00	5.46	47.56	3.70
P-25	1,351.00	8.0	PVC	150.0	3.23	1998	Open	-216.32	1.21	49.68	1.38
P-26	686.00	8.0	PVC	150.0	4.74	1998	Open	-192.85	0.57	49.16	1.23
P-27	1,275.00	12.0	PVC	150.0	9.85	1998	Open	194.02	0.17	50.79	0.55
P-30	783.00	8.0	PVC	150.0	1.13	1998	Open	144.98	0.32	50.79	0.93
P-33	885.00	12.0	PVC	150.0	2.68	1998	Open	895.35	1.67	49.05	2.54
P-34	441.00	10.0	PVC	150.0	2.57	1998	Open	0.00	0.00	49.05	0.00
P-40	2,034.00	14.0	PVC	150.0	18.11	1998	Open	-1,326.44	5.30	52.61	2.76
P-41	4,034.00	14.0	PVC	150.0	18.11	1998	Open	-1,326.44	8.40	16.22	2.76
P-38	1,172.00	8.0	PVC	150.0	1.49	1998	Open	-0.10	0.00	52.15	0.00
P-39	811.00	8.0	PVC	150.0	2.54	1998	Open	-7.30	0.00	50.42	0.05
WELL2 CASING	60.00	6.0	MSCL	110.0	4.29	1998	Open	-0.00	0.00	0.00	0.00
P-37	2,880.00	8.0	PVC	150.0	8.40	1998	Open	-0.00	0.00	60.38	0.00
P-36	473.00	8.0	PVC	150.0	6.80	1998	Open	0.00	0.00	54.32	0.00
P-35	1,350.00	12.0	PVC	150.0	3.95	1998	Open	-0.10	0.00	54.32	0.00
P-32	1,321.00	8.0	PVC	150.0	1.09	1998	Open	-410.79	3.68	49.35	2.62
P-31	1,256.00	12.0	PVC	150.0	5.55	1998	Open	-556.42	1.04	51.09	1.58
P-28	563.00	12.0	PVC	150.0	5.45	1998	Open	355.93	0.25	49.69	1.01
P-29	961.00	12.0	PVC	150.0	5.55	1998	Open	-339.00	0.33	50.79	0.96
WELL1 CASING	60.00	6.0	MSCL	110.0	5.00	1998	Open	-0.00	0.00	0.00	0.00

Scenario: T-16 April 2005 Calibration
Steady State Analysis
Pump Report

Label	Elevation (ft)	Control Status	Intake Pump Grade (ft)	Discharge Pump Grade (ft)	Discharge (gpm)	Pump Head (ft)	Calculated Water Power (Hp)
WELL1	164.00	Off	164.00	289.55	0.00	0.00	0.00
WELL2	163.00	Off	163.00	289.55	0.00	0.00	0.00

Scenario: T-16 April 2005 Calibration
Steady State Analysis
Tank Report

Label	Zone	Base Elevation (ft)	Minimum Elevation (ft)	Initial HGL (ft)	Maximum Elevation (ft)	Inactive Volume (gal)	Tank Diameter (ft)	Inflow (gpm)	Current Status	Calculated Hydraulic Grade (ft)	Calculated Percent Full (%)
RES-1	Zone	270.50	294.30	308.00	315.50	218,000.00	42.00	1,326.44	Draining	308.00	82.2

Steady State Analysis
Junction Report

Label	Elevation (ft)	Zone	Type	Base Flow (gpm)	Pattern	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
RED-1	164.00	Zone	Demand	0.00	Fixed	0.00	307.99	62.30
T-1	173.00	Zone	Demand	0.10	Fixed	0.10	307.99	58.40
T-2	169.00	Zone	Demand	6.49	Fixed	6.49	307.99	60.14
T-3	174.00	Zone	Demand	0.07	Fixed	0.07	307.99	57.97
T-5	172.00	Zone	Demand	0.00	Fixed	0.00	307.99	58.84
T-4	175.00	Zone	Demand	0.02	Fixed	0.02	307.99	57.54
T-6	175.00	Zone	Demand	1.88	Fixed	1.88	307.99	57.54
T-7	172.00	Zone	Demand	2.67	Fixed	2.67	307.99	58.84
RED-2	173.00	Zone	Demand	1.07	Fixed	1.07	307.99	58.40
RED-3	178.00	Zone	Demand	0.10	Fixed	0.10	307.99	56.24
EL-1	177.00	Zone	Demand	0.13	Fixed	0.13	307.99	56.67
T-8	182.00	Zone	Demand	0.01	Fixed	0.01	307.99	54.51
T-9	183.00	Zone	Demand	0.04	Fixed	0.04	307.99	54.08
T-10	178.00	Zone	Demand	0.35	Fixed	0.35	307.99	56.24
T-11	178.00	Zone	Demand	0.00	Fixed	0.00	307.99	56.24
T-12	177.00	Zone	Demand	0.00	Fixed	0.00	307.99	56.67
T-13	172.00	Zone	Demand	0.07	Fixed	0.07	307.99	58.84
T-14	174.00	Zone	Demand	0.14	Fixed	0.14	307.99	57.97
T-15	174.00	Zone	Demand	0.00	Fixed	0.00	307.99	57.97
T-16	172.00	Zone	Demand	0.00	Fixed	0.00	307.99	58.84
T-17	178.00	Zone	Demand	0.00	Fixed	0.00	308.00	56.24
T-18	169.00	Zone	Demand	7.20	Fixed	7.20	307.99	60.13
J-1	150.00	Zone	Demand	0.10	Fixed	0.10	307.99	68.36

Scen A 2005 Calibration
Steady State Analysis
Pipe Report

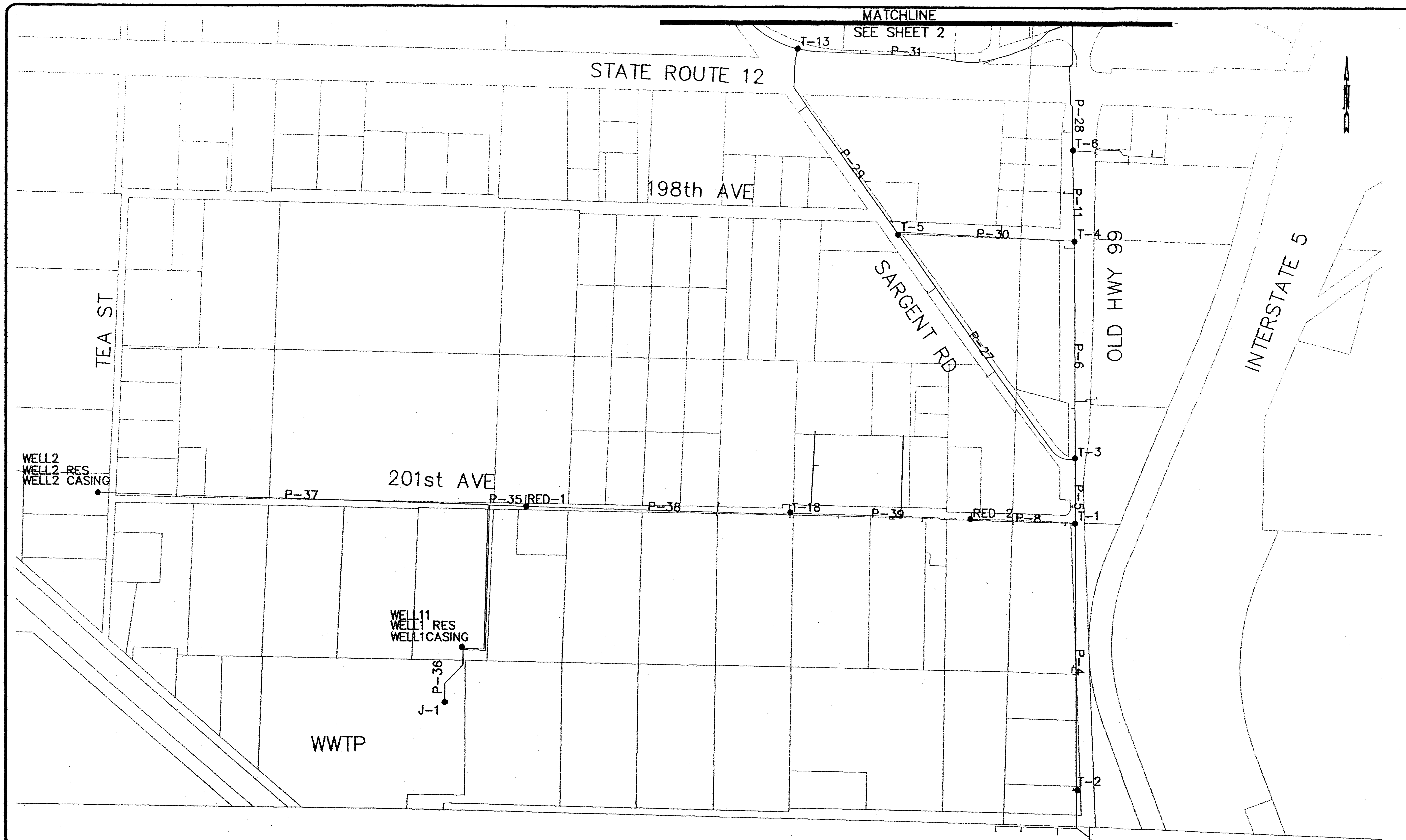
Label	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Minor Loss Coefficient	Installation Yea	Control Status	Discharge (gpm)	Pressure Pipe Headloss (ft)	Downstream Calculated Pressure (psi)
P-4	1,154.00	12.0	PVC	150.0	5.93	1998	Open	6.49	0.00	60.14
P-5	280.00	12.0	PVC	150.0	1.68	1998	Open	-14.96	0.00	57.97
P-6	953.00	12.0	PVC	150.0	10.00	1998	Open	-7.92	0.00	57.54
P-8	458.00	10.0	PVC	150.0	0.38	1998	Open	-8.37	0.00	58.40
P-11	395.00	12.0	PVC	150.0	1.63	1998	Open	-7.52	0.00	57.54
P-14	516.00	12.0	PVC	150.0	6.56	1998	Open	-15.87	0.00	56.24
P-15	664.00	14.0	PVC	150.0	2.40	1998	Open	-13.84	0.00	56.67
P-16	1,356.00	14.0	PVC	150.0	5.80	1998	Open	-13.97	0.00	54.51
P-17	325.00	14.0	PVC	150.0	1.98	1998	Open	-20.40	0.00	54.08
P-19	664.00	10.0	PVC	150.0	1.26	1998	Open	6.42	0.00	56.24
P-20	686.00	8.0	PVC	150.0	1.49	1998	Open	2.78	0.00	56.24
P-21	1,320.00	8.0	PVC	150.0	1.89	1998	Open	2.78	0.00	56.67
P-24	1,268.00	12.0	PVC	150.0	6.63	1998	Open	0.00	0.00	58.84
P-25	1,351.00	8.0	PVC	150.0	3.23	1998	Open	-3.28	0.00	56.24
P-26	686.00	8.0	PVC	150.0	4.74	1998	Open	-1.16	0.00	56.24
P-27	1,275.00	12.0	PVC	150.0	9.85	1998	Open	-7.11	0.00	58.84
P-30	783.00	8.0	PVC	150.0	1.13	1998	Open	-0.42	0.00	58.84
P-33	885.00	12.0	PVC	150.0	2.68	1998	Open	-3.80	0.00	57.97
P-34	441.00	10.0	PVC	150.0	2.57	1998	Open	0.00	0.00	57.97
P-40	2,034.00	14.0	PVC	150.0	18.11	1998	Open	-20.44	0.00	56.24
P-41	4,034.00	14.0	PVC	150.0	18.11	1998	Open	-20.44	0.00	16.22
P-38	1,172.00	8.0	PVC	150.0	1.49	1998	Open	-0.10	0.00	60.13
P-39	811.00	8.0	PVC	150.0	2.54	1998	Open	-7.30	0.00	58.40
WELL2 CASING	60.00	6.0	MSCL	110.0	4.29	1998	Open	-0.00	0.00	0.00
P-37	2,880.00	8.0	PVC	150.0	8.40	1998	Open	-0.00	0.00	68.36
P-36	473.00	8.0	PVC	150.0	6.80	1998	Open	0.00	0.00	62.30
P-35	1,350.00	12.0	PVC	150.0	3.95	1998	Open	-0.10	0.00	62.30
P-32	1,321.00	8.0	PVC	150.0	1.09	1998	Open	-3.94	0.00	56.67
P-31	1,256.00	12.0	PVC	150.0	5.55	1998	Open	-3.80	0.00	58.84
P-28	563.00	12.0	PVC	150.0	5.45	1998	Open	9.40	0.00	57.54
P-29	961.00	12.0	PVC	150.0	5.55	1998	Open	7.53	0.00	58.84
WELL1 CASING	60.00	6.0	MSCL	110.0	5.00	1998	Open	-0.00	0.00	0.00

Scenario: April 2005 Calibration
Steady State Analysis
Pump Report

Label	Elevation (ft)	Control Status	Intake Pump Grade (ft)	Discharge Pump Grade (ft)	Discharge (gpm)	Pump Head (ft)	Calculated Water Power (Hp)
WELL1	164.00	Off	164.00	307.99	0.00	0.00	0.00
WELL2	163.00	Off	163.00	307.99	0.00	0.00	0.00

Scenario: April 2005 Calibration
Steady State Analysis
Tank Report

Label	Zone	Base Elevation (ft)	Minimum Elevation (ft)	Initial HGL (ft)	Maximum Elevation (ft)	Inactive Volume (gal)	Tank Diameter (ft)	Inflow (gpm)	Current Status	Calculated Hydraulic Grade (ft)	Calculated Percent Full (%)
RES-1	Zone	270.50	294.30	308.00	315.50	18,000.00	42.00	-20.44	Draining	308.00	82.2



THURSTON COUNTY
DEPARTMENT OF WATER AND WASTE MANAGEMENT
921 LAKERIDGE DRIVE SW
BUILDING 4, ROOM 100
OLYMPIA, WA 98502
PHONE (360) 754-4681 FAX (360) 754-4682

THURSTON COUNTY

Designed By:	–
Drafted By:	–
Checked By:	–
Scale:	N.T.S.
Contract No.:	–
Project No.:	–

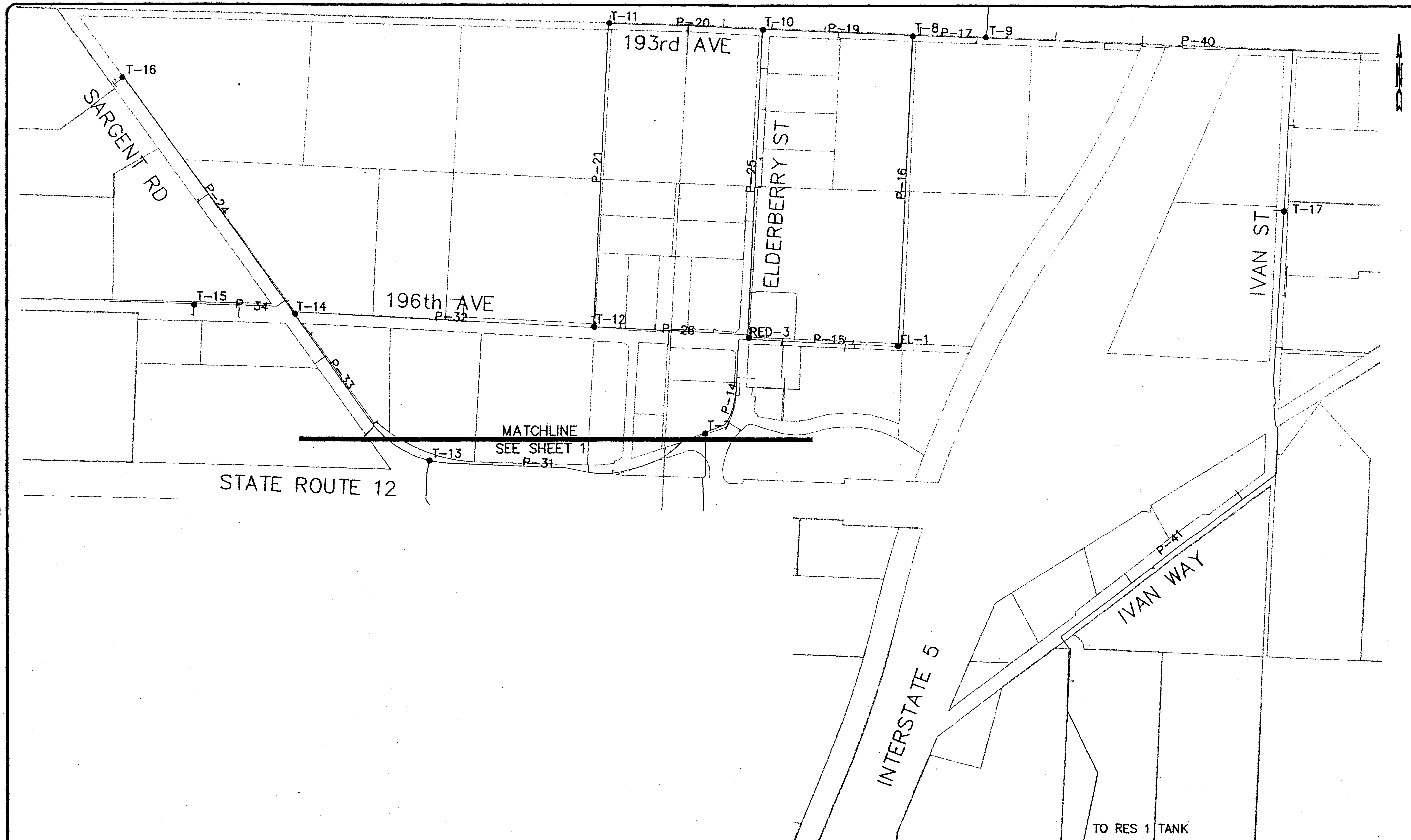
Revisions	Date

GRAND MOUND WATER SYSTEM

SYSTEM ANALYSIS

WaterCAD MODELING SYSTEM NETWORK

Sheet 1 of 2



THURSTON COUNTY DEPARTMENT OF WATER AND WASTE MANAGEMENT 921 LAKERIDGE DRIVE SW BUILDING 4, ROOM 100 OLYMPIA, WA 98502 PHONE (360) 754-4681 FAX (360) 754-4682	Designed By: – Drafted By: – Checked By: – Scale: N.T.S. Contract No.: – Project No.: –	Revisions / Date	GRAND MOUND WATER SYSTEM	SYSTEM ANALYSIS WaterCAD MODELING SYSTEM NETWORK	Sheet 2 of 2

THURSTON COUNTY

Scenario: 2025 MDD with Fire Flow
Extended Period Analysis: 2.00 hr / 2.00
Junction Report

Label	Elevation (ft)	Zone	Type	Base Flow (gpm)	Pattern	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
RED-1	164.00	Zone	Demand	0.00	Fixed	0.00	294.36	56.40
T-1	173.00	Zone	Demand	1.40	Fixed	1.40	273.19	43.35
T-2	169.00	Zone	Demand	9.40	Fixed	9.40	273.19	45.08
T-3	174.00	Zone	Demand	2.40	Fixed	2.40	272.74	42.72
T-5	172.00	Zone	Demand	9.00	Fixed	9.00	271.78	43.17
T-4	175.00	Zone	Demand	3.20	Fixed	3.20	272.48	42.18
T-6	175.00	Zone	Demand	16.10	Fixed	16.10	272.48	42.17
T-7	172.00	Zone	Demand	18.20	Fixed	18.20	272.48	43.47
RED-2	173.00	Zone	Demand	9.00	Fixed	9.00	274.61	43.96
RED-3	178.00	Zone	Demand	7.20	Fixed	7.20	273.61	41.36
EL-1	177.00	Zone	Demand	2.20	Fixed	2.20	274.21	42.06
T-8	182.00	Zone	Demand	12.60	Fixed	12.60	275.50	40.45
T-9	183.00	Zone	Demand	9.50	Fixed	9.50	276.28	40.36
T-10	178.00	Zone	Demand	14.30	Fixed	14.30	274.66	41.82
T-11	178.00	Zone	Demand	1.10	Fixed	1.10	273.85	41.47
T-12	177.00	Zone	Demand	1.10	Fixed	1.10	272.34	41.25
T-13	172.00	Zone	Demand	7.10	Fixed	7.10	270.46	42.60
T-14	174.00	Zone	Demand	9.00	Fixed	9.00	266.12	39.86
T-15	174.00	Zone	Demand	22.30	Fixed	22.30	266.12	39.86
T-16	172.00	Zone	Demand	2,002.10	Composite	2,002.10	253.88	35.43
T-17	178.00	Zone	Demand	33.60	Fixed	33.60	281.93	44.97
T-18	169.00	Zone	Demand	16.20	Fixed	16.20	282.86	49.26
J-1	150.00	Zone	Demand	0.00	Fixed	0.00	296.42	63.35

Scenario: 2025 MDD with Fire Flow
Extended Peri[illegible]nalysis: 2.00 hr / 2.00
Pipe Report

Label	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Minor Loss Coefficient	Installation Year	Control Status	Discharge (gpm)	Pressure Pipe Headloss (ft)	Downstream Calculated Pressure (psi)	Velocity (ft/s)
P-4	1,154.00	12.0	PVC	150.0	5.93	1998	Open	9.40	0.00	45.08	0.03
P-5	280.00	12.0	PVC	150.0	1.68	1998	Open	765.28	0.45	42.72	2.17
P-6	953.00	12.0	PVC	150.0	10.00	1998	Open	271.23	0.26	42.18	0.77
P-8	458.00	10.0	PVC	150.0	0.38	1998	Open	776.08	1.41	43.35	3.17
P-11	395.00	12.0	PVC	150.0	1.63	1998	Open	46.88	0.00	42.17	0.13
P-14	516.00	12.0	PVC	150.0	6.56	1998	Open	-779.05	1.13	41.36	2.21
P-15	664.00	14.0	PVC	150.0	2.40	1998	Open	-879.81	0.61	42.06	1.83
P-16	1,356.00	14.0	PVC	150.0	5.80	1998	Open	-882.01	1.29	40.45	1.84
P-17	325.00	14.0	PVC	150.0	1.98	1998	Open	-1,362.62	0.78	40.36	2.84
P-19	664.00	10.0	PVC	150.0	1.26	1998	Open	468.01	0.84	41.82	1.91
P-20	686.00	8.0	PVC	150.0	1.49	1998	Open	252.35	0.81	41.47	1.61
P-21	1,320.00	8.0	PVC	150.0	1.89	1998	Open	251.25	1.51	41.25	1.60
P-24	1,268.00	12.0	PVC	150.0	6.63	1998	Open	2,002.10	12.24	35.43	5.68
P-25	1,351.00	8.0	PVC	150.0	3.23	1998	Open	-201.36	1.06	41.82	1.29
P-26	686.00	8.0	PVC	150.0	4.74	1998	Open	-294.92	1.26	41.36	1.88
P-27	1,275.00	12.0	PVC	150.0	9.85	1998	Open	491.65	0.96	43.17	1.39
P-30	783.00	8.0	PVC	150.0	1.13	1998	Open	221.15	0.71	43.17	1.41
P-33	885.00	12.0	PVC	150.0	2.68	1998	Open	1,488.33	4.34	39.86	4.22
P-34	441.00	10.0	PVC	150.0	2.57	1998	Open	-22.30	0.00	39.86	0.09
P-40	2,034.00	14.0	PVC	150.0	18.11	1998	Open	-1,372.12	5.65	44.97	2.86
P-41	4,034.00	14.0	PVC	150.0	18.11	1998	Open	-1,405.72	9.37	9.00	2.93
P-38	1,172.00	8.0	PVC	150.0	1.49	1998	Open	801.28	11.50	49.26	5.11
P-39	811.00	8.0	PVC	150.0	2.54	1998	Open	785.08	8.25	43.96	5.01
WELL2 CASING	60.00	6.0	MSCL	110.0	4.29	1998	Open	391.90	2.39	-1.03	4.45
P-37	2,880.00	8.0	PVC	150.0	8.40	1998	Open	391.90	7.94	63.35	2.50
P-36	473.00	8.0	PVC	150.0	6.80	1998	Open	-409.38	1.99	58.15	2.61
P-35	1,350.00	12.0	PVC	150.0	3.95	1998	Open	801.28	2.06	56.40	2.27
P-32	1,321.00	8.0	PVC	150.0	1.09	1998	Open	-545.07	6.22	41.25	3.48
P-31	1,256.00	12.0	PVC	150.0	5.55	1998	Open	-791.63	2.02	43.47	2.25
P-28	563.00	12.0	PVC	150.0	5.45	1998	Open	-30.78	0.00	42.17	0.09
P-29	961.00	12.0	PVC	150.0	5.55	1998	Open	-703.81	1.32	43.17	2.00
WELL1 CASING	60.00	6.0	MSCL	110.0	5.00	1998	Open	409.38	2.84	-1.23	4.65

Scenario: 2025 MDD with Fire Flow
Extended Period Analysis: 2.00 hr / 2.00
Tank Report

Label	Zone	Base Elevation (ft)	Minimum Elevation (ft)	Initial HGL (ft)	Maximum Elevation (ft)	Inactive Volume (gal)	Tank Diameter (ft)	Inflow (gpm)	Current Status	Calculated Hydraulic Grade (ft)	Calculated Percent Full (%)
RES-1	Zone	270.50	271.50	308.00	315.50	218,000.00	42.00	-1,405.72	Draining	291.30	62.8

Scenario: 2025 MDD with Fire Flow
Extended Period Analysis: 2.00 hr / 2.00
Pump Report

Label	Elevation (ft)	Control Status	Intake Pump Grade (ft)	Discharge Pump Grade (ft)	Discharge (gpm)	Pump Head (ft)	Calculated Water Power (Hp)
WELL1	164.00	On	161.16	298.41	409.38	137.24	14.18
WELL2	163.00	On	160.61	304.35	391.90	143.74	14.22

Scenario: 2025 PHD
Extended Period Analysis: 1.00 hr / 1.00
Junction Report

Label	Elevation (ft)	Zone	Type	Base Flow (gpm)	Pattern	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
RED-1	164.00	Zone	Demand	0.00	Fixed	0.00	326.30	70.22
T-1	173.00	Zone	Demand	2.10	Fixed	2.10	312.55	60.38
T-2	169.00	Zone	Demand	13.90	Fixed	13.90	312.55	62.11
T-3	174.00	Zone	Demand	3.60	Fixed	3.60	312.27	59.82
T-5	172.00	Zone	Demand	13.20	Fixed	13.20	311.95	60.55
T-4	175.00	Zone	Demand	4.70	Fixed	4.70	311.95	59.25
T-6	175.00	Zone	Demand	23.70	Fixed	23.70	311.84	59.21
T-7	172.00	Zone	Demand	26.80	Fixed	26.80	311.69	60.44
RED-2	173.00	Zone	Demand	13.20	Fixed	13.20	313.44	60.76
RED-3	178.00	Zone	Demand	10.60	Fixed	10.60	311.43	57.73
EL-1	177.00	Zone	Demand	3.30	Fixed	3.30	311.35	58.13
T-8	182.00	Zone	Demand	18.50	Fixed	18.50	311.18	55.89
T-9	183.00	Zone	Demand	14.00	Fixed	14.00	311.11	55.43
T-10	178.00	Zone	Demand	21.00	Fixed	21.00	311.25	57.65
T-11	178.00	Zone	Demand	1.70	Fixed	1.70	311.31	57.68
T-12	177.00	Zone	Demand	1.70	Fixed	1.70	311.44	58.17
T-13	172.00	Zone	Demand	10.40	Fixed	10.40	311.74	60.46
T-14	174.00	Zone	Demand	13.30	Fixed	13.30	311.68	59.57
T-15	174.00	Zone	Demand	32.80	Fixed	32.80	311.68	59.57
T-16	172.00	Zone	Demand	3.10	Fixed	3.10	311.68	60.43
T-17	178.00	Zone	Demand	49.50	Fixed	49.50	310.60	57.37
T-18	169.00	Zone	Demand	23.80	Fixed	23.80	318.70	64.77
J-1	150.00	Zone	Demand	0.00	Fixed	0.00	327.66	76.86

Scenario: 2025 PHD
Extended Peric nalysis: 1.00 hr / 1.00
Pipe Report

Label	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Minor Loss Coefficient	Installation Yea	Control Status	Discharge (gpm)	Pressure Pipe Headloss (ft)	Downstream Calculated Pressure (psi)	Velocity (ft/s)
P-4	1,154.00	12.0	PVC	150.0	5.93	1998	Open	13.90	0.00	62.11	0.04
P-5	280.00	12.0	PVC	150.0	1.68	1998	Open	588.30	0.28	59.82	1.67
P-6	953.00	12.0	PVC	150.0	10.00	1998	Open	307.06	0.33	59.25	0.87
P-8	458.00	10.0	PVC	150.0	0.38	1998	Open	604.30	0.89	60.38	2.47
P-11	395.00	12.0	PVC	150.0	1.63	1998	Open	302.12	0.10	59.21	0.86
P-14	516.00	12.0	PVC	150.0	6.56	1998	Open	361.96	0.26	57.73	1.03
P-15	664.00	14.0	PVC	150.0	2.40	1998	Open	300.37	0.08	58.13	0.63
P-16	1,356.00	14.0	PVC	150.0	5.80	1998	Open	297.07	0.17	55.89	0.62
P-17	325.00	14.0	PVC	150.0	1.98	1998	Open	399.90	0.08	55.43	0.83
P-19	664.00	10.0	PVC	150.0	1.26	1998	Open	-121.32	0.07	57.65	0.50
P-20	686.00	8.0	PVC	150.0	1.49	1998	Open	-64.81	0.06	57.68	0.41
P-21	1,320.00	8.0	PVC	150.0	1.89	1998	Open	-66.51	0.13	58.17	0.42
P-24	1,268.00	12.0	PVC	150.0	6.63	1998	Open	3.10	0.00	60.43	0.01
P-25	1,351.00	8.0	PVC	150.0	3.23	1998	Open	77.51	0.18	57.65	0.49
P-26	686.00	8.0	PVC	150.0	4.74	1998	Open	26.53	0.01	57.73	0.17
P-27	1,275.00	12.0	PVC	150.0	9.85	1998	Open	277.64	0.33	60.55	0.79
P-30	783.00	8.0	PVC	150.0	1.13	1998	Open	0.24	0.00	60.55	0.00
P-33	885.00	12.0	PVC	150.0	2.68	1998	Open	143.94	0.05	59.57	0.41
P-34	441.00	10.0	PVC	150.0	2.57	1998	Open	-32.80	0.00	59.57	0.13
P-40	2,034.00	14.0	PVC	150.0	18.11	1998	Open	385.90	0.50	57.37	0.80
P-41	4,034.00	14.0	PVC	150.0	18.11	1998	Open	336.40	0.63	17.08	0.70
P-38	1,172.00	8.0	PVC	150.0	1.49	1998	Open	641.30	7.60	64.77	4.09
P-39	811.00	8.0	PVC	150.0	2.54	1998	Open	617.50	5.27	60.76	3.94
WELL2 CASING	60.00	6.0	MSCL	110.0	4.29	1998	Open	313.86	1.55	-0.67	3.56
P-37	2,880.00	8.0	PVC	150.0	8.40	1998	Open	313.86	5.24	76.86	2.00
P-36	473.00	8.0	PVC	150.0	6.80	1998	Open	-327.43	1.30	71.37	2.09
P-35	1,350.00	12.0	PVC	150.0	3.95	1998	Open	641.30	1.36	70.22	1.82
P-32	1,321.00	8.0	PVC	150.0	1.09	1998	Open	94.74	0.24	58.17	0.60
P-31	1,256.00	12.0	PVC	150.0	5.55	1998	Open	110.34	0.05	60.44	0.31
P-28	563.00	12.0	PVC	150.0	5.45	1998	Open	-278.42	0.16	59.21	0.79
P-29	961.00	12.0	PVC	150.0	5.55	1998	Open	-264.68	0.21	60.55	0.75
WELL1 CASING	60.00	6.0	MSCL	110.0	5.00	1998	Open	327.43	1.84	-0.80	3.72

Scenario: 2025 PHD
Extended Period Analysis: 1.00 hr / 1.00
Pump Report

Label	Elevation (ft)	Control Status	Intake Pump Grade (ft)	Discharge Pump Grade (ft)	Discharge (gpm)	Pump Head (ft)	Calculated Water Power (Hp)
WELL1	164.00	On	162.16	328.96	327.43	166.80	13.79
WELL2	163.00	On	161.45	332.90	313.86	171.46	13.59

Scenario: 2025 PHD
Extended Period Analysis: 1.00 hr / 1.00
Tank Report

Label	Zone	Base Elevation (ft)	Minimum Elevation (ft)	Initial HGL (ft)	Maximum Elevation (ft)	Inactive Volume (gal)	Tank Diameter (ft)	Inflow (gpm)	Current Status	Calculated Hydraulic Grade (ft)	Calculated Percent Full (%)
RES-1	Zone	270.50	271.50	308.00	315.50	218,000.00	42.00	336.40	Filling	309.97	91.5

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January 31, 2012

Mr. Scott Lindblom, P.E., L.G.
Engineering Program Manager/Designer
Thurston County Public Works
2404A Heritage Court SW
Olympia, WA 98502

Sent Via: *Email and US Mail*

Subject: **Thurston County Public Works**

Grand Mound Hydraulic and Storage Analyses for Department of Corrections

Dear Mr. Lindblom:

This letter summarizes the results of the hydraulic and storage analyses for the proposed Department of Corrections (DOC) development, located on the south side of Grand Mound Way SW, southwest of the existing Grand Mound water system. The Grand Mound water system is owned by Thurston County (County) and operated by the County Department of Water and Waste Management. Analyses were performed to identify the improvements necessary to provide the anticipated fire flow requirement and required pressure to the proposed DOC development, and to evaluate the additional storage requirements of the system with the DOC development.

BACKGROUND

RH2 Engineering, Inc., (RH2) was authorized by the County to identify the improvements necessary to provide the anticipated fire flow requirement and required pressure for the proposed DOC development. The proposed DOC development is anticipated to house employees and more than 1,000 beds. The following demand projections and fire flow requirements for the proposed DOC development were provided by the County.

- The average day demand (ADD) is projected to be 102,400 gallons per day (gpd).
- The maximum day demand (MDD) is projected to be 179,200 gpd.
- The fire flow requirements are projected to be 3,000 gallons per minute (gpm) for 2 hours.

EXISTING WATER DEMANDS

The County has divided the Grand Mound water system customers into two different classes for billing purposes: single-family and commercial/industrial. **Table 1** shows the historical average number of connections, annual demand and ADD per connection for both customer classes from 2005 through 2010. The commercial/industrial class includes the Great Wolf Lodge, which opened in March 2008. The demand data shown in **Table 1** includes distribution system leakage (DSL) for each year.

Table 1
Average Annual Demand and Service Connections

Year	Customer Class		Total
	Single-Family	Commercial/Industrial	
	Average Number of Connections		
2005	82	40	122
2006	92	41	133
2007	113	44	157
2008	130	47	177
2009	142	49	191
2010	172	52	223
	Average Annual Demand - Includes DSL (gallons)		
2005	6,704,320	9,551,680	16,256,000
2006	9,334,497	14,921,903	24,256,400
2007	10,816,990	16,454,010	27,271,000
2008	19,267,409	48,901,100	68,168,509
2009	18,220,985	56,696,115	74,917,100
2010	19,452,363	49,249,737	68,702,100
	Average Daily Demand per Connection (gal/day/capita)		
2005	224	654	
2006	278	997	
2007	262	1,025	
2008	406	2,851	
2009	352	3,170	
2010	311	2,620	
2008-2010 Avg	356	2,880	

The Grand Mound water system's water supply and system demand data from 2005 through 2010 is summarized in **Table 2**. The water system's annual MDD and peak hour demand (PHD) is also shown in **Table 2**. The water system's MDD was estimated using a MDD/ADD ratio of 2.0, which is the ratio presented in the *2005 Grand Mound Public Water System Plan*. The water system's PHD was estimated using Equation 5-1 of the Washington State Department of Health (DOH) *Water System Design Manual*, which is consistent with the method used to calculate PHD in the *2005 Grand Mound Public Water System Plan*.

Table 2
Historical Water Supply and System Demand

Year	ADD (gpm)	MDD (gpm)	PHD (gpm)
2005	31	62	165
2006	46	92	232
2007	52	104	250
2008	130	259	555
2009	143	285	584
2010	131	261	533

The demand of each customer class can be expressed in terms of equivalent residential units (ERUs) for demand forecasting purposes. One ERU is equivalent to the amount of water used by a single-family residence. The number of ERUs representing the demand of the commercial/industrial customer class is determined from the total commercial/industrial demand and the unit demand per ERU from the single-family residential demand data for a given year. **Table 3** presents the computed number of ERUs for both customer classes from 2005 through 2010 for the Grand Mound water system.

Table 3
Equivalent Residential Units (ERUs)

Year	Number of Connections	Total ERUs	Average Annual Demand (gallons)	Demand per ERU (gal/day/ERU)
Single-Family Residential (ERU Basis)				
2005	82	82	6,704,320	224
2006	92	92	9,334,497	278
2007	113	113	10,816,990	262
2008	130	130	19,267,409	406
2009	142	142	18,220,985	352
2010	172	172	19,452,363	311
2008-2010 Average				356
Commercial/Industrial				
2005	40	117	9,551,680	224
2006	41	147	14,921,903	278
2007	44	172	16,454,010	262
2008	47	330	48,901,100	406
2009	49	442	56,696,115	352
2010	52	434	49,249,737	311
System-Wide Totals				
2005	122	199	16,256,000	224
2006	133	239	24,256,400	278
2007	157	285	27,271,000	262
2008	177	460	68,168,509	406
2009	191	584	74,917,100	352
2010	223	606	68,702,100	311

FUTURE WATER DEMANDS

ADD and MDD projections for the proposed DOC development were provided by the County. The PHD projections were estimated using Equation 5-1 of the DOH *Water System Design Manual*. **Table 4** presents the existing system demand data from 2010 with the DOC demand projections.

Table 4
Water Demand Projections with DOC

Description	ADD (gpm)	MDD (gpm)	PHD (gpm)
Existing 2010 Demand	131	261	533
DOC Projections	71	124	289
Existing 2010 Demand with DOC	202	386	823

Table 5 presents the existing system-wide ERUs with the projected ERUs of the proposed DOC development. The ERU projections are based on the projected DOC water demands shown in **Table 4** and the average demand per ERU that was computed from the actual 2010 data shown in **Table 3**.

Table 5
ERU Projections with DOC

Year/Description	ADD (gpm)	Demand per ERU (gpd/ERU)	ERUs
Existing 2010 Demand	131	311	606
DOC Projections	71	311	330
Existing 2010 Demand with DOC	202	311	935

SOURCE CAPACITY EVALUATION

Supply facilities must be capable of adequately and reliably supplying high-quality water to the system. In addition, supply facilities must provide a sufficient quantity of water at pressures that meet the requirements of Washington Administrative Code (WAC) 246-290-230. The evaluation of the combined capacity of the sources is based on the criteria that they provide supply to the system at a rate that is equal to or greater than the MDD of the system since the facilities are providing supply to a pressure zone that has storage. The Grand Mound water system's water supply is provided by two groundwater wells, Well No. 1 and Well No. 2. Each well has a pumping capacity of 550 gpm. The combined capability of these wells to meet both existing and projected DOC demands, based on existing continuous pumping capacities of the individual wells, is presented in **Table 6**. The results of the analyses indicate that a single well has sufficient capacity to meet the existing and projected DOC maximum day demands.

Table 6
Source Capacity Evaluation

Description	2010	2010 with DOC
Required Source Capacity (gpm)		
Maximum Day Demand	261	386
Available Source Capacity (gpm)		
Well No. 1	550	550
Well No. 2	550	550
Total	1,100	1,100
Surplus or Deficient Source Capacity (gpm)		
Surplus or Deficient Amount	839	714

STORAGE CAPACITY EVALUATION

The Grand Mound water system has a single 500,000-gallon storage facility that provides gravity storage to the entire system. This section evaluates the water system's existing reservoir to determine if it has sufficient capacity to meet the system's existing and future DOC storage requirements.

Analysis Criteria

Water storage is typically made up of the following components: operational storage; equalizing storage; standby storage; fire flow storage; and dead storage. Each storage component serves a different purpose and will vary from system to system. A definition of each storage component and the criteria used to evaluate the capacity of the system's reservoir is provided below and in WAC 246-290-010.

Operational Storage – The volume of the reservoir used to supply the water system under normal conditions when the source or sources of supply are not delivering water to the system (i.e., sources are in the off mode). Operational storage is the average amount of draw down in the tank during normal operating conditions, which represents a volume of storage that will most likely be unavailable for equalizing, fire flow or standby storage. The operational storage in the Grand Mound reservoir is the amount of storage between the fill or well pump starting set point level and the overflow elevation of the reservoir.

Equalizing Storage – The volume of the reservoir used to supply the water system under peak demand conditions when the system demand exceeds the total rate of supply of the sources. DOH requires that equalizing storage be stored above an elevation that will provide a minimum pressure of 30 psi at all service connections throughout the system during PHD conditions. Because the system's supply sources primarily operate on a "call on demand" basis to fill the storage tanks, the equalizing storage requirements are determined using the standard DOH formula that considers the difference between the system PHD and the combined capacity of the supply sources.

Standby Storage – The volume of the reservoir used to supply the water system under emergency conditions when supply facilities are out of service due to equipment failures, power outages, loss of supply, transmission main breaks and any other situation that disrupts the supply source. DOH requires that standby storage be stored above an elevation that will provide a minimum pressure of 20 psi at all service connections throughout the system. The criteria for determining the standby storage requirements for the Grand Mound water system, which has multiple supply sources, is based on the standard DOH formula that requires that the amount of standby storage is sufficient to supply the system for a 48-hour period when the primary supply facility is out of service and the system is experiencing demands that are close to ADD. Additionally, DOH recommends that the minimum standby storage volume be no less than 200 gallons per ERU.

Fire Flow Storage – The volume of the reservoir used to supply water to the system at the maximum rate and duration required to extinguish a fire at the building with the highest fire flow requirements. The magnitude of the fire flow storage is the product of the fire flow rate and duration of the system's maximum fire flow requirement established by the local fire authority. DOH requires that fire flow storage be stored above an elevation that will provide a minimum pressure of 20 psi at all points throughout the distribution system under MDD conditions. The fire flow storage requirements shown in the analyses that follow are based on a maximum fire flow requirement of 2,000 gpm for 2 hours for the existing system based on information provided by the County for Great Wolf Lodge. A maximum fire flow requirement of 3,000 gpm for 2 hours was used for the analyses of the system with the proposed DOC development.

Dead Storage – The volume of the reservoir that cannot be used because it is stored at an elevation that does not provide system pressures that meet the minimum pressure requirements established by DOH without pumping. This unusable storage occupies the lower portion of most ground level reservoirs. Water that is stored below an elevation that cannot provide a minimum pressure of 20 psi is considered dead storage for the analyses that follow.

Storage Analyses Results

Existing Storage Analysis

As shown in **Table 7**, the maximum combined storage capacity of the system's reservoir is 500,000 gallons. Due to the elevation of the tank in relation to the distribution system, the reservoir has no dead storage. As a result, the total amount of usable storage for operational, equalizing, standby and fire flow purposes is 500,000 gallons. The fill or well pump starting set point level of the reservoir at night is set 5 feet lower than during the day. For the purposes of the existing storage evaluation, the nighttime pump starting set point level of the reservoir is used to calculate the reservoir's operational storage. However, full utilization of the operational, equalizing and fire flow storage components using nighttime pump starting set point levels results in an empty reservoir. It is recommended that the existing and future storage facilities be continuously operated at existing daytime set point levels to prevent emptying of the existing reservoir during a nighttime fire and to minimize the water system's storage requirement.

Table 7
Existing Storage Evaluation

Description	Daytime Set Point Level		Nighttime Set Point Level	
	2009	2010	2009	2010
Available/Usable Storage (gallons)				
Maximum Storage Capacity	500,000	500,000	500,000	500,000
Dead (Non-usable Storage)	0	0	0	0
Total Available Storage	500,000	500,000	500,000	500,000
Required Storage (gallons)				
Operational Storage	135,417	135,417	187,500	187,500
Equalizing Storage	0	0	0	0
Standby Storage	116,769	121,141	116,769	121,141
Fire Flow Storage	240,000	240,000	240,000	240,000
Totals	492,186	496,558	544,269	548,641
Surplus (or Deficient) Storage (gallons)				
Surplus (or Deficient) Amount	7,814	3,442	(44,269)	(48,641)

The results of the existing storage evaluation, as shown in **Table 7**, indicate that the existing system has approximately 3,400 gallons of surplus storage based on the 2010 daytime set point levels, but does not have sufficient storage based on the nighttime set point levels. The results of the 2009 storage evaluation are shown for comparison purposes.

The storage evaluation performed in the *2005 Grand Mound Public Water System Plan* does not predict a storage deficiency in the existing or year 2025 projections. However, by the end of 2010, the number of connections within the water system and water system demands had greatly exceeded the 2025 projections. The elevated levels of growth have resulted in an existing storage deficiency for the water system.

Future Storage Analysis

The system's future storage requirements were computed with the proposed DOC development connected to the existing system. The future analyses are based on a continuous fill or pump starting set point level of the reservoir assumed to be equivalent to the existing daytime set point level. As shown in **Table 8**, the Grand Mound water system will have an approximately 182,000-gallon storage deficiency with the proposed DOC development. However, additional storage is required to include the operational storage component in a new reservoir. Therefore, an additional 254,000 gallons of storage, with the same base and overflow elevation of the existing 500,000 gallon reservoir, is required to resolve the projected storage deficiency with the proposed DOC development, as shown in **Table 9**. Prior to the construction of additional storage, the County should also consider the storage requirements necessary to accommodate growth projected in other areas of the system.

Table 8
Future DOC Storage Evaluation without Additional Storage

Description	Required Storage with DOC
Available/Usable Storage (MG)	
Maximum Storage Capacity	500,000
Dead (Non-usable Storage)	0
Total Available Storage	500,000
Required Storage (MG)	
Operational Storage	135,417
Equalizing Storage	0
Standby Storage	187,046
Fire Flow Storage	360,000
Totals	682,462
Surplus (or Deficient) Storage (MG)	
Surplus (or Deficient) Amount	(182,462)

Table 9
Future DOC Storage Evaluation with Additional Storage

Description	Required Storage with DOC
Available/Usable Storage (MG)	
Maximum Storage Capacity	754,000
Dead (Non-usable Storage)	0
Total Available Storage	754,000
Required Storage (MG)	
Operational Storage	204,208
Equalizing Storage	0
Standby Storage	187,046
Fire Flow Storage	360,000
Totals	751,254
Surplus (or Deficient) Storage (MG)	
Surplus (or Deficient) Amount	2,746

Storage Capacity Analyses

This section evaluates the capacity of the existing and future storage facilities to determine the maximum number of ERUs that can be served. The storage capacity analysis is based on the storage capacity for equalizing and standby storage and the computed storage requirement per ERU. Operational, dead and fire flow storage capacity were excluded from the storage analysis because these components are not directly determined by water demand or ERUs. For the analyses, a reserve amount equivalent to the operational, dead and fire flow storage requirements was deducted from the total available storage capacity to determine the storage capacity available for equalizing and standby storage. This storage capacity available for equalizing and standby storage was divided by the number of ERUs presented in **Table 5** to determine the storage requirement per ERU.

Existing Storage Capacity Analysis

A summary of the results of the existing storage capacity analysis is shown in **Table 10** based on the daytime setpoint levels in the reservoir. The results of the 2009 storage evaluation are shown for comparison purposes. The results of the analysis indicate that the existing 500,000 gallon reservoir can support up to a maximum of approximately 623 ERUs. The existing storage facility has a surplus of approximately 17 ERUs.

Table 10
Existing Storage Capacity Analysis

Description	2009	2010
Storage Capacity		
Maximum Equalizing & Standby Storage Capacity (gal)	124,583	124,583
Equalizing & Standby Storage Requirement per ERU (gal)	200	200
Maximum Storage Capacity (ERUs)	623	623
Unused Available System Capacity		
Maximum System Capacity (ERUs)	623	623
ERUs	584	606
Surplus (or Deficient) Capacity (ERUs)	39	17

Future Storage Capacity Analysis

A summary of the results of the future storage capacity analysis is shown in **Table 11**. The results of the analysis indicate that the future system, with the construction of an additional 254,000 gallons of storage, will have the capacity to support up to a maximum of approximately 949 ERUs. Therefore, the future water system would have a surplus of approximately 14 ERUs with the construction of the additional storage.

Table 11
Future Storage Capacity Analysis

Description	2010 with DOC
Storage Capacity	
Maximum Equalizing & Standby Storage Capacity (gal)	189,792
Equalizing & Standby Storage Requirement per ERU (gal)	200
Maximum Storage Capacity (ERUs)	949
Unused Available System Capacity	
Maximum System Capacity (ERUs)	949
ERUs	935
Surplus (or Deficient) Capacity (ERUs)	14

DISTRIBUTION AND TRANSMISSION SYSTEM

This section evaluates the water system's distribution and transmission system to identify improvements necessary to provide the anticipated fire flow requirement and required pressure to the proposed DOC development.

Analysis Criteria

Distribution and transmission mains must be capable of adequately and reliably conveying water throughout the system at acceptable flow rates and pressures. The criteria used to evaluate the water system's distribution and transmission system is the state mandated requirements for Group A water systems contained in WAC 246-290-230, Distribution Systems. The pressure analysis criteria states that the distribution system "…shall be designed with the capacity to deliver the design peak hour demand quantity of water at 30 psi under peak hour demand flow conditions measured at all existing and proposed service water meters." It also states that if fire flow is to be provided, "… the distribution system shall also provide MDD plus the required fire flow at a pressure of at least 20 psi at all points throughout the distribution system."

Hydraulic analyses of the existing system were performed under existing PHD conditions to evaluate its current pressure capabilities. The existing system was also analyzed under existing MDD conditions to evaluate the current fire flow capabilities. Additional hydraulic analyses were then performed with the same hydraulic model under MDD conditions with the proposed DOC development to identify improvements necessary to meet the demand projections and fire flow requirements of the development. The following is a description of the hydraulic model, the operational conditions and facility settings used in the analyses.

Hydraulic Model

Description and Calibration

A computer-based hydraulic model of the existing water system was updated using Version 8.1 of the InfoWater® program, developed by MWH Soft, Inc. The hydraulic model was calibrated within generally accepted industry standards for hydraulic model accuracy by RH2 in August 2011.

Hydraulic Analysis Operational Conditions

The hydraulic model of the existing system contains 2010 demand data. Meter billing records for existing customers or estimates of large water user's average or peak water consumption were not available for use in distributing demands in the hydraulic model. Therefore, 2010 demands were uniformly distributed throughout all of the junction nodes of the model based on land use classification. The hydraulic model of the future system contains the 2010 demands and the projected demands of the DOC development. A summary of the hydraulic model's operational conditions used in these analyses is shown in **Table 12**.

Table 12
Hydraulic Analyses Operational Conditions

Description	PHD Pressure Analysis		Fire Flow Analysis	
Demand	2010 PHD	2010 PHD + DOC PHD	2010 MDD	2010 MDD + DOC MDD
Reservoir Hydraulic Grade Line (HGL) (ft)	300.5	305.5	277.5	282.6
Well No. 1	ON	ON	ON	ON
Well No. 2	ON	ON	ON	ON

Hydraulic Analyses Results

Several hydraulic analyses were performed to determine the improvements necessary to meet the pressure and flow requirements identified in the Background section of this report and contained in WAC 246-290-230. Two improvement alternatives were identified to meet the needs of the proposed DOC development and are as follows.

- Alternative 1 includes the construction of approximately 2,000 linear feet (LF) of 12-inch PVC C900 DR-18 water main between the existing Grand Mound wastewater treatment plant and the proposed DOC development, shown as Segment A in the attached figure. Alternative 1 also includes approximately 3,025 LF of 12-inch PVC C900 DR-18 water main in 203rd Avenue SW between approximately Grand Mound Way and the existing 12-inch dead end main in 203rd Avenue SW, shown as Segment B in the attached figure.

- Alternative 2 also includes Segment A, as well as approximately 4,225 LF of 12-inch PVC C900 DR-18 water main in Grand Mound Way, between approximately 203rd Avenue SW and Old Highway 99, shown as Segment C in the attached figure.

A summary of the results of the analyses for the existing and future systems, including the analyses for both alternatives, is shown in **Table 13** for representative nodes in the system.

Table 13
Hydraulic Analyses Results

		Pressure Analysis (PHD Condition)			Fire Flow Analysis (MDD + FF Condition)			
		Pressure (psi)			Available Derated Fire Flow (gpm)			Target
Approximate Location	Node Number	Existing 2010	Alternative 1 2010 with DOC	Alternative 2 2010 with DOC	Existing 2010	Alternative 1 2010 with DOC	Alternative 2 2010 with DOC	Fire Flow (gpm)
Proposed DOC Development	J677	N/A	63	63	N/A	3,366	3,226	3,000
Grand Mound Way and Old Highway 99	H751	56	58	58	2,560	2,859	3,430	2,000
201st Avenue SW at Cul-de-Sac Entrance	H1127	58	58	58	2,232	3,193	3,080	2,000
Sargent Road and 196th Avenue SW	H1439	52	54	54	4,181	4,350	4,348	2,000
Sargent Road and SR 12	H501	53	55	55	3,919	4,070	4,069	2,000
Elderberry Street and 193rd Avenue SW	H391	51	53	53	3,043	3,177	3,176	2,000
Ivan Street SW and SR 12	H53	49	51	51	4,344	4,552	4,550	2,000
Ivan Way SW near Reservoir Outlet Tee	H9	52	54	54	4,495	4,691	4,689	2,000

The results of the pressure analyses indicate that there is adequate pressure throughout the distribution system with the proposed DOC development with either the proposed Alternative 1 or Alternative 2 improvements. The results of the fire flow analyses indicate that both the proposed Alternative 1 and Alternative 2 improvements will provide adequate fire flow to the proposed DOC development. However, Alternative 2 also significantly improves the fire flow availability in the existing Old Highway 99 12-inch dead end water main. This water main is flushed regularly for water quality purposes. The installation of Alternative 2 will reduce the length of this dead end by looping the water main and will improve these existing water quality concerns. Looping the water main also provides additional service redundancy for the system's largest water user, Great Wolf Lodge, in the event that the existing dead end 12-inch water main in Old Highway 99 is out of service for emergency or maintenance purposes. Although both Alternatives 1 and 2 will meet the requirements of the DOC development, Alternative 2 will provide greater benefit to the overall water system.

CONCLUSION

The proposed improvements necessary to meet DOH minimum pressure requirements during PHD conditions and the planning-level fire flow requirement during MDD conditions are shown in the attached figure and are listed below.

- Storage Improvements
  - An additional 254,000 gallons of useable storage, with the same base and overflow elevation of the existing 500,000 gallon reservoir, is required to resolve the projected storage deficiency with the proposed DOC development. Future demand projections should be evaluated prior to the construction of additional storage to adequately size a future storage facility to accommodate other projected growth throughout the system.
- Distribution and Transmission System Improvements
  - Alternative 1
    - Approximately 2,000 LF of 12-inch PVC C900 DR-18 water main between the existing Grand Mound wastewater treatment plant and the proposed DOC development (Segment A).
    - Approximately 3,025 LF of 12-inch PVC C900 DR-18 water main in 203rd Avenue SW between approximately Grand Mound Way and the existing 12-inch dead end main in 203rd Avenue SW (Segment B).
  - Alternative 2
    - Approximately 2,000 LF of 12-inch PVC C900 DR-18 water main between the existing Grand Mound wastewater treatment plant and the proposed DOC development (Segment A).
    - Approximately 4,225 LF of 12-inch PVC C900 DR-18 water main in Grand Mound Way, between approximately 203rd Avenue SW and Old Highway 99 (Segment C).

Although both alternatives provide adequate fire flow to the proposed DOC development, it is recommended that the Alternative 2 improvements be installed to improve fire flows and water quality concerns in the 12-inch dead end water main in Old Highway 99 at the southern end of the water system, and to provide redundant supply to the existing system's largest water user.

If you have any questions regarding the analyses, please feel free to call Michele at (425) 951-5394 or Tony at (425) 951-5312. Thank you for the opportunity to assist you with this project.

Sincerely,

RH2 ENGINEERING, INC.

MICHELE R. CAMPBELL
STATE OF WASHINGTON
41414
REGISTERED
PROFESSIONAL ENGINEER
1/31/12

Michele R. Campbell, P.E.
Project Manager

TONY V. PARDI
STATE OF WASHINGTON
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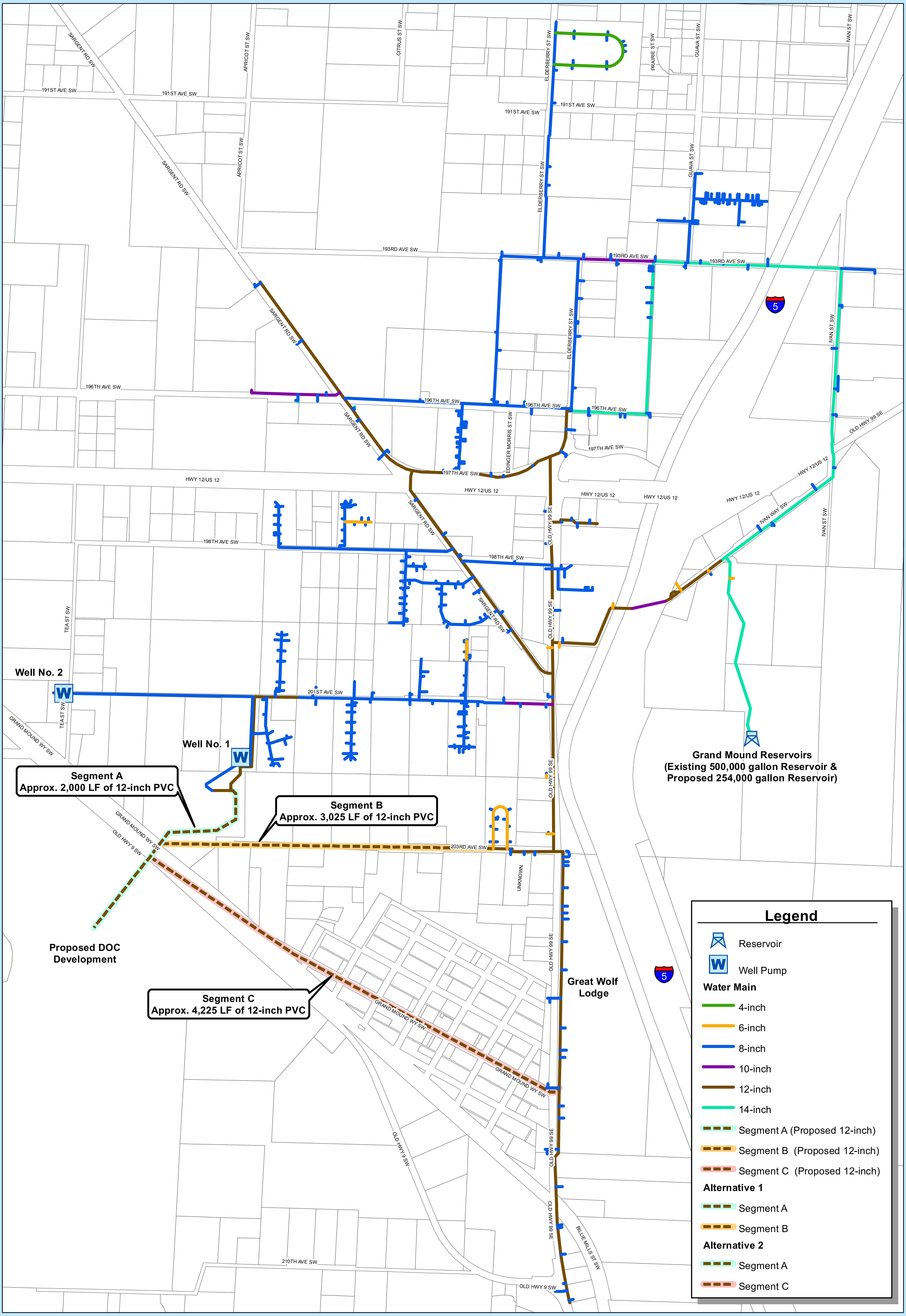
PROFESSIONAL ENGINEER
1/31/12

Tony V. Pardi, P.E.
Vice President

TVP/MRC/RMW/jq/mas

Attachments: Figure – Proposed Improvements for DOC Development



THURSTON COUNTY

GRAND MOUND WATER SYSTEM

0 200 400 800 Feet

1 inch = 400 feet

THURSTON COUNTY WASHINGTON SINCE 1852

PROPOSED IMPROVEMENTS FOR DOC DEVELOPMENT

Revision Date: 1/19/2012

RH2 ENGINEERS PLANNERS SCIENTISTS

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THURSTON COUNTY
WASHINGTON
SINCE 1852

Appendix H

Coliform Monitoring Plan

Disinfection Byproducts Sampling Plan

Coliform Sampling Procedure

Disinfectants & Disinfection Byproducts

Follow-up to an Unsatisfactory Coliform Sampling

Groundwater Rule

Groundwater Rule – Source Water Sampling Taps

Inorganic Chemical (IOC) Sampling Procedures

Lead and Copper Monitoring

Lead & Copper Monitoring & Reporting Guidance for Public Water Systems

Lead and Copper Sampling Procedures

Lead in drinking Water

Nitrate Public Health Advisory Packet

Nitrate Sampling Procedure
Grand Mound 2010 Confidence Report

Coliform Monitoring Plan

Update Date: December 15, 2011

General Information

Grand Mound Water System
Public Water System ID # 071580
Location - Thurston County

The County's coliform monitoring plan sample locations are shown on the map included in this plan. The water system consists of two ground water sources:

DOH Source Number	Source Name	Well Depth	Capacity
SOl	Well #I	62ft	462 GPM
S02	Well#2	60ft	529 GPM

GPM= Gallons per minute

All source water is treated at the Grand Mound Water Facility, at 20248 Grand Mound Way, prior to being consumed by any customers. Treatment consists of the addition of chlorine, as chlorine gas.

Treatment Location	Source Name	Treatment
20248 Grand Mound Way	SOl	Chlorine Gas /Sodium Hydroxide 25% solution ph adjustment
20248 Grand Mound Way	S02	Chlorine Gas /Sodium Hydroxide 25% solution ph adjustment

Chlorine Gas= One 150 lbs cylinder on site

The distribution system includes one 500,000-gallon reservoir.

Reservoir	Location	Capacity
Ivan Street Reservoir	5919 Ivan Street	.5MG
Total Capacity		.5MG

MG = Million Gallon

Sampling Information

The County must collect two (2) routine total Coliform samples per month. The County shall take these routine samples to determine the presence or absence of Coliform bacteria.

To represent the water consumed by all of the customers, it is important to collect samples from rotating sites in the main pressure zones. Site selection is also very important because each important because each sample must be collected without contamination from the sample collection. Currently the County utilizes dedicated sampling locations. In conjunction to sampling the system water, Thurston County also samples the raw water from each well. Well # 1 is done one month, then the following month Well # 2 is sampled. Then each well is sampled on a rotating basis throughout the year.

Field Equipment

Staff utilizes a Hach Model Chlorine and pH pocket colorimeter II for collecting chlorine residual levels for each Coliform sample. The Thurston County Health Laboratory conducts the Coliform analysis. The laboratory contacts the County for changes in normal hours of operation to ensure the County is able to alter the sampling schedule during holidays. A twenty-four hour contact number of the laboratory is kept in the Utility Operations Manager office in the event of an emergency.

In the event of a positive routine Coliform sample the laboratory must contact the County with 24 hours of confirmation of the positive sample. The County must repeat the sample at the location of the previous positive and a sample within 5-service connection upgradient and within 5-service connections downgradient for a total of three samples. These samples must be analyzed for total and fecal Coliform and be collected with 24 hours of the' notice from the laboratory. Each sample location is listed in one of the two routes included in this plan. Repeat routes are included that correspond to each routine route. Each repeat sample list contains the repeat address and both the upgradient and downgradient locations. If the County does not collect the confirmation samples or if the repeat sample is also positive, the County must follow their Public Notification Plan.

Coliform Monitoring Plan Maintenance

A copy of the current Coliform Monitoring Plan is kept at Thurston County Public Works, Utility Operations Managers office. Changes to the plan as sampling locations are modified, added or removed will be submitted to DOH for approval.

A. System Information

Water System Name Grand Mound Water System	**County** Thurston	**System I.D. Number** 07158-0
System Narrative	Sources: Well 1=462 gpm and Well 2= 529 gpm. Treatment: Chlorination and pH control both located at the Wastewater Treatment Plant. Distribution System: Single pressure zone. Water is pumped to the system and to the reservoir (500Kgal). ERU=282 gpd Residential ERU_{2012} =185;$Commercial_{2012}$ = 491	
Number of Routine Samples Required Monthly by Regulation:	Number of Sampling Sites Needed to Represent the Distribution System: 3	

B. Routine and Repeat Sample Locations

Location/Address for <u>Routine</u> Sample Sites	**Location/Address for <u>Repeat</u> Sample Sites**
X1. 192rd & Guava Street SW	***For 192rd & Guava Street SW*** 1-1. 5843 193rd Ave UW — US 1-2. 6011 193rd Ave DW — DS 1-3. 5845 192nd Ave UW — US
X2. 20500 Old Hwy 99 SW	***For 20500 Old Hwy 99 SW*** 2-1. 6130 203rd Ave SW — US 2-2. 20327 Old Hwy 99 SW — NS 2-3. 21001 Old Hwy 99 SW — DS
X3. 19603 Vision Dr. SW	***For 19603 Vision Dr. SW*** 3-1. 19610 Vision Dr. SW — DS 3-2. 6222 Edinger Morris Rd SW — DS 3-3. 6302 196th Ave SW — US

* US= upstream sample site, DS = downstream sample site

. Routine and Repeat Sample Locations – con't

Location/Address for **<u>Routine</u> Sample Sites**	**Location/Address for** **<u>Repeat</u> Sample Sites**	
X4. 6413 Tamarack Ave SW	***For 6413 Tamarack Ave SW***	
	4-1. 6317 199th Ave SW	DS
	4-2. 18817 Tamarack Ave SW	US
	4-3. 6217 119th Way SW	DS
X5. 201St & Old Hwy 99 SW	***For 201St & Old Hwy 99 SW***	
	5-2. 19747 Old Hwy 99 SW	US
	5-3. 20040 Ashbrook St SW	DS
	5-4. 19949 Old Hwy 99 SW	US

* US= upstream sample site, DS = downstream sample site

Raw water prior to treatment, from the source that is in use

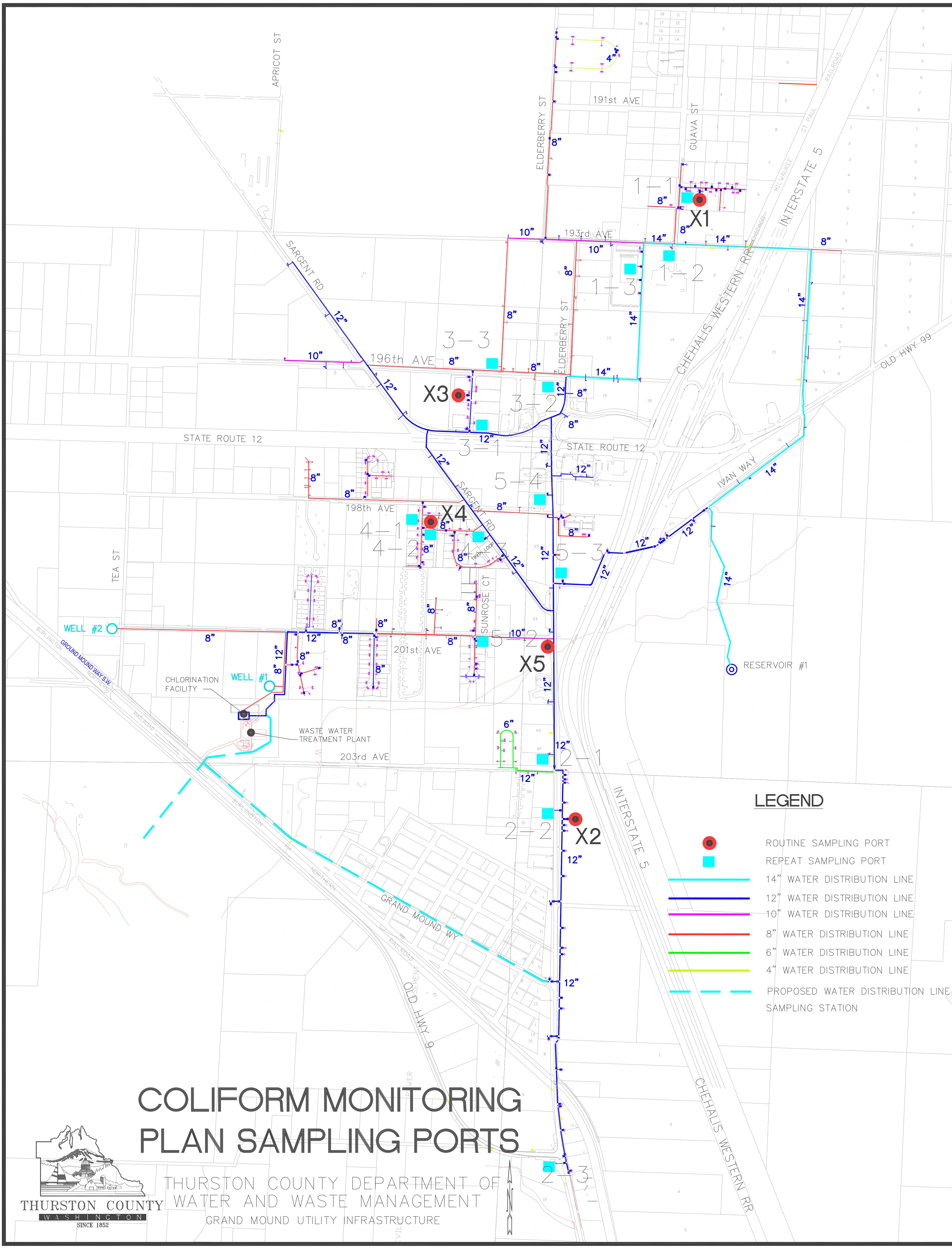
C. Routine Sample Rotation Schedule

Month	Location	Month	Location
January	1, 2, 3	July	1, 2, 3
February	4, 5	August	4, 5
March	1, 2, 3	September	1, 2, 3
April	4, 5	October	4, 5
May	1, 2, 3	November	1, 2, 3
June	4, 5	December	4, 5

D. Month Following Unsatisfactory Samples

E. Preparation Information

System Name Grand Mound Water System	**Date Plan completed**	**Dates Modified**
Name of Plan Preparer	**Position:**	**Daytime Phone #**
State Reviewer	**Date of Last Review**	


COLIFORM MONITORING
PLAN SAMPLING PORTS
THURSTON COUNTY DEPARTMENT OF
WATER AND WASTE MANAGEMENT
GRAND MOUND UTILITY INFRASTRUCTURE
THURSTON COUNTY
WASHINGTON
SINCE 1852
LEGEND
ROUTINE SAMPLING PORT
REPEAT SAMPLING PORT
14" WATER DISTRIBUTION LINE
12" WATER DISTRIBUTION LINE
10" WATER DISTRIBUTION LINE
8" WATER DISTRIBUTION LINE
6" WATER DISTRIBUTION LINE
4" WATER DISTRIBUTION LINE
PROPOSED WATER DISTRIBUTION LINE
SAMPLING STATION
X1
X2
X3
X4
X5
1–1
1–2
1–3
2–1
2–2
2–3
3–1
3–2
3–3
4–1
4–2
4–3
5–2
5–3
5–4
WELL #1
WELL #2
RESERVOIR #1
CHLORINATION FACILITY
WASTE WATER TREATMENT PLANT
APRICOT ST
ELDERBERRY ST
GUAVA ST
191st AVE
193rd AVE
196th AVE
198th AVE
201st AVE
203rd AVE
SARGENT RD
STATE ROUTE 12
TEA ST
SUNROSE CT
IVAN WAY
OLD HWY 99
OLD HWY 9
INTERSTATE 5
CHEHALIS WESTERN RR
GRAND MOUND WY
GROUND MOUND WAY S.W.
N

Grand Mound Water System

PWS System #071580

Sample Period 1

DATE	TIME	ADDRESS (Sample ID)	ZONE	pH	TEMP	CL2 Residual
__ / __ / __	__ __	Sample Port# 1 -193rd & Guava				
__ / __ / __	__ __	Well# 1 (Raw Source)	Special – Respond to schedule below			
__ / __ / __	__ __	Well# 2 (Raw Source)	Special – Respond to schedule below			
__ / __						

Sample schedule for Wells

(Well# 1 Sample Periods- January, March, May, July, September, November)

(Well #2 Sample Periods- February, April, June, August, October, December)

WAC Notes

Chapter 246-290-300: Minimum Coliform samples 2 per month. Presence of Coliform require repeat sample set within 24 hours of notification (a) site of previous presence, (b) within 5 services Upgradient and (c) 5 services Downgradient of site with presence. Repeat sites located by printing repeat form for address of positive sample!
Additional information is also available in the Coliform Monitoring Plan

TITLE: Superintendent *Printing Date* is *1110812003*

PREPARED By WDM III, CCS # SIGNATURE

Temperature in °C Bacteria counts is CFU/}.()0 mi. (NTU) Nephelometric Turbidity Units

Grand Mound Water System

PWS System #071580

Sample Period 2

DATE	TIME	ADDRESS (Sample ID)	ZONE	pH	TEMP	CL^2 Residual
_j_	_ _	Sample Port # 2-201st & Old Hwy 99				

WAC Notes

Chapter 246-290-300: Minimum Coliform samples 2 per month. Presence of Coliform require repeat sample set within 24 hours of notification (a) site of previous presence, (b) within 5 services Upgradient and (c) 5 services Downgradient of site with presence. Repeat sites located by printing repeat form for address of positive sample!
Additional information is also available in the Coliform Monitoring Plan

TITLE: Superintendent *Printing Date is 11/0812003*

PREPARED By WDM Ill, CCS # SIGNATURE

Temperature in °C Bacteria counts is CFU/100 ml. (NTU) Nephelometric Turbidity Units

May 2004

DOH PUB. #331 - 254

Fact Sheet

Disinfectants and Disinfection Byproducts

Stage 1 Rule

Background

Many water systems add chlorine or other disinfectants for treatment to destroy or inactivate microbial organisms. However, these disinfectants form disinfection byproducts (DBPs) when they react with naturally occurring organic substances in the water. Some disinfectants and DBPs cause cancer and reproductive effects in laboratory animals and may have bladder cancer and reproductive effects in humans. While there is no conclusive evidence that disinfectants or DBPs are associated with cancer or other health effects, the federal Environmental Protection Agency (EPA) issued the Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 DBPR) in 1998.

The purpose of Stage 1 DBPR is to improve public health protection by reducing exposure to disinfection byproducts (DBPs). The Washington State Department of Health incorporated the Stage 1 DBPR requirements into the drinking water regulations on April 27, 2003.

The Stage 1 DBPR establishes seven new standards and a treatment technique to further reduce DBP exposure. This rule applies to:

1) All community water systems and nontransient noncommunity (NTNC) water systems that continuously use chlorine, ozone, chloramines, or chlorine dioxide during any part of the treatment process.
2) Transient noncommunity (TNC) water systems that use chlorine dioxide.

The rule applies whether the chemical is used as a disinfectant or an oxidant.

Regulated Disinfectants

The Maximum Residual Disinfectant Levels (MRDL) for chlorine and chloramines is 4.0 mg/L as Cl_2. The MRDL for chlorine dioxide is 0.8 mg/L. Compliance with the MRDL for chlorine is based upon the running annual average (RAA) of residual measurements taken at the same time and place as routine or repeat coliform samples for 12 consecutive months. The RAA is calculated by finding the average of all included residual measurements for each month, adding 12 consecutive monthly averages together, and dividing the sum by 12. The RAA must be calculated at the end of each calendar quarter.

Regulated Disinfection Byproducts

The Stage 1DBPR regulates four DBPs. Since DBPs can continue to form as long as the organic substances and disinfectant are present, the highest concentrations are usually found at the farthest points of the system. The Maximum Contaminant Levels (MCL) and sampling requirements for DBPs are as follows:

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

HELPING TO ENSURE SAFE AND RELIABLE DRINKING WATER

Contaminant	MCL (mg/L)	Compliance
Total Trihalomethanes (TTHM)	0.080	RAA of Quarterly Averages
Five Haloacetic Acids (HAA5)	0.060	RAA of Quarterly Averages
Bromate	0.010	RAA of Monthly Averages
Chlorite	1.0	Daily

All community and NTNC systems using disinfectants must monitor for TTHMs and HAA5. Only systems using ozonation are required to monitor bromate. Systems that use chlorine dioxide must conduct daily chlorite monitoring. Bromate and chlorite must be monitored at the entry point to the distribution system. TTHM and HAA5 monitoring must be done according to the following table:

<table>
<tr><th>System Type</th><th>TTHM/HAA5 Samples</th><th>Location</th></tr>
<tr><td>Surface Water ≥ 10,000 persons</td><td>4/treatment plant/quarter</td><td>25% at maximum residence time
Others at average residence time</td></tr>
<tr><td>Surface Water 500 - 9,999 persons</td><td rowspan="2">1/treatment plant/quarter</td><td rowspan="2">At maximum residence time</td></tr>
<tr><td>Groundwater ≥ 10,000 persons</td></tr>
<tr><td>Surface Water < 500 persons</td><td rowspan="2">1/treatment plant/year in month of warmest water temperature</td><td rowspan="2">At maximum residence time</td></tr>
<tr><td>Groundwater < 10,000 persons</td></tr>
</table>

All systems, except for surface water systems serving less than 500 persons, may qualify for a reduced monitoring schedule for TTHM & HAA5 if sample results meet certain criteria.

Disinfection Byproduct Precursors

Systems providing conventional (sedimentation with filtration) surface water treatment must collect one raw water Total Organic Carbon (TOC) sample and one treated water TOC sample each month for each treatment plant. These systems must meet specified TOC percent removal levels or meet alternative compliance criteria each month to meet treatment technique requirements.

Monitoring Plans

Every affected system must develop a system-specific monitoring plan to be available for inspection by DOH and the public by January 31, 2004. Surface water systems serving more than 3,300 persons must submit their plans to DOH. All other systems should keep the plan in their system records until DOH specifically requests it. If a system wishes to demonstrate that multiple wells (other than a designated well field) are drawing from the same aquifer, thereby reducing their required monitoring, they must submit their monitoring plan with the required report.

For more information

"Chlorination of Drinking Water," DOH pub. # 331-253

"Disinfection Byproducts," DOH pub. #331-251

"Alternate Disinfectants," DOH pub. #331-252

This and other publications are available at http://www.doh.wa.gov/ehp/dw For additional copies of this publication, call (800) 521-0323.

If you need this publication in an alternate format, call (800) 525-0127. For TTY/TDD call (800) 833-6388.

Coliform Sampling Procedure

November 2010
(Revised)

DOH 331-225

Coliform Sampling Procedure

We recommend that you use the following steps when collecting your sample. If instructions from your laboratory are different, please call us for clarification.

Generally, the sample kit contains:

- A sample bottle
- A lab form
- A rubber band

Step One

Collect routine and repeat samples from sites throughout the distribution system according to your Coliform Monitoring Plan.

Choose a sample tap that represents the water in your distribution system. Avoid poor sample sites such as swivel faucets, hot and cold mixing faucets (with a single lever), leaky or spraying faucets, drinking fountains, janitorial sinks, frost-free hose bibs, and faucets below or near ground level.

Step Two

Remove any attachments from the faucet, including aerators, screens, washers, hoses, and water filters. If you choose to disinfect the sample site prior to sample collection, be sure to thoroughly flush until all disinfectant is removed.

Step Three

Turn on the cold water only and let it run with a steady stream for at least five minutes. Before collecting the sample, turn the water down to a thin stream (about the width of a pencil), then let the water run one minute. If the system is chlorinated, measure the chlorine residual and note the results on the lab slip.

Water conservation tip
You can save the flushed water in a bucket for later use.

Step Four
There may be some liquid or powder in the sample bottle to neutralize any chlorine that may be present. Do not rinse it out.

Step Five
To avoid contamination while taking the sample, hold the bottle near the bottom with one hand, hold the top of the cap with the other, and then unscrew the cap.

Do not set the cap down, touch any part of the cap that touches the bottle, or let anything touch the rim of the bottle or the inside of the cap.

Step Six
Hold the bottle under the stream of water. Be careful not to let the bottle touch the sample tap. Fill the bottle to the neck or indicated fill line, but do not allow it to overflow. Remove the bottle from the water flow and replace the cap.

Step Seven
Complete the lab slip. If there was anything unusual about the sample collection, note it on the lab slip.

Laboratory forms vary. It is important to include, the following:

- Water system ID number
- Water system name
- Collection date and time the sample was taken
- Type of sample (check ONLY ONE Type: Routine, Repeat, Raw, or For Information Only)
- Sample location (street address or other type of location identifier)
- System type (Group A or B)

Step Eight
Secure the lab slip to the bottle with the rubber band. Deliver the sample to a certified lab or to a designated drop-off location for the lab as soon as possible. Lab analysis must begin within 30 hours of sample collection.

For more information
If you have questions about coliform sampling collection procedures, call our regional office:

Eastern Region: Spokane Valley
(509) 329-2100

Northwest Region: Kent
(253) 395-6750

Southwest Region: Tumwater
(360) 236-3030

May 2004

DOH PUB. #331 - 254

Fact Sheet

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For more information

"Chlorination of Drinking Water," DOH pub. # 331-253

"Disinfection Byproducts," DOH pub. #331-251

"Alternate Disinfectants," DOH pub. #331-252

Fact Sheet

November 2007
DOH PUB. #331-187
(Revised)

Follow-up to an Unsatisfactory Coliform Sample

A drinking water sample is unsatisfactory whenever coliform bacteria are present. If your water system receives unsatisfactory sample results, you must collect a set of repeat samples within 24 hours.

The purpose of repeat samples is to confirm the presence of coliform bacteria in the system and determine possible causes of contamination. **Do not** shock-chlorinate the system before collecting repeat samples without prior approval from the Department of Health Office of Drinking Water (ODW).

Thoroughly inspect the water system

Try to identify potential sources of contamination, such as "openings" in the system and/or treatment equipment failure. Make needed repairs to your system. For help see *Troubleshooting Checklist for Coliform Contamination* (DOH Pub. #331-180).* If obvious sources of contamination are found, contact your ODW regional office at the number listed on back of this Fact Sheet.

Review your sampling procedure

Review your sampling procedure to make sure samples are taken correctly. For help see *Coliform Sampling Procedure* (DOH Pub. #331-225).*

Collect repeat samples

The number of required repeat samples is based on the number of routine samples your system collects monthly.

If your system collects ONE routine sample per month, a total of **FOUR REPEAT** samples are required from the following locations:

1. The same tap as the original unsatisfactory routine sample.
2. An active service within five active connections upstream from where the original unsatisfactory sample was taken.
3. An active service within five active connections downstream from where the original unsatisfactory sample was taken.

4. Another location – such as the source or right after the storage tank – that will provide useful information for determining a source of contamination. If you do not have a tap at the source or storage tank, choose another active service.

If a system collects TWO OR MORE routine samples per month, a total of **THREE REPEAT** samples are required from the following locations:

1. The same tap as the original unsatisfactory routine sample.
2. An active service within five active connections upstream from where the original unsatisfactory sample was taken.
3. An active service within five active connections downstream from where the original unsatisfactory sample was taken.

If you cannot sample as outlined above, or **if any repeat samples are unsatisfactory**, call your ODW regional office at the number listed below.

The month after an unsatisfactory sample

In the month following an unsatisfactory sample, a minimum of FIVE ROUTINE samples are required. These samples must be marked as "Routine" on the lab slips submitted with the samples.

If you usually take five or more samples each month, follow your regular schedule.

If any of these samples are unsatisfactory, further investigation and more repeat samples are required. Contact ODW for assistance.

For more information

Northwest Region – Kent
(253) 395-6750

Southwest Region – Olympia
(360) 236-3030

Eastern Region – Spokane
(509) 329-2100

* ODW publications are online at http://www4.doh.wa.gov/dw/publications/publications.cfm

PUBLIC HEALTH
ALWAYS WORKING FOR A SAFER AND
HEALTHIER WASHINGTON

October 2010

DOH 331-447
Revised

Groundwater Rule (GWR)

Effective November 1, 2010
Group A Public Water Supplies – Chapter 246-290 WAC

Background

To improve public health and protect drinking water sources, the Department of Health adopted the federal Groundwater Rule (GWR) on October 1, 2010. The rule builds upon the Total Coliform Rule (TCR) by addressing the health risks of fecal contamination in groundwater sources used by public water system.

Who is affected?

GWR applies to all Group A public water systems that:

- Rely entirely on one or more groundwater sources.
- Receive finished groundwater from another public water system.
- Mix surface water sources (or groundwater under the direct influence of surface water) with groundwater. *Systems that combine all of their sources before treatment are exempt from the rule.*

How are they affected?

The basic requirements of the Groundwater Rule include source water monitoring (triggered and assessment), compliance monitoring, sanitary surveys, corrective actions, and public notification.

Source Water Monitoring

Triggered Source Water Monitoring is required when one of your system's routine distribution samples collected under the TCR is total coliform positive. Within 24 hours of notification of the total coliform positive result, you must collect triggered source samples and have them tested for *E. coli.* You must test each source (prior to treatment) that was in operation at the time you collected the routine sample.

If one of your triggered source samples is *E. coli* positive, we will direct you to either take corrective action or take five additional source samples within 24 hours. If any of the five additional source samples is *E coli* positive, you must take corrective actions described on pages 3 and 4.

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

HELPING TO ENSURE SAFE AND RELIABLE DRINKING WATER

If you have more than one groundwater source, you may be able to reduce the number of source samples you must collect by submitting a **triggered source water monitoring plan.** This plan should include a system map that clearly identifies each source, routine coliform monitoring location, and any distribution system features that help identify the source associated with each sample location (such as pressure zones and isolation valves). We must approve this plan.

TIP: Your Coliform Monitoring Plan should have most of the information you need to submit a triggered source water monitoring plan.

Assessment Source Water Monitoring may be required on a case-by-case basis to evaluate sources that may be at risk for fecal contamination. This usually requires you to collect one source sample per month and have it tested for *E. coli*. We will work with you to determine how long you should sample and if any further action is required based on your results.

Other Source Monitoring Details

Small Systems: If your system serves 1,000 people or fewer and you have to collect a triggered source water sample, you can use this sample as both a triggered source water sample AND a repeat sample to meet the requirements of the Total Coliform Rule. In this case, an *E. coli* positive source water sample would result in an Acute Coliform MCL violation under the Total Coliform Rule.

Consecutive and Wholesale Systems: Consecutive systems (systems that purchase water) that receive total coliform positive sample results from a routine distribution sample must notify their wholesaler (the system selling the water) within 24 hours.

The wholesale system is required to sample all of their sources that were in operation on the date the consecutive system's positive routine sample was collected. There may be exceptions to this monitoring, so wholesale systems are encouraged to contact the department as soon as they get notice from a consecutive system.

Sample Location and Size: You must collect all source water samples at the source prior to treatment. If you are unable to meet these conditions, you may request an alternative sample location by contacting the department. All *E. coli* samples must be at least 100 milliliters (mL) and analyzed by an accredited laboratory using EPA-approved methods.

Compliance Monitoring

Compliance monitoring confirms the effectiveness and reliability of your system's treatment. If you provide 4-log treatment of viruses AND perform compliance monitoring, you won't have to meet the triggered source water monitoring requirements. The treatment must be approved by the department and located before your first customer.

4-log Treatment

Systems that provide 4-log treatment of viruses can avoid taking triggered source water monitoring samples by conducting compliance monitoring. You must notify the department you intend to exercise this option.

For chemical disinfection, you must monitor the residual concentration daily before the first customer during peak flow, and continuously monitor if you serve more than 3,300 people. Your tests must confirm you are providing a chlorine residual high enough to maintain 4-log treatment. Membrane and alternative treatment technologies must be approved and be operated and maintained as specified by the department.

You will be in violation if you fail to monitor, report, or provide adequate treatment. At a minimum, you will be required to send public notification to your customers.

Systems providing 4-log treatment that is not the result of a corrective action or state mandate may choose to do trigger source water monitoring instead of compliance monitoring.

For more information on 4-log treatment or if you provide disinfection and are not sure if it meets 4-log inactivation, contact your regional office listed on page 5.

Sanitary Surveys and Corrective Actions

GWR increases the required frequency of sanitary surveys for community water systems from once every 5 years to once every 3 years. A community water system may be allowed to stay on a 5-year schedule if it meets one of the following criteria:

1. Provides 4-log treatment of viruses for all groundwater sources.

   OR

2. Has no total coliform MCL violations, has no more than one total coliform monitoring violation since the last survey, and has no unresolved significant deficiencies in the current survey.

For information on sanitary surveys, visit our website at http://www.doh.wa.gov/ehp/dw/Programs/sanitary_survey.htm

GWR requires you to take corrective action when you have a significant deficiency or when a source water sample is *E. coli* positive. A significant deficiency is defined as “a defect in the design, operation, or maintenance, or a failure or malfunction of the sources, treatment, storage, or distribution system that the department determines to be causing, or have the potential for causing, the introduction of contamination into the water delivered to consumers.”

If left unaddressed, a significant deficiency may have the potential of causing a health risk to your customers. These deficiencies can occur at anytime, but more often they are detected during a sanitary survey.

Corrective actions can involve one or more of the following:

- Correct all significant deficiencies.
- Provide an alternative source of water.
- Eliminate the source of contamination.
- Provide 4-log treatment.

Your sanitary survey report will identify any deficiencies you need to address. If the report doesn't identify specific actions needed to correct the problem, you must contact us within 30 days to determine corrective actions. Your system has 45 days to either complete corrective actions or comply with a corrective action plan.

Public Notification

There are several situations and violations in the Groundwater Rule that require public notification. The table outlines these violations, the type of notification required, and the system type each apply to Consumer Confidence Report (CCR) requirements only apply to community systems:

Issue	Notification Required	System Type
E. coli positive groundwater source sample[1]	Tier 1 PN, CCR, Special Notification	Community and Noncommunity
Failure to take corrective action within 120 days of notification	Tier 2 PN, CCR, Special Notification	Community and Noncommunity
Failure to maintain at least 4-log treatment of viruses	Tier 2 PN, CCR	Community and Noncommunity
Failure to meet monitoring requirements	Tier 3 PN, CCR	Community and Noncommunity
Uncorrected significant deficiency[2]	Special Notice in CCR (COMM) Special Notice (NCWS)	Community Noncommunity
Unaddressed *E. coli* positive groundwater source sample[3]	Special Notice in CCR	Community

1. Consecutive systems served by the groundwater source must also notify the public.
2. Systems must continue to notify the public annually until they correct the significant deficiency.
3. Community systems must put a notice in the CCR annually until the positive source water sample has been addressed.

Systems that receive an *E. coli* positive result in a source water sample must notify their customers within 24 hours of getting their results.

Wholesale systems who receive *E. coli* positive results must notify all consecutive systems who receive the source water and all of their customers within 24 hours. The consecutive system must then notify all of their customers within 24 hours of notification from the wholesale system.

It is important to contact us as soon as possible if you receive an *E. coli* positive sample result. For more information on public notification requirements and resources, visit our website at http://www.doh.wa.gov/ehp/dw/fact_sheets/public_notification.htm

Resources

EPA has developed several guidance documents and fact sheets to assist water systems with the requirements of the rule:

- Compliance Help—includes Quick Reference Guides, Fact Sheets, and full guidance manuals: http://www.epa.gov/safewater/disinfection/gwr/compliancehelp.html
- Basic Information—includes several questions and answers: http://www.epa.gov/safewater/disinfection/gwr/basicinformation.html

The Office of Drinking has developed tools to help you as well:

- Groundwater Rule: Source Water Sample Taps (DOH 331-436): http://www.doh.wa.gov/ehp/dw/Publications/331-436.pdf

For more information

Staff from our regional offices are available to provide technical assistance, especially with source water sampling and *E. coli* positive results. Please contact them at:

Northwest Regional Office—Kent
Coliform Program: (253) 395-6775 Main Office: (253) 395-6750

Southwest Regional Office—Tumwater
Coliform Program: (360) 236-3044 Main Office: (360) 236-3030

Eastern Regional Office—Spokane Valley
Coliform Program: (509) 329-2134 Main Office: (509) 329-2100

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July 2010

DOH 331-436
Revised

Groundwater Rule:
Source Water Sample Taps

The Groundwater Rule (GWR) requires all Group A water systems with groundwater sources to sample each groundwater source for *E. coli* within 24 hours after a distribution system sample is unsatisfactory for total coliform, unless they routinely:

- Disinfect to meet the standard of 4-log virus inactivation (99.99 percent).
- Complete the associated daily compliance monitoring.

Operators must collect these samples as close to the source as possible and before any treatment facilities, pressure tanks, or storage tanks.

To meet these monitoring requirements, the Department of Health Office of Drinking Water (DOH) expects all water systems to have properly installed sample taps at each groundwater source.

What is the difference between a "GWR source sample tap" and a "chemical source monitoring sample tap"?

The GWR source sample tap is located as close to the source as possible and before any treatment. A chemical source monitoring sample tap is located after all treatment but prior to the first distribution connection.

Where should I install a GWR source-water sample tap?

Install GWR source sample taps as close to the source as possible and prior to all treatment facilities, pressure tanks, and storage tanks.

Poorly installed GWR sample taps make it difficult to use proper sampling techniques and increase the risk of contaminating a sample during collection.

GWR sample taps should:

- **Point downward**.
- **Be in a clean, accessible location.** Fecal matter may contaminate samples collected at sites with animal infestations such as bats, birds, or rodents. Sample taps buried in wood chips or wrapped in loose insulation can become contaminated.
- **Be at least 12 inches above the floor or ground level.** When taps are lower than that, water containing coliform bacteria is more likely to backsplash into the sample bottle.
- **Be located where water from flushing the tap for 5 minutes can easily drain away.**

What type of GWR source-water sample taps do I need?

If you have to install new GWR sample taps, select a smooth-nosed model with no interior or exterior threads, and no screen, aerator, or other attached appurtenances. Use the following information to evaluate whether existing source-water sample taps are adequate.

- A source-water sample tap should not be a swivel faucet, hot-and-cold mixing faucet, frost-free sillcock, petcock, plastic sample tap, drinking fountain, janitorial sink, fire hydrant, or blow-off.
- Do not use a yard hydrant. See discussion below on wells with pitless units.
- Avoid swinging faucets and faucets with risers**.**

Where do I install a GWR source-sample tap for a well with a pitless unit?

Consult with your DOH regional office for the best way to locate a GWR sample tap for your well with a pitless unit. A well with a pitless unit may have a frost-free yard hydrant installed next to the wellhead. In general, you should avoid all yard hydrants for coliform sample collection. Regular frost-free yard hydrants have weep holes that drain the water from the riser. These same holes can allow contaminated water into the hydrant. Although “sanitary” hydrants do not have weep holes, you should not use them for bacteriological sampling.

Can I locate a GWR sample tap after treatment that is not disinfection?

You should install the GWR source sample tap prior to all treatment facilities if possible, including water softeners, cartridge filters, carbon filters, chemical injection points, and so on. DOH may allow samples after treatment on a case-by-case basis and only if the treatment will have no impact on microbial quality of the source water and it is not possible to directly sample the untreated water. You must have prior approval from the department before collecting samples after treatment.

You need to understand how your water system plumbing functions to be sure you install the tap where it will definitely sample the source water. This is especially important if there are multiple sources and complex treatment-control systems. DOH may approve of bypassing a treatment system to collect a source water sample, but you should avoid that if possible.

Can I install a GWR source sample tap near a bladder pressure tank?

It is not ideal to do so. If that it is your only choice, take special care when using the tap. Pressure tanks are a potential source of contamination from sediment build-up, damaged bladders, biofilm growth, or stagnant water. If you collect a sample from a tap located near a pressure tank while the well pump is not operating, the sample will actually be from the water in the tank rather than the source water.

What should I do if I don't have an ideal GWR sample site or sample tap?

Now is the time to install the best type of GWR sample tap possible in the best location.

If a system's configuration does not allow for sampling at the source itself, DOH may approve a different sampling location if it will provide samples that represent the quality of that groundwater source.

How do I locate a GWR sample tap for a well field or spring field?

You must install a faucet on the common manifold before any treatment. This will allow you to collect a raw-water source sample that represents a blend of all the operating wells in the well field or the operating springs in a spring field.

How do I locate a GWR source sample tap for a well with a hand pump?

There is no discharge piping associated with hand pumps, so you will have to collect a source sample directly from the discharge of the hand pump.

Does the condition of the GWR sample tap make a difference?

Yes. Dirty or leaking sample taps increase the risks of an unsatisfactory result that may not represent the true quality of the source water. Sample taps should not be dripping faucets or faucets that leak around the valve stem or base.

How do I ensure the GWR source sample tap will actually sample source water?

The person who will use the GWR source sample tap must know how the system operates. If there are multiple sources or complicated treatment-control systems, that person also must ensure that it is possible to sample each source individually. Even with a simple one-well system, it is possible to sample the wrong water.

The key to successfully using a GWR source sample tap is to **make sure the well pump is operating when you collect the sample**. If the well pump is not operating, the sample will be from the distribution system, a pressure tank, or a storage tank instead of source water.

For more information

Call your DOH regional office:

Eastern Region:	Spokane Valley (509) 329-2100
Northwest Region:	Kent (253) 395-6750
Southwest Region:	Tumwater (360) 236-3030

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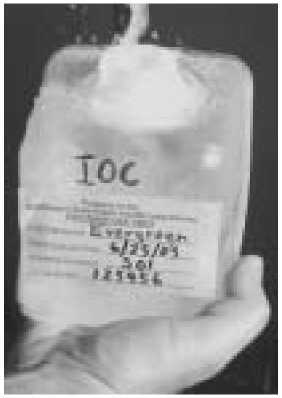
STEP SIX

Fill sample container to the shoulder of the bottle. If using a collapsible type sample bottle, be sure to expand the sample container before filling by gently blowing into the mouth of the container.



STEP SEVEN

Keep the samples refrigerated until you are ready to ship. Once samples are ready to be shipped, package samples, frozen chemical cold pack, and completed sample information form into a container and ship to the laboratory within 24 hours.

If you have questions about sampling collection procedures, contact your regional office:

Southwest Region: Tumwater
(360) 236-3030

Northwest Region: Kent
(253) 395-6750

Eastern Region: Spokane Valley
(509) 329-2100

If you need this publication in an alternate format, call (800) 525-0127. For TTY/TDD, call (800) 833-6388.

INORGANIC CHEMICAL (IOC)

SAMPLING PROCEDURE

July 2003
DOH PUB #331-221

Washington State Department of Health
ENVIRONMENTAL HEALTH PROGRAMS
DIVISION OF DRINKING WATER

INORGANIC CHEMICAL SAMPLING PROCEDURE

This brochure provides general information on how to collect an inorganic chemical sample. Steps and procedures can vary depending on the laboratory that is used so you should follow the instructions that are provided by the laboratory you are using.

The general sampling procedure for inorganic chemical analysis is as follows:

STEP ONE

Freeze the chemical cold pack before collecting samples.

STEP TWO

Locate a sampling tap that is after treatment (if applicable) but prior to entry to the distribution system.

STEP THREE

Remove any attachment from the tap such as hoses, filters, screens, or aerators.

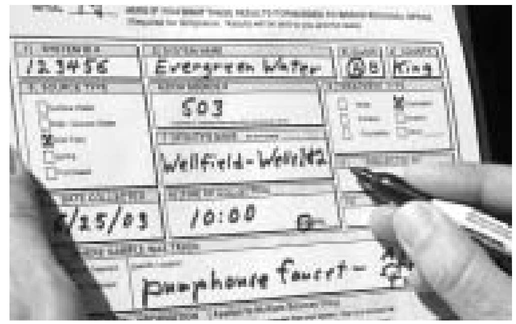
STEP FOUR

Flush the water for about 10 minutes or until the water temperature reaches a constant temperature.

STEP FIVE

While the water is running and before collecting the sample, fill out COMPLETELY the laboratory form and sample label. Laboratory forms vary, but the following information is very important to complete:

- Water System ID number
- Water System name
- DOH source number (i.e., SO1)
- Sample type and sample purpose (usually “RC” for routine compliance sample)
- Collection date and time the sample was taken
- Sample location (specific location where the sample was collected, for example “pumphouse tap”)
- System type (i.e., Group A or B)
- Sample type (i.e., pre-treatment/ raw or post-treatment/finished)



December 2009
DOH 331-111

Lead and Copper Monitoring

Guidance for public water system operators

All Group A community and nontransient noncommunity public water systems must monitor lead and copper levels in drinking water. The state Department of Health (DOH) requires this monitoring to minimize the amount of lead and copper consumers get from drinking water.

Unlike other contaminants, lead and copper do not commonly occur in source water. Instead, they result when building plumbing, faucets, and water fixtures corrode. Therefore, the purpose of this monitoring is to determine if water systems are distributing corrosive water. Systems with corrosive water must investigate and determine the best way to control corrosion.

For infants and young children, elevated levels of lead can lower birth weights and slow normal physical and mental development. For adults, it can damage kidneys, slightly increase blood pressure, and impair reproductive function. High levels of copper can cause nausea and diarrhea.

Distribution System Monitoring Requirements

Lead and copper requirements involve both initial and reduced monitoring. To ensure monitoring results represent the entire community, we base the number of water tap samples to be analyzed on population.

Initial monitoring: Collect samples from a full number of sample sites (see table) within a set 6-month period, and then a second full number of samples during the next 6 months. If both sample sets are at or below the action levels for lead and copper, the water system is eligible for a reduced monitoring schedule.

Tap Samples Required for Lead and Copper Monitoring

Population Served	Initial Monitoring – Number of sample sites	Reduced Monitoring – Number of sample sites
More than 100,000	100	50
10,001 to 100,000	60	30
3,301 to 10,000	40	20
501 to 3,300	20	10
101 to 500	10	5
100 or Fewer	5	5

Reduced monitoring: If both initial sample sets are at or below the action levels for lead and copper, the system qualifies for reduced monitoring at fewer sample sites (see table). You must take samples between June and September in each of the following 2 years. If these samples also are at or below the action levels, monitoring is reduced to once every 3 years between June and September.

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water
HELPING TO ENSURE SAFE AND RELIABLE DRINKING WATER

Selecting Sample Sites

Systems should collect water samples from homes most vulnerable to lead and copper corrosion. Generally, these are homes built between 1982 and 1987 with copper pipes.

You will need homeowners to volunteer to collect the samples. If you can't find the full number of sample sites, you can use older homes or homes with other plumbing materials. You can also consider sampling at homes with plastic service lines and plastic interior plumbing for monitoring because water fixtures remain a source of lead and copper in tap water. Faucets can contain as much as 8 percent lead by weight.

It is best not to include homes with recent plumbing repairs or replacement. These activities can loosen scale build-up on the interior wall of pipes, which may contain lead and could result in abnormally high lead results. You may change locations for reduced sampling if an original sample site is no longer available.

For sample site selection criteria, see the U.S. Environmental Protection Agency (EPA) publication, ***Lead and Copper Monitoring and Reporting Guidance for Public Water Systems* (816-R-02-009)***

Sample Collection Procedures

You should collect samples from cold-water taps that are undisturbed for at least 6 hours, but no more than 12 hours. Therefore, ask homeowners to take samples first thing in the morning.

This minimum 6-hour standing time helps to standardize the test results. It also reflects EPA's findings that standing water is a major portion of the water that people drink.

Lead and copper levels increase as long as water stands in a home's plumbing system. Lead levels can increase significantly even after only 2 hours of non-use. Water that stands longer than 12 hours may have high lead and copper levels that do not represent typical conditions.

Be sure to provide instructions for homeowners who are collecting samples. Step-by-step sampling procedures are in DOH's ***Lead and Copper Sampling Procedure*** **(331-227).***

Action Levels

The "action level" is the amount of lead or copper that triggers the requirement for a water system to investigate and determine the best way to control corrosion.

The action levels are: **0.015 milligrams per liter (mg/L) for lead**
1.3 mg/L for copper

We determine your action level by evaluating all samples you collect during the monitoring period. Your water system has an action level exceedance if more than 10 percent of your results are higher than the action levels shown above. This is commonly called your 90^{th} percentile level. When you receive the sampling results from your lab, send them to us. We will calculate the 90^{th} percentile, and contact you if the results exceed an action level. (Check with your lab; some labs will submit results to DOH for you).

Exceeding an Action Level

Water systems exceeding the action level for lead or copper must begin follow-up investigations immediately. DOH may require them to make improvements or operational changes to make the water less corrosive.

Water systems that exceed the lead action level must begin a public education campaign that includes specific language. If you need help, call your DOH regional office.

Corrosion control treatment strategies and requirements
EPA developed the following publications:

Lead and Copper Monitoring and Reporting Guidance for Public Water Systems* (816-R-02-009)

Revised Guidance Manual for Selecting Lead and Copper Control Strategies* (816-R-03-001)

Provide sample results to each homeowner

You must give the homeowners in your sampling program the results of the tests you took in their homes within 30 days of receiving the results yourself. Providing these results is an incentive for customers and can actually help you recruit participants for your sampling program. You must also submit certification that you completed this notification to the state within 3 months of delivering your notices. If you need help, call your DOH regional office.

The health effects of lead and copper

Two DOH fact sheets explain how these elements get into drinking water and health effects related to drinking water high in lead or copper:

Copper in Drinking Water* (331-178)

Lead in Drinking Water* (331-177)

Resources

Department of Health Regional Lead Copper Staff

Eastern Region, Spokane	(509) 329-2100
Northwest Region, Kent	(253) 395-6750
Southwest Region, Tumwater	(360) 236-3030

***Publications**
The publications referenced in this document are on DOH's Web site at https://fortress.wa.gov/doh/eh/dw/publications/publications.cfm

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Lead and Copper Monitoring and Reporting Guidance for Public Water Systems

Office of Water
(4606M)
EPA-816-R-02-009
www.epa.gov
February 2002

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Disclaimer

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List of Acronyms and Abbreviations

AL	Action level
ALE	Action level exceedance
CCT	Corrosion control treatment
Cu	Copper
CWS	Community water system
EP	Entry point
GUDI	Ground water under the direct influence of surface water
HNO_3	Nitric Acid
LCR	Lead and Copper Rule
LCRMR	Lead and Copper Rule Minor Revisions
LSL	Lead service line
MCL	Maximum contaminant level
MDL	Method detection limit
MFR	Multi-family residence
mg/L	Milligrams per liter
MPL	Maximum permissible level
NTNCWS	Non-transient, non-community water system
OCCT	Optimal corrosion control treatment
OWQP	Optimal water quality parameter
Pb	Lead
ppb	Parts per billion
PQL	Practical quantitation level
PSA	Public service announcement
PWS	Public water system
QA/QC	Quality assurance/Quality control
SFR	Single family residence
SMF	Standardized monitoring framework
SOWT	Source water treatment
WQP	Water quality parameter

Lead and Copper Rule Monitoring and Reporting Guidance for Public Water Systems

CHAPTER I: INTRODUCTION

What Is the Purpose of this Guidance Document?

On June 7, 1991, the United States Environmental Protection Agency or EPA, published in the *Federal Register*, a regulation to control lead and copper in drinking water. This regulation is known as the Lead and Copper Rule (also referred to as the LCR or 1991 Rule throughout this document).

On January 12, 2000, EPA published minor revisions to the 1991 Rule. The purpose of the Lead and Copper Rule Minor Revisions (LCRMR) is to eliminate unnecessary requirements, streamline and reduce monitoring and reporting burdens, and promote consistent national implementation. In some cases, EPA has added language which clarifies requirements and corrects oversights in the original rule. EPA calls the revisions "minor" because they do not affect the lead and copper maximum contaminant level goals, action levels, or other basic regulatory requirements to monitor for lead and copper at the tap and to optimize corrosion control.

This guidance document has been developed for you, the water system owner and operator of . It provides a comprehensive discussion of the monitoring and monitoring-related reporting requirements of the LCR, as amended by the LCRMR. Some of the LCRMR provisions are clarifications to the LCR are more stringent than the LCR. These are revisions for which you and your States were required to begin implementation on April 11, 2000. Some of the revisions are less stringent than the LCR (e.g., allow a reduction in monitoring if specific criteria are met) and you may not be able to implement them because your State has chosen not to adopt these provisions or has not yet incorporated these provisions into its State's drinking water regulations. Therefore, you should first check with your State before following any of these "less stringent" provisions. For water systems on Tribal lands, or located in Wyoming or the District of Columbia, the Federal version of the entire LCRMR applies. Therefore, you were able to take advantage of the burden reduction requirements of the LCRMR on April 11, 2000.

EPA recognizes that majority of systems already have their monitoring programs underway but believes that systems will find this document useful in understanding the modifications to the monitoring and reporting requirements resulting from the LCRMR.

How Is This Document Organized?

The document contains five chapters, including this introduction and a discussion of the four monitoring protocols contained in the LCR. These chapters are listed below.

- ✰ Chapter I: Introduction
- ✰ Chapter II: Lead and Copper Tap Water Monitoring and Reporting Requirements
- ✰ Chapter III: Water Quality Parameter Monitoring and Reporting Requirements
- ✰ Chapter IV: Lead and Copper Source Water Monitoring and Reporting Requirements
- ✰ Chapter V: Lead Service Line Monitoring and Reporting Requirements

Chapter I includes a discussion of the purpose of the lead and copper regulations, and an overview of the corrosion control treatment, source water treatment, public education, and lead service line replacement requirements. Chapters II through V address the following topics:

- The purpose of the sample collection;
- Which systems are subject to the monitoring requirements;
- When, where, and how to conduct the monitoring; ow to evaluate the results;
- What happens if the system does not meet its requirements;
- Criteria that allows a system to reduce and/or eliminate its monitoring requirements;

Information that must be reported to the State;

- How the LCRMR have impacted monitoring and reporting requirements; and
- Key points to remember.

Chapter II also contains a detailed discussion on how to calculate 90th percentile levels and an explanation of monitoring requirements for systems that purchase water from another system.

Please note that parenthetical references to the Code of Federal Regulations, Chapter 40 (i.e., EPA's regulations) are included throughout the document so that system owners and operators can consult the federal regulations for further details. Note also that the term "State" is used throughout the guidance document to refer to the government agency that enforces compliance with drinking water regulations and assists you in understanding and implementing these regulations. For most systems, this is an organization within the State government (e.g., Department of Natural Resources, Department of Environmental Quality, Department of Health). For the District of Columbia, Wyoming, and Native American Lands, the contact is often from the respective EPA Regional Office.

This guidance document focuses on those revisions that impact monitoring and reporting requirements. Those revisions that are unrelated to monitoring and reporting requirements are discussed in more detail in separate guidance documents. For example, the guidance document, entitled, *Lead and Copper Rule: Summary of Revisions,* April 2000, EPA 815-R-99-020, contains a discussion of each of the important changes made to the 1991 Rule by the LCRMR by major rule section (e.g., §141.81, §141.82, etc.), and identifies when you must begin complying with the new requirements. It also contains an appendix which compares the rule language of the LCR against the minor revisions. All available guidance documents, can be obtained by contacting the Safe Drinking Water Hotline at (800) 426-4791 or via the EPA website: www.epa.gov/safewater/leadcop.html. A list of key documents is provided as Appendix A.

Also included are five appendices to this document:

- ✰ Appendix A: List of LCRMR Outreach Materials for Water Systems.
- ✰ Appendix B: Definitions that explain the terms used in this guidance.
- ✰ Appendix C: Timelines that illustrate the schedule for corrosion control treatment (if applicable), lead and copper tap monitoring, and water quality parameters (if applicable).
- ✰ Appendix D: Summary of Monitoring and Reporting Violations.
- ✰ Appendix E: Worksheets and instructions to assist in identifying sampling sites, sample collection, and the documentation and justification of decisions.

What Is the Purpose of the Lead and Copper Regulations? (See §141.80 & §141.81(b))

The purpose of the lead and copper regulations is to protect public health by minimizing lead and copper levels in drinking water. Most regulations require sampling at entry points to the distribution system. Because lead and copper in drinking water is primarily due to the corrosion of distribution and household plumbing materials, tap water samples are collected at kitchen or bathroom taps of residences and other buildings. This requirement significantly complicates sample collection, requiring you, the water system, to coordinate with the people you serve.

What Systems Are Affected by the Lead and Copper Regulations? (See §141.80(a))

Lead and copper tap monitoring applies to all community water systems (CWSs) and non-transient, non-community water systems (NTNCWSs). The regulations divide these systems into three broad size categories (large, medium, and small). System size is a factor in determining the number of samples that must be collected, as well as the applicability and timing of some of the provisions.

Size	No. of people served
Small	25 - 3,300
Medium	3,301 - 50,000
Large	over 50,000

What Are the Requirements of the Lead and Copper Regulations? (See §§141.80-141.91)

Tap monitoring results are the primary factor for determining your ongoing monitoring requirements and whether you need to undertake any of the following treatment technique requirements:

- Corrosion control treatment;
- Source water treatment;
- Public education; and/or
- Lead service line replacement.

There is no maximum contaminant level (MCL) for lead or copper. However, if your lead and copper tap monitoring results are higher than the lead action level of 0.015 milligrams per liter (mg/l) and/or the copper action level of 1.3 mg/L, corrosion control treatment is required. To determine whether an action level has been exceeded, the value at the 90th percentile of all lead or copper samples collected is compared against its respective action level. This means that no more than 10 percent of your samples can be above either action level. An explanation of how to calculate the 90th percentile levels is provided in Chapter II.

If your 90th percentile level exceeds the lead action level of 0.015 mg/L, you must:

- Begin corrosion control treatment steps which include water quality parameter (WQP) monitoring during the same monitoring period in which the exceedance occurs;
- Conduct source water monitoring within 6 months of the exceedance and install source water treatment, if needed;
- Deliver public education within 60 days of the exceedance that informs your users about the health effects of lead and measures that will reduce their exposure to lead; and
- Replace lead service lines if you still exceed the lead action level after installing treatment.

If your 90th percentile level exceeds the copper action level of 1.3 mg/L, you must:

- Begin corrosion control treatment steps which include WQP monitoring during the same monitoring period in which the exceedance occurs; and
- Conduct source water monitoring within 6 months of the exceedance and install source water treatment, if needed.

> ✎ **Note:** Public education and lead service line replacement are not required if only the copper action level is exceeded.

A basic requirement of the lead and copper regulations is for systems to optimize corrosion control. This means that the water system is delivering water that is minimally corrosive, thereby reducing the likelihood that lead and copper will be introduced into the drinking water from the corrosion of lead and copper plumbing materials. Some systems have naturally non-corrosive water and would not benefit from installing treatment. Others installed corrosion control treatment prior to the effective date of the original LCR (i.e., December 7, 1992). Still other systems must install corrosion control to reduce the corrosivity of their water and thereby, their lead and copper levels.

A State can deem a system to have optimized corrosion control in one of the three ways that are listed below. For some systems, this can happen without installing treatment. As discussed in more detail later in this document, systems that have optimized corrosion control have fewer monitoring and/or treatment requirements.

You can be deemed to have optimized corrosion control if:

1. You are a small or medium system (i.e., serve 50,000 or fewer people) and your 90th percentile levels are at or below both the lead and copper action levels for 2, consecutive, 6-month monitoring periods. EPA also refers to these systems as "(b)(1) systems" because they meet the requirements of §141.81(b)(1) of the federal version of the lead and copper regulations.

2. You already have treatment in place, prior to the effective date of the 1991 LCR (i.e., prior to 12/7/92) and have conducted activities equivalent to those outlined in §141.81(b)(2). EPA also refers to these systems as "(b)(2) systems ".

3. You demonstrate that the difference between the 90th percentile tap water lead level and the highest source water lead level is less than 0.005 mg/L. To make this demonstration, you must collect tap water samples for lead at the standard number of sites (see Table 2-2), and source water samples for lead at each entry point to the distribution system during each of 2, consecutive, 6-month monitoring periods. EPA also refers to these systems as "(b)(3) systems" because these criteria are specified in §141.81(b)(3) of the regulations.

4. You demonstrate that for 2, consecutive, 6-month periods your source water lead levels are below the method detection limit (MDL) ***and*** your 90th percentile lead levels are less than or equal to the practical quantitation level (PQL) of 0.005 mg/L. This ***new*** criterion was added in the LCRMR because systems with undetectable source water lead levels and low 90th percentile lead levels could be precluded from qualifying as a (b)(3) system under the 1991 LCR. This is because source water levels that are below the MDL must be reported as 0; whereas, levels above the MDL, but less than 0.005 mg/L must be reported as 0.0025 mg/L which is half the PQL. This point is more clearly illustrated in the following two examples.

Example 1: A system with source water lead levels just below a MDL of 0.001 mg/L and a 90th percentile tap level of 0.005 mg/L would not be deemed to be optimized using the 1991 LCR (b)(3) criteria, which requires the difference to be ***less than*** 0.005 mg/L. The difference here would be 0.005 mg/L, as shown in the following equation: 0.005 mg/L - 0 mg/L = 0.005 mg/L.

Example 2: With a lead MDL of 0.001 mg/L, a system with source water levels of 0.002 mg/L and a 90th percentile of 0.0050 mg/L would be optimized under the 1991 LCR criteria because the source levels could be reported as 0.0025 mg/L. The difference here would be 0.0025 mg/L, as shown in the following equation: 0.0050 mg/L - 0.0025 mg/L = 0.0025 mg/L.

> ✎ **Note:** The LCRMR also clarify that a (b)(3) system's 90th percentile cannot exceed the copper action level of 1.3 mg/L. The 1991 LCR did not include copper levels as part of the (b)(3) criteria. A (b)(3) system that exceeds the copper action level after July 12, 2001 (i.e., 18 months after the date of rule promulgation) will no longer qualify as a (b)(3) system. Such a system must begin corrosion control treatment steps, unless such treatment is already in place.

What Are the Corrosion Control Treatment Requirements? (See §§141.81 & 141.82)

You must conduct the corrosion control treatment steps described below if: 1) you serve more than 50,000 people and you do not qualify as a (b)(2) or (b)(3) system; or 2) you serve 50,000 or fewer people and you exceed either the lead or copper action level.

Step 1: System serving 50,000 or fewer people submit a recommendation regarding the type of corrosion control to be installed (for large systems, the recommendation is included as part of the corrosion control study referred to in Step 2).

Step 2: The State decides if systems serving 50,000 or fewer people must conduct a corrosion control study to help evaluate the most effective type of corrosion control treatment for the system. For systems serving more than 50,000 people, the study is required.

Step 3: The system submits the corrosion control study, if required.

Step 4: The State determines the type of corrosion control treatment to be installed.

Step 5 The system installs corrosion control treatment.

Step 6: The system collects follow-up lead and copper tap and WQPs after the installation of corrosion control treatment. ***Note:*** *Systems serving ≤ 50,000 people are only required to collect WQP samples if they continue to exceed the lead or copper action level.*

Step 7: The State sets WQPs ranges or minimums (called optimal water quality parameters or OWQPs) that indicate that a system is operating corrosion control treatment at a level that most effectively minimizes the lead and copper concentrations at users' taps. ***Note:*** *The State is not required to set OWQPs for systems serving ≤ 50,000 people if they are at or below the lead and copper action levels, although the State may opt to do so.*

Step 8: The system conducts periodic lead and copper tap and WQP monitoring. ***Note:*** *Systems serving ≤ 50,000 people are only required to collect WQP samples during any monitoring period in which they exceed the lead or copper action level.*

> ✎ **Notes:** Systems serving 50,000 or fewer people can discontinue these steps whenever their 90th percentile levels are at or below both action levels for 2, consecutive, 6-month monitoring periods. In addition, (b)(2) systems are not required to conduct a study, install corrosion control treatment, or conduct follow-up monitoring. The LCRMR clarify that (b)(2) systems must conduct lead and copper tap and WQP monitoring after the State sets OWQPs. Further, a system that meet the (b)(3) criteria based on initial monitoring is not subject to the corrosion control treatment requirements.

Table 1-1 shows the schedule for completing corrosion control treatment steps for those systems that are subject to these requirements.

Table 1-1: Corrosion Control Treatment Steps

Requirement	Timetable for Completing Corrosion Control Treatment for Systems Serving:	
	50,000 or fewer people[2]	**More than 50,000**
System recommends the type of treatment to be installed	6 months after the lead and/or copper action level exceedance (ALE)	N/A (Part of the corrosion control study)
State decides whether study is required	12 months after the ALE	N/A (System must conduct study)
System completes study	18 months after State decision to conduct study	July 1, 1994
State determines the type of treatment to be installed	**If study is required:** 6 months after study completed **If no study is required:** – for $\leq$ 3,300: 24 months after ALE – for 3,301 - 50,000: 18 months after ALE	January 1, 1995
System installs treatment	24 months after State decision regarding the type of treatment to be installed	January 1, 1997
System conducts follow-up monitoring	12 months after treatment installation (2 consecutive, 6-month periods)	January 1, 1998
State designates OWQPs[1]	6 months after follow-up monitoring	July 1, 1998
System conducts continued monitoring	The schedule based on whether an action level is exceeded and/or compliance with OWQP ranges or minimums	

Notes:
[1]The State is not required to designate OWQPs if a system no longer exceeds both action levels after installing treatment. However, some States have opted to do so.
[2]A system whose population exceeds 50,000 after July 1, 1994 must follow the schedule for medium-size systems, beginning with the requirement to complete a corrosion control study.

Form 141-C, *Optimal Corrosion Control Treatment/Water Quality Parameter*s, has been provided in Appendix E. This form can help you to document: the results of corrosion control treatment studies, your optimal corrosion control treatment recommendation, certification that optimal corrosion control treatment has been installed, and request for modification of State decisions regarding current corrosion control treatment or WQPs. You need only complete those boxes that apply.

Lead and copper tap monitoring and WQP monitoring requirements are discussed in detail in Chapter II and III, respectively. In addition, Appendix C contains several lead and copper tap and WQP monitoring timelines that illustrate how these monitoring requirements are impacted by a system's size category and whether a system exceeds an action level.

> ***For more information on corrosion control treatment refer to:***
> *Lead and Copper Rule Guidance Manual, Volume II: Corrosion Control Treatment*, September 1992.

What Are the Source Water Treatment Requirements? (See §141.83)

Systems that exceed the lead or copper action level are triggered into source water treatment requirements. In general, these requirements will be limited to source water monitoring. EPA anticipates that few systems have high source water lead or copper levels and will require . The SOWT steps are as follows:

- Step 1: The system conducts source water monitoring at each entry point (EP) to the distribution system and submits a recommendation to the State regarding source water treatment (required of all systems that exceed the lead and/or copper action level).
- Step 2: The State decides if source water treatment is needed.
- Step 3: The system installs source water treatment (if required).
- Step 4 The system collects follow-up lead and copper samples at the tap and at each EP (only required if treatment is installed).
- Step 5: The State sets maximum permissible levels (MPLs) of lead and copper in source water (generally only specified by the State for systems installing source water treatment).
- Step 6: The system conducts periodic lead and copper source water monitoring (required regardless of whether source water treatment is installed).

Table 1-2 indicates the timing of these requirements. Please note that Steps 3 through 5 only apply to those systems that are required to install .

Table 1-2: Source Water Monitoring and Treatment Requirements				
Action	**Deadline for Completing Action**		**Number of Months from ALE**	
	SOWT Required	**SOWT Not Required**	**SOWT Required**	**SOWT Not Required**
System monitors at each EP & submits recommendation	6 months after exceeding the lead and/or copper action level		6 months	
State determines if SOWT is required	6 months after receipt of results & recommendation		12 months	
System installs SOWT	24 months after State requires SOWT	N/A	36 months	N/A
System conducts follow-up monitoring	12 months after installing treatment	N/A	48 months	N/A
State sets MPLs for lead & copper[1]	Within 6 months after follow-up monitoring	N/A	54 months	N/A
System conducts routine source water monitoring [2]	Annually for surface water/combined sources		66 months	24 months
	Triennially for ground water systems		Depends on 3-yr compliance period in effect	
System conducts reduced source water monitoring [3]	Once during each 9-year compliance cycle		Depends on 9-yr compliance cycle in effect	

1 State will set MPLs for both lead and copper even if the system exceeded only one action level.

2 The 1st year of annual monitoring begins on the date the State set MPLs or determined that SOWT was not needed. Triennial monitoring begins with the 3-year compliance period in effect when the State set MPLs or determined that SOWT was not needed.

3 Systems can qualify for reduced monitoring, at a frequency of once every 9-year compliance cycle, if they are in compliance with their MPLs for 3 ***consecutive*** compliance periods (i.e., 3 annual periods for surface water/combined sources; 3, 3-year periods (equals 9 years) for ground water systems).

> ✎ **Note:** Unlike corrosion control treatment, systems that are at or below both action levels must complete the source water treatment steps once begun. However, once the State sets MPLs or determines that source water treatment is not needed, the system is not required to collect source water samples during any source water monitoring period in which its 90th percentile lead and copper tap water levels are at or below their action levels.

Source water monitoring requirements are discussed in more detail in Chapter IV of this guidance. Detailed information regarding source water treatment is provided in *Lead and Copper Rule Guidance Manual, Volume II: Corrosion Control Treatment*, September 1992.

What Are the Public Education Requirements? (See §141.85)

If you exceed the lead action level, you must deliver public education to your customers to inform them of the health effects of lead, measures you are taking to correct the problem, and what they can do to minimize their exposure to lead. The public education requirements are different for CWSs and NTNCWSs. An overview of the requirements are provided below.

Within 60 days of exceeding the lead action level (either for the first time or again after having monitoring periods at or below the lead action level), **a CWS** must:

- Insert notices in each customer's water utility bill;
- Deliver pamphlets and/or brochures that contain the public education materials to facilities and organizations that provide services to pregnant women and children;
- Submit information to the editorial departments of the major daily and weekly newspapers circulated throughout the community; and
- Deliver public service announcements (PSAs) to radio and television stations.

A CWS must repeat delivery every 6 months for PSAs, and every 12 months for other forms of delivery, for as long as the system exceeds the lead action level.

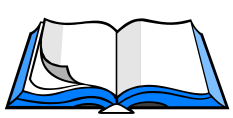
Within 60 days of exceeding the lead action level (either for the first time or again after having monitoring periods at or below the lead action level), **an NTNCWS** must distribute public education by:

- Posting informational posters in public places or in common areas of buildings served by the system; and
- Distributing informational pamphlets and/or brochures to each person served by the NTNCWSs.

An NTNCWS must repeat this information annually for as long as it exceeds the lead action level.

Any system can stop delivering public education whenever its 90th percentile lead level is at or below the action level for ***one monitoring period***. If it again exceeds the lead action level, it must recommence public education within 60 days of the exceedance.

✎ ***Please note, the LCRMR offer some flexibility in making revisions to the mandatory public education language and the distribution of public education materials.***



For more information on public education, refer to the updated guidance: *Lead in Drinking Water Regulation: Public Education Guidance*, EPA 816-R-02-010.

What Are the Lead Service Line Replacement Requirements? (See §141.84)

If treatment is not effective in reducing lead levels, systems with lead service lines must replace at least 7 percent of their lines annually (the State can require a higher rate). The State can also require systems to begin lead service line replacement if they do not meet their deadline for installing corrosion control or source water treatment. Systems can discontinue lead service line replacement if they are at or below the lead action level for ***2 consecutive monitoring periods***.

The monitoring requirements that are associated with lead service line replacement are discussed in Chapter V. A detailed discussion of the lead service line replacement requirements is provided in *Lead and Copper Rule Guidance Manual, Volume II: Corrosion Control Treatment*, September 1992.

CHAPTER II: LEAD AND COPPER TAP MONITORING AND REPORTING REQUIREMENTS

What Is The Purpose of Collecting Lead and Copper Tap Samples?

The tap water monitoring protocol for lead and copper is designed to identify those residences or sampling locations with lead service lines, lead interior plumbing, or copper pipes with lead solder. Samples collected from these locations are most likely to have high levels of lead and/or copper caused by the contact of corrosive water with lead- and copper-containing plumbing materials. You are required to monitor at these "high-risk" locations, whenever possible (versus collecting a random sample) to better ensure that high levels of lead or copper are detected and that you institute treatment that provides uniform and adequate levels of health protection throughout the distribution system. Tap water monitoring for lead and copper not only allows you to determine the lead and copper concentrations in drinking water, but if you have installed treatment, monitoring allows you to assess the effectiveness of corrosion control treatment and/or source water treatment.

Is My System Required to Collect Lead and Copper Tap Samples? (See §§140.80(a) & 141.86(c)&(d))

All CWSs and NTNCWSs must collect lead and copper tap samples. Transient, non-community water systems are not subject to the lead and copper regulations. The frequency of the monitoring and number of samples to be collected and analyzed is based primarily on how many people you serve and your tap water monitoring results.

When Do I Collect Lead and Copper Tap Samples? (See §§141.86(c) & (d))

Lead and copper monitoring can be divided into four phases:

- **Initial monitoring** that is required of all systems.
- **Follow-up monitoring** that corresponds to the 2, consecutive 6-month periods after a system completes the installation of corrosion control and is only required for systems that install treatment.
- **Routine monitoring** applies both to systems that are required to install treatment and to (b)(2) systems. For these systems, this monitoring occurs after the State sets OWQPs.
- **Reduced monitoring** corresponds to monitoring that occurs at a reduced frequency and a reduced number of sample locations. This reduction is based on a system's lead and copper 90^{th} percentile levels or compliance with OWQPs.

Each type of monitoring is discussed in greater detail below. In addition, refer to the monitoring timelines in Appendix C which help illustrate how lead and copper tap monitoring requirements are impacted by a system's size category and whether the system exceeds an action level.

Initial Lead and Copper Tap Monitoring

The LCR specifies dates by which you were required to begin monitoring. The date was dependent on the number of people that you served as shown in Table 2-1 below, and was specified for discrete 6-month monitoring periods of January through June and July through December.

Table 2-1: Schedule for Initial Monitoring[1]		
System Size (No. of People Served)	**1st Initial Monitoring Period**	**2nd Initial Monitoring Period**
3,300 and under	7/1/93 - 12/31/93	1/1/94 - 6/30/94[2]
3,301 - 50,000	7/1/92 - 12/31/92	1/1/93 - 6/30/93[2]
50,001 and more	1/1/92 - 6/30/92	7/1/92 - 12/31/92

✎ **NOTES:**
[1]If you are a new system, consult with your State LCR Coordinator to find out when you should begin lead and copper monitoring.
[2]Required if you do not exceed either action level during the 1st initial monitoring period, or if your State specifies that you must conduct this monitoring.

If you serve more than 50,000 people, you were required to conduct **both** 6-month rounds of initial lead and copper tap monitoring at the standard number of sites, required for your system size (see Table 2-2).

If you serve 50,000 or fewer people, you were required to conduct a minimum of **one**, 6-month round of initial monitoring at the standard number of sites (see Table 2-2). The requirement for you to conduct a second round of initial lead and copper tap monitoring was based on your 90th percentile lead and copper levels during the first round of monitoring as follows:

Table 2-2: Minimum Number of Lead and Copper Tap Samples for Systems on Standard Monitoring	
System Size	**No. of Samples**
> 100,000	100
10,001 - 100,000	60
3,301 - 10,000	40
501 - 3,300	20
101 - 500	10
≤ 100	5

- You were not required to collect a second round of initial monitoring if you exceeded the lead or copper action level (unless required by your State). Instead, you were triggered into corrosion control treatment steps (refer back to the corrosion control treatment discussion in Chapter I). You also had the option to continue lead and copper tap monitoring while conducting corrosion control treatment steps to determine if you were eligible to stop these steps (i.e., you had 2, consecutive, 6-month periods in which your 90th percentile lead and copper levels were at or below their respective action levels).

> ✎ **Note:** If you are triggered into corrosion control treatment requirements, some lead and copper tap monitoring will be needed to evaluate the type of corrosion control to be installed and/or fine-tune your treatment. These samples are not part of your monitoring requirements. However, some States may require systems to submit these data for compliance purposes. In this event, the lead and copper samples must be used by systems and States in calculating 90th percentile levels *[See §141.86(e)]*.

- You were required to conduct a second round of initial monitoring during the next 6 months, if you were at or below the lead and copper action levels during the first round of monitoring.

> ✎ **Note:** If you serve 50,000 or fewer people and never exceed an action level, you only have to conduct periodic lead and copper tap monitoring.
>
> ***~ No other requirements apply to you ~***

Follow-up Lead and Copper Tap Monitoring

If you are required to install corrosion control treatment, you must conduct 2, consecutive, 6-month rounds of follow-up lead and copper tap monitoring at the standard number of sites. If you serve more than 50,000 people and you did not meet either the (b)(2) or (b)(3) criteria, this monitoring was required to be conducted by January 1, 1998. If you serve 50,000 or fewer people, this monitoring must be completed within one year of installing corrosion control treatment.

Routine Lead and Copper Tap Monitoring

If you serve more than 50,000 people and you do meet the (b)(3) criteria, you must monitor semi-annually at the standard number of sites until you qualify for reduced monitoring by being in compliance with your OWQP specifications for 2, consecutive, 6-month monitoring periods.

If you serve 50,000 or fewer people and you continue to exceed either action level after installing corrosion control treatment, you must monitor semi-annually at the standard number of sites until you qualify for reduced monitoring by being in compliance with your OWQP specifications for 2, consecutive, 6-month monitoring periods.

Am I Eligible for Reduced Lead and Copper Tap Monitoring? (See §§141.86(d)(4) & (g))

Reduced Lead and Copper Tap Monitoring

Criteria for Annual Monitoring: You can reduce the frequency of your monitoring to annually and collect from a reduced number of sites, as shown in Table 2-3, if:

1. You serve 50,000 or fewer people, and you are at or below both action levels during 2, consecutive, 6-month monitoring periods. The earliest that you could qualify for reduced monitoring is after initial monitoring. You do not need prior approval from the State.

OR

2. For any size system, you operate in accordance with State-specified OWQPs during 2, consecutive, 6-month monitoring periods. ***The LCRMR** no longer require you to request reduced monitoring status from the State. However, you must receive written permission to proceed to reduced monitoring.*

Table 2-3: Minimum Number of Lead and Copper Tap Samples for Systems on Reduced Monitoring

System Size	No. of Samples
> 100,000	50
10,001 - 100,00	30
3,301 - 10,000	20
501 - 3,300	10
101 - 500	5
≤ 100	5

Note: The number of samples for systems serving ≤ 100 people is the same under standard and reduced monitoring.

REMEMBER: If you do not have the required number of sampling sites, it may be necessary to collect more than one sample from the same location, on different days, in order to collect the minimum number of required samples.

Criteria for Triennial Monitoring: You can reduce the frequency of sampling to once every 3 years and collect the reduced number of samples if you are:

1. A system that serves 50,000 or fewer people and your 90th percentile lead and copper levels are at or below both action levels for 3 consecutive years. *You do not need prior approval from the State).* Two, consecutive, 6-month periods at or below both action levels (such as the two initial monitoring periods) can count as the first year of the 3 years needed to qualify for triennial monitoring.

2. Any size system that operates in accordance with State-specified OWQPs during, 3 consecutive years, even if you exceed one or both action levels. *You must receive written permission to proceed to reduced monitoring.*

3. Any size system that demonstrates that it meets the (b)(3) criteria. The LCRMR clarify that (b)(3) systems must conduct one round of monitoring at the reduced number of sites between September 1, 1997 and September 30, 2000 and collect lead and copper tap samples at least once every 3 calendar years, thereafter *(Note: Some States may not allow triennial monitoring for certain size systems)*. If you no longer meet the (b)(3) criteria for any of the following reasons, you must begin corrosion control treatment steps, beginning with the study:

   - The difference between your 90th percentile lead level at the tap and the lead level in your source water is 0.005 mg/L or higher; or
   - You exceed the lead action level; or
   - You exceed the copper action level on or after July 12, 2001.

4. Any size system with 90th percentile lead levels of less than or equal to 0.005 mg/L and 90th percentile copper levels of less than or equal to 0.65 mg/L, for 2, consecutive, 6-month periods (also known as accelerated reduced lead and copper tap monitoring). This provision is newly allowed under the LCRMR and is less stringent than the original LCR. ✓ *You must first check with your State to determine if it has adopted this provision.*

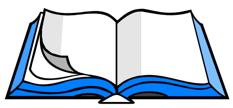
Criteria for a Monitoring Waiver: Under the LCRMR, if you serve 3,300 or fewer people, you may be eligible for a lead and/or copper monitoring waiver, that allows you to collect lead and copper samples at 9-year intervals at the reduced number of sites if you meet specific materials and monitoring criteria.

- To meet the materials criteria for lead, you must certify that the plumbing materials in your system contain no plastic pipes which contain lead plasticizers, or plastic service lines which contain lead plasticizers, and are free of lead service lines, lead pipes, lead soldered pipe joints, and leaded brass or bronze alloy fittings and fixtures, unless the fittings and fixtures meet the specifications of any standard established by SDWA section 1417(e). To meet the materials criteria for copper, you must certify that the plumbing materials in your system do not contain any copper pipes or copper service lines.

- The monitoring criteria specify that your 90th percentile lead level cannot be greater than 0.005 mg/L and your 90th percentile copper level cannot be higher than 0.65 mg/L.

Full waivers may be granted if you meet the materials and monitoring criteria for both lead and copper. Partial waivers for lead or copper may be granted if you demonstrate to the State that you meet the materials and monitoring criteria for either lead or copper, but not both. States may elect not to grant full or partial monitoring waivers. *Note: Some States are not planning on adopting this waiver provision.*

A few States granted waivers prior to the April 11, 2000, effective date of the LCRMR. If you were granted a "pre-existing waiver" and were not required to monitor, the LCRMR specify that you had to conduct at least one set of lead and copper samples at the tap at the standard number of sites by September 30, 2000.



For more information on monitoring waivers, refer to: *Monitoring Waivers under the Lead and Copper Rule Minor Revisions for Systems Serving 3,300 or Fewer People,* April 2000, EPA 815-R-99-021.

Table 2-4 below summarizes the criteria that you must meet to qualify for reduced monitoring. For systems serving more than 100 people, monitoring is conducted at a reduced number of sites.

Table 2-4: Reduced Lead and Copper Tap Monitoring Criteria

System Size (No. of people served)	Criteria	Monitoring Frequency
50,000 and fewer	At or below both action levels for 2 consecutive 6-month monitoring periods.	Annual
Any size	Meet OWQP specifications for 2 consecutive 6-month monitoring periods.	
50,000 and fewer	At or below both action levels for 3 consecutive years of monitoring.	Triennial
Any size	Meet OWQP specifications for 3 consecutive years of monitoring.	
Any size	90th percentile lead level is ≤ 0.005 mg/L and 90th percentile copper level is ≤ 0.65 mg/L for 2, consecutive, 6-month periods. ✎*Note: This is newly allowed under the LCRMR and the State must adopt it before it can be implemented.*	
Any size	Meet (b)(3) criteria: 1. the 90th percentile lead level minus the highest source water level is < 0.005 mg/L for 2 consecutive, 6-month monitoring periods. ***or*** 2. source water lead levels are below the MDL *and* the 90th percentile lead level is ≤ 0.005 mg/L for 2 consecutive, 6-month monitoring periods. ***and*** 3. after July 12, 2001, 90th percentile copper levels are at or below the copper action level.	
25 to 3,300	Meet monitoring waiver criteria: 1. 90th percentile levels are ≤ 0.005 mg/L for lead and/or ≤ 0.65 mg/L for copper. ***and*** 2. plumbing materials meet certain criteria that indicate negligible risk from lead and/or copper exposure. ***and*** 3. waiver is approved by the State.	Once every 9 years
Note: 2 consecutive, 6-months at or below both action levels can count as the first year of the 3 years needed to qualify for triennial monitoring.		

Under the LCR, you were required to conduct reduced lead and copper tap monitoring (i.e., annual or triennial monitoring) during the months of June through September. Under the LCRMR, the State may require you to collect your tap samples during months other than June through September, if it believes that another time period better represents a time of normal operation where the highest lead levels are likely to occur (e.g., seasonal system that is closed during the summer months). The LCRMR specify a one-time ***transition period*** for switching to the new monitoring period, including systems granted monitoring waivers.

If you monitor:	***Then the next round of samples is due no later than:***
Annually	21 months after the previous round
Triennially	45 months after the previous round
Every 9 years	The end of the 9-year cycle

For example, assume a system is on annual monitoring and last sampled on July 7, 2001. The system is typically closed during the summer months and the State requires the system to collect its samples during October through December. The LCRMR allow a ***maximum*** of 21 months for a system on annual monitoring to transition to the new monitoring schedule or April 7, 2003 in this example. However, since this system must collect its samples during October through November, it only has until December 31, 2002 to complete this monitoring (a little under 18 months).

Where Must I Collect My Samples? (See §141.86(a))

The lead and copper regulations require you to sample at locations that may be particularly susceptible to high lead or copper concentrations. The LCR establishes a tiering system for prioritizing sampling sites. A materials evaluation is required to help classify sampling sites into tiers. You must perform a materials evaluation before you begin lead and copper tap monitoring (refer back to Table 2-1). Table 2-5, below, defines the tiering system for prioritizing sampling sites.

Table 2-5: Tiering Classification	
If you are a CWS	***If you are an NTNCWS***
Tier 1 sampling sites are single family structures: ■ with copper pipes with lead solder installed after 1982 *(but before the effective date of your State's lead ban)* or contain lead pipes; and/or ■ that are served by a lead service line. ✎ **Note:** When multiple-family residences (MFRs) comprise at least 20% of the structures served by a water system, the system may count them as Tier 1 sites.	**Tier 1** sampling sites consist of buildings: ■ with copper pipes with lead solder installed after 1982 *(but before the effective date of your State's lead ban)* or contain lead pipes; and/or ■ that are served by a lead service line.
Tier 2 sampling sites consist of buildings, including MFRs: ■ with copper pipes with lead solder installed after 1982 *(but before effective date of your State's lead ban)* or contain lead pipes; and/or ■ that are served by a lead service line. **Tier 3** sampling sites are single family structures w/ copper pipes having lead solder installed before 1983.	**Tier 2** sampling sites consist of buildings with copper pipes with lead solder installed before 1983. **Tier 3**: Not applicable.
✎ **Note:** All States were required to ban the use of lead solder in all public water systems, and all homes and buildings connected to such systems by June 1988 (most States adopted the ban in 1987 or 1988). Contact the Drinking Water Program in your State to find out the effective date.	

Once monitoring begins, you must use the same sites, unless a site is no longer accessible to you or no longer fits the requirements of a priority site (e.g., the lead service lines that served the site have been).

The LCRMR specify that sites that are chosen for reduced monitoring (i.e., monitoring that is conducted at a 1-year, 3-year, or 9-year frequency) must be representative of those sites that were used during standard monitoring. The LCR did not contain language regarding which sites should be used for reduced monitoring. You may wish to randomly select the reduced number of sites from the larger pool used during standard monitoring. The intent of the rule is that you do not use only those sampling locations with the lowest lead or copper levels. The revised rule also gives States the choice to determine which sample locations you must use. Before proceeding, check with your State to find out what method the State uses in selecting reduced monitoring sampling sites.

<u>Sources of Information That You Should Review</u>

To identify enough sites that meet targeting criteria, you should survey all records documenting the materials used to construct and repair your distribution system and buildings connected to your distribution system. Relevant information can be attained through the following sources:

- Plumbing Codes;
- Plumbing Permits;

- Distribution Maps and Drawings;
- Inspection and Maintenance Records;
- Meter Installation Records;
- Capital Improvement and Master Plans;
- Standard Operating Procedures;
- Operation and Maintenance Manuals;
- Permit Files;
- Existing Water Quality Data;
- Interviews with Senior Personnel, Building Inspectors, and Retirees; and
- Community Survey.

EPA recommends that you identify more sampling sites than the number of samples you are required to collect during each monitoring period, in case volunteers drop out. The regulations specify the minimum number of tap samples that you must collect each monitoring period, as are shown in Tables 2-2 and 2-3. For example, if you serve 3,301 to 10,000 people, you are required to collect 40 tap water samples during each of (at least) 2, consecutive, 6-month monitoring periods. You should try to maintain a list of about 60 to 80 sampling sites that meet the Tier 1 targeting criteria. If you cannot identify 60 to 80 sites meeting the Tier 1 targeting criteria, then you should complete your list with sites meeting Tier 2 criteria, followed by those meeting Tier 3 criteria (for CWSs only). If you do not have enough Tier 1, 2, and 3 sites, the LCRMR clarify that you must complete your sampling pool with representative sites. A site is representative if its plumbing is similar to that of other sites in your system. EPA encourages you to use sites with copper plumbing installed subsequent to the local implementation if the lead ban (typically 1988 or 1989), provided these sites can be considered representative.

If your system contains lead service lines, then, if possible, half of the required sampling sites should be served by a lead service line. Using the medium system example: your sampling plan should include 20 sites that are served by a lead service line, and you should try to maintain a list of about 30 to 40 sampling sites served by lead service lines to ensure access to enough sites.

The preamble of the LCRMR (see page 1970) also clarifies that you may need to collect more than one sample from the same location, on different days, in order to meet your minimum sampling requirements. For example, if you are required to collect a minimum of five samples, but you only have one sampling site, you must collect five samples from this sampling site on different days.

Three worksheets for organizing the information collected during the materials evaluation are included in Appendix E as follows:

- Worksheet 1: Materials Survey Investigation Results
- Worksheet 2: Materials Survey Results by Number of Service Connections for each Plumbing Materials Type
- Worksheet 3: Summary of Material Survey Results

These worksheets can help you determine the sites that contain the highest priority materials. You do not have to send them to the State, unless requested. In addition, you may want to conduct some site surveys to be sure you have identified sites with lead.

<u>If You Cannot Find Enough Sampling Sites with High Risk</u>

If you are unable to collect all your samples from Tier 1 sites, then you must follow the procedures discussed below:

- When a sufficient number of Tier 1 sites do not exist or are inaccessible, you should complete your sampling pool with Tier 2 sites.
- For CWSs, when a sufficient number of Tier 1 and 2 sites do not exist or are inaccessible, you should complete your sampling pool with Tier 3 sites.
- According to the LCRMR, any water system that cannot complete its sampling at sites that meet the applicable tiering criteria must complete sampling at representative sites throughout the distribution system.
- You are not required to target buildings with lead solder installed after the effective date that the lead ban was adopted in your State.
- You should not monitor at sampling sites that have water softeners; however, if all of your available sampling sites have water softeners, you should identify the highest risk sites (Tier 1) and monitor at those locations (such as a kitchen or bathroom tap).
- If you are not able to draw at least half of your samples from taps served by lead service lines, you must collect a sample from each site that is served by a lead service line.

  For example, a system serving 3,301 to 10,000 people does not qualify for reduced monitoring and is required to collect tap water samples from a total of 40 sites, 20 of which must be from sites served by a lead service line. If, after reviewing all of the records listed on the previous page, the system can identify only 12 sites served by a lead service line, it must collect a tap water sample from each of those sites. The remaining 28 samples would be collected from other Tier 1 sites. If an insufficient number of Tier 1 sites are available, the system must use Tier 2 sites, followed by Tier 3 sites, and lastly by representative sites. *Refer back to Tables 2-2 (standard monitoring) and 2-3 (reduced monitoring) to identify the appropriate number of sites for your system size.*

- If you have no lead service lines, but you have lead goosenecks or pigtails, you can collect tap water samples at the sites with the goosenecks and/or pigtails.

How Do I Collect Lead and Copper Tap Water Samples? (See §141.86(b))

When collecting lead and copper tap samples, you must follow the procedures listed below:

- Always collect a 1-liter sample in one container only (e.g., do not split the sample between two containers).
- Always collect a first-draw sample from a tap where the water has stood in the pipes for at least 6 hours (e.g., no flushing, showering, etc.), *except where noted below in the box titled: "Related LCRMR Provisions".* However, make sure it is a tap that is used regularly, and not an abandoned or infrequently used tap.

- First-draw samples collected at single-family residences should always be drawn from the cold-water kitchen tap or bathroom tap.
- First-draw samples collected from buildings other than single-family homes should always be drawn from an interior tap from which water is typically taken for consumption.
- You may allow residents to collect sample, but you must supply the residents with instructions as to the sample collection procedures. You can use the instruction form provided as page E-5 of Appendix E. Be sure to properly label sample bottles prior to distributing them to residents.
- As a general rule, you should collect your lead and copper tap water samples early in the monitoring period in case you exceed the lead or copper action level. This is because you will be required to also collect WQP samples during the same monitoring period (refer to Chapter III for a more detailed discussion of WQP monitoring).
- After the sample is drawn, acidification of the sample should be completed by the laboratory personnel upon receipt of the sample, but in no case later than 14 days after sample collection. Neither the homeowner nor the sample collector should handle the nitric acid used for sample acidification.
- If you cannot gain access to an original sampling site during any repeat sample collections, you should collect a tap water sample from another site which meets the same targeting criteria as the original site. The replacement site should be located within reasonable proximity of the original site. *(Note: Some States require prior notification or approval of any changes in sampling sites.)* Form 141-A in Appendix E provides you with an easy-to-follow format for tracking sample site identification and certification.

Related LCRMR Provision

If you are an NTNCWS or CWS (such as a prison or hospital) that does not have enough inside taps where the water stands unused for at least 6 hours, the LCRMR allow you to use inside taps that are the most likely to have remained unused for the longest period of time. Your State contact will tell you whether you must submit a sampling plan for State approval prior to sampling at non-first-draw sample locations or if you can proceed with sampling and submit the plan with your sampling results.

✓ ***Please check with your State before collecting any non-first draw samples.***

What Are the Approved Methods for Analyzing Water Samples for Lead and Copper? (See §141.23(l))

The approved analytical methods for lead, copper, and all WQPs (pH, calcium, alkalinity, silica, orthophosphate, conductivity, and temperature) are shown in Table 2-6. A summary of the preservation protocols, sample containers, and maximum holding times for analysis is provided in Table 2-7.

Table 2-6: Approved Analytical Methods for the Lead and Copper Rule				
Contaminant	Methodology [8]			
	EPA	ASTM[3]	SM[4]	Other
Alkalinity				
Titrimetric		D1067-92B	2320 B	
Electrometric titration				I-1030-85[5]
Calcium				
EDTA titrimetric		D511-93A	3500-Ca D	
Atomic absorption; direct aspiration		D511-93B	3111 B	
Inductively-coupled plasma[2]	200.7		3120 B	
Copper				
Atomic absorption; furnace		D1688-95C	3113 B	
Atomic absorption; direct aspiration		D1688-95A	3111 B	
Inductively Coupled Plasma (ICP)[2]	200.7		3120 B	
ICP-Mass spectrometry[2]	200.8			
Atomic absorption; platform[2]	200.9			
Conductivity Conductance		D1125-95A	2510 B	
Lead				
Atomic absorption; furnace		D3559-95D	3113 B	
ICP-Mass spectrometry[2]	200.8			
Atomic absorption; platform[2]	200.9			
Differential pulse anodic stripping voltammetry				Method 1001[9]
Orthophosphate[7]				
Colorimetric, automated, ascorbic acid[6]	365.1		4500-P F	
Colorimetric, ascorbic acid, single reagent		D515-88A	4500-P E	
Colorimetric, phosphomolybdate;				I-1602-85[5]
Colorimetric, automated-segmented flow				I-2601-90[5]
Colorimetric, automated discrete				I-2598-85[5]
Ion Chromatography[6]	300.0	D4327-91	4110 B	
pH				
Electrometric[1]	150.1, 150.2	D1293-95	4500-H^+B	
Silica				
Colorimetric: molybdate blue				I-1700-85
Colorimetric: automated-seg. flow				I-2700-85

Table 2-6: Approved Analytical Methods for the Lead and Copper Rule				
Contaminant	Methodology [8]			
	EPA	ASTM[3]	SM[4]	Other
Colorimetric		D859-95		
Colorimetric: molybdosilicate			4500-Si D	
Colorimetric: heteropoly blue			4500-Si E	
Colorimetric: automated method for molybdate-reactive silica			4500-Si F	
Colorimetric: inductively-coupled plasma	200.7		3120 B	
Temperature				
Thermometric			2550	

Notes

[1] "Methods for Chemical Analysis of Water and Wastes", EPA/600/4-79/020, March 1983. Available at NTIS, PB84-128677.

[2] "Methods for the Determination of Metals in Environmental Samples—Supplement I", EPA/600/R-94/111, May 1994. Available at NTIS, PB95-125472.

[3] Annual Book of ASTM Standards, 1994 and 1996, Vols. 11.01 and 11.02, American Society for Testing and Materials. The previous versions of D1688-95A, D1688-95C (copper), D3559-95D (lead), D1293-95 (pH), D1125-91A (conductivity) and D859-94 (silica) are also approved. These previous versions D1688-90A, C; D3559-90D, D1293-84, D1125-91A and D859-88, respectively are located in the Annual Book of ASTM Standards, 1994, Vols. 11.01. Copies may be obtained from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

[4] 18th and 19th editions of Standard Methods for the Examination of Water and Wastewater, 1992 and 1995, respectively, American Public Health Association; either edition may be used. Copies may be obtained from the American Public Health Asso-ciation, 1015 Fifteenth Street NW, Washington, DC 20005.

[5] Method I-2601-90, Methods for Analysis by the U.S. Geological Survey National Water Quality Laboratory Determination of Inorganic and Organic Constituents in Water and Fluvial Sediments, Open File Report 93-125, 1993; For Methods I-1030-85; I-1601-85; I-1700-85; I-2598-85; I-2700-85; and I-3300-85 See Techniques of Water Resources Investigation of the U.S. Geological Survey, Book 5, Chapter A-1, 3rd ed., 1989; Available from Information Services, U.S. Geological Survey, Federal Center, Box 25286, Denver, CO 80225-0425.

[6] "Methods for the Determination of Inorganic Substances in Environmental Samples", EPA/600/R-93/100, August 1993. Available at NTIS, PB94-120821.

[7] Unfiltered, no digestion or hydolysis.

[8] Because MDLs reported in EPA Methods 200.7 and 200.9 were determined using a 2X preconcentration step during sample digestion, MDLs determined when samples are analyzed by direct analysis (i.e., no sample digestion) will be higher. For direct analysis of cadmium and arsenic by Method 200.7, and arsenic by Method 3120 B sample preconcentration using pneumatic nebulization may be required to achieve lower detection limits. Preconcentration may also be required for direct analysis of antimony, lead, and thallium by Method 200.9; antimony and lead by Method 3113 B; and lead by Method D3559-90D unless multiple in-furnace depositions are made.

[9] The description for Method Number 1001 for lead is available from Palintest, LTD, 21 Kenton Lands Road, P.O. Box 18395, Erlanger, KY 41018. Or from the Hach Company, P.O. Box 389, Loveland, CO 8053.

Laboratory certification will only be required for lead and copper analyses, and is based on the performance requirements included with the method detection limits. The use of the approved analytical methods for all of the WQPs as well as lead and copper is necessary to assure consistent results and high quality data. However, sample collection and analysis procedures in the field can contribute to errors in measurement. A quality assurance/quality control (QA/QC) program for field sampling/analysis and laboratory analysis should be developed and implemented by all water systems.

If a commercial or State laboratory performs the laboratory analyses, it is still important that quality control measures be taken for the field sampling portion of the monitoring program.

A complete QA/QC program should contain components at each step in the data collection process, including sample collection and methods, laboratory sample handling and analysis, and recording/reporting of the results. An important element in implementing a successful QA/QC program is the ability to properly track a sample from its collection through analysis and ultimate recording in either the State or your database. The QA/QC program requirements for sample tracking include: (1) sample identification; (2) complete sample labeling; (3) training sample collectors and field data collectors; (4) parallel construction of laboratory record keeping and database format to sample labeling and identification; and, (5) periodic self-audits of the QA/QC procedures.

Significant benefits could be gained by the implementation of a program to properly label and identify samples to track their collection, analysis, and results. Minimally, the data fields (i.e., variables defined within the laboratory and/or your database) needed to fully identify a sample are:

1. Water System Identification Number.
2. Applicable Water System Entry Point Identification Numbers. (There may be multiple entry points to a distribution system which should be identified for each sample collected within it.)
3. Sample Identification Number.
4. Sample Type Identifier: (2 Fields)
    a. First-draw tap, Distribution system, Source water for lead and copper, Source water for WQPs, or Lead service line.
    b. Initial, Follow-Up, Routine, Reduced, or Lead Service Line.
5. Sample Site Identifier: (3 Fields)
    a. Region of Distribution System. (Suggest that Region 0 be assigned for each entry point location.)
    b. Subregion of Distribution System. (Suggest that Subregion 0 be assigned for each entry point location.)
    c. Sample Site Specific Identifier.
6. Sample Collection Date.
7. Sample Collection Time.
8. Sample Period.
9. Sample Collector Identifier: Public Water System (PWS) Staff, Resident, State, or Other.
10. Parameters for Analysis: Lead, Copper, Water Quality Parameters or pH and Temperature (field measurements).
11. Sample Site Street Address - for water system use.
12. Sample Collection Route - for water system use.
13. Water system Name.
14. Water system Contact Person and telephone number.

You should include data fields to identify those samples delivered to the laboratory representing travel blanks and blind spikes. As part of your routine QA/QC program for analytical results, travel blanks should be included in at least 10 percent of the sampling kits delivered to and returned from homeowners performing tap monitoring. Additionally, for lead and copper analyses, at least three blind spike samples should be included during every 6-month monitoring period for medium and large water systems, and at least one such sample for small water systems.

Table 2-7: Sample Handling Requirements for Lead, Copper, and Water Quality Parameters			
Contaminant or Parameters	**Preservative**	**Container[1]**	**Maximum Holding Time[2]**
Lead	Conc. HNO_3 to pH <2[3]	P or G	6 months
Copper	Conc. HNO_3 to pH <2[3]	P or G	6 months
pH	None	P or G	Test Immediately[4]
Conductivity	Cool, 4°C	P or G	28 days
Calcium	Conc. HNO_3 to pH <2[5]	P or G	6 months
Alkalinity	Cool, 4°C	P or G	14 days
Orthophosphate	Cool, 4°C	P or G	48 hours
Silica	Cool, 4°C	P only	28 days
Temperature	None	P or G	Test Immediately[4]

[1] P = Plastic, hard or soft; G = Glass, hard or soft.

[2] In all cases, samples should be analyzed as soon after collection as possible.

[3] If nitric acid ($HNO_{3)}$ cannot be used because of shipping restrictions or is not used because homeowners are collecting samples, the sample for analysis can be shipped to a laboratory where it must be acidified (generally to pH < 2) with concentrated HNO_3 as soon as possible but not later than 14 days after sample collection. Sample must stand in the original container used for sampling for at least 28 hours after acidification. Laboratories should match the acid matrix of their samples, quality control, and calibration standards for accurate results. The latter two sets of solutions will have the same, fixed concentration of acid. It is recommended that good laboratory practice would be to determine by prior tests the amount of acid necessary to achieve some pH <2, and make it consistent with the standards used. For instance, for most waters, the previous EPA recommendation of 0.15% v/v of HNO_3 will result in a pH < 2. Therefore, all samples can be automatically preserved with 1.5 mL of the acid, and all standards can be made with the same acid concentration. In some extreme, high-alkalinity cases, more acid may be necessary.

[4] "Test Immediately" generally means within 15 minutes of sample collection. In the case of pH, the sample should be measured as soon as the sample is taken and should be measured under closed system conditions, particularly if the water is poorly buffered.

[5] If HNO_3 cannot be used because of shipping restrictions or safety concerns for sampling personnel, the sample for analysis may be initially preserved by icing and immediately shipping it to the laboratory. Upon receipt in the laboratory, the sample must be acidified with concentrated HNO_3 to pH < 2.

How Do I Evaluate My Results? (See §§141.80(c)(3) & 141.86(f))

Lead and copper analytical results are evaluated against an action level, not an MCL. The lead action level is exceeded if the concentration of lead in more than 10 percent of tap water samples collected during any monitoring period is greater than 0.015 mg/L (i.e., if the 90th percentile level lead level is greater than 0.015 mg/L). The copper action level is exceeded if the concentration of copper in more than 10 percent of tap water samples collected during any monitoring period conducted is greater than 1.3 mg/L (i.e., if the 90th percentile level copper level is greater than 1.3 mg/L). All samples that meet the proper site selection and sample collection procedures are used to determine the 90th percentile calculation, even if you collect samples from more sites than required.

The 90th percentile is calculated separately for lead and copper. The procedure for determining the lead 90th percentile value is as follows:

If you are required to collect more than 5 samples:

Step 1: Place ***lead*** results in ascending order (from lowest to highest value).

Step 2: Assign each sample a number, 1 for lowest value.

Step 3: Multiply the total number of samples by 0.9.

Step 4: Compare the 90th percentile level to the action level of 0.015 mg/L(i.e., 15 parts per billion (ppb)). If your 90th percentile value is higher than 0.015 mg/L, you have an exceedance.

Repeat this procedure for ***copper*** *sample results, except compare the 90th percentile copper level against its action level of 1.3 mg/L. If your 90th percentile value is greater than 1.3 mg/L, you have an exceedance.*

If you are required to collect 5 samples:

Step 1: Place lead or copper results in ascending order.

Step 2: Take the average of the 4th and 5th highest sample. This is your 90th percentile level.

Step 3: Compare the 90th percentile level against the lead or copper action level.

REMEMBER: All sample results taken during the monitoring period must be included in your 90th percentile calculations, unless a result has been invalidated (refer to the section in this chapter, entitled, What If The State Determines That My Samples Are Invalid?). If a sample is invalidated, its replacement sample must be included in the 90th percentile calculation. ~~Further, a 90th percentile level cannot be calculated if the system has collected less than the minimum required number of samples.~~ (Superceded by 3/9/04 memo on web.)

Below are two examples to help demonstrate the 90th percentile calculation for systems that are required to collect more than 5 samples. The first example explains how to determine whether you have exceeded an action level when your 90th percentile level is a whole number. The second example shows how to make this determination, using either rounding or interpolation, when your 90th percentile level contains a decimal. This may happen when you collect more than the minimum required number of samples.

Example 1: Determining Whether An Action Level Has Been Exceeded When the 90th Percentile Level is A Whole Number	
Sample Rank	**Sample Value** (mg/L)
1	0.000
2	0.000
3	0.002
4	0.005
5	0.005
6	0.006
7	0.006
8	0.010
9 (90th %)	***0.015***
10	0.020
The system does not exceed the lead action level because its 90th percentile level (the 9th sample) is 0.015 mg/L which equals the lead action level. To have an exceedance, the 90th percentile level must be greater than 0.015 mg/L.	

In Example 2 below, the system is required to collect a minimum of 10 valid samples. It collects 12 valid samples and thus, all 12 are used in the 90th percentile calculation. In this example, the 90th percentile level is 10.8 (i.e., ***12 samples x 0.9 = 10.8***).

Example 2: Determining Whether An Action Level Has Been Exceeded When the 90th Percentile Level Contains A Decimal	
Sample Rank	**Sample Value** (mg/L)
1	0.000
2	0.000
3	0.002
4	0.005
5	0.005
6	0.005
7	0.006
8	0.006
9	0.010
10	0.014
11	0.018
12	0.020

Either rounding or interpolation can be used to determine the 90th percentile level when the sample that represents the 90th percentile value is not a whole number. Your State may specify which method you should use.

Using Rounding: EPA's policy is to:

1. Round down to the nearest whole number if your decimal is 0.4 or lower.
2. Round up to the nearest whole number if your decimal is 0.5 or higher.

In this example, the 90th percentile sample is 10.8, and you would round up to 11. So, the sample that is ranked 11th in the list represents the 90th percentile value that you compare to the relevant action level.

Using rounding, the 90th percentile result is 0.018 mg/L and the system exceeds the lead action level of 0.015 mg/L.

Using Interpolation: To determine the 90th percentile level, using interpolation, you would:

1. Subtract the difference between the two samples between which your 90th percentile falls. In this example you subtract the 10th sample result of 0.014 mg/L from the 11th sample result of 0.018 mg/L, for a difference of 0.004 mg/L.
2. Multiply the difference of 0.004 mg/L by 0.8 because the 90th percentile level is 0.8 higher than the 10th sample result: 0.004 x 0.8 = 0.0032 mg/L (or 0.003 when rounded to the number of significant figures).
3. Add 0.003 to the lower of the two sample results, in this example to the 10th sample result of 0.014 mg/L: 0.003 + 0.014 = 0.017 mg/L.

Using interpolation, the 90th percentile lead level is 0.017 mg/L and the system exceeds the lead action level.

✎ **Note:** The LCRMR allow the State to perform the 90th percentile calculation for you if:

- your State has notified you that it will perform this calculation;
- you provide your sampling results and sampling site information by the State-specified date; and
- your State gives you the results of the 90th percentile calculation before the end of the monitoring period.

However, if you do not meet all three of these criteria, you must calculate the 90th percentile results yourself, and provide them to the State.

What If the State Determines that My Samples Are Invalid? (See §141.86(f))

Under the LCRMR the State can invalidate a lead or copper tap water sample if ***any*** one of the following are true:

1. The laboratory establishes that improper analysis caused errors;
2. The State determines that the sample site did not meet the site selection criteria;
3. The sample container was damaged in transit; or
4. Substantial reason exists to believe that the sample was tampered with.

In order for the State to make this determination, you must report to the State all sample results and documentation of the reasons that the samples should be invalidated. Samples may not be invalidated solely on the grounds that a follow-up sample result is higher or lower than the original sample. ✓ ***Please check with your State before requesting sample invalidation, because your State may be unable to implement this provision until it has been incorporated into its drinking water regulations.***

Replacement Samples: If the State invalidates your sample(s), you only need to collect a replacement sample if the number of valid samples is below the minimum number of required samples. For example, assume you are on standard monitoring and only collect the required number of samples (use 40 as an example). If one of these samples is invalidated, you only have 39 valid samples, and therefore, must collect 1 replacement sample. Conversely, if you initially collected 41 samples and 1 was invalidated, you would still have 40 valid samples and would not need to collect a replacement sample. Note that if a replacement cannot be taken at the same location, it should be taken at a location other than one already used for sampling during the monitoring period.

Replacement samples must be taken as soon as possible, but within 20 days of the date of invalidation, or by the end of the applicable monitoring period, whichever is later. Note that if these samples are taken after the end of the applicable monitoring period, they cannot be used to fulfill the sampling requirements of a subsequent period. For example, assume a replacement sample is collected in July 2001 for one invalidated sample that was collected during the January through June 2001 monitoring period. You cannot include this replacement sample as part of your samples for the July through December 2001 monitoring period.

Please note that you may find yourself in a situation where the State invalidates your sample(s) on a date that does not allow you to collect a replacement sample during the months in which you are required to conduct monitoring (i.e., June through September or an alternate period designated by the State). In this event, you can collect this sample outside this time period, as long as you collect the sample(s) no later than 20 days after the date the sample(s) was(were) invalidated or by the end of the monitoring period, whichever occurs later. For example, assume you are required to conduct monitoring during June through September and the State invalidates one of your samples on October 15, 2000. You have until November 4, 2000 (i.e., 20 days after the State's invalidation decision) to collect the replacement sample.

REMEMBER: If a sample is determined to be invalid, you cannot include it in your 90th percentile calculations. However, the replacement sample must be included in the calculation.

What Should I Do If I Exceed an Action Level While I am Monitoring at 6-month intervals? (See §141.80)

If the 90th percentile lead level exceeds 0.015 mg/L or if the 90th percentile copper level exceeds 1.3 mg/L, you must:

- Conduct WQP monitoring in each monitoring period in which you exceed an action level, if you serve 50,000 or fewer people. If you are a large system, you are required to collect WQPs regardless of whether you exceed an action level (unless you meet the (b)(3) criteria) (see §141.87). Refer to Chapter III which discusses WQP requirements in more detail.
- Collect lead and copper source water samples and submit a source water treatment recommendation to the State, if you have not already done so within 6 months of the exceedance (see §141.83(b)). Form 141-D, Source Water Monitoring and Treatment, in Appendix E has been provided to assist you with compiling the information needed to support and provide your recommendation. You do not need to complete the boxes entitled "Certification that Source Water Treatment Has Been Installed" or "Request for Modification of State Treatment Decisions and/or Maximum Permissible Lead and Copper Levels".
- Submit an optimal corrosion control treatment recommendation to the State, if you have not already done so within 6 months of the exceedance for systems serving 50,000 or fewer people. Systems serving more than 50,000 people were required to provide this recommendation as part of their corrosion control study by July 1, 1994 (see §141.81)(e)(1)).

In addition, for lead action level exceedances, you must:

- Deliver the public education program described in *Lead in Drinking Water Regulation: Public Education Guidance*, EPA 816-R-02-010. If your system has never exceeded, or if the exceedance occurred after a monitoring period without a lead exceedance, then delivery is due within 60 days. If it is a continued exceedance, then delivery is every 6 months or annually depending on whether you are a CWS or NTNCWS and depending on the form of public education delivery required (see §141.85).
- If you exceed the lead action level after installing optimal corrosion control treatment and/or source water treatment (whichever occurs later), you must replace 7 percent of your lead service lines within 12 months of the exceedance. You also must replace an additional 7 percent every 12 months thereafter for as long as you continue to exceed the lead action level. However, the State may require that more than 7 percent be replaced each year (see §141.84). Chapter V provides an overview of the lead service line replacement requirements and a more detailed discussion regarding the related monitoring and reporting requirements.

What Should I Do If I Exceed the Lead or Copper Action Level During Reduced Monitoring? (See §§141.80 & 141.86(d)(4)(vi)(A))

If the 90th percentile lead level exceeds 0.015 mg/L ***or*** 90th percentile copper level exceeds 1.3 mg/L, you must:

- Stop monitoring at a reduced number and frequency, and, 6 months from the date of the exceedance, begin collecting the standard number of samples every 6 months (see §141.86(d)(4)(vi)). Refer back to Table 2-2 to find the correct number of sites for your system size.
- Conduct WQP monitoring in each monitoring period in which you exceed an action level, if you serve 50,000 or fewer people. If you are a large system, you are required to collect WQPs regardless of whether you exceed an action level (unless you meet the (b)(3) criteria) (see §141.81(b)(3) & §141.87).
- If you have not collected source water samples or submitted a source water treatment recommendation to the State, do so within 6 months of the exceedance (see §141.83(b)). As mentioned previously, you can use Form 141-D to assist you with preparing and documenting your source water treatment monitoring results and recommendation.
- If you exceed the lead action level after installing optimal corrosion control treatment and/or source water treatment (whichever occurs later), you must begin lead service line replacement (see §141.84).
- Within 60 days of a lead action level exceedance, deliver the public education program described in EPA's *Lead in Drinking Water Regulation: Public Education Guidance,* EPA 816-R-02-010 (see §141.85).

Can I Ever Discontinue Lead and Copper Tap Monitoring?

No, the lead and copper regulations do not allow you to discontinue lead and copper tap monitoring; only to reduce the number and frequency of this monitoring.

What Lead and Copper Tap Monitoring Information Must I Report to the State? (See §§141.90(a) & (h))

<u>Within 10 Days of the End of the Monitoring Period</u>

Within 10 days of the end of the monitoring period (i.e., 6 months, 1 year, 3 years, or 9 years), you must report the following information to the State:

- All tap sample results, including any samples which meet the lead and copper monitoring protocol and are above the minimum required number of samples for standard or reduced monitoring.
- Documentation for any tap sample for which you are requesting sample invalidation (if applicable).

- 90^{th} percentile calculations. Under the LCRMR, the State may elect to do this for you. However, if the State has not contacted you about this, you are responsible for these calculations.
- Written explanation for any changes in sampling location (e.g., if homeowners no longer allow sampling from their taps).

<u>Newly Required by the LCRMR</u>

If you are on a reduced monitoring schedule (i.e., collect lead and copper tap samples less frequently than semi-annually), the LCRMR require you to submit notification of any change in source water or treatment within 60 days of the change or sooner if required by the State. The State may return you to a standard monitoring schedule or take other appropriate steps, if needed.

Less Stringent LCRMR Reporting Provisions:

The following provisions are generally less stringent than the LCR and your State may not be able to implement them until the provisions are incorporated into its regulations. Your State may also elect not to incorporate these revisions into its regulations. ✔***Please check with your State before following through on any of these provisions.***

- Under the LCRMR you may no longer be required to provide a:
  - certification showing that residents who took samples were informed of proper sampling procedures;
  - certification that each sample represents a first-draw sample;
  - justification for using sites that do not meet the Tier 1 criteria; or
  - written request for moving to a reduced tap monitoring schedule when you meet your optimal WQPs (under §141.86(d)(4)).

- If you are an NTNCWS or CWS (such as a prison or hospital) that does not have enough inside taps where the water stands unused for at least 6 hours, the LCRMR allow you to use inside taps that are the most likely to have remained unused for the longest period of time. The State will determine whether you must receive prior approval to collect non-first draw samples, or whether you can submit documentation that identifies each site and length of standing time for the samples collected at these sites when you submit your sample results. Unless you make additional changes to your sampling plan during subsequent monitoring periods, this is a one-time reporting requirement.

What Should I Do If I Sell Water To, or Buy Water From, Another Water System? (See §141.29)

EPA's position on the consolidation of sampling requirements under the Lead and Copper Rule was stated in a January 10, 1992 memorandum, entitled "*Consecutive Systems Regulated under the National Primary Drinking Water Regulations for Lead and Copper*". Highlights and excerpts from this memorandum are presented below.

EPA believes it is reasonable to reduce monitoring in consecutive systems if the systems can demonstrate they are interconnected in a manner that justifies treating them as a single system, in accordance with §141.29.

Prior to allowing consecutive systems to consolidate their sampling, the State should submit to its EPA Regional office a written explanation of how the monitoring, treatment, and reporting requirements will be administered and enforced in consecutive systems that consolidate their operations for lead and copper. These proposals should clearly identify which systems will be held accountable for violations of any of the rule's requirements. Should enforcement actions ever become necessary, it is vital that the party responsible for monitoring, or, if needed, subsequent treatment and/or other activities (including public education or lead service line replacement) be clearly identified and accept responsibility for any rule violations.

The key elements that should be contained in the proposal are:

1. Rationale for reduced monitoring;
2. Explanations of the responsibilities among systems involved, including which water system(s) is (are) responsible for:
   - Collecting and reporting to the State the results of the lead and copper tap monitoring and all WQP monitoring;
   - Completing corrosion control requirements under §§141.81 and 141.82; and
   - Lead service line replacement.

> ✎ **Note:** EPA expects that the parent water system will take responsibility for corrosion control throughout the entire area served. Depending on contractual agreements, the size and configuration of the satellite system(s), and the distance from the parent treatment facility, individual corrosion control treatment may need to be installed at a point or points other than the parent plant.

3. How the following provisions will be modified:
   - Determination of 90th percentile lead and copper concentrations in the consolidated system; and
   - WQP monitoring to determine baseline values and ensure that optimal corrosion control treatment is properly installed and maintained.
4. If applicable, how the responsibility for public education, source water monitoring, and source water treatment will differ from the responsibilities as assigned in the preamble to the LCR.

> ✎ **Note:** In the preamble to the 1991 LCR, EPA has stated that responsibility for public education delivery resides with the retailer (i.e., the consecutive or "satellite" system) and responsibility for source water monitoring and treatment resides with the wholesaler or "parent" system.

What Happens If I Do Not Fulfill My Lead and Copper Tap Monitoring And Reporting Requirements? (See §141.80(k))

If you do not meet all of the following monitoring and reporting requirements within the time frame specified by the rule, you are in violation of these requirements:

- Use appropriate sampling procedures in accordance with §§141.86(a) and (b);
- Collect the required number of samples during the specified time frame in accordance with §§141.86(c) and (d);
- Ensure samples are analyzed properly in accordance with §141.89(a);
- Submit all required monitoring information on time in accordance with §141.90(a); ***or***
- Report a change in treatment, or an addition of a new source, within 60 days or within the time frame specified by the State, if you are on reduced monitoring, have a waiver, or are a (b)(3) system, as required by §141.90(a)(3).

Depending on whether the State adopts the less stringent provisions of the LCRMR into its revised drinking water regulation, you may also be in violation if you do not meet the following requirements within the timeframe specified by the rule:

- Meet replacement sample requirements for invalidated samples as described in §141.86(f)(4) where these samples are needed to meet minimum sampling requirements;
- Meet the conditions of your monitoring waivers in §141.86(g) or provide the required information in §§141.90(a)(4)(ii)-(iv);
- Provide sample information needed for your State to perform the 90^{th} percentile calculation as outlined in §141.90(h);
- Collect non-first draw samples that did not meet the criteria in §141.86(b)(5); ***or***
- Meet the monitoring deadline for transitioning to an alternate period (i.e., months other than June through September) for collecting reduced lead and copper tap samples, as specified in §141.86(d)(4)(iv)(B).

If you are out of compliance, you must:

1. Report the violation to the State within 48 hours of determining the noncompliance (see §141.31(b)).
2. Deliver public notification to your customers. If your State has not adopted the new public notification requirements, refer to §141.32. Otherwise, refer to §141.201 & §§141.203 - 141.206 or to EPA's *Public Notification Handbook* (EPA 816-R-00-010, June 2000). The Handbook is available on EPA's website at www.epa.gov/safewater/pn.html.

3. If you are a CWS, include a discussion of the violation in your consumer confidence report, including potential adverse health effects and actions taken to address the violation. Refer to §§141.153 & 141.154 or to EPA's *Preparing Your Drinking Water Consumer Confidence Report* (EPA 816-R-99-002, March 1999). This document is available on EPA's website at www.epa.gov/safewater/ccr1.html.

Also keep in mind that:

1. An action level exceedance is not a violation and does not trigger public notification requirements. However, if you exceed the lead action level, you must deliver public education to your customers. In addition, if you are a CWS, you must include in your consumer confidence report, the 90th percentile value for the most recent sampling (if it is a value greater than 0) and the number of sites that exceeded the action level.
2. If you have been granted a monitoring waiver and do not conduct your lead and copper monitoring properly or on-time, you no longer meet the conditions of your waiver and the State may revoke your waiver. You can reapply at a later date when you again meet the eligibility requirements for a waiver.
3. Consecutive rounds of monitoring are needed to qualify for reduced lead and copper tap monitoring. Thus, noncompliance with your lead and copper tap monitoring requirements can impact how quickly you can qualify for reduced monitoring.

What Provisions of the LCRMR Pertain to Lead and Copper Tap Monitoring and Reporting? (See §141.86 & §141.90(a))

The table below summarize those lead and copper tap monitoring and related reporting provisions that have been discussed throughout Chapter II. The table distinguishes between those provisions that you were required to begin implementing on April 11, 2000 and those less stringent provisions with which you must first check with your State before implementing. Remember, if you own or operate a water system on Tribal lands, in Wyoming, or the District of Columbia, the Federal version of the LCRMR applies to you. Therefore, you were required to implement all of the following provisions beginning April 11, 2000.

You Were Required to Comply with These Monitoring Requirements Beginning April 11, 2000
If you do not have enough Tier 1, 2, or 3 sites, you must use representative sites to meet minimum sampling requirements.
If you are on reduced lead and copper tap monitoring, you must collect from sites that are representative of the ones you used during standard monitoring. *(Your State entity may specify where to collect these samples.)*
If you are on reduced lead and copper tap monitoring, are a (b)(3) system, or have a monitoring waiver, you must notify your State in writing no later than 60 days after changing treatment or adding a new source.

You Must First Check With Your State Before Implementing the Following Provisions
Your State may allow you to conduct reduced lead and copper monitoring during months other than June through September.
If you operate 24 hours a day and you do not have enough taps that can supply first-draw lead and copper samples, you may be able to collect samples from the taps that have the longest standing times.
You can collect lead and copper tap water samples once every 3 years after monitoring for only 2 consecutive, 6-month monitoring periods, if your 90^{th} percentile levels are ≤ 0.005 mg/L for lead and ≤ 0.65 mg/L for copper.

You Must First Check With Your State Before Implementing the Following Provisions (Continued)

You can ask your State to invalidate lead and copper tap water samples if the samples meet ***at least one*** of the criteria below and you provide documentation that supports your request:

- There is a laboratory error;
- The sample was damaged in transit;
- The State determines that the sample was taken from an inappropriate site; or
- The State believes the sample was tampered with.

Note: *If you do not have enough valid samples after the State invalidates your sample(s), you must collect enough replacement samples to meet the minimum sampling requirements.*

You may request a 9-year monitoring waiver for lead and/or copper tap monitoring if:

- You serve 3,300 or fewer persons;
- Your 90^{th} percentile levels are ≤ 0.005 mg/L for lead and/or ≤ 0.65 mg/L for copper; and
- Your plumbing materials meet certain criteria that indicate negligible risk from lead and/or copper exposure.

You may no longer be required to:

1. Calculate and report your 90^{th} percentile lead and copper levels if:
   - Your State has notified you that it will perform this calculation;
   - You provided your sampling results and sampling site information to your State no later than the date specified by your State *(**Note:** this date will be sometime before the end of the monitoring period)*; and
   - Your State gave you the results of the 90^{th} percentile calculation before the end of the monitoring period.
2. Submit certifications that you followed proper sampling procedures or that homeowners collected samples after receiving proper instructions.
3. Provide justifications if your sampling pool contains Tier 2 or Tier 3 sites or an insufficient number of sites served by lead service lines.
4. Request in writing your State's permission to monitor for lead and copper on a reduced schedule after you meet your OWQPs. *(You still must **receive written approval** from your State before you begin reduced monitoring.)*

What Key Points Should I Remember About Lead and Copper Tap Monitoring? (See §§141.81 & 141.86)

- ✦ You must sample at Tier 1 sites. If an insufficient number exist, use Tier 1, followed by Tier 2, Tier 3, and representative sites. *(Note: Tier 3 sites only apply to CWSs.)*
- ✦ If you have lead service lines in your distribution system, you should collect at least half of your samples from sites served by lead service lines. If you have no lead service lines, but you have lead goosenecks or pigtails, you can collect tap water samples at the sites with the goosenecks and/or pigtails.
- ✦ You should identify more sampling sites than the number of samples you are required to collect during each monitoring period, in case volunteers drop out.
- ✦ If you do not have the required number of sampling sites, it may be necessary to collect more than one sample from the same location, on different days, in order to collect the minimum number of required samples.
- ✦ Samples must be 1-liter in volume and be taken from an interior tap where the water has stood in the pipes for at least 6 hours *(except as noted below)*.
- ✦ If you are an NTNCWS or CWS that does not have enough inside taps where the water stands unused for at least 6 hours, your State may allow you to use inside taps that have remained unused for the longest period of time.
- ✦ You should collect samples early enough in the monitoring period in case WQP samples are required (e.g., small or medium systems that exceeds the lead or copper action level).
- ✦ You must initiate corrosion control treatment steps if you exceed the lead or copper action level or if you serve more than 50,000 people and you are not a (b)(2) or (b)(3) system.
- ✦ You must collect source water samples if you exceed lead and copper action levels.
- ✦ If you serve 50,000 or fewer people, you can stop corrosion control treatment steps whenever your 90^{th} percentile lead and copper levels are at or below their action levels for 2, consecutive, 6-month monitoring periods. You must recommence these steps if you again exceed either action level.
- ✦ If you serve 50,000 or fewer people, you qualify for reduced annual monitoring if you have 2, consecutive, 6-month periods at or below both action levels. You can qualify for triennial monitoring if you have 3 consecutive years of monitoring at or below both action levels.
- ✦ Regardless of the number of people that you serve, you can qualify for reduced monitoring if you are in compliance with your OWQP specifications for a minimum of 2, consecutive, 6-month periods and you receive written approval from the State.
- ✦ Regardless of the number of people that you serve, you can qualify for triennial monitoring at the reduced number of sites, if your 90^{th} percentile lead level is $\leq$ 0.005 mg/L ***and*** 90^{th} percentile copper level is $\leq$ 0.65 mg/L, for 2, consecutive, 6-month periods *(if the State has adopted this provision)*.
- ✦ If you serve 3,300 or fewer people, you can monitor once every 9 years at the reduced number of sites, if you qualify for a monitoring waiver, and the State has adopted this provision.

CHAPTER III: WATER QUALITY PARAMETER MONITORING AND REPORTING REQUIREMENTS

What Is The Purpose of Collecting Water Quality Parameter Samples? (See §141.87)

WQPs are used to determine the corrosivity of the water, and if needed, to help the State determine the type of corrosion control that system should install and how the treatment should be operated. For most water systems that require treatment, corrosion control treatment is the primary mechanism for reducing their lead and copper levels.

WQP samples include analysis for:

- pH;
- Alkalinity;
- Calcium;
- Conductivity;
- Water temperature;
- Orthophosphate, if an inhibitor containing phosphate is used; and
- Silica, if an inhibitor containing silica is used.

WQP samples are collected at two separate locations:

- At entry points to the distribution system; and
- At representative taps throughout the distribution system *(approved coliform sampling sites may be used)*.

Which Systems Must Collect Water Quality Parameter Samples? (See §141.87)

If you serve more than 50,000 people, you must conduct some WQP monitoring. However, if you meet the (b)(3) criteria based on initial lead and copper tap monitoring, you are only required to conduct WQP monitoring during the same 2, consecutive, 6 months in which you conducted initial lead and copper tap monitoring.

If you serve 50,000 or fewer people, you do not have to collect WQP samples unless you exceed an action level. During any monitoring period in which you exceed the lead or copper action level, WQP samples must be collected from entry points to the distribution system and from a set of representative sites located throughout the distribution system.

When Do I Collect Water Quality Parameter Samples? (See §§141.87(b)-(e))

Water quality parameter monitoring can be divided into three phases:

- Initial WQP monitoring;
- Follow-up monitoring that occurs in the year following the installation of corrosion control treatment; and
- Monitoring that occurs after the State sets OWQPs.

Each of these is discussed in greater detail below. In addition, refer to the timelines in Appendix C which illustrate how WQP monitoring requirements are impacted by a system's size category and whether it exceeds an action level.

<u>**Initial WQP Monitoring**</u>

Initial WQP monitoring is conducted during the same monitoring period(s) as initial lead and copper tap monitoring. During initial monitoring, WQP samples are collected at representative sites in the distribution system (also referred to as tap samples) and at each entry point to the distribution system for:

- pH;
- Alkalinity;
- Calcium;
- Conductivity;
- Temperature;
- Orthophosphate, when a phosphate-based corrosion inhibitor is used; and
- Silica, when a silicate-based corrosion inhibitor is used.

If you serve more than 50,000 people, you were required to conduct WQP monitoring during the same 2, consecutive, 6-month monitoring periods as initial tap monitoring. Thus, for systems that were in existence prior to 1992, WQP monitoring was required to be conducted during the monitoring periods of January 1 through June 30, 1992 and July through December 31, 1992.

If you serve 50,000 or fewer people, and you exceeded the lead and/or copper action level, you must monitor before the end of the 6-month initial tap monitoring period(s) during which the action level is exceeded. Because WQP samples must be collected in the same monitoring period in which you exceed an action level, you should collect lead and copper tap water samples early in the monitoring period. If you exceed during the first round of initial tap monitoring, you are immediately triggered into corrosion control treatment requirements. If your State requires you to collect a second set of lead and copper tap samples or you elect to conduct this monitoring and you exceed the action level, you will also be required to collect WQP samples during this 6-month monitoring period. Table 3-1 below illustrates the timing for systems serving 50,000 or fewer people that were in existence prior to January 1992.

REMEMBER: For systems of any size, while you are conducting a corrosion control study and installing corrosion control treatment, you are not required to collect WQP samples, unless required by the State. Samples that are required as part of the study or during treatment installation are not counted towards compliance with your normal WQP sampling requirements.

Table 3-1: Initial WQP Requirements for Systems Serving 50,000 and Fewer People

If you serve...	*And you exceeded during the...*	*You were required to collect WQP samples during...*
3,301 to 50,000 people	1st monitoring period of July - December 1992	July - December 1992
	2nd monitoring period of January - July 1993	January - July 1993
25 to 3,300 people	1st monitoring period of July - December 1993	July - December 1993
	2nd monitoring period of January - July 1994	January - July 1994

✎ **Note:** If you are a new system, the State will specify when you must begin initial lead and copper tap monitoring. WQP samples must be collected before the end of the 6-month initial tap monitoring period(s) during which an action level is exceeded.

REMEMBER: A small or medium system that does not exceed an action level does not have conduct any WQP monitoring unless required by the State.

During each initial monitoring period in which you are required to conduct WQP monitoring, you must collect:

- 2 samples at each of the number of tap sites specified in Table 3-2; and
- 2 sample at each entry point to the distribution system.

Table 3-2: Standard Number of WQP "Tap" Sites and Samples		
System Size (No. of People Served)	**No. of Sites (Standard)**	**No. of Samples (2 per site)**
> 100,000	25	50
10,001 to 100,000	10	20
3,301 to 10,000	3	6
501 to 3,300	2	4
≤ 500	1	2

As an example, assume a system serving 9,000 people has 3 entry points. The regulation requires the system to collect 2 distribution samples at 10 sites and 2 samples at each entry point to the distribution system. Therefore, during January through June 1992, these systems would have collected 20 WQP tap samples and 6 entry point samples. During July through December 1992, the system would have collected the same number of entry point and WQP samples.

Follow-up WQP Monitoring

Follow-up monitoring occurs in the 12 months immediately following the installation of corrosion control treatment. These samples are collected during the same 2, consecutive, 6-month monitoring period(s) as follow-up lead and copper tap monitoring.

If you serve more than 50,000 people, you were required to conduct this monitoring during 2, consecutive, 6-month monitoring periods of January through June 1997 and July through December 1997, unless the State determined you met the criteria of a (b)(2) or a (b)(3) system. As previously discussed, (b)(2) systems have already installed treatment that is equivalent to that required under the lead and copper regulations. These systems are not required to conduct initial or follow-up WQP monitoring.

If you serve 50,000 or fewer people, WQP monitoring is only required during each of the 6-month follow-up monitoring periods in which you exceed the lead or copper action level. Therefore, if you install corrosion control treatment and are at or below both action levels, you are not required to conduct follow-up WQP monitoring. However, your State may require you to continue WQP monitoring to demonstrate that you are properly operating corrosion control treatment.

You must collect 2 samples at each of the number of WQP sites specified in Table 3-2, during each of 2, consecutive, 6-month monitoring periods for:

- pH;
- Alkalinity;
- Calcium, when calcium carbonate stabilization is used;
- Orthophosphate, when a phosphate-based inhibitor is used; and
- Silica, when a silicate-based inhibitor is used.

These samples should be collected evenly throughout the year to reflect seasonal variability.

You also must immediately begin taking ***1 set*** of the following WQP samples at each entry point at least once every 2 weeks:

- pH;
- When alkalinity is adjusted, a reading of the dosage rate of the chemical used to adjust alkalinity and the concentration of alkalinity; and
- When an inhibitor is used, a reading of the dosage rate of the inhibitor used and the concentration of orthophosphate or silicate (whichever is used).

> ✎ **Note:** Once treatment has been installed, entry point monitoring changes from 2 samples per entry point at 6-month intervals to 1 sample per entry point at least every 2 weeks.

After corrosion control treatment has been installed, the LCRMR allow ground water systems to limit sampling points to those representative of the water quality and corrosion control treatment conditions throughout the system. If this option is used, prior to sampling, the system must demonstrate to the State that the selected sites are indeed representative. Please note that this option does not apply to initial monitoring and can only apply if the State incorporates this provision into its drinking water regulations. ✔***First check with your State to determine if you can take advantage of this provision.***

Monitoring after the State sets OWQPs

The State uses the lead and copper tap and WQP data collected before and after the installation of corrosion control treatment to set WQP ranges or minimums (called optimal water quality parameters or OWQPs) that indicate that a system is operating corrosion control treatment at a level that most effectively minimizes the lead and copper concentrations at users' taps. The State sets ranges or minimums for the following OWQPs at entry points and within the distribution system (i.e., tap samples) within 6 months of receiving lead and copper and WQP follow-up monitoring results:

- pH;
- Alkalinity *(when alkalinity is adjusted)*;
- Orthophosphate *(when a phosphate inhibitor is used);*
- Silica *(when a silicate inhibitor is used);* and
- Calcium *(when calcium carbonate stabilization is used as part of corrosion control).*

For example, the State might require you to maintain pH between 7.8 and 8.2 at each entry point and a pH of 7.0 to 8.0 at all sampling sites in the distribution system. Similarly, the State might require you to install sodium bicarbonate at a dosage rate of 10 mg/L (measured at each entry point) to maintain alkalinity above 20 (measured at all distribution system sites). The State can also designate values for additional water quality control parameters.

The concentration of each applicable WQP is measured at entry points and at a specified number of sites within the distribution system (refer back to Table 3-2). Measurements at the entry points also include a reading of the dosage rate of the chemical used to adjust the alkalinity (if applicable) and a reading of the dosage rate of the inhibitor used (if applicable).

After OWQPs are set, the frequency of WQP tap monitoring remains semi-annually (unless you qualify for reduced monitoring), and the frequency for entry point monitoring remains every 2 weeks.

If you serve more than 50,000 people and do not qualify as a (b)(3) system, you must collect WQP samples and operate in compliance with the OWQPs designated for your system. If you installed corrosion control treatment prior to the effective date of the rule (i.e., are a (b)(2) system), the LCRMR clarify that the State will designate OWQPs and that you must conduct WQP monitoring. Prior to the LCRMR, the regulation was unclear regarding the continuing monitoring requirements for (b)(2) and (b)(3) systems.

If you serve 50,000 or fewer people, you are only required to collect WQP samples during those monitoring periods in which an action level exceedance occurs, unless required by the State.

You must collect 2 samples every 6 months at the standard number of WQP tap sampling sites that is specified in Table 3-2 for:

- pH;
- Alkalinity;
- Calcium, when calcium carbonate stabilization is used;
- Orthophosphate, when a phosphate-based inhibitor is used; and
- Silica, when a silicate-based inhibitor is used.

You must collect 1 set of samples at each entry point (except those ground water systems that can limit entry point monitoring to representative sites) at least once every 2 weeks for:

- pH;
- When alkalinity is adjusted, a reading of the dosage rate of the chemical used to adjust alkalinity and the concentration of alkalinity; and
- When an inhibitor is used, a reading of the dosage rate of the inhibitor used and the concentration of orthophosphate or silicate (whichever is used).

> ✎ **Note:** The LCRMR also clarify that for those systems with treatment in place, the State must take measures to ensure that systems are operating treatment properly. Thus, the State could require you to collect WQP samples, even if you serve 50,000 or fewer people, or qualify as a (b)(3) system.

~Refer to the section entitled, "Can I Ever Reduce My WQP Monitoring?",
for a discussion of the criteria that allow you to reduce the frequency of WQP tap monitoring~

How Do I Select My Sampling Sites? (See §141.87(a))

Distribution Samples

You must identify sampling sites in your distribution system representative of the water quality throughout the distribution system. These samples are also referred to as WQP tap samples. The number of tap WQP sampling sites are specified in Table 3-2. For ease, you may want to sample from sites used for coliform monitoring. The advantages associated with using these sites are: (1) access is available since the sites are already being used as sampling locations; (2) personnel are already in place to perform monitoring at these sites; and (3) the locations should be representative of the distribution system conditions as required by the Total Coliform Rule. You also can use the taps from which you collect lead and copper tap samples.

In order to ensure that your distribution sampling sites (or "tap" samples) are representative of water quality throughout the distribution system, you should consider the following:

- Size of the population you serve and where the population is located;
- All of the different sources of water you currently use;
- All of the different treatments installed and operating;
- The effects of seasonal variability on treatment and water quality;
- The proximity of WQP sites to lead and copper tap water sampling sites;
- The proximity of WQP sites to supplemental chlorination feed points;
- The proximity of WQP sites to ground or elevated storage locations;
- The sampling sites' representativeness of typical detention times of water in the distribution system;
- The sampling sites' representativeness of distinct pressure zones located throughout the distribution system; and
- The sampling sites' representativeness of distribution system materials.

Also, avoid areas in the distribution system where maintenance or flushing is conducted because water quality upsets are more likely to occur in these places. Remember, you are trying to collect data that is representative of typical water quality conditions in the distribution system.

Entry Point Samples

You must sample from each entry point to the distribution system to obtain a sample that is representative of the source after treatment. If 2 or more sources are combined before distribution, your sample must be representative of all sources used.

How Do I Collect Water Quality Parameter Samples? (See §141.87(a))

<u>To Keep in Mind at the Sampling Site</u>

Unlike lead and copper tap samples, WQP samples should be fully flushed. Samples collected at entry points to the distribution system must be collected at locations representative of each source of water after treatment.

If your system draws water from more than one source, and the sources are combined before distribution, you must collect samples at sites in the distribution system where the water is representative of all sources being used.

If you collect the WQP samples in the distribution system from the same location as coliform and disinfectant residual samples, you should collect the WQP samples in the following manner:

- Fully flush the tap and collect the coliform sample;
- Collect a sample to measure disinfectant residual;
- Collect and analyze sample for temperature and pH; and
- Collect the samples for the other WQPs.

When you collect WQP samples, you should always record your observations about color, suspended solids, and the flushing time required prior to achieving acceptable sampling conditions. During collection of the WQP samples, care should be taken to avoid the introduction of air bubbles into the sample which can affect the pH, conductivity, and dissolved oxygen content of the water sample.

Plastic or glass containers can be used when collecting WQP samples unless silica analyses are required, in which case, plastic must be used. All samples should be stored in a cool environment until analyzed. During transportation, care should be taken to avoid breakage of the sample.

<u>Parameter-specific procedures to keep in mind</u>

Temperature and pH: Temperature analyses must be conducted in the field to ensure accuracy. Measure temperature using either a hand-held thermometer or a combined temperature/pH electrode and meter. pH measurements must also be conducted in the field and must be made with a pH electrode and meter within 15 minutes of sample collection. The meter should be capable of measuring to 1/10 of a unit. The pH probe should be placed in a holding bottle and secured during transport. The probe's membranes are very delicate and should not come in contact with hard surfaces or be allowed to dry out. Pack a replacement probe just in case. In addition:

- Before collecting the pH sample, the pH electrode should be calibrated at pH 7.0 and a second pH level; either 4.0 or 10.0, depending on the pH range typically found within the distribution system.
- Before collecting the sample, remove the faucet aerator and run the water gently to flush the line.
- Fill the sample bottle to slightly overflowing.

- Use a closed-system bottle — which allows you to insert the thermometer or pH probe—to reduce measurement error.
- If you use a hand-held thermometer, insert it in the sample and record the reading when it stabilizes. Insert the pH electrode immediately after removing the thermometer.
- If you use a combined electrode and meter, insert it in the sample immediately after filling the bottle and measure temperature. Change the meter to measure pH levels and gently rotate the bottle until the pH reading stabilizes (may take several minutes).
- Record the pH measurement, rinse the electrode with deionized water and replace it in the holding bottle.

Other WQPs: When you collect WQP samples for alkalinity, calcium, conductivity, orthophosphate, and silica, you should take two, 500 mL samples at each sampling location. Two samples are needed because the calcium analysis is conducted using a separate sample in order to acidify the sample prior to measurement. The two, 500 mL samples counts as one set of samples; thus, you must repeat this for each of your 2 entry point sample sets during initial monitoring, as well as your 2 distribution ("tap") samples sets that are required during each WQP monitoring period.

How Does the State Determine If I Am In Compliance With My Optimal Water Quality Parameter Values? (See §141.82(g))

Prior to the LCRMR, you would incur a violation if the WQP value of any sample or the average of the original sample and confirmation sample was below the minimum value or outside the range designated by the State. If you elected to collect a confirmation sample, you were required to collect it within 3 days of collecting the original sample.

In each monitoring period in which you did not meet your OWQP specifications, you would incur a violation. For entry point monitoring, compliance was determined every 2 weeks. For tap WQP monitoring, compliance was determined for the monitoring period in effect (i.e., 6 months, 1 year, or 3 years).

Under the LCRMR, EPA revised the procedure for calculating compliance with OWQPs based on concerns raised by several States and water systems. A major concern was that the 1991 compliance approach created a significant disincentive for sampling WQPs more frequently than required, since the more frequently measurements are taken, the greater the potential that some of the results will be outside the OWQP ranges or below the OWQP minimums set by the State. Another concern was the "averaging" of results was not the best approach from an effective corrosion control perspective. A system might have to increase pH scale and cause other problems simply to set the average within range.

Under the LCRMR, compliance determinations are always based on a 6-month period, regardless of the system's monitoring schedule (e.g., daily, biweekly, semi-annually, annually, triennially) or whether the WQP results are from an entry point or the distribution system. The start of the first 6-month period begins on the day the State has designated OWQPs.

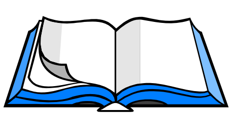
You cannot be outside the OWQP ranges or below the OWQP minimum (also known as an excursion) for more than a total of 9 days at a specific sampling point or combination of sampling points, or for a specific WQP or combination of WQPs during a 6-month period. The 9 days can occur anytime during the 6-month period and do not have to be consecutive. The 9 days allow you to make necessary repairs that may be causing your system to not meet its OWQP specifications.

Confirmation samples are no longer used. You must use the results of all WQP samples collected during the 6-month period at a sampling location to determine OWQP compliance and report these results to the State. However, States have discretion to delete results of obvious sampling errors from this calculation.

Daily values are calculated for each WQP at each sampling location. The procedure for determining the daily value is based on the sampling frequency for that WQP and sampling point. It is quite possible for you to collect several samples a day for a given WQP at one sampling location and to conduct annual monitoring at another. Although the term "daily values" contains the word "daily", in many instances, the daily value represents a measurement that was collected more or less frequently than once per day. Table 3-3, below, explains how to calculate the daily value based on the sampling frequency for a given WQP.

> ✎ *Please note that the State is not required to use this new OWQP compliance procedure.*
> ✓ *First check with your State to determine when and if you should use this new procedure for assessing compliance with your OWQPs.*

Table 3-3: Daily Value Calculation Based on Monitoring Frequency	
If you are monitoring for a specific WQP at a sampling site:	***Then the daily value is:***
More frequently than Daily	Calculated by averaging all the results measured at the sampling location for that WQP during the day. If both continuous monitoring results and grab samples are collected on the same day, both must be included in the calculation of the daily value. States can specify the frequency with which continuous monitoring results should be recorded. A State can also require systems to determine the "daily value" using another formula when they monitor more frequently than daily at the same sampling location. ✓ *First check with your State regarding the frequency of recording values and procedures for aggregating results.*
Daily	Results of each daily sample for that WQP at that location.
Biweekly	Results of each sample collected during the 2-week period for that WQP at that location.
Semi-annually	Results of each sample collected during the 6-month period for that WQP at that location.
Annually or Triennially	The most recent measurement(s) taken, even if the measurement(s) was (were) collected during a previous monitoring period. **Example:** A system is on annual WQP tap monitoring during January - December 2000. It measures pH at the tap on January 10, 2000 (pH = 7.5) and June 20, 2000 (pH = 7.6). For the 6-month period of January - June 2000, there are two daily values because both measurements were collected during the 6-month period being evaluated. For the 6-month period of July - December 2000, only the most recent value of 7.6 is used.



For more information on the new OWQP compliance procedure, refer to: *How to Determine Compliance with Optimal Water Quality Parameters as Revised by the Lead and Copper Rule Minor Revisions,* February 2001, EPA 815-R-99-019.

Can I Ever Reduce My WQP Monitoring? (See §141.87(e))

After the State sets OWQPs, you can qualify for a reduction in the amount of monitoring conducted at tap locations ***only*** if you are in compliance with your OWQPs (i.e., do not have excursions for more than 9 days in a 6-month period). This reduction does not apply to entry point WQP monitoring. Entry point monitoring remains at a frequency of every 2 weeks.

Criteria for Reducing the Number of WQP Tap Samples

If you are in compliance with your OWQPs after 2, consecutive, 6-month monitoring periods ***and you serve more than 10,000 people***, you can reduce the number of sample sites at which you collect tap WQP samples from the standard number to the reduced number as shown in Table 3-4 below. However, 2 samples are still required at each location and the frequency remains at semi-annually.

Table 3-4: Reduced Number of WQP Tap Sites and Samples

System Size (No. of People Served)	No. of Sites (Reduced)	No. of Samples (2 per site)
> 100,000	10	20
10,001 to 100,000	7	14
3,301 to 10,000	3	6
501 to 3,300	2	4
25 to 500	1	2

✎ **Note**: The number of WQP tap samples for systems serving ≤ 10,000 people is the same under standard and reduced monitoring.

Criteria for Annual Monitoring

If you are in compliance with your OWQP specifications for 3 consecutive years of monitoring (beginning on the date the State sets WQP values), you may also reduce the frequency with which you collect your distribution WQP samples from once every 6 months to once per year and collect from the reduced number of sites.

Criteria for Triennial Monitoring

If you are on an annual WQP tap monitoring frequency and you are in compliance with your OWQPs for 3 ***consecutive*** years of monitoring, you may reduce the frequency with which you collect WQP tap samples from annually to once every 3 years. Systems serving more than 10,000 people would continue to collect from the reduced number of sites.

✎ **Note:** Unlike lead and copper tap monitoring, the first year of semi-annually monitoring does not count toward the first year of meeting the triennial monitoring criteria. Instead, you must collect WQP tap samples at the annual frequency for 3 consecutive years to qualify for triennial WQP tap monitoring.

The LCRMR has added an accelerated reduced monitoring provision for tap WQPs. You can now reduce the frequency of WQP monitoring at the tap to once every 3 years more rapidly than before. In order to qualify, you must demonstrate for 2 consecutive monitoring periods (either 6-month or annual periods):

1. Your 90^{th} percentile lead level does not exceed 0.005 mg/L;
2. Your 90^{th} percentile copper level does not exceed 0.65 mg/L; and
3. You are in compliance with your OWQP requirements.

In general, this provision will apply to large systems because unless required by the State, small and medium systems that are at or below both action levels are not subject to WQP monitoring requirements. ✔***First check with your State to determine if you can take advantage of this provision.***

Table 3-5 below summarizes the criteria that you must meet to qualify for reduced WQP tap monitoring. For systems serving more than 10,000 people, WQP tap monitoring is conducted at a reduced number of sites. Remember, this reduction does not apply to entry point samples; once corrosion control treatment is installed, these samples are collected at least every 2 weeks.

Table 3-5: Reduced WQP Tap Monitoring Criteria

Criteria[1] ***(Required time period in which system is in compliance with its OWQP Specifications)***	**Monitoring Frequency**	**Number of Years Since State Set OWQPs**
2 consecutive 6-month periods	Every 6 months	One
3 consecutive years (equals six, 6-month periods)	Annual	Three
3 consecutive years of ***annual*** monitoring[2]	Triennial	Six
2 consecutive monitoring periods: 1. 90^{th} percentile lead level ≤ 0.005 mg/L; 2. 90^{th} percentile copper level ≤ 0.65 mg/L; and 3. in compliance with OWQP specifications.	Triennial	As early as One Year

[1] Compliance with OWQPs must occur in consecutive periods to qualify for reduced monitoring.
[2] Unlike lead and copper tap monitoring, semi-annual monitoring cannot count as the first year toward the triennial monitoring criteria. A system must be in compliance with its OWQP specifications for 3 years in which it collects WQP tap samples at the annual frequency before qualifying for triennial monitoring.

REMEMBER: If your State is using the new OWQP compliance procedure, you are in compliance with your OWQPs if you have excursions on no more than 9 days in a 6-month period (at any entry point or WQP tap sampling site or combination of sites). As long as this is the case, you can count this monitoring period toward qualifying for reduced monitoring.

Can I Ever Discontinue Water Quality Parameter Monitoring? (See §§141.81(b)(3), 141.82(g), & 141.87(b)-(e))

If you serve 50,000 or fewer people and you no longer exceed an action level, you can discontinue WQP monitoring. However, if you meet these criteria after installing treatment, your State may require you to continue WQP monitoring. The LCRMR clarify that systems with treatment in place must continue to properly operate it. Systems will also be required to undertake any additional measures that the State deems necessary to ensure treatment is operated properly. This may mean continued WQP monitoring even if you are at or below both action levels.

Similarly, if you are a large system and the State deems you to be a (b)(3) system, you are not required to continue WQP monitoring. However, if the State makes this determination after you have installed treatment, the State may require you to continue to conduct some WQP monitoring.

REMEMBER: If you serve 50,000 or fewer people, if you again exceed the lead or copper action level, you will be required to resume WQP monitoring. Similarly, if you are a large system and no longer meet the (b)(3) criteria, you also will be required to collect WQPs.

What Water Quality Parameter Monitoring Information Must I Report to the State? (See §§141.90(a)(1)(vi)-(viii) & (5))

The LCRMR clarify that you must report WQP monitoring results within the first 10 days following the end of each 6-month compliance period. *This reporting requirement still applies even if your State has not adopted the new OWQP compliance procedure.* For example, during the year of 2001, any WQP samples that you collected during January through June 2001 would be due to the State by July 10, 2001. Those samples that you collected during July through December 2001 would be due to the State by January 10, 2001. If you are on annual or triennial WQP tap monitoring, there will be some 6-month monitoring periods in which you will not have any tap WQP results to report.

If you are a ground water system and you are requesting approval to limit entry point monitoring to representative sites, you must provide a demonstration that selected sites represent water quality and treatment conditions. ✓***Please check with your State before providing this demonstration to be sure this provision is included in the State's regulations.***

What If I Do Not Fulfill My WQP Requirements? (See §§141.80(k), 141.82(g), & 141.87(e)(4))

If you do not meet all of the following monitoring and reporting requirements within the timeframe specified by the rule, you are in violation of these requirements:

- Use appropriate sampling procedures in accordance with §§141.87(a)(1);
- Collect the required number and type of samples in accordance with §§141.87(a)(2),(b)-(e);
- Ensure samples are analyzed properly in accordance with §141.89(a);
- Submit all required monitoring information on time in accordance with §141.90(a)(vi)-(viii); ***or***
- Meet the State-approved sampling plan for collecting WQPs at representative entry point locations in accordance with §§141.87(c)(3) *(this criterion would only apply if you are a ground water system and your State's regulation allows you to limit entry point WQP monitoring to representative sites).*

In addition, you are in violation if you do not meet your OWQP ranges or minimums set by the State. If your State assesses compliance using the 1991 LCR procedure, you are out of compliance if the results of any WQP sample, or the average of the original sample and a confirmation sample, does not meet the State-designated OWQP ranges or minimums. Under the LCRMR, you are in violation of your requirements if you have OWQP excursions for more than 9 days in a 6-month compliance period.

If you are out of compliance with your monitoring, reporting, or OWQP requirements, you must:

1. Report the violation to the State within 48 hours of determining the noncompliance (see §141.31(b)).
2. Deliver public notification to your customers (see §141.32 if your State has not adopted the new public notification requirements or §141.201 & 141.203 - 141.206 if your State has adopted these new requirements).
3. Include a discussion of the violation in your consumer confidence report if you are a CWS, (see §§141.153).
4. Return to semi-annual WQP tap monitoring and lead and copper tap monitoring at the standard number of sites, if you are on reduced monitoring and you are in violation of your OWQP requirements. ***Note:*** *A monitoring and reporting violation does not impact your WQP monitoring schedule.*

EPA has also defined the timing of a 6-month monitoring period for small and medium systems on reduced lead and copper tap monitoring that are triggered into WQP monitoring because of an action level exceedance. For these systems, the end of the 6-month period for WQP monitoring is synchronized with the end of the reduced lead and copper tap monitoring period during which an action level was exceeded. This revision was made to correspond to the new OWQP compliance procedure which is based on 6-month monitoring periods. For example, if you are on annual lead and copper tap monitoring during the time period of January 1 through December 31, 2001 and you exceed an action level, the corresponding WQP monitoring period would be July 1 through December 31, 2001.

What Provisions of the LCRMR Pertain to Water Quality Parameter Monitoring and Reporting? (See §141.82(g), §§141.87(c)(3) & (e)(ii), & §141.90(a))

The table below summarizes those provisions that directly impact your WQP monitoring and reporting requirements. It distinguishes between those provisions that you were required to begin implementing on April 11, 2000 and those less stringent provisions with which you must first check with your State before implementing. For water systems owned or operated on Tribal lands, in Wyoming, or the District of Columbia, all of the provisions listed below became applicable on April 11, 2000.

You Were Required to Comply with These Monitoring Requirements Beginning April 11, 2000
If you have installed corrosion control treatment but are not required to conduct WQP monitoring, you must continue to properly operate and maintain corrosion control treatment at all times.
You must report WQP monitoring results within the first 10 days following the end of the 6-month OWQP compliance period.

You Must First Check With Your State Before Implementing the Following Provisions

The LCRMR revises the OWQP compliance procedure as follows:

- "Daily values" are now used to determine compliance. Daily values are the sample results for each WQP and are calculated for each WQP at each sampling location. They are based on the sampling frequency for that WQP and sampling point.
- You are only out of compliance if you have an "excursion" for more than a total of 9 days during a 6-month period. An excursion is any "daily value" for a WQP that is below the minimum value or outside the range set by the State.
- Compliance determinations are always based on 6-month periods, regardless of your monitoring schedule (e.g., daily, biweekly, semi-annually, annually, triennially) or whether the sample is from an entry point or tap.
- Confirmation samples are no longer used. You must report the results of all samples collected during the 6-month period.

You can proceed to triennial WQP tap monitoring if you:

- Qualify for accelerated reduced lead and copper tap water monitoring (your 90^{th} percentile levels are $\leq$ 0.005 mg/L for lead and $\leq$ 0.65 mg/L for copper), and
- Are in compliance with your OWQPs for 2 consecutive monitoring periods (either 6-month or annual).

You may limit biweekly WQP entry point monitoring to representative locations if:

- You are a ground water system; and
- You can demonstrate that these sites are representative of your system's water quality conditions.

What Key Points Should I Remember About Water Quality Parameter Monitoring? (See §§141.82(g) & 141.87)

- If you serve more than 50,000 people, you must conduct some WQP monitoring.
- If you serve 50,000 or fewer people, you do not have to collect WQP samples unless you exceed an action level or are required to by the State. However, you must collect WQP samples during any monitoring period in which you exceed the lead or copper action level.
- Samples must be collected from entry points to the distribution system and from a set of representative sites located throughout the distribution system (coliform sites may be used).
- Unlike lead and copper tap samples, WQP samples should be fully flushed. Samples collected at entry points to the distribution system must be collected at locations representative of each source of water after treatment.
- After you install corrosion control treatment, entry point monitoring changes from 2 samples per site every 6 months to 1 sample per site every 2 weeks.
- You can collect WQP tap samples from a reduced number of sites and/or a reduced frequency by meeting your OWQP requirements for a specified number of consecutive monitoring periods for both WQP entry points and distribution samples. Entry point monitoring remains biweekly.
- Unlike lead and copper tap monitoring, you cannot count semi-annual monitoring toward meeting the triennial monitoring criteria. You must have conducted WQP tap monitoring annually for 3 ***consecutive*** years and be in compliance with your OWQPs for these 3 years to qualify for triennial WQP tap monitoring.
- If your State adopts the new procedure for OWQP compliance, you are in compliance with your OWQP requirements if you have excursions for no more than a total of 9 days at specific sampling point or combination of sampling points, or for a specific WQP or combination of WQPs during a 6-month period.
- If you are on reduced monitoring for lead and copper tap monitoring or WQP tap monitoring, you must return to standard monitoring if you have excursions on more than 9 days in a 6-month period (based on the LCRMR compliance approach).

CHAPTER IV: LEAD AND COPPER SOURCE WATER MONITORING AND REPORTING REQUIREMENTS

What Is The Purpose of Collecting Source Water Samples? (See §§141.81(b)(3) & 141.88(a))

The purpose of requiring lead and copper sampling at the entry points to the distribution system is to:

1. Determine the contribution from source water to total tap water lead and copper levels.
2. Assist you and the States in designing an overall treatment plan for reducing lead and copper levels at the tap.
3. Assist the State in determining whether source water treatment is necessary to reduce lead and copper levels at the tap.

Source water samples are also required if you are trying to demonstrate that you have optimized corrosion control by meeting the criteria under §141.81(b)(3). Refer to the section entitled, What Is the Purpose of the Lead and Copper Regulations?, in Chapter I for a discussion of the (b)(3) criteria.

Which Systems Must Collect Source Water Samples? (See §141.88(a))

For systems of any size, source water monitoring for lead and copper is required if a system exceeds the lead or copper action level based on the 90^{th} percentile lead or copper level ***in tap water samples***. Source water monitoring is also required for systems electing to demonstrate that they qualify as (b)(3) systems. Therefore, if a system never exceeds the lead or copper action level or is not trying to demonstrate that it qualifies as a (b)(3) system, lead and copper source water monitoring is not required.

> ✎ **Note:** If you are a (b)(3) system, your State may require you to collect source water samples every 3 years when you conduct lead and copper tap monitoring to confirm your (b)(3) status.

When Do I Collect Source Water Samples? (See §§141.88(a)-(e))

<u>If This Is The First Time You Have Exceeded The Lead Or Copper Action Level</u>

When you exceed the lead or copper action level for the first time, you must collect a sample at each entry point to the distribution system. Each sample must be analyzed for both lead and copper and the results must be submitted to the State within 6 months of the exceedance. The State will use these sample results to determine if source water treatment is needed. In addition to submitting source water samples, you must also submit a source water treatment recommendation to the State for review and approval within 6 months of exceeding an action level. This recommendation is based on source water monitoring results. You are not required to conduct a source water treatment study. As part of your recommendation, you should consider: ion exchange, reverse osmosis, lime softening, and coagulation/filtration. You can also recommend that no source water treatment is needed. EPA's guidance document *Lead and Copper Rule Guidance Manual Volume II: Corrosion Control*, September 1992 (see page 3-34), recommends source water treatment when the concentration of lead in the source water is greater than 0.010 mg/L or the concentration of copper in source water is greater than 0.800 mg/L.

Form 141-D in Appendix E may be used to report your source water monitoring results ***and*** your source water treatment recommendation. If you use this form, you must also attach a copy of the analytical results from the laboratory. The State will make a decision regarding source water treatment and notify you within 6 months of its receipt of your sample results.

If The State Requires You To Install Source Water Treatment

If the State requires you to install source water treatment, you have 24 months to complete installing this treatment. You are not required to conduct source water monitoring while installing this treatment other than samples that you may elect to take to evaluate the performance of your treatment. You are not required to report these results to the State.

Once you have installed source water treatment, you must collect one sample from each entry point during 2, consecutive, 6-month periods, and analyze this sample for both lead and copper even if you exceed only one of the action levels. With the "before and after treatment" lead and copper results, the State will designate maximum permissible levels (MPLs) for lead and copper. These MPLs represent the highest lead and copper concentrations that are allowed in water entering the distribution system after source water treatment. The State will set MPLs for both lead and copper even if you exceeded the action level of only one of these contaminants.

After the State sets MPLs, your monitoring requirements are based on your source type as follows:

- ***If you use ground water as your only source,*** you must monitor during 3-year compliance periods. The first 3-year compliance period is the one in effect when the State specified MPLs for lead and copper. These are the same compliance periods that were established under the Standardized Monitoring Framework (SMF) for Phase II/V contaminants (e.g., 1993 - 1995, 1996 - 1998, 1999 - 2001, 2002 - 2004, etc.). This was done to allow you to coordinate your source water monitoring for lead and copper with other monitoring requirements.
- ***If you use surface water, ground water under of the direct influence of surface water (GUDI), or any combination of these sources with ground water***, you must monitor annually. The first annual monitoring period begins on the date that the State set your MPLs.

You can further reduce your source water monitoring frequency to once every 9 years based on the SMF compliance cycle (i.e., 1993 - 2001, 2002 - 2010, etc). The number of sites from which you must collect source water samples remains at one sample per entry point.

You can reduce your monitoring frequency to once every 9 years if you meet the criteria listed below.

- ***If you use ground water exclusively,*** you can collect source water samples once every 9 years if you do not exceed either the lead or copper MPL for 3 ***consecutive***, 3-year compliance periods (i.e., 9 years).
- ***If you use surface water, ground water under of the direct influence of surface water (GUDI), or any combination of these sources with ground water,*** you can collect source water samples once every 9 years if you do not exceed either MPL for 3 ***consecutive*** years.

If You Are Not Required To Install Source Water Treatment

If you continue to exceed the lead or copper action level but the State determines that source water treatment is not needed, your continued monitoring requirements are based on the date that the State made this determination and your source type as follows:

- ***If you use ground water as your only source,*** you must monitor during 3-year compliance periods. The first 3-year compliance period is the one in effect when the State determines that source water treatment is not needed.
- ***If you use surface water, GUDI, or any combination of these sources with ground water***, you must monitor annually. The first annual monitoring period begins on the date that the State determines that source water treatment is not needed.

> ✎ **Note:** Some States may have set MPLs for systems that were not required to install source water treatment. For these systems, the monitoring schedule is based on when the State set MPLs. More specifically, systems using ground water exclusively would begin triennial monitoring with the 3-year period in effect when the State set MPLs. All other systems would begin annual monitoring on the date that the State set MPLs.

The LCRMR expand the universe of systems that can conduct source water monitoring at a frequency of once every 9 years. The 1991 LCR did not allow systems that exceeded an action level, but for which the State did not set MPLs, to reduce the frequency of source water monitoring. ✓***Please check with your State to determine if they have adopted the provision described below.***

If you exceed an action level after the State has determined that source water treatment is not needed, you can reduce the frequency of source water monitoring if:

- your source water lead concentrations are ≤ 0.005 mg/L; and
- your source water copper concentrations are ≤ 0.65 mg/L; and
- you maintains these levels for 3 ***consecutive*** compliance periods.

Ground water systems would qualify for reduced monitoring after 3 consecutive, 3-year compliance periods or after 9 years. Surface water systems (or those using a combined source) would qualify after 3 consecutive years.

> **REMEMBER:** You cannot qualify for reduced source water monitoring unless the 3 compliance periods in which you meet the reduced monitoring criteria are consecutive.

Once you qualify for reduced source water monitoring (regardless of whether you install source water treatment or not), ***you are not required to return to standard monitoring***. In other words, an exceedance of an action level or of an MPL does not impact your source water monitoring schedule.

Where Are These Samples Collected? (See §141.88(a))

The sample location, collection methods, and number of samples required are the same as for Phase II/V contaminants, as explained below.

<u>Sampling Requirements Based on Your Source</u>

If you use ground water as your only source, you must take at least one sample at every entry point to the distribution system which is representative of each well after treatment. If there are separate entrances to your distribution system from either individual wells or wellfields, a sample must be collected from each discrete entry point. If you use multiple wells that draw from the same aquifer, the State can identify an individual well for monitoring, as long as there is no treatment or blending.

If you use surface water, GUDI, or any combination of these sources with ground water, you must take at least one sample at every entry point to the distribution system after the application of treatment or in the distribution system at a point which is representative of each source after treatment. These samples may be collected after storage during normal operating conditions or at the high service pumps.

<u>Other Considerations for All Systems Conducting Source Water Monitoring</u>

You must have your samples analyzed for ***both lead and copper*** even if you have only exceeded the action level for one of these contaminants.

If you are drawing from sources that are combined, samples should be taken during normal operations so that the water is representative of all sources being used.

Some States allow a maximum of 5 samples to be combined together and analyzed as one sample (known as compositing). The LCRMR require that compositing be done by a certified laboratory. There are two types of compositing: (1) compositing of samples collected within the same system (intra-system compositing) and (2) compositing among different systems (inter-system compositing). Inter-system composting is only allowed for systems serving 3,300 or fewer people. ✓***First check with your State to determine whether compositing of source water samples is allowed.***

If the lead concentration in a composite sample is greater than or equal to the lead resampling trigger of 0.001 mg/L, or if the copper concentration is greater than or equal to the copper resampling trigger of 0.160 mg/L, then a follow-up sample for the contaminant which exceeded the trigger should be taken at each site and analyzed within 14 days of when the original sample was collected. If duplicates of or sufficient amounts are available from the original samples from each sampling point, these may be used instead of resampling.

> ✎ **Note:** The LCRMR increased the copper resampling trigger from greater than 0.020 mg/L or 0.001 mg/L (depending on the analytical method) to greater than or equal to 0.160 mg/L and the changed the lead resampling trigger from greater than 0.001 mg/L to greater than *or equal* to 0.001 mg/L.

You must take each repeat sample at the same sampling site unless conditions make sampling at another site more representative of each source or treatment plant.

REMEMBER: Compositing allows you to save on analytical costs. It does not reduce the number of samples that you must collect. Also remember to first check with your State to determine if compositing of samples is allowed.

How Does the State Evaluate My Source Water Monitoring Results? (See §§141.83(b)(4) & 141.88(a)(2))

If the State sets MPLs for lead and copper, it will compare your source water results to these levels. If you exceed the lead or copper MPL, you can take a confirmation sample within 14 days of collecting the original sample. If the average of these results are still higher than the MPL, you are in violation. The State may require you to make changes to your source water treatment. If the State does not set these levels, it will review your results to determine if there are any significant fluctuations in your source water levels, indicating a possible need for source water treatment.

✎ **Note:** 90^{th} percentile levels are never calculated for source water samples.

Can I Ever Discontinue Source Water Monitoring? (See §141.88(d)(2))

Once you exceed either the lead or copper action level, you are always subject to source water monitoring requirements. However, ***afte***r the State has designated MPLs or determined that you are not required to install source water treatment, you ***are not required to collect any source water samples*** during any monitoring period in which your 90^{th} percentile lead or copper levels of tap water samples are at or below their action levels for the entire source water monitoring period in effect. If your lead and copper tap and source water monitoring periods do not overlap, then source water monitoring is not required if your 90^{th} percentile lead and copper levels from the last monitoring period were at or below their respective action levels. These points are illustrated in the three examples below.

EXAMPLE 1:

A system qualifies for reduced source water monitoring for the compliance cycle of 2002 through 2010. During this time period, the system is on triennial lead and copper tap monitoring. It conducts lead and copper tap monitoring during 2001 through 2003, 2004 through2006, 2007 through 2009, and 2010 through2012. Both the lead and copper 90^{th} percentile levels are below the lead and copper action levels for all four monitoring periods. The system is not required to conduct source water monitoring because it was below both action levels during the entire source water monitoring period in effect (i.e., the 9-year compliance cycle of 2002 through 2010).

EXAMPLE 2:

Another system qualifies for reduced source water monitoring for the compliance cycle of 2002 through 2010. It conducts lead and copper tap monitoring during 2001 through2003, 2004 through 2006, 2007 through 2009, and 2010 through 2012. During the compliance period of 2010 to 2012, it exceeds the lead action level. These lead and copper tap samples were collected during 2011. This system is not required to conduct source water monitoring during 2001 through 2010, but it would be required to conduct this monitoring during 2011 through 2019 because of the exceedance that occurred in 2011.

EXAMPLE 3:

Beginning January 1, 2000, a surface water system is on an annual source water monitoring schedule, and a triennial lead and copper tap monitoring schedule. The system collects lead and copper samples during 2001 for the compliance period of 2000 through 2002. It continues to exceed the copper action level, but still qualifies for triennial tap monitoring because it is in compliance with its OWQPs. The next time the system collects samples is in 2004 (for the 3-year tap monitoring period of 2003 through 2005) and for the first time, it is below both action levels.

The source water monitoring period in effect in this example is one year. This system must conduct source water monitoring in 2000, 2001, and 2002 because the system exceeded the copper action level. The system is also required to conduct monitoring in 2003 although no lead and copper tap monitoring occurred because it exceeded the copper action level during the last monitoring period. It is not required to conduct source water monitoring during 2004 and 2005 because the system was below both action levels.

REMEMBER: Once the State sets MPLs or determines that you are not required to install source water treatment, you can discontinue source water monitoring if you no longer exceed the lead or copper action level during the entire source water monitoring period in effect. The State does not set MPLs until after follow-up monitoring has been completed. Therefore, if you are required to install source water treatment, you must complete the 2 consecutive, 6-month rounds of follow-up source water monitoring even if you no longer exceed the lead or copper action level in your tap water samples.

What Source Water Monitoring Information Must I Report to the State? (See §141.90(b))

You must provide the following information within 10 days of the end of the monitoring period *(based on your source water lead and copper sampling schedule — 6 months, 1 year, 3 years, or 9 years)*:

- All source water sample results; and
- With the exception of your first round of source water monitoring, the identification of any new sampling location(s) and an explanation for any changes in your sampling site(s).

What If I Do Not Fulfill My Source Water Monitoring And Reporting Requirements? (See §§141.80(k) & 141.83(b)(5))

If you do not meet all of the following monitoring and reporting requirements within the timeframe specified by the rule, you are in violation of these requirements:

- Use appropriate sampling procedures (see §§141.88(a)(1) and (2));
- Collect the required number of source water samples (see §§141.88(a)(1) - (e));
- Ensure samples are analyzed properly (see §141.89(a)); ***or***
- Submit all required sampling information on time (see §141.90(b)).

You are also in violation if you do not meet your State-designated or approved MPLs. If you are above either MPL, you can take a confirmation sample within 2 weeks of the original sample, if allowed by the State. The results of the original and confirmation samples are averaged to determine whether you are in compliance with your MPLs (see §§141.88(a)(2)).

If you are out of compliance with your monitoring, reporting, or MPLs, you must:

1. Report the violation to the State within 48 hours of determining the noncompliance (see §141.31(b)).
2. Deliver public notification to your customers (see §141.32 or if the State has adopted the new public notification requirements, see §141.201 & §§141.203 - 141.206.)
3. Include a discussion of the violation in your consumer confidence report if you are a CWS (see §§141.153).

~ Also keep in mind that consecutive rounds of monitoring are needed to qualify for reduced lead and copper source water monitoring. Thus, noncompliance with your monitoring requirements will impact how quickly you can qualify for reduced monitoring. ~

What Provisions of the LCRMR Pertain to Source Water Monitoring and Reporting Requirements? (See §§141.88(a)(iv) & 141.88(e)(2)(ii))

The table below summarizes those provisions that directly impact your source water monitoring requirements. The LCRMR did not change your source water reporting requirements. The table distinguishes between those provisions that you were required to begin implementing on April 11, 2000 and those less stringent provisions with which you must first check with your State before following. For water systems owned and operated on Tribal lands, Wyoming, or the District of Columbia, all of the provisions listed below became applicable on April 11, 2000.

You Were Required to Comply with These Monitoring Requirements Beginning April 11, 2000
EPA has clarified that compositing (if permitted by the State) must be conducted by certified lab personnel. EPA has revised the resampling trigger for composite samples to: • ≥ 0.001 mg/L for lead; and • ≥ 0.160 mg/L for copper. *(This one for copper is less stringent because the resampling trigger was increased from 0.020 mg/L to 0.160 mg/L.)*
You Must First Check With Your State Before Implementing the Following Provisions
You may conduct source water monitoring on a reduced schedule even though you exceed an action level, ***if***: • your source water levels are ≤ 0.005 mg/L for lead and ≤ 0.65 mg/L for copper; and • your State has determined that source water treatment is unnecessary.

What Key Points Should I Remember About Lead and Copper Source Water Monitoring? (See §§141.83 & 141.88)

- Source water lead and copper monitoring is not required if you do not exceed the lead or copper action level based on tap water monitoring or you are not trying to qualify as a (b)(3) system.
- You must analyze for both lead and copper even if you exceed only one of the action levels in lead or copper tap monitoring.
- You must collect a set of samples at each entry point and provide a source water treatment recommendation (that can include no treatment needed) within 6 months of exceeding an action level. No source water treatment study is required.
- Source water samples are compared against the lead and copper MPLs. 90th percentile levels ***are not*** calculated for source water samples and compared against the action level.
- If you are required to install source water treatment, you must complete follow-up source water monitoring regardless of whether your 90th percentile lead and copper tap monitoring results are at or below the lead and copper action levels. If you are required to install source water treatment, the State will establish MPLs for both lead and copper even if you only exceeded one of the action levels in tap water monitoring.
- Once the State sets MPLs or determines that source water treatment is not needed, ground water systems must monitor every 3 years beginning with the SMF compliance period in effect when the State made the applicable decision.
- Once the State sets MPLs or determines that source water treatment is not needed, surface water systems or ones using a combined source must monitor annually. The first year begins on the date the State made the applicable decision.
- You can collect source water samples once every 9 years based on SMF compliance cycles, if for 3 ***consecutive*** compliance periods you do not exceed your MPLs (equals 9 years for ground water systems and 3 years for all other systems).
- Your State may allow you to collect source water samples once every 9 years if:
  - you continue to exceed the lead or copper action level and are not required to install source water treatment, but
  - for 3 ***consecutive*** compliance periods your source water lead and copper levels do not exceed 0.005 mg/L and 0.65 mg/L, respectively.
- Once you are on reduced source water monitoring, an exceedance of an action level in lead or copper tap monitoring or an exceedance of an MPL does not alter your monitoring schedule.
- After the State has designated MPLs or determined that you are not required to install source water treatment, you are not required to collect any source water samples during any monitoring period in which your 90th percentile lead or copper levels of tap water samples are at or below their action levels for the entire source water monitoring period in effect.

CHAPTER V: LEAD SERVICE LINE MONITORING AND REPORTING REQUIREMENTS

What Is The Purpose of Collecting Lead Service Line Samples? (See §§141.84(a) - (d)(1))

You must begin replacing lead service lines if you continue to exceed the lead action level after installing corrosion control treatment and/or source water treatment (in whichever sampling occurs later). The State can also require you to begin lead service line replacement if you are required to install corrosion control treatment or source water treatment and have not installed such treatment.

There are two reasons for collecting lead service line samples.

1. To determine if a lead service line must be replaced. You are not required to replace an individual lead service line if the lead concentration of all samples from the line is less than or equal to 0.015 mg/L. This line counts as a replaced line. You are required to replace a minimum of 7 percent of your lead service lines annually for as long as you continue to exceed the lead action level. ***This monitoring is optional***, but it may save you the expense of replacing a lead service line.

2. To determine the impact of partial lead service line replacement on lead levels. Partial lead service line replacement occurs when you do not replace the privately-owned portion of the line, because of legal restrictions or the owner decides not to pay for the replacement of the privately-owned portion. In this event, you must collect a sample that is representative of the water in the service line that you partially replaced and have the sample analyzed for lead within 72 hours after the partial lead service line replacement. ***This monitoring is required.***

Which Systems Must Collect Lead Service Line Samples? (See §§141.84(a) & (d)(1))

Only those systems that are required to replace lead service lines may be required to conduct some lead service line monitoring. As stated above, monitoring to determine whether a line needs to be replaced is optional. However, the cost of a lead analysis is less expensive than the cost to replace a line.

If you replace a line, but do not replace the privately-owned portion of the line, then you must collect a sample that is representative of the water in the service line. This sample is ***not*** required if you replace the ***entire*** lead service line, or if you only replaces a gooseneck, pigtail, or other fittings and these are the only lead components in your service line.

When Do I Collect Lead Service Line Samples? (§§141.84(b) & (e)(3))

The first required year of lead service line replacement begins on the date you exceed the lead action level in tap samples collected after installing corrosion control or source water treatment, whichever is later, or as specified by the State.

You are required to replace at least 7 percent *(or more if required by the State)* of the initial number of lead service lines in your distribution system. The initial number of lead service lines is the number in place at the time the replacement program began. You must continue replacing the required percentage of lead service lines each year until you no longer exceed the lead action level during ***2 consecutive monitoring*** periods of any duration.

How Do I Collect Lead Service Line Samples? (See §141.86(b)(3))

You can collect these samples using one of the following procedures. For each method, collect a 1-liter sample from the tap by filling the sample bottle to the 1-liter mark, then cap immediately.

- *Flushing a Specified Volume* - The sample should be collected from the building tap which is closest to the portion of the lead service line that was not replaced (i.e., the first tap in the building, most likely a kitchen or bathroom tap on the first floor). Flush the estimated volume of water between the service connection and the sample tap. You can estimate the volume of water by using Table 5-1, Pipe Volume Table. EPA recommends selecting the pipe diameter that is one size larger than the actual pipe size, since pipe material thickness can vary, affecting the interior diameter and the actual volume of water. You can also estimate the volume by measuring the length and diameter of piping from tap to connection and the length and diameter of the service connection itself into a graduated beaker or cylinder to ensure that you have collected the correct volume, then close the tap.
- *Direct Service Line Samples* - In communities where the meters are located outside the buildings (or unmetered areas) service line taps may already exist. Prior to sampling, water should be run to flush the pipe that connects the faucet and the service line. If no tap exists, but the lead service line can be made accessible, a tap constructed of lead-free materials can be installed directly into the line for sample collection purposes. However, because installation of a tap directly into the lead service line could induce additional corrosion activity and is an expensive process as well, this option is not recommended when there are no existing service line taps.
- *Temperature Variation* - This method is recommended if the temperatures of lead service line and interior piping are easily distinguishable (for example in a single-family home). A tap sample should be collected by gently opening the tap and running the water at a normal flow rate, keeping a hand/finger under the flowing water. When a change in water temperature is detected, a 1-liter sample should be collected by filling the sample bottle to the appropriate level and capping.

Table 5-1: Pipe Volume Table (Volumes Listed in Liters)						
Pipe Length (Feet)	**Pipe Diameter (Inches)**					
	3/8	**1/2**	**5/8**	**3/4**	**1**	**1¼**
2	0.06	0.09	0.14	0.19	0.32	0.50
3	0.09	0.14	0.21	0.29	0.49	0.74
4	0.11	0.18	0.27	0.38	0.65	0.99
5	0.14	0.23	0.34	0.48	0.81	1.24
6	0.17	0.27	0.41	0.57	0.97	1.48
7	0.20	0.32	0.48	0.67	1.14	1.73
8	0.23	0.36	0.55	0.76	1.30	1.98
9	0.26	0.41	0.62	0.86	1.46	2.22
10	0.28	0.45	0.69	0.95	1.62	2.47
11	0.31	0.50	0.75	1.05	1.78	2.72
12	0.34	0.55	0.82	1.14	1.95	2.96
13	0.37	0.59	0.89	1.24	2.11	3.21
14	0.40	0.64	0.96	1.33	2.26	3.46
15	0.43	0.68	1.03	1.43	2.43	3.71
16	0.46	0.73	1.10	1.52	2.60	3.95
17	0.49	0.78	1.16	1.62	2.76	4.20
18	0.51	0.82	1.23	1.71	2.92	4.45
19	0.54	0.86	1.30	1.81	3.08	4.70
20	0.57	0.91	1.37	1.90	3.24	4.94
25	0.71	1.14	1.71	2.38	4.06	6.18
30	0.86	1.36	2.06	2.85	4.87	7.41
35	1.00	1.59	2.40	3.33	5.68	8.65
40	1.14	1.82	2.74	3.80	6.49	9.88
60	1.43	2.27	3.43	4.76	8.11	12.36

Notes:

1. Volumes can be added together for pipe lengths not listed.
2. Liters can be converted to gallons by dividing by 3.785.
3. EPA recommends selecting the pipe diameter that is one size larger than the actual pipe size, since pipe material thickness can vary, affecting the interior diameter and the actual volume of water.

Can I Ever Discontinue Lead Service Line Monitoring? (See §141.84(f))

You can discontinue lead service line replacement and thus eliminate any need to conduct lead service line monitoring whenever your 90^{th} percentile lead levels are at or below the lead action level for ***2, consecutive monitoring periods***. You must start replacement again if you subsequently exceed the lead action level during any monitoring period.

REMEMBER: It takes 2, consecutive monitoring periods to stop replacement, but only 1 monitoring period to be triggered back into lead service line replacement.

What Lead Service Line-Related Information Must I Report to the State? (See §141.90)(e))

Within 12 Months of When You Exceed the Lead Action Level

You must provide the State with written demonstration that your materials evaluation was completed, including the evaluation to identify the initial number of lead service lines in your distribution system, as follows:

- Schedule for replacing at least 7 percent each year of the initial number of lead service lines in your distribution system.
- Letter stating for the previous year:
  - the number of lines scheduled that were to be replaced;
  - the number and location of lines actually replaced; and
  - if measured, the water lead concentration and location of each lead service line sampled, the sampling method, and the date of sampling.

This letter is due every 12 months until you complete lead service line replacement or no longer exceed the lead action level during 2, consecutive rounds of tap monitoring.

Newly Required Under the LCRMR

If you do not replace the entire length of the lead service line (i.e., partial replacement), you must provide the following information to the State.

- The analytical results of lead service line samples collected in response to partial lead service line replacement:
  - the results are due within 10 days following the month in which you received these analytical results; and
  - the State can also eliminate the requirement to report these sample results.
- Any additional information as specified by the State, and in a time and manner prescribed by the State, to verify that all partial lead service line replacement activities have taken place.

No Longer Required under LCRMR

Under the LCRMR you are no longer need to provide evidence that you do not control the entire lead service line if you are only replacing a portion of the line. Under the 1991 LCR, you were required to replace the entire line unless you could demonstrate that you did not "control" the entire line. The LCRMR require you to replace the portion that you own versus control, thereby, making this demonstration unnecessary.

What If I Do Not Fulfill My Lead Service Line Replacement Requirements? (See §141.80(k))

You are in violation if you fail to:

- Replace the required number of lead service lines by the annual deadline (i.e., at least 7% annually) (see §§141.84(a) & (b)); ***or***
- Report the required lead service line information on time that demonstrates that the replacement rate was met (see §141.90(e)).

You are also in violation if you do not meet the following partial lead service line replacement requirements (only applicable if you do not replace the entire lead service line) (see §141.84(d)):

- Provide notice and guidance to residents at least 45 days before lead service line replacement begins (unless the State allows a shorter notification period);
- Collect a tap sample within 72 hours of completing the partial lead service line replacement;
- Mail and/or post results of the analysis to the owner and residents within 3 days of receipt of the results; ***or***
- Report information that the State requires to assess whether you met your partial lead service line replacement monitoring and notification requirements.

If you are in violation for any of the above reasons you must:

1. Report the violation to the State within 48 hours of determining the noncompliance (see §141.31(b)).
2. Deliver public notification to your customers (see §141.32 if your State has not adopted the new public notification requirements or §141.201 & 141.203 - 141.206 if your State has adopted these new requirements).
3. Include a discussion of the violation in your consumer confidence report if you are a CWS (see §141.153).

What Provisions of the LCRMR Pertain to Lead Service Line Monitoring and Replacement? (See §141.88(d) & §141.90(e))

The table below summarize each of the LCRMR provisions that impact your lead service line monitoring and replacement requirements. You were required to begin implementing these requirements on April 11, 2000.

You Were Required to Comply with These Monitoring and Reporting Requirements Beginning April 11, 2000

Under the LCRMR, you:

- Must replace the portion of the lead service line that you own. Under the LCR you were required to replace the portion of the line that you controlled, unless you could demonstrate that you controlled less than the entire line.
- Must notify the owner (or owner's authorized agent) about the replacement, and offer to replace the owner's portion of the line.
- Are not required to pay for replacing the privately-owned portion of the line.
- Are not required to replace the privately-owned portion of the line if precluded by law, or where the owner chooses not to pay the cost of replacing the privately-owned portion.

In those instances where you do not replace the privately-owned portion of the line, you must:

- Notify all residents served by the line you are replacing, at least 45 days prior to partial replacement. The State can allow you to provide less advanced notice if the line is being replaced in conjunction with emergency repairs.
- Collect at your expense ***one*** representative service line sample for each replaced lead service line within 72 hours of removing the line. Under the LCR, you were required to collect a sample from each resident (if the resident(s) so desired) within 14 days of the partial replacement.
- Report sample results to the building owner(s) and the resident(s) served by the partially replaced line within 3 business days of receiving these results. You must notify residents by mail. However, for multi-family dwellings you can post the notification in a conspicuous common-use area of the building.
- Submit these monitoring results to the State within the first 10 days of the month following that in which you receive the results. However, the LCRMR give States the option to modify reporting requirements, so you need to check with your State to be sure of your specific requirements.

What Key Points Should I Remember About Lead Service Line Monitoring and Reporting? (See §§141.84 & 141.86(b)(3))

✦ Lead service line replacement is not required unless:
- You continue to exceed the lead action level in monitoring conducted after you install corrosion control treatment or source water monitoring (whichever occurs later); *or*
- The State requires it because you have missed your deadline for installing corrosion control treatment or source water treatment.

✦ You are not required to replace an individual lead service line if the lead concentration of all samples from the line is less than or equal to 0.015 mg/L. This line counts as a replaced line.

✦ If you do not replace the privately-owned portion of a lead service line (also known as partial lead service line replacement), you must collect a sample that is representative of the water in the service line within 72 hours of the replacement.

✦ There are 3 methods for collecting a lead service line sample: 1) Flushing a specified volume; 2) Direct service line samples; and 3) Using temperature variation.

✦ You can discontinue lead service line replacement and thus, any need to conduct lead service line monitoring whenever your 90th percentile lead levels are at or below the lead action level for 2, consecutive monitoring periods.

✦ You must recommence lead service line replacement if you subsequently exceed the lead action level during any monitoring period.

For more information on partial lead service line replacement, refer to: *Notification and Reporting Requirements for Partial Lead Service Line Replacement under the Lead and Copper Rule*, April 2000,
EPA 815-R-99-022

APPENDICES

- Appendix A: List of LCRMR Outreach Materials for Water Systems
- Appendix B: Definitions
- Appendix C: Monitoring Timelines
- Appendix D: Summary of Monitoring and Reporting Violations
- Appendix E: Worksheets and Instructions

APPENDIX A
List of LCRMR Outreach Materials for Water Systems

Below is a comprehensive list of outreach materials that were developed to help you understand and implement the minor revisions to the Lead and Copper Rule.

Guidance Documents

✓ *How to Determine Compliance with Optimal Water Quality Parameters as Revised by the Lead and Copper Rule Minor Revisions,* February 2001, EPA 815-R-99-019.

✓ *Lead and Copper Rule: Summary of Revisions,* April 2000, EPA 815-R-99-020.

✓ *Monitoring Waivers under The Lead and Copper Rule Minor Revisions for Systems Serving 3,300 or Fewer People,* April 2000, EPA 815-R-99-021.

✓ *Notification and Reporting Requirements for Partial Lead Service Line Replacement under the Lead and Copper Rule,* April 2000, EPA 815-R-99-022.

✓ *Lead in Drinking Water Regulation: Public Education Guidance* (revised), EPA 816-R-02-010

Fact Sheets

✓ Fact Sheet for Public Water Systems that Serve 3,300 or Fewer Persons, February 2001, EPA 816-F-00-007.

✓ Fact Sheet for Public Water Systems that Serve 3,301 to 50,000 Persons, February 2001, EPA 816-F-00-008.

✓ Fact Sheet for Public Water Systems that Serve More Than 50,000 Persons, February 2001, EPA 816-F-00-009.

✓ Fact Sheet for Tribal Water System Owners and Operators, February 2001, EPA 816-F-00-010.

Training

✓ Comprehensive Lead and Copper Rule Training, January 2001.

> You can obtain any of these documents from the Safe Drinking Water Hotline, or the Office of Ground Water and Drinking Water web page at www.epa.gov/safewater/leadcop.html.

APPENDIX B
Definitions

Term	Definition
✎***Note: New terms introduced under the LCRMR are shown in italics.***	
90th Percentile	The highest concentration of lead or copper in tap water that is exceeded by 10 percent of the sites sampled during a monitoring period. This value is compared to the lead or copper action level (AL) to determine whether an AL has been exceeded.
Accelerated Reduced Lead and Copper Tap Monitoring	*Allows water systems with very low levels of lead and copper in their tap water to be placed on a triennial monitor schedule after only 2, consecutive, 6-month monitoring periods. 90th percentile lead level must be ≤ 0.005 mg/L, and 90th percentile copper levels must be ≤ 0.65 mg/L.*
Accelerated Reduced Water Quality Parameter (WQP) Monitoring	*Allows water systems to proceed more quickly to a triennial WQP monitoring schedule. Systems must meet the requirement for accelerated reduced lead and copper levels and be in compliance with their optimal water quality parameter specifications for 2, consecutive monitoring periods (either 6-month or annual periods).*
Action Level (AL)	The concentration of lead or copper in tap water which determines whether a system may be required to install corrosion control treatment, collect WQP samples, collect lead and copper source water samples, replace lead service lines, and/or deliver public education about lead. The action level for lead is 0.015 mg/L or 15 ppb. The action level for copper is 1.3 mg/L or 1300 ppb.
(b)(1) system	A small or medium system that is at or below both action levels during 2, consecutive, 6-month rounds of lead and copper tap monitoring.
(b)(2) system	A systems that is deemed to have optimized corrosion control after demonstrating that it has completed corrosion control treatment steps prior to 12/7/92 that are equivalent to those described in §141.81(b)(2) of the regulation.
(b)(3) system	A system that is deemed to have optimized corrosion control by demonstrating that it has minimal levels of corrosion entering the distribution system based on lead and copper source and tap water samples.
Community Water System (CWS)	A public water system that services at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.
Corrosion Control Treatment	A treatment designed to reduce the dissolving of lead and/or copper in plumbing materials during water delivery to consumers.
Cu	The chemical symbol for copper.
Daily values	*The sample results of WQPs. They are calculated for each WQP at each sampling location. They are based on the sampling frequency for that WQP and sampling point.*
Deemed to have optimized corrosion control	Systems that are delivering minimally corrosive water (i.e., (b)(1), (b)(2), or (b)(3) systems). These systems are subject to fewer monitoring and treatment technique requirements.
Entry Point	Refers to points of entry to the drinking water distribution system from which samples will be representative of each source of supply after treatment.
Exceedance	Occurs when the 90th percentile lead or copper sample is above its respective action level.

Term	Definition
✎*Note: New terms introduced under the LCRMR are shown in italics.*	
Excursion	*Refers to a "daily value" for a WQP at a sampling location that is below the minimum optimal water quality parameter (OWQP) value or outside the range of values designated by the State.*
First-Draw Sample	Refers to a 1-liter sample of tap water that has been standing motionless in plumbing pipes at least 6 hours and is collected without flushing the tap.
Follow-up Monitoring	Refers to the lead and copper tap water and WQP (tap and entry point) monitoring that takes place after corrosion control treatment is in place and before the State determines OWQP ranges or minimums. The samples are taken during the 2, consecutive 6-month monitoring periods immediately following the installation of corrosion control treatment.
Full Waiver	*This waiver allows a small system to collect both lead and copper tap samples at a frequency of once every 9 years at a reduced number of sites. To receive this waiver a system must meet the monitoring and materials criteria for both lead and copper.*
GUDI	An acronym for systems that have been determined to be ground water under the direct influence of surface water.
Initial Tap Monitoring	For systems serving 50,000 or fewer people, refers to the first set(s) of lead and copper tap water samples that are taken at 6-month intervals until which point the system exceeds either action level, or is at or below both action levels for 2, consecutive, 6-month monitoring periods. For systems serving more than 50,000 people, refers to tap samples collected during the first 2, consecutive, 6-month periods of monitoring.
Large Water System	A water system that serves more than 50,000 people.
LCR	An acronym for the Lead and Copper Rule. Also referred to in this document as the 1991 Rule.
LCRMR	*The acronym for the Lead and Copper Rule Minor Revisions.*
Lead Service Line (LSL)	A service line made of lead which connects the water main to the building inlet and any lead pigtail, gooseneck or other fitting which is connected to such lead line.
Materials Survey	Refers to a system's initial evaluation of materials that are contained in its pipes and distribution system in order to identify sites with a high risk of lead and copper occurrence.
Maximum Permissible Levels (MPLs)	The highest allowable lead and copper concentrations after treatment for source water that is entering a water system's distribution system. These levels are determined by the State after it has reviewed source water samples from before and after a system has installed source water treatment, and are set to reflect lead and copper levels from a properly operated and maintained treatment system.
Medium Water System	A water system that serves 3,301 to 50,000 people.
Method Detection Limit (MDL)	The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.
Monitoring Waiver	*This waiver allows a small system (those serving 3,300 or fewer people) to collect lead and copper tap samples at a frequency of once every 9 years at a reduced number of sites. To receive this waiver a system must meet the monitoring and materials criteria for lead and copper.*
Non-transient, Non-Community Water System (NTNCWSs)	A public water system that is not a community water system and regularly serves at least 25 of the same persons during a minimum of 6 months of each year.

Term	Definition
✎***Note: New terms introduced under the LCRMR are shown in italics.***	
Optimal Corrosion Control Treatment (OCCT)	The corrosion control treatment that minimizes the lead and copper concentrations at users' taps while ensuring that the treatment does not cause the water system to violate any national primary drinking water regulations.
Optimal Water Quality Parameters (OWQPs)	Specific ranges or minimums that are determined by the State for each relevant WQP. OWQPs represent the conditions under which systems must operate their corrosion control treatment to most effectively minimize the lead and copper concentrations at their users' taps.
Partial Wavier	*This type of waiver may be granted if a small system meets the materials and monitoring criteria for either lead or copper, but not both. It allows the system to monitor once every 9 years at a reduced number of sites for the contaminant for which it receives the waiver. The State may elect not to grant partial waivers.*
Pb	The chemical symbol for lead.
Practical Quantitation Level (PQL)	The lowest concentration of an analyte that can be reliably measured within specified limits of precision and accuracy during routine laboratory operating conditions. For lead, the PQL equals 0.005 mg/L; for copper it equals 0.050 mg/L.
Public Water System (PWS)	A system that provides piped water for human consumption, which has at least 15 service connections or regularly serves an average of at least 25 individuals daily for at least 60 days of the year. It includes: 1) the collection, treatment, storage, and distribution facilities operated and used by the system, and 2) any collection or pretreatment storage facilities not under the control of the system, but which it primarily uses.
Reduced Monitoring	Refers to the sampling frequency and number of monitoring sites from which a system must collect lead and copper tap samples or WQP distribution samples after it has met the criteria that is specified under §141.86(d)(4) or §141.97(e), respectively. After meeting any one of these criteria, systems are allowed to sample from a reduced number of monitoring sites and/or at a reduced frequency.
Representative Site	*A sampling site that is connected to plumbing materials which are similar to materials used at other sites in the water system.*
Service Line Sample	A 1-liter sample of water, collected in accordance with §141.86(b)(3), that has been standing for at least 6 hours in a lead service line.
Single Family Residences (SFRs) Single Family Structure	Single family residence structures which can include for purposes of identifying targeted sampling locations: (1) Non-Residential structures; and (2) Multi-Family Residences (MFRs) if they constitute more than 20% of the service connections within the system's service area. A building constructed as a single-family residence that is currently used as either a residence or a place of business.
Small Water System	A water system that serves 25 to 3,300 people.
Solder	A metallic compound used to seal joints in plumbing. Until the lead ban took effect, most solder contained about 50 percent lead.
Source Water Sample	A sample collected at entry point(s) to the distribution system representative of each source of supply after treatment.
Source Water Treatment	Treatment designed to remove lead and/or copper from the source of the water supply.

Term	Definition
✎***Note: New terms introduced under the LCRMR are shown in italics.***	
Special-Case CWS	*A facility, such as a prison or a hospital, where the population served is not capable of or is prevented from making improvements to plumbing or installing point of use treatment devices; and the water system supplies water as part of the cost of services provided and does not separately charge for water consumption. For certain monitoring and public education requirements, these systems may be treated like an NTNCWS.*
Standard Monitoring	Refers to the monitoring frequency and number of monitoring sites from which a system must collect samples before a system has qualified to go to a reduced monitoring schedule. Standard monitoring is conducted at 6-month intervals.
Tier 1 Site	For a CWS, it is a single family structure that contains lead pipes, or copper pipes with lead solder installed after 1982, and/or is served by lead service lines. For an NTNCWS, it is a building that contains copper pipes with lead solder installed after 1982, and/or is served by lead service lines.
Tier 2 Site	For a CWS, it is a building and multiple-family residence that contains lead pipes, or copper pipes with lead solder installed after 1982, and/or is served by lead service lines. For an NTNCWS, it is a building that contains copper pipes with lead solder installed before 1983.
Tier 3 Site	Applies only to a CWS, and is a single family structures that contain copper pipes with lead solder installed before 1983.
Water Distribution System	Refers to the piping, devices, and related fittings that are used to carry a system's drinking water to its users. It includes the treatment plant, distribution system, water meter, water meter setting equipment, piping and plumbing that conveys drinking water, and individual fixtures.
Water Quality Parameters (WQPs)	Used to help systems and States determine what levels of corrosion control treatment would work best for the system and whether this treatment is being properly operated and maintained over time. WQPs include: pH, temperature, conductivity, alkalinity, calcium, orthophosphate, and silica.

APPENDIX C
Monitoring Timelines

- **Lead and Copper Tap and WQP Monitoring Schedule for Large Water Systems (> 50,000)**
  This timeline illustrates the schedule for corrosion control treatment (CCT), lead and copper tap monitoring, and WQP monitoring for (b)(3) and non-(b)(3) large systems.

- **Lead and Copper Tap Schedule for Medium Water Systems (3,301 - 50,000) that Do Not Exceed An Action Level**
  This timeline shows the lead and copper monitoring requirements for medium water systems that do not exceed an action level.

- **Lead and Copper Tap and WQP Monitoring Schedule for Medium Water Systems (3,301 - 50,000) that Exceed An Action Level (No Longer Exceed After Installing Treatment)**
  This timeline illustrates the CCT and monitoring schedule for medium systems that no longer exceed an action level after treatment.

- **Lead and Copper Tap and WQP Monitoring Schedule for Medium Water Systems (3,301 - 50,000) that Exceed An Action Level (Continue to Exceed After Installing Treatment)**
  This timeline shows the CCT and monitoring schedule for medium water systems that continue to exceed an action level after CCT.

- **Lead and Copper Tap Schedule for Small Water Systems (≤ 3,300) that Do Not Exceed An Action Level**
  This timeline shows the lead and copper monitoring requirements for small water systems that do not exceed an action level.

- **Lead and Copper Tap and WQP Monitoring Schedule for Small Water Systems (≤ 3,300) that Exceed An Action Level (No Longer Exceed After Installing Treatment)**
  This timeline illustrates the CCT and monitoring schedule for small systems that no longer exceed an action level after treatment.

- **Lead and Copper Tap and WQP Monitoring Schedule for Small Water Systems (≤ 3,300) that Exceed An Action Level (Continue to Exceed After Installing Treatment)**
  This timeline illustrates the CCT and monitoring schedule for small systems that continue to exceed an action level after installing CCT.

Insert file (revised mon timelines)

APPENDIX D
Summary of Monitoring and Reporting Violations

Monitoring and Reporting (M/R) violations fall into four major categories as described below.

1. M/R for lead and copper at customers' taps

You are in violation if you do not meet all of the following monitoring and reporting requirements within the time frame specified by the rule:

- Use appropriate sampling procedures in accordance with §§141.86(a) and (b);
- Collect the required number of samples during the specified time frame in accordance with §§141.86(c) and (d);
- Ensure samples are analyzed properly in accordance with §141.89(a);
- Submit all required monitoring information on time in accordance with §141.90(a); ***or***
- Report a change in treatment, or an addition of a new source, within 60 days or within the time frame specified by the State, if you are on reduced monitoring, have a waiver, or are a (b)(3) system, as required by §141.90(a)(3).

Depending on whether the State adopts the less stringent provisions of the LCRMR into its revised drinking water regulation, you may also be in violation if you do not meet the following requirements within the timeframe specified by the rule:

- Meet replacement sample requirements for invalidated samples as described in §141.86(f)(4) where these samples are needed to meet minimum sampling requirements;
- Meet the conditions of your monitoring waivers in §141.86(g) or provide the required information in §§141.90(a)(4)(ii)-(iv);
- Provide sample information needed for your State to perform the 90th percentile calculation as outlined in §141.90(h);
- Collect non-first draw samples that did not meet the criteria in §141.86(b)(5); ***or***
- Meet the monitoring deadline for transitioning to an alternate period (i.e., months other than June through September) for collecting reduced lead and copper tap samples, as specified in §141.86(d)(4)(iv)(B).

2. M/R for WQPs at entry points and taps in the distribution system

You are in violation if you do not meet all of the following monitoring and reporting requirements within the time frame specified by the rule:

- Use appropriate sampling procedures in accordance with §§141.87(a)(1);
- Collect the required number and type of samples in accordance with §§141.87(a)(2),(b)-(e);
- Ensure samples are analyzed properly in accordance with §141.89(a);
- Submit all required monitoring information on time in accordance with §141.90(a)(vi)-(viii);
- Meet the State-approved sampling plan for collecting WQPs at representative entry point locations in accordance with §§141.87(c)(3) *(this criterion would only apply if you are a ground water system and your State's regulation allows you to limit entry point WQP monitoring to representative sites).*

2. M/R for WQPs at entry points and taps in the distribution system (continued)

APPENDIX D
Summary of Monitoring and Reporting Violations

Monitoring and Reporting (M/R) violations fall into four major categories as described below.

In addition, you are in violation if you do not meet your OWQP ranges or minimums set by the State as follows:

- If your State assesses compliance using the 1991 LCR procedure, you are out of compliance if the results of any WQP sample, or the average of the original sample and a confirmation sample, does not meet the State-designated OWQP ranges or minimums.
- If your State assesses compliance using the LCRMR, you are in violation of your requirements if you have OWQP excursions for more than 9 days in a 6-month compliance period.

3. M/R for lead and copper in source water

You are in violation if you do not meet all of the following monitoring and reporting requirements within the time frame specified by the rule:

- Use appropriate sampling procedures (see §§141.88(a)(1) and (2));
- Collect the required number of source water samples (see §§141.88(a)(1) - (e));
- Ensure samples are analyzed properly (see §141.89(a)); ***or***
- Submit all required sampling information on time (see §141.90(b)).

In addition, you are in violation if you do not meet your State-designated or approved MPLs (see §141.88(a)(2)) *(Note: If you are above either MPL, you can take a confirmation sample within 2 weeks of the original sample, if allowed by the State. The results of the original and confirmation samples are averaged to determine whether you are in compliance with your MPLs*)

4. M/R for lead and other requirements associated with lead service line replacement

You are in violation if you do not:

- Replace the required number of lead service lines by the annual deadline (i.e., at least 7% annually) (see §§141.84(a) & (b)); ***or***
- Report the required lead service line information on time that demonstrates that you replaced the required number of lead service lines by the annual deadline (see §141.90(e))

You are also in violation if you do not meet the following partial lead service line replacement requirements *(only applicable if you do not replace the entire lead service line) (see §141.84(d))*:

- Provide notice and guidance to residents at least 45 days before lead service line replacement begins (unless the State allows a shorter notification period);
- Collect a tap sample within 72 hours of completing the partial lead service line replacement;
- Mail and/or post results of the analysis to the owner and residents within 3 days of receipt of the results; ***or***
- Report information that the State requires to assess whether you met your partial lead service line replacement monitoring and notification requirements.

APPENDIX E
Worksheet and Instructions

- **Worksheet 1: Materials Survey Investigation Results**
  This worksheet can be used to record information about sampling sites based on your materials investigation (e.g., presence of lead service lines (LSLs), contact information).

- **Worksheet 2: Materials Survey Results by Number of Service Connections for each Plumbing Materials Type**
  This worksheet allows you to record the number of service connections by type of structure (i.e., single or multi-family residence, or public/commercial buildings) and the type of interior and distribution system plumbing materials (e.g., copper pipe with lead solder, LSL).

- **Worksheet 3: Summary of Material Survey Results**
  This worksheet allows you to tally the number of service connections by type of structure and type of plumbing material.

- **Suggested Directions for Homeowner Tap Sample Collection Procedures**
  This page provides suggested language that you can use when instructing homeowners on the proper procedure for collecting lead and copper tap samples.

- **Form 141-A: Sample Site Identification and Certification**
  This form is used to identify: the number of sites that meet the tiering criteria; a certification that each sample was collecting using proper sampling procedures; your 90^{th} percentile calculations and the number of samples upon which these levels are based; the number of WQPs sample collected vs. the number of required samples; and an explanation of any changes in sampling locations.

- **Amended Form 141-A: Sample Site Identification and Certification**
  This version of Form141-A deletes those certifications which are no longer required under the LCRMR. However, you must first check with your State before using this form.

- **Form 141-B: Request for Reduced Lead and Copper Tap Monitoring**
  This form can be used to request permission from the State to collect lead and copper tap samples at a reduced number and frequency based on your continued compliance with your OWQPs. The LCRMR no longer require you to submit a formal request for reduced monitoring; however, first check with your State to determine if this requirement still applies.

- **Form 141-C: Optimal Corrosion Control Treatment Recommendation**
  This 2-page form has several applications. It can be used to: 1) document the results of monitoring used to evaluate various corrosion control treatment (CCT) options and to provide your study recommendation, 2) certify that you have properly installed CCT, or 3) request a modification to your State's decision regarding CCT and/or OWQPs.

- **Form 141-D: Source Water Monitoring and Treatment**
  This form is similar to Form 141-C. It can be used to: 1) document your initial source water monitoring and source water treatment (SOWT) recommendation; 2) certify that you have properly installed SOWT; or 3) request a modification to the State's decision regarding SOWT or MPLs.

WORKSHEET #1
MATERIALS SURVEY INVESTIGATION RESULTS

PWS ID NUMBER

POPULATION SERVED BY PWS

Type of Structure	Location	Contact Person		LSL	Home Plumbing Material	Verified	Volunteered	Selected		Received Training Material
		Name	Phone					Routine	Optional	

WORKSHEET #2

MATERIALS SURVEY RESULTS BY NUMBER OF SERVICE CONNECTIONS FOR EACH PLUMBING MATERIALS TYPE

PWS ID NUMBER

POPULATION SERVED BY PWS

Type of Structure	Type of Plumbing Material				
	Interior Plumbing			Distribution System Piping	
	Lead Pipe	Copper with Lead Solder >1982[4]	Copper with Lead Solder <1983[5]	LSLs	
				Entire Line	Partial Line
	Number of Service Connections			Number of Service Connections	
SFRs[1]					
MFRs[2]					
BLDGs[3]					
TOTAL					

1 SFR - single family residence
2 MFR - multi-family residence
3 BLDG - public or commercials buildings
4 Refers to buildings that contain copper pipes with lead solder installed after 1982.
5 Refers to buildings that contain copper pipes with lead solder installed before 1983.

WORKSHEET #3
SUMMARY OF MATERIALS SURVEY RESULTS

PWS ID NUMBER

POPULATION SERVED BY PWS

Plumbing Material	Type of Structure		
	SFR[1]	MFR[2]	BLDG[3]
	Number of Service Connections		
Interior Plumbing			
Lead Pipe			
Copper Pipe With Lead Solder >1982[4]			
Copper Pipe With Lead Solder <1983[5]			
Service Lines			
LSLs			
Entire Line			
Partial Line			
Total Available Sites			

[1] SFR - single family residence
[2] MFR - multi-family residence
[3] BLDG - public or commercials buildings
[4] Refers to buildings that contain copper pipes with lead solder installed after 1982.
[5] Refers to buildings that contain copper pipes with lead solder installed before 1983.

Suggested Directions for
Homeowner Tap Sample Collection Procedures

These samples are being collected to determine the lead and copper levels in your tap water. This sampling effort is required by the U.S. Environmental Protection Agency and your State, and is being accomplished through the cooperation of homeowners and residents.

Collect samples from a tap that has not been used for a minimum of 6 hours. Because of this requirement, the best time to collect samples is either early in the morning or in the evening upon returning from work. Be sure to use taps that have been in general use by your household for the past few months. The collection procedure is described in more detail below.

1. Prior arrangements will be made with the customer to coordinate the sample collection event. Dates will be set for sample kit delivery and pick-up by water department staff.
2. There must be a minimum of 6 hours during which there is no water used from the tap the sample is taken from and any taps adjacent or close to that tap. The water department recommends that either early mornings or evenings upon returning home are the best sampling times to ensure that the necessary stagnant water conditions exist.
3. A kitchen or bathroom cold-water faucet is to be used for sampling. If you have water softeners on your kitchen taps, collect your sample from the bathroom tap that is not attached to a water softener, if possible. Place the opened sample bottle below the faucet and gently open the cold water tap. Fill the sample bottle to the line marked "1000-mL" and turn off the water.
4. Tightly cap the sample bottle and place in the sample kit provided. Please review the sample kit label at this time to ensure that all information contained on the label is correct.
5. ***IF ANY PLUMBING REPAIRS OR REPLACEMENT HAS BEEN DONE IN THE HOME SINCE THE PREVIOUS SAMPLING EVENT, NOTE THIS INFORMATION ON THE LABEL AS PROVIDED. ALSO IF YOUR SAMPLE WAS COLLECTED FROM A TAP WITH A WATER SOFTENER, NOTE THIS AS WELL.***
6. Place the sample kit outside of the residence in the location of the kit's delivery so that department staff may pick up the sample kit.
7. Results from this monitoring effort will be provided to participating customers when reports are generated for the State. However, if excessive lead and/or copper levels are found, immediate notification will be provided (usually 10 working days from the time of sample collection).

Call ____________________ at ________________if you have any questions regarding these instructions.

TO BE COMPLETED BY RESIDENT		
Water was last used:	Time________________	Date________________
Sample was collected:	Time________________	Date________________

I have read the above directions and have taken a tap sample in accordance with these directions.

____   ____________________

Signature   Date

SAMPLE SITE IDENTIFICATION AND CERTIFICATION

System's Name: ____________________ **System Type:** ☐ CWS ☐ NTNCWS

Address: ____________________

Number of People Served:

____

____

☐ >100,000 ☐ 501 to 3,300
☐ 10,001 to 100,000 ☐ 101 to 500
☐ 3,301 to 10,000 ☐ ≤100

System ID: ____________________

Contact Person: ____________________ **Telephone number:** ____________________

CERTIFICATION OF SAMPLING SITES

LEAD SOLDER SITES

# of single-family structures with copper pipes with lead solder installed after 1982 or lead pipes and/or lead service lines (Tier 1)	________
# of multi-family structures with copper pipes with lead solder installed after 1982 or lead pipes and/or lead service lines (Tier 1)	________
# of buildings containing copper pipes with lead solder installed after 1982 or lead pipes and/or lead service lines (Tier 2)	________
# of sites that contain copper pipes with lead solder installed before 1983 (Tier 3)	________
# of sites that do not meet Tier 1, 2, or 3 criteria *(to be used only if other conditions have been exhausted)*	________
TOTAL	________

The following sources have been explored to determine the number of structures which have interior lead pipe or copper pipe with lead solder.

______ **Plumbing and/or building codes**
______ **Plumbing and/or building permits**
______ **Contacts within the building department, municipal clerk's office, or State regulatory agencies for historical documentation of the service area development**
______ **Water Quality Data**

Other Resources Which PWS May Utilize

______ **Interviews with building inspectors**
______ **Survey of service area plumbers about when and where lead solder was used from 1982 to present**
______ **Survey residents in sections of the service area where lead pipe and/or copper pipe with lead solder is suspected to exist**
______ **Interviews with local contractors and developers**

Explanation of Tier 2 and Tier 3 sites (attach additional pages if necessary) ____________________
____

SAMPLE SITE IDENTIFICATION AND CERTIFICATION

CERTIFICATION OF SAMPLING SITES

LEAD SERVICE LINE SITES

# of samples required to be drawn from lead service line sites ____________

# of samples actually drawn from lead service line sites ____________

Difference (explain differences other than zero) ____________

The following sources have been explored to determine the number of lead service lines in the distribution system.

_____ Distribution system maps and record drawings

_____ Information collected for the presence of lead and copper as required under §141.42 of the Code of Federal Regulations

_____ Capital improvement plans and/or master plans for distribution system development

_____ Current and historical standard operating procedures and/or operation and maintenance (O&M) manuals for the type of materials used for service connections

_____ Utility records including meter installation records, customer complaint investigations and all historical documentation which indicate and/or confirm the location of lead service connections

_____ Existing water quality data for indications of 'troubled areas'

Other Sources Which PWS Utilized

_____ Interviews with senior personnel

_____ Conduct service line sampling where lead service lines are suspected to exist but their presence is not confirmed

_____ Review of permit files

_____ Community survey

_____ Review of USGS maps and records

_____ Interviews with pipe suppliers, contractors, and/or developers

Explanation of fewer than 50% LSL sites identified (attach additional pages if necessary):______________________
____
_

CERTIFICATION OF COLLECTION METHODS

I certify that:

- Each first draw tap sample for lead and copper is 1 liter in volume and has stood motionless in the plumbing system of each sampling site for at least 6 hours.
- Each first draw sample collected from a single-family residence has been collected from the cold water kitchen tap or bathroom sink tap.
- Each first draw sample collected from a non-residential building has been collected at an interior tap from which water is typically drawn for consumption.
- Each first-draw sample collected during an annual or triennial monitoring period has been collected in the months of June, July, August, or September or in the alternate period specified by the State.
- Each resident who volunteered to collect tap water samples from his or her home has been properly instructed by [insert water system's name] ____ in the proper methods for collecting lead and copper samples. I do not challenge the accuracy of those sampling results. Enclosed is a copy of the material distributed to residents explaining the proper collection methods, and a list of the residents who performed sampling.

SAMPLE SITE IDENTIFICATION AND CERTIFICATION

RESULTS OF MONITORING

THE RESULTS OF LEAD AND COPPER TAP WATER SAMPLES MUST BE ATTACHED TO THIS DOCUMENT

# of samples required ______ **# of samples submitted ______**

90th Percentile Pb ______ **90th Percentile Cu ______**

Note: If the State has informed you that it will calculate your 90th percentile levels, you do not need to submit the 90th percentile calculations. However, you must still provide your sample results to the State by the deadline that they have specified.

THE RESULTS OF WATER QUALITY PARAMETER SAMPLES MUST BE ATTACHED TO THIS DOCUMENT

# of WQP tap samples required ________ **# of WQP tap samples submitted ________**

# of entry point samples required ________ **# of entry point samples submitted ________**

CHANGE IN SAMPLING SITES

Original site address: ____

____

____

New site address: ____

____

____

Distance between sites (approximately): ____

Targeting Criteria: **NEW:** ______________________ **OLD:** ______________________

Reason for change (attach additional pages if necessary)______________________

____

____

____

____

SIGNATURE

______________________ ______________________ ______________________

PRINTED NAME **TITLE** **DATE**

✎ **Note: The LCRMR no longer require you to complete the certification of sampling sites, or certification of collection methods. A modified version of Form 141-A is provided below. This revised form deletes those certifications that are no longer required under the LCRMR. Please check with your State before using the amended Form 141-A.**

Amended Form 141-A **Page 1 of 2**

SAMPLE SITE IDENTIFICATION AND CERTIFICATION

System's Name: ____ **System Type:** ☐ **CWS** ☐ **NTNCWS**

Address: ____ **Number of People Served:**

____

____

☐ >100,000	☐ 501 to 3,300
☐ 10,001 to 100,000	☐ 101 to 500
☐ 3,301 to 10,000	☐ ≤100

System ID #: ____

Contact Person: ______________________________________ **Telephone number:** ___________________

RESULTS OF MONITORING

THE RESULTS OF LEAD AND COPPER TAP WATER SAMPLES MUST BE ATTACHED TO THIS DOCUMENT

# of samples required ______ **# of samples** ______
90th Percentile Pb ______ **90th Percentile Cu** ______

Note: If the State has informed you that it will calculate your 90th percentile levels, you do not need to submit the 90th percentile calculations. However, you must still provide your sample results to the State by the deadline that they have specified.

THE RESULTS OF WATER QUALITY PARAMETER SAMPLES MUST BE ATTACHED TO THIS DOCUMENT

# of WQP tap samples required ______ **# of WQP tap samples submitted** ______
# of entry point samples required ______ **# of entry point samples submitted** ______

SAMPLE SITE IDENTIFICATION AND CERTIFICATION

CHANGE IN SAMPLING SITES

Original site address: ______________________________

____

____

New site address: ______________________________

____

____

Distance between sites (approximately): ______________________________

Targeting Criteria: **NEW:** ______________ **OLD:** ______________

Reason for change (attach additional pages if necessary)______________________________

____

____

____

____

SIGNATURE

______________ ______________ ______________

PRINTED NAME **TITLE** **DATE**

✎ **Note:** The LCRMR no longer require a system, which is in compliance with its OWQPs, to submit a written request to its State to allow it to collect lead and copper tap samples at a reduced number and frequency. Therefore, this or a similar form may no longer be required by your State. **Please note** that this form ***cannot*** be used to request a monitoring waiver. Monitoring waiver forms are provided in the guidance document, *Monitoring Waivers under the Lead and Copper Rule Minor Revisions for Systems Serving 3,300 or Fewer People,* April 2000, EPA 815-R-99-021.

Form 141-B **Page 1 of 1**

REQUEST FOR REDUCED LEAD AND COPPER TAP WATER

System's Name: ________________________________ **System Type:** ☐ **CWS** ☐ **NTNCWS**

Address: ________________________________ **Number of People Served:**

________________________________ ☐ **>100,000** ☐ **501 to 3,300**

________________________________ ☐ **10,001 to 100,000** ☐ **101 to 500**

☐ **3,301 to 10,000** ☐ **≤100**

System ID #: ________________________________

Contact Person: ________________________________ **Telephone number:** ____________________

The ________________________________ water system hasoperated in accordance with the State-specified water quality parameters during each of the following monitoring periods. The above named water system hereby requests that the State permit the system to reduce lead and copper tap water monitoring from:

☐ **Biannual to Annual**

or

☐ **Annual to Triennial**

☐ **100 to 50**
☐ **60 to 30**
☐ **40 to 20**
☐ **20 to 10**
☐ **10 to 5**

The results of all water quality parameter samples and lead and copper tap water samples collected during each of the monitoring periods are summarized and attached.

____
SIGNATURE

________________________ ________________________ ________________
PRINTED NAME **TITLE** **DATE**

OPTIMAL CORROSION CONTROL TREATMENT RECOMMENDATION

System's Name: ______________________________ System Type: ☐ CWS ☐ NTNCWS

Address: ______________________________ Number of People Served:

____

____

☐ >100,000 ☐ 501 to 3,300
☐ 10,001 to 100,000 ☐ 101 to 500
☐ 3,301 to 10,000 ☐ ≤100

System ID #:

Contact Person: ______________________________ Telephone number: ________________

RESULTS OF MONITORING

The Results of Source Water, Tap Water, and WQP Samples Must Be Attached to This Document

# of tap water samples required ______ # of tap water samples submitted ______
# of source water samples required ______ # of source water samples submitted ______

RESULTS OF OPTIMAL CORROSION CONTROL TREATMENT STUDIES

(If the State requires you to conduct additional treatment analyses, copy this form and attach the results.)

Test 1 — Alkalinity & pH Adjustment			Test 2 — Calcium Hardness Treatment		
Before	Parameters	After	Before	Parameters	After
________	Pb	________	________	Pb	________
________	Cu	________	________	Cu	________
________	pH	________	________	pH	________
________	alkalinity	________	________	alkalinity	________
________	calcium	________	________	calcium	________
________	conductivity	________	________	conductivity	________
________	orthophosphate	________	________	orthophosphate	________
________	silicate	________	________	silicate	________
________	water temperature	________	________	water temperature	________

Test 3 — Addition of Corrosion Inhibitor			Test 4 —		
Before	Parameters	After	Before	Parameters	After
________	Pb	________	________	Pb	________
________	Cu	________	________	Cu	________
________	pH	________	________	pH	________
________	alkalinity	________	________	alkalinity	________
________	calcium	________	________	calcium	________
________	conductivity	________	________	conductivity	________
________	orthophosphate	________	________	orthophosphate	________
________	silicate	________	________	silicate	________
________	water temperature	________	________	water temperature	________

OPTIMAL CORROSION CONTROL TREATMENT RECOMMENDATION

CORROSION CONTROL TREATMENT RECOMMENDATION

1. **Treatment recommendation and rationale:**

____

____

2. **Test methodologies used to evaluate each treatment (e.g., pipe rig loop tests, metal coupon tests, etc.):**

____

____

3. **Identify any chemical or physical constraint that limits or prohibits the use of a particular corrosion control treatment (attach all data indicating that a particular treatment has adversely affected other water treatment processes or is ineffective for reducing corrosion):**

____

____

CERTIFICATION THAT OPTIMAL CORROSION CONTROL TREATMENT HAS BEEN INSTALLED

The ______________________________ water system certifies that optimal corrosion control treatment has been installed and is being properly operated as agreed to between the above named water system and the State of ____________________. Optimal corrosion control treatment was required to be installed by _______________ (date). Optimal corrosion control treatment was installed on _______________ (date).

REQUEST FOR MODIFICATION OF CURRENT CORROSION CONTROL TREATMENT AND/OR WATER QUALITY PARAMETERS

Reason for modification:____

____

(Attach all supporting studies, data, treatment specifications, etc., that substantiate this request for modification.)

____

SIGNATURE

________________________________ ____________________________ __________________

PRINTED NAME **TITLE** **DATE**

SOURCE WATER MONITORING AND TREATMENT

System's Name: ___________________________________ **System Type:** ☐ CWS ☐ NTNCWS

Address: ____

Number of People Served:

____

☐ >100,000 ☐ 501 to 3,300

☐ 10,001 to 100,000 ☐ 101 to 500

____

☐ 3,301 to 10,000 ☐ ≤100

System ID #:

Contact Person: ___________________________________ **Telephone number:** ___________________

SOURCE WATER DATA

Attach all data collected at all entry points to the distribution system. List the highest values obtained in sampling for this monitoring period and attach the results of all other samples collected at each entry point.

Entry Point Location	Lead Values (in mg/L)	Copper Values (in mg/L)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

SOURCE WATER MONITORING AND TREATMENT

SOURCE WATER TREATMENT RECOMMENDATION

Treatment recommendation: ____

____

Reason for treatment/no treatment recommendation: ***(Attach additional pages as needed.)***

____

____

CERTIFICATION THAT SOURCE WATER TREATMENT HAS BEEN INSTALLED

The ______________________________ water system certifies that source water treatment has been installed and is being properly operated as agreed to between the above named water system and the State of ____________________. Water treatment was required to be installed by _______________ (date). Source water treatment was installed on _______________ (date).

REQUEST FOR MODIFICATION OF STATE TREATMENT DECISION AND/OR MAXIMUM PERMISSIBLE LEAD AND COPPER LEVELS

Reason for modification: ____

____

(Attach all supporting studies, data, treatment specifications, etc., that substantiate this request for modification.)

____

SIGNATURE

______________________________ ________________________ ________________

PRINTED NAME **TITLE** **DATE**

For more information

If you have questions about sample collection procedures, call your local Department of Health regional office:

Eastern Region, Spokane
(509) 329-2100

Northwest Region, Kent
(253) 395-6750

Southwest Region, Olympia
(360) 236-3030

***Lead and Copper Monitoring** (DOH 331-111)* is available online at <https://fortress.wa.gov/doh/eh/dw/publications/publications.cfm>

PUBLIC HEALTH
ALWAYS WORKING FOR A SAFER AND HEALTHIER WASHINGTON

Lead and Copper Sampling Procedure

December 2009
Revised

DOH 331-227

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Lead and Copper Sampling

State regulations require all community and nontransient noncommunity water systems to monitor lead and copper levels in drinking water.

Unlike other contaminant monitoring, the samples for lead and copper testing must come from water taps inside your customers' homes.

The steps and procedures for collecting lead and copper samples for testing vary from lab to lab. Before you begin, check with your laboratory. Be sure to follow the instructions your laboratory gives you.

For help, call the nearest Department of Health regional office listed at the end of this brochure.

Step One

Select sampling sites

There are specific guidelines for selecting the homes where you collect samples, the number of samples required, and setting up a monitoring schedule. For more information, see the publication, **Lead and Copper Monitoring** (DOH 331-111).*

You can:

- **Have residents collect the samples**. Be sure to provide directions and sampling kits.
- **Take the samples yourself**. Ask residents to allow system personnel into their homes to take the samples.

Step Two

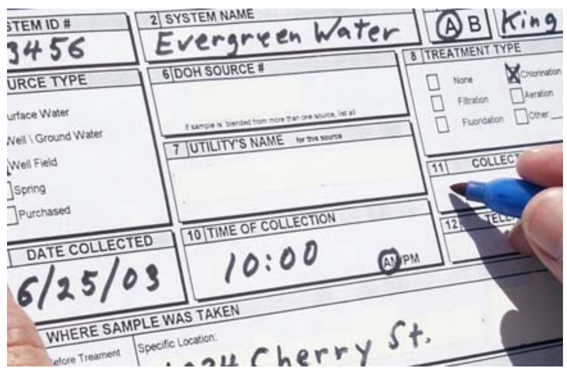
Tell homeowners what to expect

- Do not use any water throughout the residence for at least 6 hours, but no more than 12 hours prior to sampling.
- The sample must come from a kitchen or bathroom cold-water faucet.
- Do not run any water prior to sampling. The object is to get the "first draw" of the water sitting stagnant in the pipes.
- To ensure stagnant water conditions exist, the best sampling times are early morning or evening, when residents return home.
- Make sure the water does not go through a hose or filter before it reaches the sample container.

Step Three

Collect samples

- Place the open bottle below the faucet and gently open the cold-water tap.
- Fill the sample container to the shoulder of the bottle or the line marked "1,000 ml" and turn the water off.
- Cap the bottle tightly.
- Label the bottle (see step 4) and place it in the sample kit provided.



Step Four

Complete lab form and sample label

You will either provide completed labels to the homeowners, or fill them out when you collect the samples.

Laboratory forms vary, so be sure to include the following:

- Water system name
- Water system ID number
- System type (Group A or Group B)
- System contact (name and phone numbers for evening and day)
- Date and time the sample was collected
- Sample location (Use the street address or another location identifier for the home where the sample was collected)
- DOH source number (Use "Dist." to indicate distribution samples)
- Sample purpose (Usually "RC" for routine compliance sample)

Step Five

Ship the samples

When the samples are ready for shipping, package them up along with the completed sample information form and send them to the laboratory.

Fact Sheet

Lead in Drinking Water

Dec. 2009

DOH 331-177
(Revised)

How Lead Gets Into Water

Lead in drinking water usually comes from water distribution lines or household plumbing rather than lakes, wells or streams. Lead from other sources, such as ingesting old-paint chips or dust, can add to the effects of lead in water.

Health Issues

Because the nervous and circulatory systems in young children are not fully developed, lead and other toxic substances can easily enter the brain. Long-term exposure to even low levels of lead can cause irreversible learning difficulties, mental retardation, and delayed neurological and physical development. Infants and children up to age 6 are most susceptible to these toxic effects. Pregnant women exposed to lead can pass the effects to their unborn child. Exposure for adults primarily affects the nervous system. It can impair hearing, vision, and muscle coordination. Lead is also toxic to the blood, kidney, heart, and reproductive system.

Lead poisoning is a particular problem because there may be no unique signs or symptoms associated with lead exposure. Early symptoms of lead poisoning may include loss of appetite, fatigue, irritability, anemia and, sometimes, abdominal pain. Because of the general nature of symptoms at this stage, lead poisoning is not often suspected.

Measuring Lead in Drinking Water

Lead may be present in your home drinking water if:

- There are lead pipes, brass fixtures, or lead connectors in your home or community water system.
- Lead solder was used on your home water pipes.
- You have soft water (low mineral content), or acidic water.

The only way to know the amount of lead in your household water is to have your water tested. Many certified labs in Washington perform these tests for $20 to $40 per test. Lab staff can answer questions and tell you how to collect water samples. For the name of a certified drinking water laboratory near you, call the Office of Drinking Water (see phone list on page 2).

Reducing Lead Exposure

Ways to reduce lead in home drinking water:

- If water in a particular faucet is not used for six hours or longer, "flush" the pipes by running cold water through it until the water is noticeably colder—about one minute. The more time water sits in your home's pipes, the more lead and other dissolved metals the water may contain.
- Use only cold water for drinking, cooking, and making baby formula. Hot water may contain higher levels of lead.
- Clean the screens and aerators in faucets frequently to remove captured lead particles.
- If building or remodeling, only use "lead free" piping and materials for plumbing.

Drinking Water Regulations

We require public water systems to:

- Collect samples from some residential customers.
- Treat the water when more than 10 percent of samples exceed the action level (0.015 parts per million).
- Provide annual public education to all consumers when samples exceed the action level for lead.

For More Information

Visit the Office of Drinking Water online at http://www.doh.wa.gov/ehp/dw or call:

Southwest Region, Tumwater	(360) 236-3030
Northwest Region, Kent	(253) 395-6750
Eastern Region, Spokane Valley	(509) 329-2100
General Information	(800) 521-0323

Department of Health's Childhood Lead Poisoning Prevention Program: (800) 909-9898

PUBLIC HEALTH
ALWAYS WORKING FOR A SAFER AND
HEALTHIER WASHINGTON

May 2010

DOH 331-259-1

Nitrate

Public Health Advisory Packet

Instructions for water systems

If you have nitrate sample results above the maximum contaminant level (MCL) of 10 milligrams per liter (mg/L), you must notify your customers within 24-hours after receiving the sample results. We developed this packet to help you respond when nitrate levels in your water supply exceed 10 mg/L.

Templates and Forms	DOH Pub.
Door Hanger (English and Spanish)	331-259-2
News Release Template: Announcing the Nitrate Advisory	331-259-3
News Release Template: Rescinding the Nitrate Advisory	331-259-4
Warning to Drinking Water Customers (English)	331-259-5
Warning to Drinking Water Customers (Spanish)	331-259-6
Public Notice Certification Form: Nitrate MCL Violation	331-248

Publications	DOH Pub.
Nitrate in Drinking Water Questions & Answers (English)	331-214
Nitrate in Drinking Water Questions & Answers (Spanish)	331-214s
Nitrate Sampling Procedure Brochure	331-222
Office of Drinking Water authority over operators and water systems Fact Sheet	331-449
D*rinking Water After-Hours Emergency Hotline* Brochure	331-133

Public Notification Templates and Forms
Page 2 has information and instructions on using the nitrate public notification templates and forms.

Health

HELPING TO ENSURE SAFE AND RELIABLE DRINKING WATER

Templates and forms

Public Notification: You can choose from two templates to provide public notice to your customers.

- **Door Hanger** (331-259-2): English on one-side and Spanish on the other.
  - This public notice is a quick way to inform customers of contamination in the water. It includes precautions they can take to protect themselves.
  - You can get door hangers from local health departments and our regional offices.

- **Warning to Drinking Water Customers:** English (331-259-5) and Spanish (331-259-6). This public notice provides detailed information about health effects and instructions for your customers.

Public Notice Certification Form Nitrate MCL Violation (331-248): You must complete this form and mail it to our regional office within 10 days after notifying your customers about a MCL violation. You must also send us a copy of the public notice you provided to your customers.

News Releases: These templates have sample information we recommend you include in a news release. If you need help contacting the media, contact your regional office.

- **Announcing Nitrate Advisory** (331-259-3): Notifies your customers of a nitrate advisory.

- **Rescinding Nitrate Advisory** (331-259-4): Notifies your customers the nitrate advisory is over.

For more information

Contact our regional office:

Eastern Region: Spokane Valley (509) 329-2100
Northwest Region: Kent (253) 395-6750
Southwest Region: Tumwater (360) 236-3030

PUBLIC HEALTH
ALWAYS WORKING FOR A SAFER AND
HEALTHIER WASHINGTON

People with disabilities can request this publication in other formats. To submit a request, call (800) 525-0127. For TTY or TDD, call (800) 833-6388. Office of Drinking Water publications are online at http://www.doh.wa.gov/ehp/dw

For more information

If you have questions about sample collection procedures, call the Department of Health Office of Drinking Water:

Eastern Region, Spokane
(509) 329-2100

Northwest Region, Kent
(253) 395-6750

Southwest Region, Tumwater
(360) 236-3030

PUBLIC HEALTH
ALWAYS WORKING FOR A SAFER AND HEALTHIER WASHINGTON

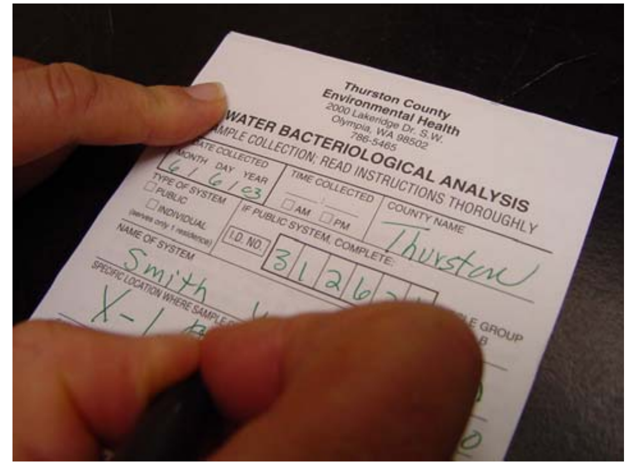
The Department of Health is an equal opportunity agency. For persons with disabilities, this document is available on request in other formats. To submit a request, please call 1-800-525-0127 (TTY 1-800-833-6388). For additional copies of this publication, call 1-800-521-0323. This and other publications are available at http://www.doh.wa.gov/ehp/dw

Nitrate Sampling Procedure

December 2009
(Updated)

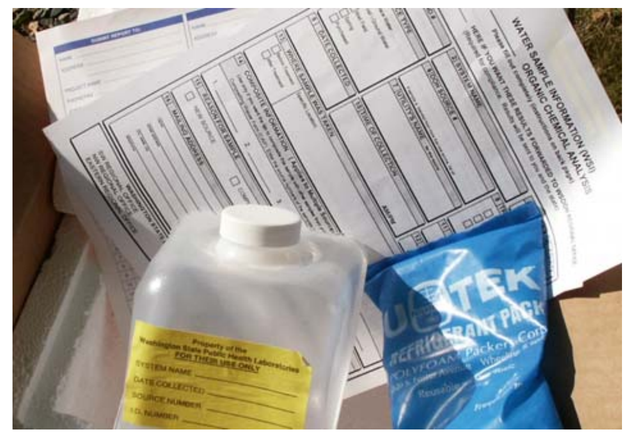
DOH 331-222

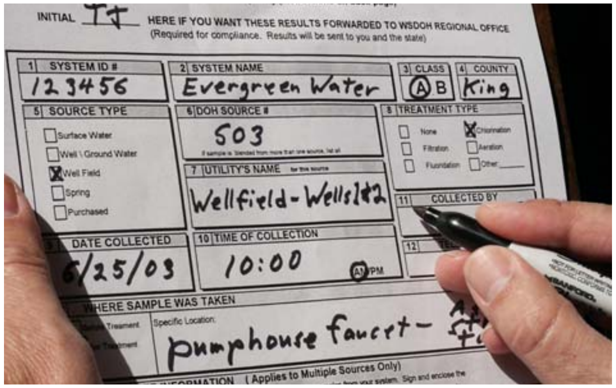
Washington State Department of Health
Division of Environmental Health
Office of Drinking Water



Nitrate Sampling Procedure

This brochure provides general information on how to collect a sample for nitrate. Steps and procedures can vary depending on the laboratory used, so you should follow the instructions provided by the laboratory you are using.





The general sampling procedure for nitrate monitoring is as follows:

The day before

Step One: Freeze the chemical cold pack.

Step Two: COMPLETE the laboratory form and sample label.

Laboratory forms vary. Be sure to include the following:

- Water system name
- Water system ID number
- System type (Group A or Group B)
- DOH source number (such as SO1)
- Sample purpose (usually "RC" for routine compliance sample)
- Date and time the sample was collected
- Sample location (specific location where you collected the sample. For example, "pump house tap.")
- Sample type (pre-treatment, raw, or post-treatment)

Sample Collection Day

Step One: Locate a sampling tap that is after treatment (if applicable) but before water enters the distribution system.

Step Two: Remove any attachment from the tap such as hoses, filters, screens, or aerators.

Step Three: Flush the water for about 5 minutes or until the water reaches a constant temperature.

Step Four: Fill the sample container to the shoulder of the bottle.

After completing sample collection

Keep all samples refrigerated until you are ready to ship them. When samples are ready for shipping, pack the samples, frozen chemical cold pack, and completed sample information form into a container and ship it to the laboratory within 24 hours.

Some county health departments and laboratories will pick up samples at a central drop-off location. Be sure to follow their schedule so that your samples reach the lab in time.

Thurston County Water Quality Report Grand Mound 2010

#071580

It's Your Water!

If you are a Grand Mound property manager, please pass this on to your tenant or guest. Thank you!

Dear Water Customer,

Thurston County is pleased to present this annual water quality report for the Grand Mound water system. This report provides detailed results from drinking water tests taken in 2009, and compares the results to federal and state standards.

Thurston County distributes monitoring results every year in accordance with the federal Safe Drinking Water Act and mandates by the Washington State Department of Health. Test results from 2010 will be reported in 2011.

We are proud to report that your water meets or exceeds all standards set for quality and safety. If you have questions about this report or your water utility, please call me at 754-2930 or e-mail petriema@co.thurston.wa.us.

Sincerely,

Mark Petrie

Supply and Treatment

The Grand Mound water source consists of two wells, each drilled in the Qva Aquifer approximately 2,200 feet apart. Well #1 is located just off 201st Avenue S.W. Well #2 is located off Tea Street.

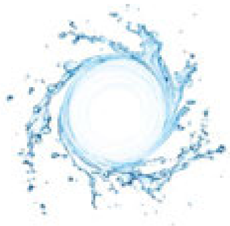
The state Department of Health requires the Grand Mound water system, and many other water systems across Washington, to use chlorine to disinfect drinking water.

Trace amounts of sodium hydroxide are also added to balance the natural acidity of the ground water in Grand Mound. The sodium hydroxide reduces the possibility that copper and lead will dissolve into the water from household plumbing.

Summary of Results

State and federal laws set strict limits on the level of contaminants allowed in public water systems. We are proud to report your drinking water meets or exceeds all federal and state requirements. Although trace levels of nitrate, copper and lead were detected in 2009, the Environmental Protection Agency (EPA) has determined that your water is SAFE at these levels.

THURSTON COUNTY
WASHINGTON
SINCE 1852



Thurston County
Public Works Department
2404 A1 Heritage Ct. SW
Olympia, WA 98502

Drinking Water and Your Health

All drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants.

The presence of contaminants does not necessarily indicate that the water poses a health risk. For more information about contaminants and potential health effects, call the Environmental Protection Agency's Safe Drinking Water Hotline at 1-800-426-4791.

Some people, however, may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly people, and infants can be particularly at risk of infections. These people should seek advice about drinking water from their health care providers.

EPA/CDC guidelines on appropriate means to lessen the risk of infection by cryptosporidium and other microbiological contaminants are also available from the EPA hotline.

Indoor Drought Busters!
10 Tips to Conserve Your Water

Despite moderate to heavy rainfall this spring, the Northwest faces a serious threat of drought this summer and fall due to low snowpacks. As reported in the National Drought Mitigation Center's spring newsletter, "The Pacific Northwest and the Rocky Mountains are expected to see drought expand and intensify through the next several months."

Here are 10 simple actions you can take to conserve one of our most precious resources.

1. Wash full loads of laundry and dishes. You'll save time, energy and water—as much as 2,000 gallons a year.

2. Waiting for the shower to get hot? Collect the water while you wait. Use it to water plants or rinse vegetables.

3. When washing dishes by hand, turn the water off. Use one sink for washing and a second for rinsing.

4. Boiling eggs, steaming vegetables? Reuse the water. Plants love the nutrients in water used to steam broccoli, asparagus and other vegetables.

5. Don't pre-rinse dishes. Newer dishwashers don't require it.

6. Replace older faucet nozzles or aerators with new ones rated at two gallons per minute or less. Cost: a few dollars.

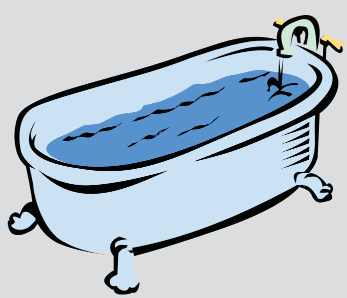
7. Turn the water off while shaving and brushing your teeth.

8. Got a pre-1994 toilet? Replace it and save up to 10,500 gallons of water and between $50 and $125 a year!

9. Install a water-saving showerhead that uses less than 2 .5 gallons per minute. You'll save water and energy.

10. Time your showers for a week; then see if you can cut a minute off each shower.

Data courtesy of www.savingwater.org



Water Quality Table

Most of the data in this report comes from tests taken January 1 through December 31, 2009. Some of the information is older, because certain contaminants are not tested every year.

The tables list only compounds that were detected. If you are interested in the compounds that were monitored but not detected, please call Mark Petrie, utility operations manager, at 754-2930.

Inorganic contaminants (2009 data)					
Contaminant	**Violation Y/N**	**Level Detected**	**Allowed Level (MCL)**	**Ideal Goal (MCLG)**	**Likely Source of Contamination**
Nitrate (as Nitrogen) Well #1	N	3.4 mgl	10 mgl	10 mgl	Runoff from fertilizer use; leaching from septic tanks; sewage; erosion of natural deposits
Nitrate (as Nitrogen) Well #2	Y	No sample pulled. See explanation next page. **	10 mgl	10 mgl	Runoff from fertilizer use; leaching from septic tanks; sewage; erosion of natural deposits
Copper and lead (2009 data)					
Contaminant	**Violation Y/N**	**Level Detected**	**Allowed Level (MCL)**	**Ideal Goal (MCLG)**	**Likely Source of Contamination**
Copper	N	.053 mgl	AL=1.3 mgl	1.3 mgl	Corrosion of household plumbing systems
Lead	N	.008 mgl	AL=.015 mgl	0 mgl	Corrosion of household plumbing systems
Disinfection byproducts (2009 data)					
Contaminant	**Violation Y/N**	**Level Detected**	**Allowed Level (MCL)**	**Ideal Goal (MCLG)**	**Likely Source of Contamination**
Trihalomethanes	N	0.9 ugl	80 ugl	n/a	Disinfection byproduct

Definitions

Maximum contaminant level: The "maximum allowed" (MCL) is the highest level of a contaminant allowed in drinking water. MCLs are set at very stringent levels. To understand the possible health effects described for many regulated constituents, a person would have to drink two liters of water every day at the MCL level for a lifetime to have a one-in-a-million chance of having the described health effect.

Maximum contaminant level goal: The "goal"(MCLG) is the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

Parts per million (ppm) or milligrams per liter (mg/l): One part per million corresponds to a single penny in $10,000 or one minute in two years.

Micrograms per liter (ugl): Micrograms per liter are equivalent to parts per billion (ppb). One part per billion corresponds to one second in 32 years.

Action level (AL): Action level (AL) refers to the concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

How to Reach Us

If you have questions about this report or your water utility, please call Mark Petrie, utility operations manager, at 754-2930 or Denise Velthuysen, accounting assistant, at 709-3077. E-mail addresses are petriema@co.thurston.wa.us and velthud@co.thurston.wa.us. Information is also available at: www.co.thurston.wa.us/wwm.

What We Look For in Your Water

- **Inorganic contaminants**, which are non-carbon based compounds such as metals, nitrates and asbestos. These contaminants are naturally occurring in some water, but can get into water through farming, chemical manufacturing, and other human activities. Nitrates are tested every year, however, most other inorganic contaminants are tested every four years according to a mandated timetable.

- **Copper and lead** can leach into residential water from building plumbing that contains copper plumbing, lead-based solder, brass fixtures, or some types of zinc coatings used on galvanized pipes and fittings. Test results are summarized on page 2.

- **Microbiological contaminants,** which include viruses and bacteria. These contaminants may come from wastewater treatment plants, septic systems, agricultural livestock operations and wildlife. Of the 24 bacteria samples taken in the Grand Mound distribution system in 2009, none came back positive.

- **Synthetic organic chemicals** include pesticides and herbicides, and they may come from agriculture, urban stormwater and residential uses. The latest test results from 2007 showed no detections.

- **Organic chemical contaminants,** including synthetic and volatile organic chemicals, are byproducts of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, and septic systems. No organic chemicals were detected in 2008. the last year tests were conducted.

- **Radionuclides** are radioactive compounds that can occur naturally or result from oil and gas production. The Grand Mound water system is tested for Radium 228. The test results from 2009 show no detections.

- **Disinfection byproducts** form when chlorine or other disinfectants used to treat drinking water react with naturally occurring materials in the water. The Grand Mound water system samples for disinfection byproducts in locations throughout the water distribution system. See page 2 for test results.

Explanation of Violation

We, Thurston County Grand Mound Water System, I.D. 071580, located in Thurston County, are required to monitor your drinking water for specific contaminants on a regular basis. Results of regular monitoring are an indicator of whether or not your drinking water meets health standards. During 2009, we did not monitor or test for nitrate, and therefore cannot be sure of the quality of your drinking water during that time.

Although we did not sample for nitrates from Well #2 in 2009, the utility did sample for nitrates from Well #1. Those results came back below the allowable level as seen in the Water Quality Table on page 2. The oversight was an administrative error, and the utility wants to ensure our customers we have followed up with the Department of Health to sample Well #2 in 2010. The results from both Well #1 and Well #2 have come back below the MCL (allowed level).

Explicación de Infracción

Nosotros, el Sistema de Acueductos de Grand Mound y del Condado de Thurston, con identificación 07158O, ubicado en el Condado de Thurston, tenemos la responsabilidad de vigilar regularmente su agua potable, para detectar la presencia de ciertos contaminantes específicos. Los resultados de esta vigilancia regular indican si su agua potable cumple o no con las normas sanitarias. Durante el año 2009, no vigilamos los nitratos ni hicimos la prueba de detección de nitratos; así que no podemos estar seguros de la calidad de su agua potable durante ese período.

Aunque no tomamos muestras para detectar nitratos en el Pozo N.º 2 en 2009, el servicio público sí sacó muestras para detectar nitratos del Pozo N.º 1. Estos resultados salieron por debajo del nivel permitido, como se puede ver en la "Tabla de calidad del agua" en la página 2. Este lapso fue un error administrativo y el servicio público quiere asegurar a nuestros clientes que hicimos los arreglos necesarios con el Departamento de Salud para tomar muestras del Pozo N.º 2 en 2010. Los resultados recibidos, tanto del Pozo N.º 1 como del Pozo N.º 2, salieron por debajo del nivel permitido (MCL, nivel máximo de contaminación).

Para nuestros clientes hispanohablantes: Esteinforme resume los resultados de los análisis hechos al agua potable durante el 2009. Los resultados demostraron que su agua potable cumplió con todas lasnormas de seguridad estatales y federales. En cumplimiento con los requisitosen materia de informes, los resultados para 2010 serán enviados por correo en 2011.

THURSTON COUNTY
WASHINGTON
SINCE 1852

Appendix I

Cross Connection Control Plan

Thurston County Code 15.11

Cross-Connection Control Plan

1. The County Commissioners of Thurston County have determined that any cross-connections in the public water supply managed by Thurston County pose a potential hazard to water quality within the county; and

2. Washington Administrative Code 246-290-490 requires that Thurston County develop and implement a cross-connection control program, and it is in the best interest of the County to develop and enforce a cross-connection control plan to regulate and prohibit any cross-connections when detected. The cross-connection control plan will follow the requirements of WAC: 246-290-490 and the Uniform Plumbing Codes, and using the manual of Cross-Connection published by the University of California and Cross-Connection control manual published by the PNWS/AWWA as guidelines in our program.

3. The installation of backflow prevention assemblies to prevent back pressure or back-siphonage into the public water system is necessary for the public health, welfare, and safety. Therefore, all installation of backflow assemblies will be Premise Isolation, installed down stream from the County's water metering device to protect the County's water distribution system from any potential hazard that is determined by Thurston County and in accordance with the WAC: 246-290-490, the Uniform Plumbing Codes, and the County's Cross-Connection Control Program along with using the guidelines of the Manual of Cross-Connection Control published by USC and the PNWS/AWWA Manual for Cross-Connection Control, as they presently exist and as they may, from time to time, be amended.

IT IS THEREFORE RESOLVED by the Thurston County Board of Commissioners of Thurston County, Washington, as follows:

The Definitions, Abbreviations and Acronyms Relating to cross-connections that are used frequently in cross connection control are found in the WAC: 246-290-010.

1. Cross-Connections Declared Unlawful

When the installation or maintenance of a cross-connection, which endangers the water quality of the County's potable water supply (in the opinion of the County or any of its designated representatives who are qualified in the protection of municipal water quality) is prohibited. Thurston County requires that all water service connections, domestic potable water, fire sprinkler systems, or irrigations systems have cross-connection protection. (Any such cross-connection installed now that does not conform with County standards and exist hereinafter is hereby declared unlawful and shall be disconnected and removed immediately.)

2. Backflow Prevention Assemblies to be Installed

Backflow prevention assemblies, when required to be installed in the assessment of the County or any of its designated representatives, will be installed at the expense of the user. The assembly will be installed as Premises Isolation. Premises Isolation assemblies will be installed down stream from the County's water metering device, but within 6' of the meter box or before any other use connection, to protect the County's water distribution system from any potential hazard that is determined by Thurston County. All assemblies will be installed, in accordance with the County's Cross-Connection Control Plan, WAC: 246-290-490 Section 4 (a-g), UPC, and the PNWS/AWWA Cross-Connection Control Manual.

Upon completion of installation, Thurston County must be notified within 48 hours by mail or by coming into our offices and meeting with the County's Cross-Connection Control Specialist (CCS) indicating that the backflow assembly has been installed. Upon notification, the County's CCS will inspect the installation. Once the backflow assembly has been inspected by the County's CCS the County Back-Flow Assembly Tester (BAT) will test said assembly to ensure it is operating in accordance to the states operating standards such as those in the USC Manual. The County does reserve the right for the property owner to be responsible to have the said assembly(s) tested by a certified Back-Flow Assembly Tester (BAT) using procedures acceptable to the department such as those in the USC Manual and send in the test report indicating the backflow assembly(s) has passed a certified test.

In-Premise installation of backflow assemblies can be installed only with written permission by the County's CCS or can be mandated along with Premises Isolation when high health hazards are determined to exist by the CCS. When written permission is granted to install the backflow assembly inside of a building, the assembly shall be readily accessible during regular working hours. All backflow assembly will be readily accessible to all County personnel with proper identification during regular working hours of 8:00 a.m. to 4:30 p.m. in accordance with County code 15.10.120. If there is an exchange of ownership of a In-Premise backflow assembly and/or at any time these requirements are not met, Thurston County has the right to enforce Premises Isolation, the installation of an appropriate backflow assembly as determined by the County's CCS on the down stream side of the County's metering device but within 6' of the property line or prior to any other use connection.

In the event that these requirements are not met in the determination of the County's CCS, the County will follow the procedures as set forth in section 6 (a-f) of this resolution.

3. <u>Backflow Prevention Assemblies to be Inspected and Tested</u>

Backflow prevention assemblies installed shall be inspected and tested:

a. At the time of initial installation; and
b. Annually after initial installation; and
c. After the assembly is repaired or relocated; and
d. More often, if tests indicate repeated failure or a backflow incident.

The County shall notify the service customer that an annual test of the backflow prevention assembly is required not less than 30 days before such annual test is required unless an emergency test is deemed necessary by the County. The service customer may have such test performed by any person so certified by the Washington State Board of Health as a certified BAT and the results delivered to the County not more than 30 days from notice of testing.

Development Services will not release certificate of Occupancy until the facility(s) backflow assembly(s) has passed a certified test by a state certified BAT.

If the test described herein is not performed within the time required, Thurston County will enforce County code 15.10.070(G.1). Bypassing of an existing backflow assembly or tampering so as to require reinstallation or repair of a backflow assembly is subject to penalty in accordance with 15.10.070 (G.1).

4. <u>Backflow Assemblies Test Procedures</u>

Thurston County will ensure that all backflow assemblies that are within its service area will be tested in accordance with WAC 246-290-490, The Manual of Cross-Connection Control-Ninth Edition published by the foundation for Cross-Connection Control and Hydraulic Research University of Southern California and PNWS/AWWA Cross Connection Control Manual 6th Edition, December 1995 as they presently exist and as they may, from time to time, be amended.

5. <u>Air-Gap Substitution Permitted</u>

Thurston County may permit the substitution of a properly installed air-gap in lieu of an approved backflow prevention assembly. All such air-gap substitutions shall be inspected annually by a Washington State certified backflow assembly tester.

6. <u>Procedures of Abatement of Unlawful Cross-Connections and Installations of Backflow Prevention Assemblies</u>

Cross-connections declared in this resolution to be unlawful, whether presently existing or hereinafter installed, and/or unlawful use or operation of a private water supply system served by the subject to abatement in accordance with the following procedures:

a. In the event that the County, or any of its designated representatives, determines that a cross-connection as herein provided does exist, written notice shall be mailed to the person in whose name the water service is established under the County records or, alternatively, a copy of such written notice shall be posted on the premises served.

b. The notice shall provide that the cross-connection described herein shall be corrected within thirty (30) days of the date such notice is mailed or posted on the premises.

c. In the event such cross-connection is not abated within the prescribed time, water service to said premises will be shut off immediately and the property owner directed to install a backflow prevention assembly(s). Should the County be required to terminate the water service, the County will bill the property owner for all costs incurred by service, including, but not limited to an automatic hookup fee based on code 15.12.010.

d. In the event such cross-connection is not abated within the prescribed time, the County shall also have the option of hiring a contractor to abandon the cross-connection, including the installation of a backflow prevention assembly(s). In such event, the

County will bill the property owner for all costs incurred. Ten days after default in payment of such costs, the County will have the right to lien the real property and commence foreclosure proceedings pursuant to Thurston County code 15.10.340 to collect such amount.

e. In the event that the cross-connection, in the opinion of the County's CCS, or any of its designated representatives, poses a potential health or system hazard to the public water supply, service from the County's water supply system to the premises may be terminated without prior notice, provided, however, that notice will be posted on the premises in the manner heretofore provided at the time said service is terminated; provided further, that the County's cross-connection control program specialist shall notify the Department of Health when a water service has been shut off.

f. Any new service customer with cross-connections as described herein, shall be refused water service or a certificate of occupancy by the County, until such time, as the prospective service customer has installed and has a certified BAT test and passed the backflow prevention assembly as required by the County.

7. <u>Backflow Assembly Testers Quality Control</u>

Backflow Assembly Testers (BAT) shall supply the County with documentation indicating their testing equipment has an annual certificate of accuracy and that their Department of Health BAT Certification Card is of the current year. These documents shall be supplied to the County's CCS on or before March 30th of each year. BAT's must comply with the testing procedures published by the Washington State Department of Health. BAT's must contact the County's CCS or designated personnel 72 hours (3 working days) before testing of any backflow assembly within the service area of Thurston County. Test reports must be returned to the County's CCS within 30 days of testing. Signature of tester must be leadegable with first and last named printed below signature and the BAT's certificate number. If test reports are delivered without the above requirements, they will be returned to sender.

8. <u>Costs</u>

All costs associated with purchase, installation, inspection, testing, repairs, replacement, and maintenance of the backflow prevention assembly are the financial responsibility of the customer. Customers who fail to comply with the Thurston County Cross-Connection Control Plan by customers are subject to violations and penalties as described in the County's code 15.10.070. Certified BAT's and CCS's are also subject to violations and penalties if they do not comply with the County's Cross-Connection Control Plan, WAC: 246-290-490, and DOH Backflow Prevention Assembly Field Test Procedures. County code 15.10.070 (G) lists fees and penalties.

9. <u>Record Keeping</u>

Record keeping is accomplished with a manual filing system and a computerized software data base program. Every five (5) years manual files such as assembly test forms, incidents and annual summary reports will be up-dated and condensed, digitally transferred to disk and held in a secured area.

10. Reporting of Backflow Incidents

Reporting of a known backflow incident to have contaminated the public water system or occurred within the premises of a consumer served by Thurston County will be documented, and the incident will be reported to the department, local administrative authority and the local health jurisdiction as described in the WAC: 246-290-490 (8) f-g. Once a backflow incident is identified, the property owner or business owner will have to isolate the premises from the County's water system and have a certified BAT perform and test on the backflow assembly. If said premises does not have a certified backflow assembly installed, an assembly or assemblies must be installed before restoring water service to said premises. To ensure the premises is free of physical, aesthetic, communicable or chemical hazards the property or business owner must demonstrate that the premises plumbing system has been flushed of contaminant, disinfected with a 200ppm chlorine solution, and flushed clean of all contaminants.

11. Adoption of State Regulations

Rules and regulations of the Washington State Department of Health regarding public water supplies, entitled "Cross-Connection Control," WAC 246-290-490, as they presently exist and as they may, from time to time, be amended, are hereby adopted and incorporated herein by this reference as if set forth in full. Thurston County has set forth more stringent cross-connection control requirements and may, from time to time, amend the requirements in accordance with WAC 246-290-490 (Sec.2, d).

12. Miscellaneous Control Assembly

Thurston County reserves the right, as a condition of water service, to require any party seeking water service or seeking an upgrade, (retrofitting or redesigning in any way of an existing water service) to install a backflow preventative assembly or similar approved assembly at the location where the County, (or the County's designee) determines a need to protect the County's water system and / or facilities.

13. Thurston County Not Liable for Damages

Thurston County shall not be liable for damages, nor will allowances be made, for loss of production, sales, or service or other consequential damages arising out of the implementation of any of the measures required by and/or contained in this Resolution.

14. Effective date

This resolution and the policies set forth herein shall be effective upon the date of adoption by the Thurston County Board of Commissioners set forth below.

15.11.010 - State provisions adopted.

The provisions of WAC 246-290-490 as amended as of or after the effective date of the ordinance codified in this chapter, relating to cross-connection control and elimination and the use of backflow prevention devices, when such are considered to be advisable, are adopted and made a part hereof, and all provisions of the Washington Administrative Code may be executed and applied by the department of public works in determining when cross-connections are prohibited and when backflow prevention devices shall be required.

(Ord. 13604 § 3 (part), 2006)

(Ord. No. 14318, § 3, 12-15-2009)

15.11.020 - Cross-connections and backflow prevention.

A.

The installation and maintenance of a cross-connection that will, or has the potential to, endanger the quality of the potable water supply of the county's water systems is prohibited. Any such cross-connection existing at the effective date of the ordinance codified in this chapter or hereafter installed, is declared to be unlawful. Cross-connections that cannot be controlled and/or eliminated shall require the installation of a approved backflow prevention device or approved air gap and regular inspection and testing in accordance with WAC 246-290-490 and the county's cross-connection control program.

B.

Service to any property, landowner or water user receiving its water supply from a county water system shall be contingent upon compliance with all requirements of the rules and regulations of the Washington State Department of Health, the county's cross connection control program and this chapter. Service shall be discontinued to any premises, water use or property owner for failure to comply, and any discontinued service will not be reestablished until the county's cross-connection control specialist has approved compliance with such requirements.

C.

Any customers using water from any of the county's water systems are responsible for compliance with this chapter and shall be strictly liable for all damages incurred as a result of failure to comply with the express terms and provisions contained herein.

(Ord. 13604 § 3 (part), 2006)

(Ord. No. 14318, § 3, 12-15-2009)

15.11.030 - Department of public works and development services to administer.

The departments of public works and development services shall be responsible for administering this chapter consistent with WAC 246-290-490 and the county's cross-connection control program as adopted by the board of county commissioners.

(Ord. 13604 § 3 (part), 2006)

(Ord. No. 14318, § 3, 12-15-2009)

15.11.040 - Inspection—Right of entry.

The county's cross-connection control specialist and other duly authorized employee(s) bearing proper credentials and identification shall be permitted to enter upon all properties receiving water service form the county for the purposes of inspection, observation and testing in accordance with the provisions of this chapter.

(Ord. 13604 § 3 (part), 2006)

(Ord. No. 14318, § 3, 12-15-2009

15.11.050 - Backflow prevention device inspection, testing and repair charges.

A.

Backflow prevention assembly inspection, as required under Section 15.11.030 shall be seventy-five dollars.

B.

Backflow prevention assembly testing, when performed by the county, shall be sixty-five dollars.

C.

Repairs made to backflow prevention assemblies outside premises shall be performed only by a certified backflow assembly tester. Assemblies in-premises shall be done by a licensed plumber. County staff will only perform repairs to assemblies outside of premises and the actual cost for labor and materials shall be charged to the owner. If the work is performed by a backflow assembly tester or a licensed plumber, he or she shall provide written notification to the county of completion of repairs and request an inspection upon completion of his or her work.

(Ord. 13604 § 3 (part), 2006)

(Ord. No. 14318, § 3, 12-15-2009)

15.11.060 - Backflow prevention device charges.

When, pursuant to Section 15.11.030, backflow prevention assemblies are required to be installed, the property owner may request that the county install the assembly. If installed by the county, the county shall charge the owner the actual costs incurred for all materials and labor for the installation.

(Ord. 13604 § 3 (part), 2006)

(Ord. No. 14318, § 3, 12-15-2009)

15.11.070 - Violation—Penalty.

A.

Any person who violates or fails to comply with any of the provisions of this chapter shall be deemed guilty of a misdemeanor and, upon conviction hereof, shall be subject to punishment as provided by law.

B.

The prosecuting attorney may bring such actions as are deemed necessary to prevent the violation of and compel compliance with the provisions of the chapter.

THURSTON COUNTY
WASHINGTON
SINCE 1852

Appendix J

Public Notification Plan

Public Notice Certification

Drinking Water Warning Form

Drinking Water Warning Door Hangers

News Release Form

Public Notification Requirements Contacts

Emergency Call Up Roster

Public Notification Plan

Public notification is a top priority.

The Grand Mound water system shall deliver safe and reliable drinking water to their customers 24 hours a day, 365 days a year. If the drinking water supply becomes contaminated, many people can become seriously ill or die. Any time the water system has a situation that poses a risk to public health, the County shall notify their customers, in accordance with state and federal law.

Notifying our water system customers as quickly as possible when their water may not be safe to drink, gives them time to take actions to protect their health.

Formal public notification requirements are required whenever the Grand Mound water system is in violation of:

- Drinking water quality or monitoring requirements
- Operating under a variance or exemption
- Other situations that pose a public health risk, such as a disruption in service

Notifying our customers in a timely manner about actual or potential threats associated with drinking their tap water can help people make informed decisions affecting their health. Our customers will be notified within 24 hours if there is a serious problem.

Key issues of public interest:

The three tiers will be used to determine the specific requirements for public notification.

- **Tier 1:** Acute health concerns require notification within 24 hours
- **Tier 2:** Chronic health concerns require notification within 30 days
- **Tier 3:** Reporting and monitoring violations require notification within 365 days

Other aspects of the revised public notification rules include:

- An expanded list of violations and situations requiring 24-hour notification
- Simplified health effects language
- Standard language for monitoring violations
- A requirement for the water system to send a copy of all public notifications and the certification of compliance with public notification regulations to the Department of Health
- Allowing notices for individual violations to be combined into the annual Consumer Confidence Report, if public notification requirements can still be met

THURSTON COUNTY
WASHINGTON
SINCE 1852

Thurston County Public Works

Utility Operations

News Release

For Immediate Release: *Date*

Contact: Thurston County Public Works Department, Utility Services Manager 360-239-2539

Thurston County – Thurston County is advising all water customers to boil their drinking water after recent samples showed the presence of _________________________. The Washington State Department of Health (DOH) has been notified and Thurston County is working closely with the Division of Drinking Water to find the source of contamination and fix the problem, which may include disinfecting the system. The boil water advisory will remain in effect until further notice.

Mark Petrie, Utility Maintenance and Operations Manager, stated “We are doing all we can to eliminate the bacteria from the water system. Safe and reliable drinking water is critical to good health and responding to this kind of emergency is our highest priority,” said system spokesperson.

No illness related to the community’s drinking water has been reported. To correct the problem

(e.g. Chlorine was applied to the entire system on ________.)

The boil water advisory includes several precautionary steps that customers should take. These include using purchased treated bottled water or boiled water for any water that might be consumed: drinking, brushing teeth, dishwashing, preparing food and making ice. Water should be boiled for 3-5 minutes, and then allowed to cool before using.

The advisory will remain in effect until Thurston County and DOH are confident there is no longer a threat of illness to their customers. Once satisfactory results are reported, customers will be notified that the advisory has been lifted.

If you have any questions, please call us at 360-754-2930.

DRINKING WATER WARNING

The _____________________ Water System, ID __________, located in Thurston County is contaminated with fecal coliform / *E. coli* bacteria.

Fecal coliform/ *E. coli* bacteria were detected/confirmed in the water supply on _______. These bacteria can make you sick and are a particular concern for people with weakened immune systems.

DO NOT DRINK THE WATER WITHOUT BOILING IT FIRST. Bring all water to a boil, let it boil 3-5 minutes, and let it cool before using. Boiled or purchased bottled water should be used for dinking, making ice, brushing teeth, washing dishes, and food preparation until *further notice*. Boiling kills bacterial and other organisms in the water.

Fecal coliforms and E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause short-term effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems. The symptoms above are not caused only by organisms in drinking water. If you experience any of these symptoms and they persist, you may want to seek medical advice. People at increased risk should seek advice about drinking water from their health care provider.

What happened: What is the suspected or known source of contamination?

The following is being done to correct the problem:

We have consulted with the Washington State Department of Health about this incident. We will notify you when you no longer need to boil the water. We anticipate resolving the problem by ____________________.

For more information please contact the Utility Services Manager at (360) 239-2539 or at Thurston County Public Works Department, 2404-A Heritage Court SW, Olympia, WA 98502.

Please share this notice with all the people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.

Notice is sent to you by Thurston County Public Works Department, Utility Operations and Maintenance on _______________.

PUBLIC NOTICE CERTIFICATION
Acute Coliform MCL

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Within 10 days of notifying your customers, you must send a copy of each type of notice you distribute (hand-delivered notices, press releases, newspaper articles, etc.) to our regional office. Also, complete and send this form, which certifies that you have met all the public notification requirements. If the boil water advisory remains in effect more than three months, you must notify your water users again and provide another Public Notice Certification to us. *With this certification, you are also stating that you will meet future requirements for notifying new billing units of the violation or situation.*

Water System:____ID #__________County:_______________

Violation Date:_____ / _____ / _____ Violation Type:____

This public water system certifies that public notice has been given to water users, following state and federal requirements for delivery, content, and deadlines.

Complete the following items:

Yes No

☐ ☐ Distribution was completed on ___ / ___ /____. Check all that apply:
- ☐ Hand delivery,
- ☐ Press release (TV, radio, newspaper, etc.),
- ☐ Posting at__________________________ (by DOH approval only),
- ☐ Other _____________________________ (by DOH approval only).

☐ ☐ Were the water users notified within 24 hours?

_______________________________________ ___________________ ____________________

Signature of owner or operator Position Date

If you need this publication in an alternate format, call (800) 525-0127 or for TTY/TDD call (877) 833-6341.

Northwest Regional Office:
20435 72nd Ave S Suite 200
Kent WA 98032
(253) 395-6775
Fax: (253) 395-6760

Southwest Regional Office:
PO Box 47823
Olympia WA 98504-7823
(360) 236-3030
Fax (360) 664-8058

Eastern Regional Office:
16201 E Indiana Ave Suite 1500
Spokane Valley WA 99216
(509) 329-2100
Fax: (509) 329-2104

DRINKING WATER WARNING

The _____________________ Water System, ID______, located in ___________County is contaminated with fecal coliform/ *E. coli* bacteria.

Fecal coliform/ *E. coli* bacteria were detected/confirmed in the water supply on ________. These bacteria can make you sick and are a particular concern for people with weakened immune systems.

DO NOT DRINK THE WATER WITHOUT BOILING IT FIRST. Bring all water to a rolling boil for one minute. Let it cool before using. Boiled or purchased bottled water should be used for drinking, making ice, brushing teeth, washing dishes, and food preparation until *further notice*. Boiling kills bacteria and other organisms in the water.

Fecal coliforms and E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause short-term effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems. The symptoms above are not caused only by organisms in drinking water. If you experience any of these symptoms and they persist, you may want to seek medical advice. People at increased risk should seek advice about drinking water from their health care provider.

What happened? What is the suspected or known source of contamination?

The following is being done to correct the problem:

We have consulted with the Washington State Department of Health about this incident. We will notify you when you no longer need to boil the water. We anticipate resolving the problem by ______________________.

For more information, please contact _______________ at ( )___-_____ or at _________________________.
(owner or operator) (phone number) (address)

Please share this notice with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distribution copies by hand or mail.

This notice is sent to you by ____________________ Water System on ___/___/____

10/17/08

WARNING:

Do not drink tap water without boiling it first!

☐ **Fecal coliform**
☐ **E. coli bacteria**
☐ **Other:** ______________________________

were detected in the water supply on:
(date) ___________________.

Boiling kills bacteria and other organisms in the water:

- **Bring water to a rolling boil for one minute**
- **Let water cool before using**

To avoid possible illness: use boiled or purchased bottled water for drinking, making ice, brushing teeth, washing dishes, and food preparation until further notice.

Contact your doctor, if you experience one or more of these symptoms: nausea, cramps, diarrhea, jaundice, headache and/or fatigue. People with chronic illnesses, infants and the elderly may be at higher risk and should seek medical advice.

Water System: _________________________
I.D.: ___________________________________
County: ______________________________
Contact: ______________________________
Telephone: ____________________________
Date notice distributed: _________________

What is fecal coliform and E. coli?

Fecal coliform and E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these waters can cause short-term effects, such as diarrhea, cramps, nausea, headaches or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.

How long will this warning be in effect?

We will consult with the Washington State Department of Health about this incident. We will notify you when you no longer need to boil the water.

Vea al reverso para la versión en Español.

October 2008

WARNING:

Do not drink tap water without boiling it first!

☐ **Fecal coliform**
☐ **E. coli bacteria**
☐ **Other:** ______________________________

were detected in the water supply on:
(date) ___________________.

Boiling kills bacteria and other organisms in the water:

- **Bring water to a rolling boil for one minute**
- **Let water cool before using**

To avoid possible illness: use boiled or purchased bottled water for drinking, making ice, brushing teeth, washing dishes, and food preparation until further notice.

Contact your doctor, if you experience one or more of these symptoms: nausea, cramps, diarrhea, jaundice, headache and/or fatigue. People with chronic illnesses, infants and the elderly may be at higher risk and should seek medical advice.

Water System: _________________________
I.D.: ___________________________________
County: ______________________________
Contact: ______________________________
Telephone: ____________________________
Date notice distributed: _________________

What is fecal coliform and E. coli?

Fecal coliform and E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these waters can cause short-term effects, such as diarrhea, cramps, nausea, headaches or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.

How long will this warning be in effect?

We will consult with the Washington State Department of Health about this incident. We will notify you when you no longer need to boil the water.

Vea al reverso para la versión en Español.

October 2008

ADVERTENCIA:
¡No tome el agua de la llave sin antes hervirla!

☐ **Bacteria coliforme fecal**
☐ **Bacteria E. coli**
☐ **Otra:** ________________________________

fueron encontradas en su sistema de agua:
(el día)____________________.

Hervir el agua mata a las bacterias y otros organismos en el agua:

- **Ponga el agua en la estufa hasta que hierva y deje hervir el agua por un minuto**
- **Deje enfriar el agua antes de usarla**

Para evitar posibles enfermedades y hasta nuevo aviso: use agua hervida o agua potable embotellada para tomar, hacer hielo, limpiarse los dientes, lavar los platos y para preparar comidas.

Hable con su doctor si usted tiene uno o más de los siguientes síntomas: náusea, dolor estomacal, diarrea, ictericia, dolores de cabeza y/o cansancio. La gente con enfermedades crónicas, bebés y personas mayores de edad, pueden estar en situación de alto riesgo y deben consultar con su médico o proveedores de servicios médicos.

Sistema de agua: ______________________
I.D.: ___________________________________
Condado: ______________________________
Contacto: ______________________________
Teléfono: ______________________________
Fecha de notificación: __________________

¿Qué son las bacterias coliforme fecal y E. coli?

Coliformes fecales o E. coli son bacterias cuya presencia indica que el agua esta contaminada con desechos humanos o de animales. Microbios de esos desechos pueden causar diarrea, dolor estomacal, náusea, dolores de cabeza u otros síntomas. Pueden representar un peligro para la salud de bebés, niños y niñas de corta edad y personas con sistemas inmunológicos en alto riesgo.

¿Por cuánto tiempo va a estar en efecto esta advertencia?

Vamos a consultar con el Departamento de Salud del estado de Washington acerca de este incidente. Le vamos a notificar cuando ya no sea necesario hervir el agua.

See reverse side for English version.

ADVERTENCIA:
¡No tome el agua de la llave sin antes hervirla!

☐ Bacteria coliforme fecal
☐ Bacteria E. coli
☐ Otra: ________________________________

fueron encontradas en su sistema de agua:
(el día)____________________.

Hervir el agua mata a las bacterias y otros organismos en el agua:

- Ponga el agua en la estufa hasta que hierva y deje hervir el agua por un minuto
- Deje enfriar el agua antes de usarla

Para evitar posibles enfermedades y hasta nuevo aviso: use agua hervida o agua potable embotellada para tomar, hacer hielo, limpiarse los dientes, lavar los platos y para preparar comidas.

Hable con su doctor si usted tiene uno o más de los siguientes síntomas: náusea, dolor estomacal, diarrea, ictericia, dolores de cabeza y/o cansancio. La gente con enfermedades crónicas, bebés y personas mayores de edad, pueden estar en situación de alto riesgo y deben consultar con su médico o proveedores de servicios médicos.

Sistema de agua: ______________________
I.D.: ___________________________________
Condado: ______________________________
Contacto: ______________________________
Teléfono: ______________________________
Fecha de notificación: __________________

¿Qué son las bacterias coliforme fecal y E. coli?

Coliformes fecales o E. coli son bacterias cuya presencia indica que el agua esta contaminada con desechos humanos o de animales. Microbios de esos desechos pueden causar diarrea, dolor estomacal, náusea, dolores de cabeza u otros síntomas. Pueden representar un peligro para la salud de bebés, niños y niñas de corta edad y personas con sistemas inmunológicos en alto riesgo.

¿Por cuánto tiempo va a estar en efecto esta advertencia?

Vamos a consultar con el Departamento de Salud del estado de Washington acerca de este incidente. Le vamos a notificar cuando ya no sea necesario hervir el agua.

See reverse side for English version.

THURSTON COUNTY
WASHINGTON
SINCE 1852

News Release

For Immediate Release: <DATE>
Contact: Water purveyor/system contact name and telephone number

<Water System> announces boil water advisory for all customers in <area>

CITY NAME — The <SYSTEM NAME> is advising all water customers to boil their drinking water after recent samples showed the presence of <fecal coliform, E. coli, total coliform>. The Washington State Department of Health (DOH) has been notified and <SYSTEM NAME> is working closely with the Office of Drinking Water to find the source of contamination and fix the problem, which may include disinfecting the system. The boil water advisory will remain in effect until further notice.

<System spokesperson quote> (e.g. "We are doing all we can to eliminate the bacteria from the water system. Safe and reliable drinking water is critical to good health and responding to this kind of emergency is our highest priority," said system spokesperson.)

<NUMBER or NO> illnesses related to the community's drinking water have been reported. To correct the problem <WHAT IS BEING DONE> (e.g. Chlorine was applied to the entire system on DATE.)

The boil water advisory includes several precautionary steps that customers should take. These include using purchased treated bottled water or boiled water for any water that might be consumed: drinking, brushing teeth, dishwashing, preparing food and making ice. Water should come to a rolling boil for one minute, then allowed to cool before using.

The advisory will remain in effect until <SYSTEM NAME> and DOH are confident there is no longer a threat of illness to their customers. Once satisfactory results are reported, customers will be notified that the advisory has been lifted.

If you have any questions, please call us at <TELEPHONE NUMBER>.

###

10-17-08

PUBLIC NOTIFICATION REQUIREMENTS

Public notification is required for all acute MCL violations.

Local Health District:

Thurston County Public Health- Sara Brallier- 360-867-2629
Dr. Yu- 360-867-2500

State:
Washington State Department of Health- Sandy Brentlinger- 360-236-3044
Jozef Bezovics, P.E. - 360-236-3038
(Regional Engineer)

Must notify DOH by end of business day once you receive notice of violation, or if Notice received after close of business, by end of next business day.

Radio:

KITI	Phone-	1-360-736-1355
KELA	Phone-	1-360-736-3321

Television:

KOMO:	Phone/e- mail	tips@komo4news.com 1-TV-TIPS-KOMO, press 1
KING	Phone/e-mail	newstips@king5.com 1-206-448-5555
KIRO	Phone/e-mail	newstips@kirotv.com 1-206-728-7777

News Paper:

The Chronicle	Phone-	360-807-8203
The Olympian	Phone-	360-754-5400

EXHIBIT 6-8 EMERGENCY CALL-UP ROSTER

GRAND MOUND

Public Works	754-5480
Custom Security	800-426-5338
Dispatch (aka Central Dispatch)	800-926-7761
Grand Mound Water & Wastewater Plant	273-4449
Fire Dist I	273-5582
Thurston County Sheriff	786-5500 /9 I I

CITY OF CENTRALIA

Riverside Fire Authority	736-3975 /9 I I
Centralia Police Department	360-330-7680
Centralia Public Works Department	360-330-7512
Centralia Street Department	360-330-7512
Centralia Water/Wastewater	360-330-7512

LEWIS COUNTY

Emergency Management	360-740-1151
Environmental Health	360-740-1146
Public Services	360-740-1 123
Public Works	360-740-I I23
Sheriff	360-748-9286

STATE

DOH Southwest Regional Office		360-236-3030
	Fax	360-664-8058
	After Hours	800-832-5452
Office of Drinking Water Hotline		1-877-481-4901
Dept. of Ecology's Spill Response		360-407-6300

OTHER

One Call Locate		800-423-5555
Billing (ID #32844)		206-454-8888
Verizon		800-624-9675
Sprint (call before dig)		800-521-0579
Geolink Fiber Integrity Center		800-252-1133
Century Link (Locate, Inc.)		800-954-I 2 I I
Phone Repair	Business Lines	800-2 14-8043
	Residential	800-954-1211
Puget Sound Energy (Gas Division)		888-225-5773
Area Supervisor, Justin Shahan:		360-663-6213
Utility Underground Locate Center		800-424-5555
Burlington Northern Trouble Reports		800-832-5452 (Option 1)
Longview/Kelso		360-578-2361
Centralia Providence Hospital		360-736-2803

THURSTON COUNTY PUBLIC WORKS CONTACT PHONE NUMBERS

		Phone
During Business Hours:	Olympia Office	754-4580
After Business	Water& Wastewater Plant	273-4449
		239-2539
	Director	239-0041
	Water On Call Person	800-926-7761
EMERGENCY		911

Problems Requiring Immediate Response (After Hours) Non-Emergency (After Hours)

800-926-7761 (Central Dispatch)

754-2930 (Voice Mail)

THURSTON COUNTY
WASHINGTON
SINCE 1852

Appendix K

Development Standards for Water and Sewer Systems

THURSTON COUNTY

WASHINGTON

SINCE 1852

Development Standards for Water and Sewer Systems Thurston County, Washington

Prepared by: Thurston County
Department of Water and Waste Management
January 2007

Development Standards
for
Water and Sewer Systems
Thurston County, Washington

Help us improve these standards!

If you become aware of errors, missing information, discrepancies, or unclear language, please help us improve these standards by sending your comments to the Department of Water and Waste Management at the email address below:

TO: wwm-webmaster@co.thurston.wa.us
RE: Comments - Water and Sewer Standards

Thank you for your assistance,

Thurston County Department of Water and Waste Management
January 2007

THURSTON COUNTY
WASHINGTON
SINCE 1852

Development Standards for Water and Sewer Systems Thurston County, Washington

Prepared by: Thurston County
Department of Water and Waste Management
January 2007

TABLE OF CONTENTS

DEVELOPMENT STANDARDS FOR
WATER AND SEWER SYSTEMS
THURSTON COUNTY, WASHINGTON

1.00 GENERAL

1.01 Abbreviated Plans

Abbreviated plans for water and sewer systems may be submitted for single family homes, duplexes, and some commercial buildings. Thurston County reserves the right to require a proposed water and sewer be designed by a professional engineer. All contractors shall be licensed, insured, and bonded in the State of Washington consistent with all applicable rules and regulations by the Washington State Department of Labor and Industries.

1.02 Water Standards

Any extension of the Water System must be approved by the Director of Thurston County Department of Water and Waste Management or his/her designee and, all extensions must conform to these standards. In designing and planning for any development, it is the developers' responsibility to see that adequate water for both domestic use and fire protection is attainable. The developer must show, in the proposed plans, how water will be supplied and whether adequate water pressure and flow will be attained in case of fire. An analysis of the system may be required if it appears that the system might be inadequate. All contractors shall be licensed, insured, and bonded in the State of Washington consistent with all applicable rules and regulations by the Washington State Department of Labor and Industries.

Prior to the release of any water meters, all Public Works improvements must be completed and approved including granting of right-of-way or easements, and all applicable fees must be paid. In development where water or any private utility work and public street improvements are required, no paving of the public right-of-way shall occur until all utility improvements in the street construction area are complete.

1.03 Sanitary Sewer Standards

Sanitary sewerage refers to waste water derived from domestic, commercial and industrial pretreated waste to which storm, surface, and ground water are not intentionally admitted. Pretreatment shall follow all the requirements as set forth by Thurston County Code 15.09.060 – Discharge Limitations.

Any extension of Thurston County's sanitary sewer system must be approved by Thurston County and must conform to the, Thurston County Health Department, State of Washington Department of Ecology (DOE), and State of Washington Department of Health (DOH) requirements. Additionally, all sewer system extensions of the Grand Mound Sewer System must conform to the Wastewater Engineering Report and Facility Plan for the Grand Mound Sewer System (December 1999).

A public sewer system must be used within the Grand Mound Service area where a public sewer is available. Where public sewer is not available within the Grand Mound Sewer Service Area, connection is required provided that the sewage from the structure originates within 200 feet of the public sewer, except in the case of private residential or commercial developments where the developed property abuts a right-of-way in which a public sewer is located or where a service connection is otherwise provided. In this case, connection of all structures generating sewage shall be required to connect to the public sewer regardless of distance from the public sewer.

In new development where sanitary sewer improvements or any private utility work and public street improvements are required, no paving of the public right-of-way shall occur until all utility improvements in the right-of-way are complete. Anyone who wishes to extend or connect to the sewer system should contact Thurston County Development Services. Developers and engineers are encouraged to use existing sanitary sewer manholes, where possible, to connect to the new systems to the existing sanitary sewer system. One new manhole will be allowed to be installed in the existing sanitary sewer main per development. No additional manholes and/or taps into the existing sanitary system will be allowed without the written authorization of the Director or his/her designee. All contractors shall be licensed, insured, and bonded in the State of Washington consistent with all applicable rules and regulations by the Washington State Department of Labor and Industries.

Grease traps, oil-water separators, and other mechanical systems may be required at the discretion of Thurston County.

Prior to the acceptance of the sanitary sewer system, all Public Works improvements must be completed and accepted including granting of right-of-way or easements, and all applicable fees must be paid. In development where sanitary sewer or any private utility work and public street improvements are required, no paving of the public right-of-way shall occur until all utility improvements in the street construction area are complete.

1.04 Design Standards

The design of all water and sanitary sewer system extensions and connections shall conform to Thurston County Standards. The layout of water system extensions shall provide for the future continuation and/or looping," of the existing system as determined by Thurston County. The General Notes included in Appendices C and D shall be included on all plans dealing with water and sanitary sewer system designs.

1.04.1 Plan Checklist

Abbreviated Plans

Where abbreviated plans are allowed, Plans shall contain, at minimum, the following information and shall be neatly presented on an 8 ½" x 11" or larger sheet:

DEVELOPMENT STANDARDS FOR
WATER AND SEWER SYSTEMS
THURSTON COUNTY, WASHINGTON

ABBREVIATED PLANS STANDARD ITEMS

- ☐ North Arrow
- ☐ Existing and Proposed Site Improvements
  - ☐ All structures shall be accurately located
  - ☐ Access shall be clearly delineated
- ☐ Property Lines and Easements
- ☐ Existing Water and Sewer System
  - ☐ Main Size
  - ☐ Invert elevations of sewer main in nearest manhole, upstream and downstream, of proposed tap to water and sewer
- ☐ Proposed Service Location, size, and slope
- ☐ Plat Number, Parcel Number, Street Address
- ☐ Existing Septic System (if applicable)
- ☐ Existing Well (if applicable)

Plans other than abbreviated plans shall follow the following requirements. Standard items to be included with development plan submittals are identified below. These items are considered a minimum for review of water utility and sanitary sewer system plans. Plans shall be submitted in ANSI B (11"x17") format with a minimum text height of 0.08 inches. All contents of the plans shall be reproducible (up to three times) without loss of readability or clarity.

A survey must be completed by a professional land surveyor licensed in the State of Washington whose professional stamp shall be affixed to each applicable plan sheet. In addition, the design engineer shall affix his/her professional engineering stamp to each plan sheet.

Standard Items - Plan

- ☐ Centerline and Stations
- ☐ Edge of Pavement and Width
- ☐ Right-of-Way and Width
- ☐ Existing Utilities
- ☐ Property Lines, Parcel Numbers, and Street Address
- ☐ Identify Street Names, Right of Way, Lots
- ☐ Easements, Width and Type
- ☐ Stations for Structures
- ☐ Type of Pipe
- ☐ Flow Direction of Arrows

Standard Items - Profile

- ☐ Profile Grades (decimal Ft./Ft.)
- ☐ Existing and Horizontal Ground
- ☐ Scale (horizontal and Vertical)

- ☐ Stationing
- ☐ Type of Pipe
- ☐ Vertical Elevation Increments
- ☐ Existing Utilities
- ☐ Utility Crossings

Water Plan

- ☐ No smaller than 40 scale unless approved by Thurston County
- ☐ System Map (1"=300') showing existing and proposed mains with line size, at least 2 valves-one on both sides of the project, and hydrants
- ☐ Existing Utility Conflicts
- ☐ Fixtures (need horizontal and vertical control)
  - ☐ Fire Hydrants
  - ☐ Blow-off (at end of line if no hydrant)
  - ☐ Vacuum and Air Release Valves when Required
- ☐ Station, Offset and Size of Tees, Crosses, Elbows, Adaptors and Valves Need Coupling Type
- ☐ Valves (2 each tee, 3 each cross)
- ☐ Fire Department Connection
- ☐ Backflow Prevention Devices
- ☐ Thrust Blocking if Required at all Fittings Including In-Line Valves
- ☐ Distance from Sewer
- ☐ Bearing and Distance of Each Pipe Run
- ☐ Service to Each Lot (include open tracts)
- ☐ Sample Station
- ☐ Domestic Meter with station, size, and offset
- ☐ Irrigation Meter with station, size, and offset
- ☐ Power Source and Type of Service for Irrigation

Water Profile

- ☐ Existing and Proposed Utility Crossings
- ☐ Show Fixtures (tees, crosses, hydrants)
- ☐ Type of Pipe
- ☐ Show Valves and Couplers
- ☐ Size of Watermain
- ☐ Length of Watermain in L.F.
- ☐ Cover Over Pipe
- ☐ Grades (Engineered Design Grade to F.L.)

Water - Miscellaneous

- ☐ Detail Sheet
- ☐ Water General Notes

Sanitary Sewer Plan

- ☐ No smaller than 40 scale unless approved by Thurston County
- ☐ System Map (1"=300') showing Tie-In to Existing System, Including Line Size and Valves
- ☐ Manhole
  - ☐ Station and Offset Shown at Each Manhole/Cleanout
  - ☐ Manholes Numbered
  - ☐ Manhole Type Designation
  - ☐ Flow Direction (with arrow on pipe)
  - ☐ Distance from Water Lines

- ☐ Depth at Property Line and Distance from Downhill Manhole for Side Sewer
- ☐ Service to Each Lot
- ☐ Bearing and Distance (or station, offset and angle) of Each Pipe Run When Not Parallel to Centerline
- ☐ Existing Septic Tanks/Drainfields (with note to abandon if necessary)
- ☐ Station, Offset, and Size of Tees, Crosses, Elbows, Adaptors, and Valves

Sanitary Sewer - Profile

- ☐ Manholes Numbered
- ☐ Invert Elevation Showing Direction, In and Out
- ☐ Rim Elevation
- ☐ Grades Shown (decimal FT/FT) (minimum slopes)
- ☐ Type of Pipe
- ☐ Size of Pipe
- ☐ Length of Pipe (in L.F.)
- ☐ Existing Utilities and Crossings Shown
- ☐ Proposed Utility Crossings
- ☐ Show Fixtures (tees, crosses, valves, and couplers)
- ☐ Cover Over Pipe

Sanitary Sewer - Miscellaneous

- ☐ Detail Sheet
- ☐ Sewer General Notes see Appendix D

1.05 Abbreviated Plans

Abbreviated plans, where accepted, shall conform to applicable areas of these standards and are subject to approval by Thurston County. The abbreviated plans shall generally describe the proposed project, proposed water and sewer service, and how the proposed service will connect to the existing water and sewer system.

1.05.1 Water Service

Specific elements of water service shall conform to the following:

1. Backflow prevention assembly, per Section 2.09;
2. Service connections, per Section 2.10;
3. Irrigation, per Section 2.11;
4. Hydrostatic Tests, per Section 2.13;
5. Sterilization and Flushing, per Section 2.14;
6. Termination of Services, per Section 2.15.

1.05.2 Sanitary Sewer Service

Specific elements of sewer service shall conform to the following:

1. Building/Side Sewer, per Section 3.11;
2. Service connections per Section 3.04;
3. Sanitary Treatment Effluent Pump (STEP) Standards per Section 6.00;
4. Grinder Pump Systems per Section 7.00;
5. Gravity Sewer from Building for Vacuum System per Section 8.04;

1.06 Water Main/Sanitary Sewer Crossings

In case of conflict between the Thurston County Water and Sewer Development Standards and the Department of Ecology Sewage Works Design for requirements regarding sewer and water separation, the most restrictive shall be used, at the discretion of Thurston County.

The Contractor shall maintain a minimum of 18 inches of vertical separation between sanitary sewers and water mains and services. The minimum cover for water main of 42 inches may be reduced to 30 inches upon approval by Thurston County to provide for as much vertical separation as possible. See standard detail WA-01.

The longest standard length of water pipe shall be installed so that the joints will fall equidistant from any sewer crossing. In some cases where minimum separation cannot be maintained, it may be necessary to encase the water pipe and/or sewer service in pipe or concrete. No concrete shall be installed unless specifically directed by Thurston County.

1.07 Conflicts

At crossings of other utilities where the water pipe is within six inches of the other utilities, a polyethylene foam block shall be placed between the pipes. The block shall act as a compression cushion between the pipes.

Conflicts with other utilities may require the pipe alignment be modified in the field. Such realignment shall be subject to approval by Thurston County.

1.08 Staking

All surveying and staking shall be performed by an engineering or surveying firm capable of performing such work. The engineer or surveyor directing such work shall be licensed by the State of Washington.

A preconstruction meeting shall be held with the Thurston County prior to commencing construction. The minimum staking of sewer lines shall be as follows:

1.08.1 Water Systems:

1. Stake centerline alignment every 50 feet (25 feet through curve sections) with cuts and/or fills to bottom of trench maintaining 42 inches of cover over pipe. Centerline cuts are not required when road grade is to finished sub grade elevation.
2. Stake location of all fire hydrants, hydrant flange elevations, tees, water meters, setters and other fixtures with cut or fill to finished grade.

1.08.2 Sanitary Sewer Systems:

1. Centerline alignment must be staked with cuts and/or fills to flowline every 50 feet.
2. Manholes must be staked with hubs to include invert elevations of all pipes and top of rim elevations to finished grade.
3. Location of valves, fixtures, valve pits, wet wells, septic tanks, and other appurtenances shall be staked for force mains, gravity and vacuum lines.

1.09 Trench Excavation

Clearing and grubbing when required shall be performed within the easement or public right-of-way as permitted by Thurston County and/or governing agencies. Debris resulting from the clearing and grubbing shall be disposed of by the owner or contractor in accordance with the terms of all applicable permits.

The Contractor shall perform excavation of every description and in whatever materials encountered to the depth indicated on the Plans or specified in the Special Provisions. Excavations shall be made by open cut unless otherwise provided for. Trenches shall be excavated to true and smooth bottom grades and in accordance with the lines given by the Engineer or shown on the Plans. The trench bottom shall provide uniform bearing and support for each length of pipe.

Bell holes shall be excavated to the extent necessary to permit accurate work in making and inspecting the joints. The banks of the trenches shall be kept as nearly vertical as soil conditions will permit, and where required to control trench width or to protect adjacent structures, the trench shall be sheeted and braced. Trench widths to 1 foot above the top of the pipe shall not exceed 30 inches maximum or 1½ times the outside diameter of the pipe plus 18 inches whichever is greater. Standard excavating equipment shall be adjusted so as to excavate the narrowest trench possible.

The trench shall be kept free from water until joining is complete. Surface water shall be diverted so as not to enter the trench. The owner shall maintain sufficient pumping equipment on the job to insure that these provisions are carried out.

The length of trench excavation in advance of pipe laying shall be kept to a minimum. Excavations shall be either closed up at the end of the day or protected per Section 1-07.23(1) of the WSDOT Standard Specifications.

Conformance with Washington Industrial Safety and Health Administration (WISHA) and Labor and Industries (L&I) Safety Standard for worksite related issues is the Contractor's responsibility.

If workers have to enter any trench or other excavation four (4) feet or more in depth that does not meet the open pit requirements of Section 2-09.3(3)B of the WSDOT Standard Specifications, it shall be shored. The Contractor alone shall be responsible for worker safety, and the Contracting Agency assumes no responsibility. See the WSDOT/APWA specification for more thorough requirements regarding trench excavation.

The Contractor shall supply all safety equipment, including all shoring necessary shoring equipment, to complete the work consistent with WISHA and L&I standards for worker safety. Upon completing the work, the Contractor shall remove all shoring unless the Plans or the Engineer direct otherwise.

The Contractor shall exercise sound engineering and construction practices in excavating the trench and maintaining the trench so that no damage will occur to any foundation, structure, pole line, pipe line, or other facility because of slough or slopes, or from any other cause. If, as a result of the excavation, there is disturbance of the ground, which may endanger other property, the Contractor shall immediately take remedial action at no additional expense to the Contracting Agency. No act, representation, or instruction of the Engineer shall in any way relieve the Contractor from liability for damages or costs that result from trench excavation.

Care shall be taken not to excavate below the depth specified. Excavation below that depth shall be backfilled with foundation material and compacted as specified herein.

See the WSDOT/APWA specification for complete requirements regarding trench excavation.

1.10 Backfilling

Prior to backfilling, form lumber and debris shall be removed from the trench. Sheeting used by the Contractor shall be removed just ahead of the backfilling.

Backfill up to 12 inches over the top of the pipe shall be evenly and carefully placed. Materials capable of damaging the pipe or its coating shall be removed from the backfill material. The remainder of the material shall be placed by dumping into the trench by any method at the option of the Contractor, and shall be compacted as specified hereinafter.

A minimum of a 3-inch sand cushion shall be placed between the water or sewer main and existing pipelines or other conduits when encountered during construction and as directed by the Engineer or Thurston County.

Backfilling and surface restoration shall closely follow installation of pipe so that not more than 100 feet is left exposed during construction hours without approval of Thurston County. Selected backfill material shall be placed and compacted around and under the water and sewer mains by hand tools to a height of six inches above the top of the main. The remaining backfill shall be compacted to 95 percent of the maximum density in traveled areas, 90 percent outside traveled area. Where governmental agencies other than Thurston County have jurisdiction over roadways, the backfill and compaction shall be done to the satisfaction of the agency having jurisdiction. If suitable backfill material, as determined by Thurston County, is not available from trenching operations, Thurston County may order the placing of bedding conforming to APWA Standard Specification 9-03 around the main and gravel base conforming with Section 9-03 of the Standard Specifications for backfilling the trench.

Control density fill may be required for backfill material, at the discretion of Thurston County.

See the WSDOT/APWA specification for complete requirements regarding backfilling.

1.11 Street Patching and Restoration

This section pertains to existing public roads and those roads proposed to be dedicated to the County as public roads. All work shall be performed consistent with these standards and Thurston County Road Standards. Inconsistencies and conflicts shall be governed by the Thurston County Road Standards.

All roadway crossings shall be done by means of boring or pushing (untrenched installation). Opening of the roadway surface shall not be permitted unless it has been determined by the Engineer, or his designated representative, that boring or pushing can not be done.

When a trenched crossing is approved, restoration shall be in accordance with one of the following guidelines:

1. Controlled density backfill, CDF shall be required as a backfill material; or

2. Select backfill, meeting the requirements of the Standard Specifications may be used. Backfill shall be compacted to at least 95 percent density and placed in a maximum of 12-inch lifts, as specified in the Standard Specifications. Written verification of compaction, based upon acceptable testing methods, and placement of the backfill shall be required.

Native material may be used as backfill material when standard acceptable tests show the material meets the requirements for backfill material as specified in the Standard Specifications. The requirements for compaction and placement in item B above also apply when native material is used.

All utilities placed parallel to and within the pavement structure shall be required to rebuild a minimum of half the road, from centerline for utilities in one driving lane, to include grinding and the replacement of a minimum 0.20' of asphalt.

When conditions are warranted, the Engineer may require all or a portion of the trench be backfilled with a combination of select backfill or CDF. Conditions that may warrant a combination use may be, but not limited to, the depth of trench required, the type of material that is being excavated and crossings on arterial and collector roadways.

When conditions are warranted, the Engineer may require financial security for a minimum of 10-years in the form of a bond, irrevocable letter of credit or irrevocable assignment of interest in a bank account for all or a portion of restoration. Conditions that may warrant this may be, but not limited to, the placement of utilities in or near sensitive areas and areas of continuous settlement.

See Chapter 6.00 of the Thurston County Road Standards for complete trench backfill and restoration requirements.

1.12 Record Drawings

The Engineer of Record shall submit one full size and three 11x17 sets of record drawings, bearing the engineer's stamp of record, to Thurston County before receiving Final Approval. An electronic copy of the record drawings shall be submitted concurrently in a media format approved by Thurston County.

2.00 WATER

2.01 Main Line - Water

A. Within the urban growth area (UGA):

i. Water mains shall be sized to provide adequate domestic, plus fire flow at the required residual pressure. Fire flow requirements will be determined by the Building Safety Official/Fire Marshall; however, the quantity of water required will in no case be less than 1,000 GPM at 20 psi residual pressure and 1,500 GPM at 20 psi for multi-family, commercial and industrial areas.

ii. The minimum water main size shall meet minimum fire flow requirements and be equal to or larger than six inches for looped lines and eight inches for dead end lines as long as fire flow requirements can be met.

B. Outside the UGA:

i. Water mains shall be sized to provide adequate domestic flow at the required residual pressure.

ii. The minimum water main size shall meet provide adequate domestic flow requirements and be equal to or larger than six inches for looped lines and eight inches for dead end lines. No dead end mains shall be longer than 1,200 lineal feet.

Larger size mains may be required in specific areas as outlined in the *Grand Mound Water System Plan*. Nothing shall preclude Thurston County from requiring the installation of a larger sized main in areas not addressed in the *Grand Mound Water System Plan* if Thurston County determines a larger size is needed to meet fire protection requirements or for future service. Oversizing agreements may be negotiated with Thurston County.

C. Water mains shall be looped where feasible to ensure improved water quality and provide redundancy. The water main will be designed to meet desired velocities of seven feet per second (fps) during any flow condition to reduce the chance of water hammer.

D. A water quality sampling station may be required at the discretion of Thurston County. (See Standard Detail WA-20)

E. All water mains that may be extended or looped will end with an approved gate valve and blind flange.

F. Pressure of 45 to 60 psi shall be maintained at the main during peak day demands. A pressure of 45 PSI provides adequate pressure at all the fixtures, and pressure above 65 PSE results in excess water usage and is above the target level set in the Thurston

County Water Conservation plan.

G. When pressures reach 80psi or above, during static conditions, a pressure reducing valve is required on the customer's side of the meter.

H. All material for water distribution and transmission shall be new and unblemished. All pipe for water mains shall have flexible gasketed joints and shall comply with one of the following types:

Ductile iron pipe shall conform to AWWA C 151 Class 52 and have a cement mortar lining conforming to AWWA C 104. All pipes shall be joined using non-restrained joints which shall be rubber gasket, Tyton type, or mechanical joint, conforming to AWWA C 111.

PVC Pipe: All PVC pipe shall conform to the latest revision of the following specifications: Four inch through 12 inch pipe shall meet AWWA C900 ASTM 2241 Class 200 standards. Fourteen inch through 20-inch pipe shall meet AWWA C905 Class 235 standards.

I. All fittings for ductile iron pipe or PVC pipe shall be ductile iron compact fittings conforming to AWWA C 153. All shall be cement mortar lined conforming to AWWA C 104. Plain end fittings shall be ductile iron if mechanical joint retainer glands are installed on the plain ends. All fittings shall be connected by flanges or mechanical joints. Where required, Mega-Lug retainer glands will be used.

J. Transition couplings shall be Style 501 Manufactured by Romac Industries, or equal. Flanged coupling adaptors shall be Style 912 Manufactured by Rockwell, or equal.

K. Sleeve couplings shall be ductile iron, mechanical joint type in accordance with AWWA C110, except the minimum sleeve length shall be 6 inches.

L. Joint restraint follower glands installed with mechanical-joint fittings shall be equal to the Mega-Lug Series 1100 Retainer Glands Assembly manufactured by EBAA Iron, Inc., or equal.

M. All pipe and services shall be installed with 12 gauge coated copper toning wire taped to the top of pipe, brought up and tied off at the tope of the valve box. Two (2) feet of slack shall be exposed and tied off at the top of the valve box and meter box. A one pound magnesium anode shall be buried with the force main every 1,000 lineal feet maximum for cathodic protection. Toning wire splices and connections to anodes shall join wires both mechanically and electrically, shall employ epoxy resin or heat shrink tape insulation and shall be encapsulated in splice pots. Toning wire shall be tested prior to acceptance.

N. Detectable marking tape shall be installed over all water lines. The tape shall be placed twelve (12) inches above the top of the pipe and shall extend its entire length. Detectable marking tape shall meet the requirements of Section 9-15.18 of the Standard Specifications.

N. The minimum cover for all water mains from top of pipe to finish grade shall be 42 inches unless otherwise approved. Deviations from water main locations may be allowed by approval of Thurston County where existing utilities will interfere. Shallower or increased depths of burial because of interference will require extraordinary protective measures.

2.02 Connection to Existing Water Main

The developer's engineer shall be responsible for determining the scope of work for connection to existing water mains. See standard Detail WA-02. All cut-ins and all taps to water mains shall be witnessed by a Thurston County inspector.

At any connection to an existing line where a new valve is not anticipated, the existing valve must be pressure tested to County Standards prior to connection. If an existing valve fails to pass the test, the Contractor shall make the necessary provisions to test the new line prior to connection to the existing system or install a new valve and replace the existing valve, at the discretion of Thurston County.

Where connections require "field verification" connection points will be exposed by the Contractor and fittings verified two working days prior to distributing shut down notices. Shut down notices will be distributed by the Contractor.

All material required for the connection will be at the site prior to the shutdown and start of work. Connection to a new section shall only be made after the new section has been tested and disinfected. Connecting pipe will be swabbed with strong chlorine solution such as liquid household bleach with 5 or 6% chlorine before making the connection. After work is started, work will proceed continuously, as rapidly as possible, until necessary connection and restoration of services is accomplished. Care shall be taken throughout construction to avoid contamination of materials.

2.03 Service Interruption

The contractor shall provide Thurston County a minimum of 48 hours notice, or two full working days, whichever is longer, of any planned connection to an existing pipeline. This includes all cut-ins and live taps. Notice is required so any disruptions to existing services can be scheduled. The contractor shall notify customers involved or affected by the water service interruption. The contractor shall make every effort to schedule water main construction with a minimum interruption of water service. All taps shall be made between the hours of 8:00 a.m. and 2:00 p.m. No tap shall be made to an existing main on a Friday without approval by the County.

Water will not be shut off overnight or over weekends or holidays. Water disruptions shall not be longer than four (4) hours, unless contractor provides water to all affected users. In certain situations, Thurston County may dictate scheduling of water main shutdowns so as not to impose unnecessary shutdowns during specific periods to existing customers.

2.04 Hydrants

A. The lead from the service main to the fire hydrant shall be ductile iron cement mortar lined Class 52 no less than six inches in diameter. The gate valve shall be located a minimum of eight (8) feet from the hydrant, unless otherwise approved by Thurston County.

B. Fire Hydrants shall have two (2), 2-1/2 inch NST outlet/port, and one 4-1/2 inch NST threaded outlet/port and equipped with one 5 inch Storz fitting or approved equal pumper outlet/port connection. The hydrant shall be the dry barrel type and shall be of the "safety" or break-away style. The end connections shall be mechanical joint or flanged conforming to AWWA C110, 110a, and C111. See standard detail [WA-03].

C. Hydrants shall be Mueller Centurion or Clow F2500.

D. Hydrants shall be painted with Sun Yellow High Grade Enamel #13312.

E. All hydrants shall be bagged until system is approved.

F. All chains between caps and hydrants shall be cut and removed.

G. Unless otherwise required, following guidelines shall apply for hydrant number and location:

1. At least one hydrant shall be installed at all roadway intersections.
2. Hydrants shall be placed at a maximum interval of one hydrant per 330 lineal feet of watermain in all areas except single-family and duplex residential areas.
3. Hydrant spacing of 600 feet will be required for single-family and duplex residential areas.
4. When any portion of a proposed building is in excess of 150 feet from a water supply on a public street on-site hydrants shall be required.
5. For dead ends mains within the UGA, hydrants shall be placed off dead ends of mains, with a valve, blind flange, and appropriate thrust blocking.

H. Fire hydrants shall be set as shown in standard detail WA-03.

I. For requirements regarding use, size and location of a fire department connection (FDC) and/or post indicator valve contact the Building Official/Fire Marshall. Location of FDC shall be shown on water plans.

J. Where needed, Thurston County or Building Official/Fire Marshall may require hydrants to be protected by two or more posts (bollards), each four inches in diameter by five feet in height made of either reinforced concrete or steel. Adequate clear zone is three foot radius as shown in standard detail [WA-05].

K. Fire hydrants must be installed, tested, and accepted prior to the issuance of a full building permit.

2.05 Valves

All valves and fittings shall be ductile iron with ANSI flanges or mechanical joint ends with restraints. All existing valves shall be operated only by Thurston County employees, or its agents or assignees.

Valves shall be installed in the distribution system at sufficient intervals to facilitate system repair and maintenance, provided:

1. In no case shall there be less than one valve every 1,000 lineal feet;
2. There shall be two valves on each tee;
3. There shall be three valves on each cross.

Specific requirements for number of valves configuration and spacing will be made at the plan review stage by Thurston County.

A. Gate valves shall be used on all lines. The design, materials and workmanship of all gate valves shall conform to AWWA C509-80 latest revision. Gate valves shall be resilient wedge non-rising stem (NRS) with two internal O-ring stem seals and shall open when the stem is rotated counterclockwise. Gate valves shall be Mueller, M & H, American Flow Control Series 500, or as otherwise determined by Thurston County. Valve ends shall be mechanical joint or ANSI flanges. The valves shall be placed at a maximum depth of 42", measured from finished grade.

Extension systems shall be constructed of steel and attached to the valve operating nut with set screws drilled into the nut.

B. Valve Box; all valves shall have a standard water valve box set to grade with a cast iron riser from valve to within four to six inches of valve box top and shall be a Buffalo Style Valve box. The valve box shall be installed such that the lugs line up with the direction of the pipe. Valve box lids will be ductile iron and shall be anti kick-out, and marked "water." A three foot by three foot by four inch concrete pad shall be set around each valve box at finished grade. In areas where valve box falls in road shoulder, the ditch and shoulder shall be graded before placing concrete pad. See standard detail WA-04.

C Valve marker posts shall be four inch by four-inch reinforced concrete or schedule 40 steel posts five feet long stamped with "W" and distance to valve. Post shall be painted with one base coat and two coats white oil base enamel. See standard detail WA-05.

2.06 Casing

Steel casing pipe shall be schedule 20 steel or equal. Pipe spacers shall be Cascade style CC5 with eight-inch runners as available from Cascade Waterworks, or approved equal. Casing pipe and spacer shall be sized for pipe being installed. Install minimum of three spacers per section of pipe. Casing should be sand packed and sealed in accordance with manufacturers' recommendations.

2.07 Air and Vacuum Release

Valve air and vacuum release valves shall be Val-Matic 201-C or as otherwise determined by Thurston County. Galvanized piping shall be Schedule 40. Valve chamber shall be standard precast concrete manhole section with cast iron manhole ring and 2-foot diameter cover, traffic pattern, imprinted with "WATER." See standard Detail WA-06.

The installation shall be set at the high point of the line when required. Where possible, pipes are to be graded to prevent the need for an air release valve. Air release valves may not be required, at the County's discretion.

2.08 Blowoff Assembly

A. Within the UGA, if a fire hydrant is not located at the end of a dead end main, a blowoff assembly shall be required.

B. Outside the UGA boundary, a blowoff assembly shall be required at the end of a dead end main.

C. On water mains which will be extended in the future, the valve which operates the blowoff assembly shall be the same size as the main and provided with a concrete thrust block. The pressure rating for blowoff assemblies shall be 200 psi. Installation shall be as set forth in see standard detail WA-07.

2.09 Backflow Prevention

All water system connections to serve buildings or properties with domestic potable water, fire sprinkler systems, or irrigation systems will comply with the minimum backflow prevention requirements as established by the DOH and Thurston County in its Cross Connection Program. The installation of required backflow devices is necessary to protect the existing water system and users from possible contamination. All backflow prevention assemblies will be of a type and model pre-approved by the DOH or Thurston County (see standard detail WA-08). No cross connections will be created, installed, used, or maintained within the water service area. Approved backflow prevention assemblies will be installed at the expense of the user, either at the service connection or within the premises, as determined by Thurston County Cross Connection Specialist in each of the following circumstances:

A. If the nature and extent of any activity on the premises, or the materials used in connection with any activity on the premises, or materials stored on the premises could contaminate or pollute the potable water supply.

B. On premises having one or more cross connections.

C. Internal cross connections that are not correctable or intricate plumbing arrangements that make it impracticable to ascertain whether or not cross connections exist.

D. A repeated history of cross connections being established or reestablished.

E. Unduly restricted entry so that inspections for cross connections cannot be made with sufficient frequency or with sufficient notice to assure that cross connections do not exist.

F. Materials of a toxic, objectionable, or hazardous nature, either liquids, solids, or gases being used such that if back siphonage should occur, a health hazard could result.

G. Any mobile apparatus that uses water from any water system managed by Thurston County.

H. All uniform plumbing codes (UPC) must be maintained.

I. Assemblies installed at the point of delivery or on the internal plumbing system of any building shall not have galvanized piping attached to the inlet side of the assembly. Rigid piping, such as brass or copper, is allowed on the inlet side.

J. On any premise where installation of an approved backflow prevention device is deemed to be necessary to accomplish the purpose of these regulations in the judgment of the Thurston County certified cross connection specialist.

K. Any use of radiant heat will require the installation of a reduced pressure (RP) backflow assembly at the meter.

L. A reduced pressure (RP) backflow assembly is required at all new commercial buildings and will be required to be installed when a change of use occurs at a commercial building. The RP device shall be installed at the meter. See Standard Detail WA-10.

M. On any premise where an appropriate cross-connection report form has not been filed with the office of the Thurston County Department of Water and Waste Management.

N. On any premise where a bypass arrangement is installed around a backflow assembly, a second backflow assembly of equal protection shall be installed on the bypass piping.

Thurston County will have the authority to perform regular inspections on all backflow assemblies, both inside and outside any building connected to the County's water system and will be provided access to the premises to inspect.

O. The Contractor shall provide Thurston County the certificate for testing of any backflow prevention assembly before releasing the Certificate of Occupancy on any building.

a. A list of state-certified approved testers may be obtained from Thurston County.
b. Backflow Prevention Assembly testers shall hold a current Washington State Department of Health Backflow Assembly Tester Certification.

P. The Fire District #1 will test the fire line and obtain the certificate for underground piping. In any situation, the Fire District #1 will not test the fire line until the main line up to the fire line has been tested and approved.

a. Backflow assemblies for fire protection shall have integrated shutoff valves approved as part of the assembly and shall be separate from any post indicator valve installed on the fire service line.
b. Double-check detector assemblies shall be required on all fire lines. See standard Detail WA-09.

2.10 Service Connection

A. **Connection to New Mains:** All service connections relating to new development will be of the appropriate size as determined by industry standard and approved by the Thurston County and installed by the developer at the time of mainline construction. After the lines have been constructed, tested and approved, the owner may apply for a water meter. The Contractor shall supply and Thurston County will install a Sensus SRII Touch Read style water meter (read in cubic feet) after the application has been made and all applicable fees have been paid. Water meters will be set only after system is inspected and approved. See standard details [WA-12 to WA-16].

B. **Connection to Existing Mains:** When water is desired to a parcel fronting an existing main but not served by an existing setter, an application must be made to Thurston County. Upon approval of the application and payment of all applicable fees, Thurston County will tap the main, and install the service line, the meter, box, and setter.

C. Tapping valves shall be intended for use in tapping applications. Tapping valves shall be resilient seated gate valves with a thrust collar with stainless-steel bearing, vulcanized SBR rubber coating of the wedge (gate), lugs, and stem bore; fully coated inside and outside to AWWA C-550; two o-rings above thrust collar and one o-ring below thrust collar; and cast tongue and groove between gate and valve body. Tapping sleeves shall be stainless steel with a flanged SBR gasket; ¾" NPT stainless steel test plug with standard square head for pressure testing; SBR gaskets for use in water service; stainless steel, type 304, nuts, bolts, and shell; and predrilled stainless steel, type 304 flange.

D. Service lines shall be a minimum of one inch high density polyethylene pipe (HDPE), minimum pressure class 200 psi, grade PE 3408. Glued joints will not be accepted. Service lines will be installed a minimum of 45 degrees off the main. Pipe joints shall be made with mechanical couplers, pack joint type in accordance with manufacturer's recommendations.

E. Detectable marking tape shall be installed over all water lines. The tape shall be placed twelve (12) inches above the top of the pipe and shall extend its entire length. Detectable marking tape shall meet the requirements of Section 9-15.18 of the Standard Specifications.

F. Twelve (12) gauge copper toning wire shall be wrapped around the pipe on all service lines. Service saddle shall be all bronze with stainless steel straps. PVC service saddles may be required at the discretion of Thurston County or his/her designee. All clamps shall have rubber gasket and iron pipe threaded outlets.

G. Corporation stop shall be all bronze and shall be Ford type F1101 or approved equal with iron pipe threads conforming to AWWA C 800. Stainless steel inserts shall be used with pack joints and polyethylene pipe.

H. Customer shut off valve shall be provided and shall be PVC ball valves with PVC valve boxes on all 3/4" and 1" water service lines. The ball valves shall be PVC construction rated at 200 psi with non-rising stems and polypropylene handwheel as manufactured by Spears Manufacturing Company or equal. The work shall include providing PVC/PE adaptors. The PVC valve box shall be 6-inch (minimum) PVC pipe with glued cap.

I. Gate valves 3" and smaller shall be supported on a 4"x8"x16" precast block with no anchor strap required.

J. Master meters will not be allowed for service to more than one building. An approved backflow prevention system must be installed in conjunction with any master meter. Deviations from this may be granted by Thurston County.

K. Meter boxes shall be Carson BCF and BC Series rectangular meter boxes. Meter boxes shall be pre-drilled to accommodate the Sensus touch-read pad supplied by the contractor.

2.11 Irrigation

All irrigation systems shall be installed with an approved backflow prevention assembly approved by AWWA and the Department of Health, as discussed in Section 2.09. Backflow Prevention.

Irrigation sprinklers shall be situated so as to not wet any public street or sidewalk.
All meters will be Sensus SRII Touch Read style water meter (in cubic feet). Meters must be totally field programmable including meter number. Meter boxes shall be pre-drilled to accommodate the Sensus touch-read pad supplied by the contractor.

2.12 Thrust Blocking and Joint Restraints

Location of thrust blocking shall be shown on plans. Thrust block concrete shall be Class B poured against undisturbed earth. A plastic barrier shall be placed between all thrust blocks and fittings. The County may require the use of Mega-Lug restrainers in lieu of concrete thrust blocking.

A. Thrust Blocking: Blocking shall be formed and poured only against the fitting and shall not cover or extend over the joint. The location of all thrust blocking shall be shown on the plans. The addition of restrained joint fittings may not eliminate the need for thrust blocking.

B. Joint Restraints: If undisturbed soil will not provide adequate support for the thrust blocking or if installation of thrust blocking is impractical in the opinion of Thurston County, the Contractor shall provide joint restraints either side of a fitting for the number of pipe lengths specified by the Engineer and as required by DIPRA. Where thrust blocking is not installed, all fittings shall be installed with joint restraints (tie rods, joint harnesses, joint restraint follower glands, lock-type joint systems, or other joint restraints). All joint restraints shall be designed for a maximum pressure of 200 psi. A combination of thrust block and joint restraints may be used as directed by the Engineer.

The Contractor shall furnish and install all fittings of the configuration required by actual field conditions and by the Engineer at the time of construction, whether or not such fittings are specifically indicated on the plans. The Contractor's joint restraint system shall be submitted to the Engineer for approval.

See standard detail WA-17 to WA-19 for thrust block locations and calculations.

2.13 Hydrostatic Tests

Prior to the acceptance of the work, the installation shall be subjected to a hydrostatic pressure test of 225 psi for 15 minutes, and any leaks or imperfections developing under said pressure shall be remedied by the contractor. No main shall be hydrostatically tested until the lines are flushed of chlorine. The main shall be tested between valves. Insofar as possible no hydrostatic pressure shall be placed against the opposite side of the valve being tested. Test pressure shall be maintained while the entire installation is inspected.

The contractor shall provide all necessary equipment and shall perform all work connected with the tests. The contractor will be responsible for tracking and purchasing the water used for the test. Backflow assembly is required when filling the new main. Tests shall be made after all connections have been made. This is to include any and all connections as shown on the plan. The contractor shall perform the test to assure that the equipment to be used for the test is adequate and in good operating condition and the air in the line has been released before requesting Thurston County to witness the test.

The test shall be accomplished by pumping the main up to the required pressure, stopping the pump for 15 minutes, and then pumping the main up to the test pressure again. During the test, the section being tested shall be observed to detect any visible leakage.

A clean container shall be used for holding water for pumping up the pressure on the main being tested. This makeup water shall be sterilized by the addition of chlorine to a concentration of 50mg/l, unless otherwise directed by Thurston County.

The quantity of water required to restore the pressure shall be accurately determined by pumping through a positive displacement water meter. The meter shall be approved by the Engineer. Acceptability of the test will be determined as follows:

$$L = \frac{SD\sqrt{P}}{266{,}400}$$

The quantity of water lost from the main shall not exceed the number of gallons per hour as determined by the formula:

in which

L	=	allowable leakage, gallons/hour
D	=	nominal diameter of the pipe in inches
P	=	test pressure during the leakage test (psi)
S	=	gross length of pipe tested, feet

There shall not be an appreciable or abrupt loss in pressure during the 15 minute test period.

Any visible leakage detected shall be corrected by the Contractor regardless of the allowable leakage specified above. Should the tested section fail to meet the pressure test successfully as specified, the Contractor shall, at no additional expense to Thurston County, locate and repair the defects and then retest the pipeline.

Alternate test methods may be allowed at the sole discretion of Thurston County.

See Section 2.09 for testing responsibilities for backflow prevention devices.

2.14 Sterilization and Flushing

Sterilization of water mains shall be accomplished by the contractor in accordance with the requirements of the Washington State Department of Health and in a manner satisfactory to Thurston County. When discharging chlorinated water during flushing, the water must be de-chlorinated. At no time shall chlorinated water from a new main be flushed into a body of fresh water. This is to include lakes, rivers, streams, drainage ways, and any and all other waters where fish or other natural water life can be expected. Any discharge of highly chlorinated water to the sewer collection system is not allowed unless the utility operations manager approves it.

When a chlorine concentration has been established throughout the line, the valves shall be closed and the line left undisturbed for a minimum 24 hours. The line shall then be thoroughly flushed and water samples taken by Thurston County at least 24 hours after flushing and disinfecting for approval by the Thurston County Health Department. Should the initial treatment result in unsatisfactory bacteriological test, the original chlorination procedure shall be repeated by the contractor until satisfactory results are obtained. The sample can only be taken on Mondays, Tuesdays, or before 12:00 p.m. (noon) on Wednesdays. Testing and sampling shall take place after all underground utilities are installed and compaction of the roadway section is complete. The Contractor shall provide Thurston County a minimum of two days notice before sampling. Refer to Detail WA-21.

2.15 Construction Completion Report Form

A "Construction Completion Report For Distribution Main Projects" [form number DOH 331-147 (3/00)] shall be completed for each project as required per Washington State Department of Health, Drinking Water Program (DOH) and referred to in WAC 246-290-125(2). The applicable sections of this form shall be completed by the Engineer of Record and submitted with the record drawings. The completed form may be maintained on file at Thurston County and be made available to DOH. Thurston County, at its discretion, may forward a copy of completed forms to DOH. An example of this form can be found in Appendix E.

2.16 Termination of Services

If, in the opinion of Thurston County, failure on the part of any customer to discontinue the use of all cross connections, except in accordance with the Standard, is sufficient cause for the immediate discontinuance of public water service to the premises (*Washington Administrative Code 246-290-490*). Thurston County may install the appropriate backflow prevention device at the owner's expense.

3.00 GRAVITY SEWER

3.01 Marking Side Sewers

The location of side sewers at the property line shall be marked by the Contractor with a steel fence post; 4 feet long buried in the ground a depth of 3 feet. The fence post shall be a minimum of four feet long and be made of 14 gauge steel with u-channel construction with a riveted anchor spade. At least one foot must remain above the finished grade. A one foot long piece of dimensional lumber (2 by 4) shall be securely affixed to the exposed stake and shall be painted traffic white. The depth to the side sewer or tee shall be indicated in black paint on the 2 by 4. In addition a length of 12 gauge galvanized wire shall be provided to extend from the plugged end of the side sewer or tee. The upper end shall emerge at the 4 foot stake, but shall not be fastened to it. Alternate material may be used at the discretion of Thurston County.

The location of all side sewers shall be marked on the face or top of the concrete curb with an "S" embossed ¼ inch into the concrete, where appropriate.

3.02 Design Standards

The design of any sewer extension/connection shall conform to Thurston County Standards, DOE Standards, and any applicable standards as set forth herein. The most stringent standard shall apply, at the discretion of Thurston County.

The layout of extensions shall provide for the future continuation of the existing system as determined by the County. New gravity sewer systems shall be designed on the basis of an average daily per capita flow of sewage of not less than 100 gallons per day in conjunction with a peaking factor, or approved alternative methods. (Refer to Table G2-1, Criteria for Sewage Works Design). This figure is assumed to cover normal infiltration, but an additional allowance shall be made where conditions are unfavorable. Generally, laterals and sub-main sewers should be designed to carry, when running full, not less than 400 gallons daily per capita contributions of sewage. When deviations from the foregoing per capita rates are used, a description of the procedure used for sewer design shall be submitted to Thurston County Development Services for review and approval.

3.03 Mainline-Gravity

A. Size: Sewer mains shall be sized for the ultimate development of the tributary area. Nothing shall preclude the County from requiring the installation of a larger sized main if the County determines a larger size is needed to meet the requirements for future service.

The minimum size for submains and mains shall be eight inch inside diameter. The minimum size for a lateral shall be six inches.

The design is subject to all other design requirements as noted in this Chapter.

B. Material. Sewer main shall be HDPE pipe conforming to ASTM F714, with heat-fused joints, or PVC, ASTM D 3034, SDR 35 or ASTM F 679 with joints and rubber gaskets conforming to ASTM D 3212 and ASTM F 477.

C. Depth. Gravity sewer will typically have a minimum depth of five (5) feet with minimum slope dependent upon the line size, adequate head room within manholes for maintenance personnel and vertical clearance between water and sewer lines. Actual depth will be determined by slope flow, velocity and elevation of existing system.

D. All building sewer connections to the main shall be made with a tee or a wye connection. All new mains connecting to existing mains shall require the installation of a new manhole if not made at an existing manhole.

3.04 Connection to Existing System

A. Connection of new pipe lines to existing manholes shall be accomplished by using provided knock-outs. Where knock-outs are not available, the manhole shall be core drilled for connection. The transition of connecting channels shall be constructed so as not to interrupt existing flow patterns.

B. Connection of a pipe line to a system where a manhole is not available shall be accomplished by pouring concrete base and setting manhole sections. The existing pipe shall not be cut into until approval is received from the County.

C. Connections to manholes requiring a drop shall follow the criteria as outlined in the "Drops" section later in this chapter.

D. Connections where an existing stub out is not available or where a new building sewer is the same size as the existing main shall be accomplished by the installation of a new manhole. Deviations to this may be approved by Thurston County.

E. Taps shall not protrude into the exiting main. A County inspector shall be notified 48 hours prior to any tap of a sewer. All connections to the main sewer line shall follow criteria outlined elsewhere in these standards.

3.05 Manholes

Precast manholes shall meet the requirements of ASTM C 478 with either a precast base or a cast-in-place base made from 3000 psi structural concrete. Manholes shall be Type 1, 48 inch diameter minimum. The minimum clear opening in the manhole frame shall be 24 inches. Joints shall be rubber gasketed conforming to ASTM C 443 and shall be grouted from the inside. Lift holes shall be grouted from the outside and inside of the manhole. Manholes constructed of other materials may be approved by the Director of Water and Waste Management. Material specifications need to be submitted for review before an alternate material will be considered. See Figures SS-01 through SS-03 for details.

Eccentric manhole cone shall be offset so as not to be located in the tire track of a traveled lane.

Manhole frames and covers shall be cast iron casting marked "Sewer" conforming to the requirements of ASTM A-30, Class 25, and shall be free of porosity, shrink cavities, cold shuts or cracks, or any surface defects which would impair serviceability. Repairs of defects by welding or by the use of smooth-on or similar material will not be permitted. Manhole rings and covers shall be machine-finished or ground-on seating surfaces so as to assure non-rocking fit in any position and interchangeability.

Where lock-type castings are required by Thurston County, the casting device shall be such that the cover may be readily released from the ring and all movable parts shall be made of non-corrosive materials and otherwise arranged to avoid possible binding.

All casting shall be coated with a bituminous coating prior to delivery to the job site.

Safety steps shall be fabricated of polypropylene conforming to an ASTM D-4101 specification, injection molded around a 1/2 inch ASTM A-615 grade 60 steel reinforcing bar with anti-slip tread. Steps shall project uniformly from the inside wall of the manhole. Steps shall be installed to form a continuous vertical ladder with rungs equally spaced on 12 inch centers.

Gravity sewers shall be designed with straight alignment between manholes.

Manholes shall be provided at a maximum of 400 foot intervals, at intersections and at changes in direction, grade or pipe size.

Minimum slope through the manhole shall be 0.10 feet from invert in to invert out. The inlet and the outlet shall have at least 90 degrees deflection, unless otherwise approved by the County.

Manhole Sizing shall be determined by the following criteria:

A. 48" Manhole
   1. Two connecting pipes, 8 inch to 12 inch diameter
   2. Three connecting pipes, 8 inch to 10 inch diameter, perpendicular
   3. Four connecting pipes, 8 inch diameter, perpendicular

B. 54" Manhole
   1. Two connecting pipes, 8 inch to 12 inch with more than 45 degree deflection
   2. Three connecting pipes 10 inch 12 inch diameter perpendicular
   3. Four connecting pipes, 10 inch to 12 inch diameter, perpendicular

C. 72" Manhole

1. Two connecting pipes, 15 inch to 18 inch diameter with less than 45 degree deflection
2. Three connecting pipes, 15 inch diameter, perpendicular
3. Four connecting pipes, 15 inch diameter, perpendicular

In the above criteria "deflection" refers to the angle between any two pipe channels in the manhole.

The above configurations will provide adequate shelves and room for maintenance. For other pipe configurations, the size of the manhole shall be approved by the County.

3.06 Slope

All sewers shall be designed and constructed to give mean velocities, when flowing full, of not less than 2.0 feet per second based on Mannings formula using an "n" value of 0.013. Use of other practical "n" values may be permitted by the County if deemed justifiable on the basis of research or field data submitted. The following minimum slopes should be provided, however, slopes greater than these are desirable.

Sewer Size (Inches)	Minimum % Slope % (Feet per 100')
6	1.00 (0.0100 Ft/Ft)
8	0.40 (0.0040 Ft/Ft)
10	0.28 (0.0028 Ft/Ft)
12	0.22 (0.0022 Ft/Ft)
14	0.17 (0.0017 Ft/Ft)
15	0.15 (0.0015 Ft/Ft)
16	0.14 (0.0014 Ft/Ft)
18	0.12 (0.0012 Ft/Ft)
21	0.10 (0.0010 Ft/Ft)
24	0.08 (0.0008 Ft/Ft)
27	0.07 (0.0007 Ft/Ft)
30	0.06 (0.0006 Ft/Ft)
36	0.05 (0.0005 Ft/Ft)

Sewers shall be laid with uniform slope between manholes.

3.07 Increasing Size

Manholes shall be provided where pipe size changes occur.

Where a smaller sewer joins a larger one, the invert of the larger sewer should be lowered sufficiently to maintain the same energy gradient.

3.08 High Velocity Protection

Where velocities greater than 15 feet per second are expected, special provisions such as thrust blocking and restrained piping materials-shall be installed to protect against displacement by erosion and shock.

3.09 Drops

Straight grades between invert out of last manhole and connection to existing are preferred over drop connections whenever possible. Care must be taken when designing steep grades or sweeps so as not to create a situation of excessive velocity or excavation. Grade changes associated with "sweeps" shall not be allowed unless otherwise approved by Thurston County.

An outside drop connection shall be provided for a sewer entering a manhole at an elevation of 24 inches or more above the manhole invert. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24 inches, the invert shall be filleted to prevent solids deposition.

An inside drop connection will not be allowed by the Thurston County unless otherwise approved by Thurston County.

Outside drop structures shall be constructed with ASTM D-3034, SDR35 PVC or epoxy lined ductile iron pipe Class 52 and epoxy lined cast iron fillings. The entire drop connection shall be encased in concrete. Outside drop structures shall be constructed per Figure SS-04.

3.10 Cleanouts

Cleanouts are not an acceptable substitute for manholes; however, they may be used in lieu of manholes at the end of 6 or 8 inch diameter lines of not more than 150 feet in length at the discretion of Thurston County. This does not include a 6 inch building sewer to serve one or two single family dwellings. Location of cleanout for building sewer is governed by the Uniform Plumbing Code as adopted. There will be a cleanout at the property line for all side sewer laterals, with similar diameter to the size of the lateral in the right-of-way. Cleanouts at the property line shall have locking frame and cover, Olympic Foundry No. 1025-16 and 1025-18 or similar. The unit will be at the finish ground grade but no higher than 12 inches above ground. (see Figure SS-05).

3.11 Building/Side Sewer

A building or side sewer refers to the extension from a building sewer beginning two feet outside the outer foundation wall at the structure to the sanitary sewer main or to a cleanout located at the right-of-way or easement line. A building or side sewer shall conform to the following standards, unless otherwise approved by the County.

1. Material: PVC, ASTM D 3034, SDR 35 with joints and rubber gaskets conforming to ASTM D 3212 and ASTM F 477

2. Minimum Diameter – Four (4) inch diameter

3. Minimum Slope – 2%

4. Maximum Angle- 45 degrees

5. Depth
   a. Minimum – Five (5) feet
   b. Maximum – Ten (10) feet

Building sewers from the main to the right-of-way line shall be minimum 4 inch diameter. Side sewers shall rise at a maximum angle of 45 degrees and a minimum slope of 2% to a minimum depth of 5 feet below the finished ground surface at the property line, except where the property owner requires additional depth (see Figure SS-06).

Maintenance of the building sewer is the responsibility of the property owner. A building permit must be obtained from the County before connection of a building sewer to the public sewer. Materials and design criteria for a building sewer are covered by the Uniform Plumbing Code (UPC) as adopted. Inspection of the building sewer is the responsibility of the Thurston County

Cleanouts shall be installed at all horizontal and vertical directional changes.

3.12 Testing Gravity Sewers

Prior to acceptance and approval of construction, the following tests will apply to each type of construction:

A. Gravity Sewer
   1. After the pipes have been cleaned, the gravity sewer pipe will be subject to a low-pressure air test pursuant to the current WSDOT/APWA specifications. The contractor will furnish all equipment and personnel for conducting the test under the observation of the County inspector. The testing equipment will be subject to the approval of the County.

      The contractor will make an air test for his own purposes prior to notifying the County to witness the test. The air test for acceptance will be made after the trench is backfilled and compacted and the roadway section is completed to subgrade.

All wyes, tees, and end-of-side sewer stubs will be plugged with flexible joint caps, or acceptable alternates, securely fastened to withstand the internal test pressures. Such plugs or caps will be readily removable and their removal will provide a socket suitable for making a flexible, jointed lateral connection or extension.

2. A mandrel test in accordance with Section 7-17.3(4)H of the Standard Specifications may be required for all new gravity sewer mains at the discretion of Thurston County.

3 The television inspection will be conducted at the applicant's expense. The inspection shall be performed under direct supervision of County personnel. Television inspections performed without County personnel present will be deemed invalid and will be repeated at the contractor's expense. Television inspection will be done after the air test has passed; the manhole has been channeled, and before the roadway is paved. Immediately prior to a television inspection, enough water will be run down the line so it comes out the lower manhole and the line is flushed clean and all debris is removed. Portions of the work may be performed incrementally upon approval of Thurston County.

   Acceptance of the line will be made after the television inspection tape has been reviewed and approved by the inspector. Any tap to an existing system needs to be televised as well.

   The County may require the Contractor to televise the new line during periods of high groundwater within the first year after construction and acceptance of the line. Any conditions resulting in inflow and infiltration (I & I) will be considered a system failure. Any failures shall be repaired by and at the expense of the contractor.

B. Manholes

A vacuum test of all manholes is required prior to acceptance. The structure will be tested in accordance with ASTM-C 1244-93. This test method covers procedures for testing cast in place or precast concrete manhole sections using the vacuum test method to demonstrate the integrity of the installed materials and the construction procedures. Testing will be done in the following manner:

1. All lift holes and pipes entering into the manhole will be plugged, taking care to securely brace each plug from being drawn into the structure.

2. The test head will be placed at the top portion of the structure in accordance with the manufacturers' recommendations.

3. A vacuum of 10 inches of mercury will be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. With the valves closed, the time will be measured for the vacuum to drop by 1 inch to 9 inches. The manhole will pass the vacuum test if the time is greater than the time shown in Table 1.

4. If the manhole fails the initial test, necessary repairs will be made by an approved method. The structure will then be retested until a satisfactory test is obtained.

5. If the manhole joint is displaced during the vacuum test, the manhole will be disassembled, the seal replaced, the structure reassembled, and retested until compliance is obtained.

6. Testing can be done either before or after backfill operations around the structure; however, if during backfill operations it is found that the structure has been disturbed and it is suspected that the integrity of the joint has been compromised, retesting will be required.

7. All other requirements stipulated in Section 7-05 of the latest edition of the Washington State Department of Transportation's *Standard Specifications for Road, Bridge and Municipal Construction* that has been adopted by the County will also be adhered to for final acceptance of the manhole structure.

Table 1 below gives allowable time loss in seconds; i.e., test section is acceptable if vacuum does not drop below 9 inches until after the times shown below have expired.

TABLE 1
Minimum Test Times for Various Manhole Diameters

Depth (ft)	Diameter in Inches Depth								
	30	**33**	**38**	**42**	**48**	**54**	**60**	**66**	72
	Time in Seconds								
8	11	12	14	17	20	23	26	29	33
10	14	15	18	21	25	29	33	36	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	48	51	57
16	22	24	29	34	40	46	52	58	67
18	25	27	32	38	45	52	59	65	73
20	28	30	35	42	50	53	65	72	81
22	31	33	39	46	55	64	72	79	89
24	33	36	42	51	59	64	78	87	97
26	36	39	46	55	64	75	85	94	105
28	39	42	49	59	89	81	91	101	113
30	42	45	53	63	74	87	98	108	

4. A mandrel test in accordance with Section 7-17.3(2)G of the WSDOT/APWA Standard Specifications will be performed by and at the expense of the contractor on all sewers except laterals when televising reveals a possible defect or belly in the pipe.

5. Any time that testing reveals problems that lead to repairs by the contractor, the County may require complete retesting of the entire system that was repaired. This work will be required to ensure that the integrity of the system was not compromised during the repair work.

4.00 LIFT STATIONS

4.01 Design Standards

The design of any lift station shall conform to County standards and the Department of Ecology's "Criteria of Sewage Works Design" and the "Ten State Standards". The most stringent shall apply, at the discretion of the County. In addition, the plans shall include the following:

1. An overall site drawing of the lift station showing the location of all components including elevations;
2. Service size, voltage and enclosure type and location in relation to the pump station;
3. A list of specific materials used including quantity description and manufacturer name;
4. A schematic and line diagram of the service and motor control center and lift stations; The electrical shall be designed to meet state and local electrical code requirements;
5. The plans shall show all applicable telemetry installation with schematics; and
6. An operation and maintenance manual from the lift station manufacturer shall be supplied.
7. A lift station emergency by-pass connection shall be installed.
8. Confined spaces shall be eliminated when possible. When unavoidable, the design and construction of sewage facilities must implement alternative means or implement equipment and procedures to perform operation and maintenance of newly constructed confined spaces.

A design report shall be submitted with each lift station demonstration its conformance with the standards as outlined above and shall address the following items:

Pump Data	- Size and type - Horsepower - Pump curves - Head capacity - Velocity
Motor	- Size and type - Cycle length - Type of mount Controls - Type
Telemetry	- Alarm system (must be compatible with County system) Housing - Size and type - Ventilation - Humidity control - Interior lighting - Access

Auxiliary Power	- Provision for connection required of all lift stations and may be required to furnish auxiliary generator at the direction of the County
Well Sizing	- Type - Storage capacity
Maintenance	- Warranty -tools and equipment required
Electrical Service	- Size and type - Source
Corrosion Protection	- Type of materials - Coatings - Linings - Maintenance
Site Layout	- Location of lift station on property
Testing	- Operational - pressure
Piping and Valves	- Size and type - Bypass

5.00 PRESSURE SEWER (FORCE MAIN)

5.01 General

Low pressure systems, i.e., force mains may be considered for situations where high ground water table or topography make gravity sewer impractical. STEP systems are addressed separately later in these standards.

5.02 Design Standards

The design of any sewer extension/ connection shall conform to Thurston County standards, Department of Ecology's "Criteria of Sewage Works Design, and any applicable standards as set forth herein.

The layout of extensions shall provide for the future continuation of the existing system as determined by Thurston County. In addition, main extensions shall be extended to and through the site of the affected property fronting the main.

The system shall be designed at full depth of flow on the basis of an average daily per capita flow as shown on Table G2-1, DOE Criteria for Sewage Works Design. A friction factor of 0.013 shall be used for Mannings "n" value.

New sewer systems shall be designed by methods in conjunction with the basis of per capita flow rates. Methods shall include the use of peaking factors for the contributing area, allowances for future commercial and industrial areas, and modification of per capita flow rates based on specific data. Documentation of the alternative method used shall be provided along with plans.

The applicable Thurston County General Notes shall be included on any plans dealing with pressure sanitary sewer design.

5.03 Force Main

A. Material. Force mains for sizes up to 12 inches shall be ductile iron AWWA C151 Class 50 or PVC C900 with ductile iron fittings and gasketed joints. For 14 to 24 inch mains, pipe shall be ductile iron AWWA C151 Class 50 or PVC C905 with ductile iron fittings and gasketed joints. A more rigid pipe may be required where unlimited trench widths occur. All ductile iron pipe and fittings shall be epoxy coated or PE lined and designed for use with corrosive materials.

B. Depth. Force mains shall have a minimum 36 inches of cover to top of pipe. See Chapter 5 for sanitary sewer/water main crossing requirements.

C. Velocity. The minimum velocity allowed is 2 feet per second (fps) at average Dry Weather Flow. 2 fps is required to maintain solids in suspension although 3 fps is desired to scour settled solids. Maximum velocity allowed shall be 8 fps.

5.04 Surge Protection

PVC is subject to fatigue failure due to cyclic surge pressures. The pressure sewer shall be constructed to minimize rapid changes in velocities and include a properly sized surge tank.

5.05 Air/Vacuum Valves

Air release valves and air/vacuum valves shall be located at the high points of the line within a standard 48 inch manhole or a comparable sized, approved vault that provides 18" of clearance on all sides between assembly and walls. Air release valves shall be fitted with an activated carbon canister to absorb compounds with disagreeable odors prior to releasing the air to the surrounding area. Grades shall be designed to minimize the need for air/vacuum valves when practical. Vehicular access to valve is required for maintenance (see Figure SS-07).

5.06 Force Main Drain

Provisions to drain a force main to facilitate repairs or to temporarily remove a force main from service shall be provided. This may be accomplished through the use of a valved tee connected to a drain line at the low point of the line, with isolation valves both sides of the tee along the main line or at the direction of the Director of Water and Waste Management. A manhole shall be set over the force main at the valved tee.

5.07 Thrust Blocking

Location of thrust blocking shall be shown on plans. Thrust block concrete shall be Class B poured against undisturbed earth. A plastic barrier shall be placed between all thrust blocks and fittings.

Designed and approved restraining joint systems may be allowed in lieu of thrust blocking. Restraining joint brand, type, and size shall be specified on the plans (see Figures SS-08 and SS-09).

5.08 Force Main Termination

Hydrogen sulfide odors (H_2S) and the buildup of sulfuric acid (H_2SO_4) occur in the operation of a force main. To mitigate these conditions, some type of control method(s) shall be used. This may include chemical addition at the pump station and/or the re-aeration of the waste water at or near the terminus. Re-aeration may include the following:

1. Construction of a vault housing an aspiration assembly.
2. The use of hydraulic fall (vertical siphon) within the terminal manhole.
3. High velocity discharge with smooth transition so as not to cause splashing of force main into the down stream gravity sewer.

These methods would all require an adequate source of fresh air at the vault or manhole. At a minimum, the manhole at the terminus and the first manhole downstream of the terminus shall be coated with Tnemic 120 vinyl ester quantum polymorphic resin or approved equal which is resistant to sulfuric acid and hydrogen sulfide.

5.09 Manhole/Vault Access

All manholes and vaults are required to have a paved access a minimum width of 12 feet.

5.10 Testing

Force Main

1. Prior to roadway paving and final acceptance of the project, the pressure and service lines will be subjected to a hydrostatic pressure test. Tests shall be performed at a minimum pressure of at least 50% above the design working pressure. The method of testing shall be in accordance with Section 7-11.3(11) of the WSDOT Standard Specifications for Road, Bridge, and Municipal Construction, "Pipe Installation for Water Mains-Hydrostatic Pressure Test" or AWWA 906 test pressures. Leakage shall not exceed the amount given in the following formula:

   $$L = \frac{ND\sqrt{P}}{7{,}400}$$

   L = allowable leakage, gallons per hour
   N = number of joints in length of pipeline tested
   D = nominal diameter of the pipe in inches
   P = average test pressure during the leakage test (psi)

   No air will be allowed in the line. The main will be tested between valves. Insofar as possible, no hydrostatic pressure will be placed against the opposite side of the valve being tested. The pressure test will be maintained while the entire installation is inspected.

   The contractor will provide all necessary equipment and will perform all work connected with the tests. Tests will be made after all connections have been made. This is to include any and all connections as shown on the plan. The contractor will perform all tests to assure that the equipment to be used for the test is adequate and in good operating condition and the air in the line has been released before requesting a Thurston County representative to witness the test.

Wet Wells

2. A water test for all wet wells in accordance with the manhole water test for "Gravity Sewers" will be required.

Mandrel Test

3. A mandrel test in accordance with Section 7-17.3(4)H of the Standard Specifications may be required, at the discretion of the Thurston County.

Lift Station

4. The contractor must provide verification of operating parameters such as pump operation, alarms, and electrical inspection. Inspections are to be conducted in the presence of a Thurston County representative. The final verification will be documented in a written report that will be submitted to Thurston County for review and approval prior to acceptance of all lift stations.

6.00 SANITARY TREATMENT EFFLUENT PUMP (STEP) STANDARDS

Only in areas where specifically identified and approved by Thurston County through the Thurston County Comprehensive Sanitary Sewer Plan, and/or the Thurston County General Sewage Plan as appropriate, pressure sewer systems may be permanently installed to serve residential and light commercial locations where conventional gravity sewers are impractical, or for reasons of topography are not feasible or would be difficult to maintain because of limited accessibility. Extension of gravity sewer lines may be required if areas upstream of project have been designated for gravity sewer service.

6.01 Description and Scope

A pressure sewer system is a permanent facility consisting of a tank or tanks for settling and digesting wastewater solids, and a pressure piping system for conveying the supernatant liquid into the gravity sewer system. The pressure piping system may be "gravity" where topography allows, but normally will be pumped.

Where pumped, the system shall include a pump and pump control panel. The control panel is to be mounted within view of the tank, preferably on the building wall. House plumbing shall discharge sanitary wastewater only into the minimum 1000-gallon concrete single compartment septic tank containing the pump. Roof drains and other stormwater sources shall be strictly excluded.

House plumbing shall be designed and installed according to current Thurston County codes. The tank, one-inch service connection and related components shall be per these technical specifications and shall be warranted by manufacturer and contractor for a minimum of 12 months (24 months minimum for tank) after acceptance of installation by Thurston County.

6.02 Testing

1. Prior to final acceptance of the project the pressure mainline and service lines will be subject to a hydrostatic pressure test of 200 lbs for 15 minutes and all leaks or imperfections that develop, will be remedied by the contractor. No air will be allowed in the line. The main will be tested between valves. Insofar as possible, no hydrostatic pressure will be placed against the opposite side of the valve being tested. The pressure test will be maintained while the entire installation is inspected.

   The contractor will provide all necessary equipment and will perform all work connected with the tests. Tests will be made after all connections have been made. The contractor will perform all tests to assure that the equipment to be used for the test is adequate and in good operating condition and the air in the line has been released prior to requesting a Thurston County representative to witness the test.

2. A water test of the STEP tank at the factory and on-site after installation, is required in accordance with the criteria outlined in Section 6.15 and 6.16 of these standards. The contractor will perform the test and supply all necessary equipment and materials. The testing will be conducted in the presence of a Thurston County representative. Tests will commence by 3:00 p.m. to ensure adequate time for testing to be conducted during the standard workday.

3. The contractor must provide verification of operating parameters such as pump operation, alarms, and electrical inspection. Inspections are to be conducted in the presence of a Thurston County representative. The final verification will be documented in a written report that will be submitted to Thurston County for review and approval prior to acceptance of all STEP systems.

6.03 Ownership and Operation

Operation and maintenance of the service lateral, tank, pump, and pump controls shall be the responsibility of Thurston County and will be owned by Thurston County. Power shall be provided by the customer. The customer shall be responsible for notifying Thurston County when the control panel alarm buzzer is activated. All drains and plumbing between the tank and the building shall be the private responsibility of the customer. Each settling tank shall contain a minimum freeboard reserve of 200 gallons, allowing Thurston County forces to respond to alarms during regular working hours. The customer shall be responsible for curtailing water usage until Thurston County forces respond to the customers' call and service the tank or equipment on the next normal working day. Thurston County will accept no responsibility for damages or pay any claims resulting from a plumbing backup, such as may occur if water usage is not curtailed during an alarm condition. Normal water use may be safely resumed only after the red alarm light on the control panel is off.

Tanks should be pumped out as required. Pumping and disposal of the pumped material shall be in accordance with Thurston County Health Department rules. Solids pump-out and disposal shall be the responsibility of Thurston County.

Owners are responsible to keep a twelve (12) inch buffer around tank lids. Lids must be free of debris, grass, landscaping material (rock, wood chips, etc.), and must be accessible and exposed to Thurston County inspectors and maintenance personnel. Lids are not to be covered or have objects resting on or over them.

6.04 Safety

The control panel will be sealed by Thurston County to prevent exposure to electrical hazard. The riser lid shall not be covered.

The customer shall be cautioned that the tank is not designed to be driven over and might collapse under the weight of a vehicle. Where final grading, landscaping, or other work could subject the tank top to excessive loading, the engineer shall be responsible for specifying safe tank top strength. If a traffic bearing tank is required, it shall be the responsibility of the customer to submit a satisfactory design by a Registered Professional Engineer qualified in Structural Design for Thurston County review and approval.

Thurston County will perform any tapping required of existing sewers for service connections. The customer should schedule for the tap when permit application is made.

6.05 Required Dedications

Easements shall be required for all publicly owned components on private property. Design Plumbing between building and tank shall be designed in accordance with the Uniform Plumbing Code, and approved by Thurston County.

6.06 Construction Checklist

The Construction Checklist for Pressure Sewer Systems shall be initialed by the appropriate inspector, and submitted with the record drawing required for final approval and acceptance by the Thurston County.

6.07 STEP Standards – Mechanical and Electrical Specifications

The following specifications describe the type and standard of quality acceptable and approved for pressure sewer on-site installation and components. Where the name of a specific manufacturer or model is listed, the intention is to indicate the minimum acceptable quality, and not to exclude other products which equal or surpass the reference item, provided that alternate parts are interchangeable with those specified. See Figures SS-13 through SS-16 and Figures SS-18 through SS-20 for standard details of STEP systems.

It is necessary to obtain prior written approval for installation of alternate components prior to ordering materials. Alternate components installed without specific approval will be rejected. All judgments regarding the interchangeability and acceptability to the Thurston County of alternate materials and components shall be made solely on the authority of Thurston County.

6.08 Pipe

All service connection pipes shall be one inch, minimum Schedule 40 PVC solvent weld joint. Larger pipe shall be two inches, minimum PVC complying with S\ASTM D 1784 (PVC Resin Compound), ASTM 2241, SDR 21, 200 psi working pressure rated. All services shall be installed with solid No. 12 AWG insulated copper toning wire, on top of pipe, continuous. Marking tape shall be placed approximately nine inches above the pipe when the trench is backfilled.

Pipe shall be installed per Thurston County Standard Plans (flexible pipe bedding detail and trench backfilling and resurfacing). PVC pipe with solvent weld joints that may be subject to thermal contraction shall be snaked in trench.

6.09 Joints

Rubber ring gaskets shall comply with ASTM D-1869 and D-3139 specifications and shall be supplied by the pipe or fitting manufacturer. Lubricant shall water soluble, non-toxic, non-supportive of bacterial growth, and have no deteriorating effect on the PVC or gasket.

Solvent cements and primer for joining PVC pipe and fittings shall comply with ASTM D-2564 and be as recommended by the pipe and fitting manufacturers.

6.10 Fittings

Pipe fittings shall have minimum working-pressure ratings equal to the pipe with which they are connected. All fittings shall be PVC 1120, rubber joint complying with ASTM D-1784, D-2466, or D-2467, for pipe larger than one inch 1.D. unless otherwise noted on engineering drawings.

6.11 Valves

All one-inch valves shall be PVC ball valves with pre-loaded EPDM stem seals micro-finished PVC ball and self-adjusting polyethylene ball seat to compensate for wear and prevent over-tightening. It shall be designed for use with corrosive fluids, for low torque manual operation, and for a working pressure of 150 psi. The valve shall be Model No. LT-l000-S, as manufactured by KBI (King Brothers Industries), or equal.

Two-inch and larger valves shall be cast iron body, resilient seated, gate valves Mueller (or M&H 4067) or approved equal, epoxy coated or plastic lined, suitable for septic service. Mainline valves shall be located at every cross street (not to exceed 600 feet spacing on runs without intersecting street).

6.12 Check Valves

The check valves used on service lines shall be a tee or wye pattern swing check PVC. It shall have a working pressure of 150 psi and shall require only 1/2 psi of back pressure for complete closure. It shall be as manufactured by KBI, Model No. KSC-1O00-, or approved equal.

6.13 Pigging Ports

A pigging port is a projectile that is forced through the inside of a pipe to clean pressure pipelines. A pigging port is used as a point to send or retrieve the pig (see Figures SS-10 to SS-12).

Pigging ports may be required:

1. At every change in pipeline size;
2. At the end of every dead end line;
3. At the connection point to the main when the line being constructed will be a secondary main.

These locations are subject to review and approval by Thurston County.

6.14 Septic Tanks

Tanks shall be 1,000-gallon minimum concrete, pre-cast concrete or fiberglass dual chamber, and shall have been designed by a Registered Professional Engineer qualified in Structural Design (see Figure SS-13). All tanks shall be constructed for acceptance of pump assemblies or effluent filters and have pre-cast groove to allow positive attachment of the riser. The manufacturer/designer shall provide the structural design and certification to Thurston County for review. The design or analysis shall be in accordance with accepted engineering practice. Tanks shall be designed for the following loading conditions:

1. Top of tank 400 lbs. per square foot.
2. The tank shall be designed to support an additional minimum 2 500 lb. wheel load.
3. The tank shall be designed to withstand hydrostatic loading equal to the maximum depth of bury, in addition to the soil loading. Maximum depth of bury shall be measured from the ground elevation to the invert of the sewer line entering the tank.

Unusual installations, if required by local conditions, will require special design consideration, as will tanks located where a vehicle might be driven over them.

All tanks shall be guaranteed in writing by the tank manufacturer/contractor for a period of two years from the date of installation on the project. Manufacturers signed guarantee shall accompany delivery of precast or fiberglass tanks. The tanks shall be installed when the house is being built. The landscaping over and in the immediate area of the tank shall be kept to a minimum to provide easy access to the lid.

Finished landscaping shall maintain a minimum twelve (12) inch buffer around tank lids. Lids must be free of debris, grass, landscaping material (rock, wood chips, etc.), and must be accessible and exposed to Thurston County inspectors and maintenance personnel. Lids are not to be covered or have objects resting on or over them.

6.15 Concrete Tanks

Walls, bottom and top of reinforced-concrete tanks shall be designed using one-way or two-way slab analysis. Stresses in each face of monolithically-constructed tanks may be determined by analyzing the tank cross-section as a continuous fixed frame. The tank, including walls, top slab, and bottom slab shall be poured monolithic ally; alternatively, waterstops may be provided at the top of the tank.

Reinforcing steel shall be ASTM A-615, Grade 60, fy = 60 000 psi. Details and placement shall be in accordance with ACI 315 and ACI 318.

Concrete material and placement shall meet the requirements of section 6-02 of the Standard Specifications (1988 Standard Specifications for Road, Bridge, and Municipal Construction prepared by Washington State Department of Transportation and the American Public Works Association) with the following modifications:

A. Classification of Structural Concrete - Class of concrete shall be AX (4,000 psi) fc' = 5,000 psi.

B. The concrete mix shall not be modified unless the mix design is reviewed and approved by Thurston County.

C. Tanks shall be protected by applying a heavy cement-base waterproof coating, Thoroseal or approved equal, on both inside and outside surfaces.

D. Tanks shall be constructed and furnished with access openings of the size and configuration shown on the standard plans. Modification of completed or existing tanks will not be permitted, for structural, warranty, and liability reasons. Tanks shall be furnished without concrete access hole lids. In order to demonstrate water tightness, tanks shall be tested prior to acceptance. Each precast tank shall be tested at the factory, by filling with water to the base of the riser and letting stand. After 24 hours, the tank should be refilled to the soffit and the exfiltration rate shall be determined by measuring the water loss during the next two hours. The two-hour loss shall not exceed one gallon.

E. Form release used on tank molds shall be Nox-Crete or equal. Diesel or other petroleum products are not acceptable.

F. Precast tanks shall not be moved from the manufacturing site to the job site until the tank has cured for seven days or has reached two-thirds of the design strength.

G. After the tanks have been set in place and the riser installed, but prior to backfilling, each tank shall be tested by filling the tank to two inches above the base of the riser for a two-hour period. Water loss shall not exceed one gallon.

H. Tanks installed where groundwater levels are above tank bottom require precautions to prevent flotation. In general, tanks shall immediately be filled with water and shall never be pumped down more than three feet below top of tank. In high groundwater locations tanks should be anchored in place to prevent floating.

I. Tank excavation shall be backfilled with select material free of coarse gravel and larger (3/4-inch plus materials) and compacted to a dry density equal to or greater than that of the adjacent, undisturbed soil. Finish grading, cleanup, and restoration shall be completed prior to final acceptance by the County.

6.16 Fiberglass Tanks

The tank shall be constructed with a glass fiber and resin content specified by the manufacturer and with no exposed resin-coated glass fibers. The manufacturer must be approved by Orenco Systems, Inc., 2826 Colonial Road, Roseburg, OR 97470, and by Thurston County, Washington. The manufacturer shall supply to Thurston County, without charge, satisfactory evidence of testing by an approved laboratory showing compliance with IAPMO I CC 3- 74, excepting as herein modified. Any metal part shall be 300 series stainless steel.

A. Inspections may be made by the inspector in the suppliers' yard, within the plant, upon delivery and again after installation. The wall thickness shall average at least 1/4-inch. When less than 3/16-inch in thickness or if any delamination is suspected within any portion of the tank, the inspector may drill a 1/4 inch diameter hole through the tank wall for inspection purposes. If the required minimum 3/16-inch thickness is not found, repair, if feasible, shall be the responsibility of the contractor. repair is judged not feasible, the tank shall be rejected. If the required minimum 3/16-inch thickness is found and no delamination is present the repair shall be the responsibility of the County.

B. Holes specified for the tank shall be provided by the manufacturer. Resin shall be properly applied to all cut or ground edges so that no glass fibers are exposed and all voids are filled.

C. Ty-Seal neoprene gaskets for equal shall be used at the inlet to join the tank wall and the ABS inlet piping. ABS Schedule 40 pipe and fittings shall be used at the inlets.

D. Each tank shall be water tested on the project site after assembly and prior to backfill by the contractor and witnessed by the inspector. Every tank shall be assembled by the contractor and water raised to the brim of the manhole for a minimum of two hours. The tank shall show no leakage from section seams, pinholes, or other imperfection. Any leakage is cause for rejection.

E. When leakage occurs, if the tank is not rejected by the inspector, an additional water test for a minimum of two hours shall be made on the tank after repairs have been completed. The contractor shall be responsible for making all corrective measures in production or assembly necessary to insure a completely watertight tank.

F. After installation (including backfill) of tank (with riser) is completed each tank shall be filled with water to two inches above the base of the riser for a two-hour period to confirm that there is no leakage. Every tank test shall be witnessed by the inspector.

Installation and Handling Procedures:

G. Fiberglass septic tanks shall be handled, stored and installed as recommended by the manufacturer.

H. Backfill shall include a minimum six-inch thick envelope of pea gravel completely around the tank.

I. A minimum of 1 1/4 cubic yards of concrete per 1,000 gallons of tank capacity shall be placed above the gravel envelope over the tank--located between the riser ports. A layer of six mil plastic shall be placed between the concrete and the gravel to prevent bonding. The concrete cap shall be rough formed into sections not to exceed 10 cubic feet and include enough reinforcing steel placed to provide handles for the removal of the individual sections.

6.17 Tank Risers

Inlet and outlet risers shall be fiberglass or ribbed PVC as manufactured by Orenco Systems, Inc., 2826 Colonial Road, Roseburg, OR 97470, or equal. Outlet risers shall be a minimum of 18 inches high or as otherwise shown on the engineering drawings, and have a minimum nominal diameter of 24 inches. Outlet risers shall be factory equipped with the following:

A. One I-inch or 1 1/4-inch diameter neoprene grommet for the pump discharge, installed no less than 8 inches or more than 15 inches from the top of the riser.

B. A PVC splice box, with 4 cord grips and 1 inch outlet fitting, Mode I No. SB41, or equal, shall be mounted within 15 inches of the top of the riser.

A lid shall be furnished with each riser. It shall be bolted to the riser and shall be constructed of fiberglass with an aggregate finish.

Each riser shall be bonded to the top of the concrete tank with a two-part epoxy that shall be supplied with the riser by the manufacturer. The epoxy shall be applied in accordance with the manufacturer's recommendations. A generous bead of epoxy shall be laid completely around the bottom of the riser prior to mounting the riser on the top of the tank. After the riser is in place, a generous fillet shall be run completely around the inside base. The epoxy shall be allowed to be based on manufacturers' recommendations, before backfill is placed over tanks. Care shall be exercised during the curing period to avoid dislodging the riser or disrupting the water-tight seal between the riser and tank.

Where riser depth exceeds 36 inches over the top of the tank, a 48-inch diameter manhole will be placed to allow servicing of the fiberglass riser and attachments.

6.18 Gravity Discharge Tank Equipment

Gravity discharge tanks shall be equipped with ORENCO SYSTEMS Model F1248 Effluent Filter, or equal, installed in conformance with the standard plans and composed of the following components:

A. PVC vault, 12-inch diameter by 48-inch depth with eight 1-3/8 inch diameter inlet holes, polyethylene effluent screen, 1-1/4-inch diameter PVC intrusion pipe with overflow screen on top.

B. 1-1/4-inch diameter PVC discharge fitting with seep ring.

C. 1-1/4-inch diameter PVC 90-degree elbow for mounting on the bottom of the vault.

D. 1-1/4-inch diameter flexible PVC hose, a minimum of 60 inches in length with quick-disconnect fittings on vault end.

6.19 Effluent Pumping Tank Equipment

Pumps shall be listed for use in effluent. All pumping systems shall be ORENCO SYSTEMS Model) SI S 4000 Series High Head Pumping Assemblies or equal composed of:

A. Standard Vault: PVC Vault and Flow Inducer, Model No. PVU 571819, or equal, with eight 1 3/8-inch diameter inlet holes.

B. Hose and Valve Assembly includes one-inch diameter flexible PVC hose with quick-disconnect fittings and PVC ball valve. Model No. HV 100 B or equal.

C. Mercury Switch Float Assembly, Model MF-ABR, or equal, with three mercury floats mounted on a PVC stem which attaches to vault.

D. Pump: OSI High-Head, 1/2 hp, 110CV, signal phase Model 8 OSI 03 HH or 8 OSI 05 HH, or equal, with 8-foot cord and 1/8-inch bypass orifice for effluent application, or approved equivalent.

All pumping systems shall be installed in accordance with the manufacturer recommendations.

6.20 Controls and Alarms

Positions on the PVC 3-float assembly are to be set at the following levels: High tank level alarm is to be set 9 inches below underside of tank top, "on" at 32 inches below alarm and "off" in same float as "on" set 32 inches below "on" and redundant "off" with low-level alarm set 4 inches below "off."

Control panels shall be ORENCO SYSTEMS Model A-lRO *(simplex alarm panel, pump voltage 115 VAC, redundant off)* or equal, with the following features:

A. Audible alarm, panel mount with a minimum of 80 db sound pressure at 24 inches.

B. Oil-tight visual alarm with push-to-silence feature.

C. Automatic audio-alarm reset.

D. 15 amp motor rated toggle switch, single- pole, double-throw with three positions: manual (MAN), automatic (AUTO) and center (OFF).

E. NEMA 4X-rated fiberglass enclosure with gasketed, hinged cover, and locking latch. Seal will be installed by Thurston County at time of Thurston County's acceptance of the completed installation, and shall signify final acceptance.

F. Alarm circuit shall be wired separately from the pump, so that if the internal Pump overload switch is tripped, the alarm will still function.

G. 20-amp power isolation switch to de-energize entire control panel, to permit servicing panel without access to the customers' breaker switches. The pump control panel shall be mounted on a metal post buried a minimum of 24 inches in concrete within 10 feet of the step tank lids, within sight of the pump and visible from the vehicular access point for the house, or as otherwise approved.

H. Wiring from panel to splice box shall be conduit-encased with a 3/4" EY conduit seal at the riser, below the control panel, minimum 18 inches burial, color stranded wire of a size and type per code. There shall be a dedicated circuit breaker serving the pump control panel.

I. Hour meter and event counter base area must be included so the meter and counter may be moved from one installation to another.

6.21 Valve and Service Connection Boxes

A service valve box shall be placed over each ball and check valve in each service line. Check valve shall be located upstream of ball valve in each service valve box.

All service connect boxes shall be manufactured by Carson Industries, Inc. Model No. 1419, or equal, with hinged cover and 1419 E extension box as required, or approved equal. These boxes shall have a bolt-down cover.

6.22 STEP/ Grinder Pressure Main System – Acceptance Testing

1. Mainline and Service Lines

The pressure mainline and service lines will be subject to a hydrostatic pressure test. The pressure test shall be pursuant to Section 7-11.3(11), Hydrostatic Pressure Test, in the WSDOT *Standard Specifications for Road, Bridge and Municipal Construction*. The test shall be modified as follows:

a. The hydrostatic pressure shall equal 100 psi in excess of operating pressure or in no case shall the test pressure be less than 150 psi.

b. Any leaks or imperfections developing under said pressure will be remedied by the contractor.

c. The pressure test will be maintained while the entire installation is inspected.

d. The contractor will provide all necessary equipment and will perform all work connected with the tests.

e. Tests will be made after all connections have been made.

f. The contractor will perform all tests to assure that the equipment to be used for the test is adequate and in good operating condition and the air in the line has been released before requesting the County to witness the test.

g. Water for acceptance testing of tanks and service lines shall be supplied by the customer or contractor.

2. Tank

A water test of the septic, S.T.E.P., or grinder tank at the factory and on-site after installation is required in accordance with the criteria outlined in Chapter 7E.060. In addition, the contractor shall:

a. Perform the test and supply all necessary equipment and materials;
b. Conduct the test in the presence of a County inspector;
c. Supply water for acceptance testing of tanks and service lines.

3. Lift Station

Verification by County inspector of all operating parameters such as:

a. Pump operation;
b. Alarms;
c. An electrical inspection is required prior to acceptance of any STEP system installation.

4. Service Line Testing

Service line piping shall be tested prior to backfilling by:

a. Pumping against the closed ball valve in the service box with a hand pump or other acceptable method.
b. No leakage will be accepted.
c. The pump shall be connected to the discharge line at the PVC union in the hose and valve assembly.
d. The union in the service box shall be loosened to allow the trapped air to escape and then be re-tightened to begin the test.

5. Gravity service lines

Gravity service lines shall be tested for leakage by:

a. Plugging the air vent in the riser;
b. Removing the effluent filter from the vault and placing it on the ground beside the riser;
c. Disconnecting the fitting at the bottom of the vault.
d. A proper fitting shall be attached to the flexible outlet hose to allow testing by pumping against the closed ball valve in the service box with a hand pump or other acceptable method.
e. The union in the service box shall be loosened to allow the trapped air to escape and then be retightened to begin the test.
f. No leakage will be accepted.

7.00 GRINDER PUMP SYSTEM

7.01 General

Grinder pump system may be installed to serve one or multiple residential and commercial user(s) only where approved by the County. A grinder pump application with approved site plat is required.

All grinder systems shall be owned and maintained by the customer. The County shall take over ownership and maintenance at the valve connection to the main at the right-of-way.

A grinder system is a facility consisting of a holding tank, grinder pump, and pressure piping system for conveying the wastewater and solids into the sewer system.

Power will be provided and paid by the customer.

All sewer pipe, drains, and plumbing between the building and force main before discharging to the sewer main will be the responsibility of the customer.

Grease traps shall be installed as required by the Uniform Plumbing Code at the discretion of Thurston County. Minimally, commercial grinder systems that have kitchen or cooking facilities, such as churches, community gathering places, restaurants, schools, etc., shall require installation of a grease trap. A sampling port shall be placed in a location approved by Thurston County. The owner shall be responsible for proper maintenance of any grease trap installed.

Only sanitary wastewater shall be discharged into the tank; roof drains and other stormwater sources shall be strictly excluded.

7.02 Design Standards

The developer or builder shall submit a grinder system design by a licensed engineer for the County's approval.

7.03 Grinder System Force Main

A. Mainline. The minimum pipe size used is 2 inches nominal diameter. This is based on maintenance requirements rather than flow. Pipe will be PVC, ASTM D2241, SDR 21 (200) with rubber gasketed joints. Gaskets will comply with ASTM D 1869. Mains will have a minimum 36 inches of cover to top of pipe. See Chapter 1.06 for sanitary sewer/water main crossing requirements. Main lines will be the following diameters: 2, 3, 4, 6, 8, 10, 12, ...

B. Service line. Service connection pipe will be minimum 1-inch diameter, Schedule 80 PVC water pipe, solvent weld joint located at 90 degrees to the mainline when possible. Solvent cements and primer for joining PVC pipe and fittings will comply with ASTM D 2564 and will be used as recommended by the pipe and fitting manufacturers. Services will have a minimum 24 inches of cover to top of pipe. Pressure services crossing over any waterline will follow DOE requirements.

C. Building Sewer. The gravity building sewer between the building and the tank will be designed and installed in accordance with the Uniform Plumbing Code as adopted by the County. The owner will be responsible for maintenance of the building sewer.

D. All pipes will be installed with continuous tracer tape installed 12 to 18 inches under the proposed finished grade. The marker tape will be marked "sewer" and be plastic, non-biodegradable metal core or backing that can be detected by a standard metal detector. Tape will be Terra Tape "D" or approved equal. In addition to tracer tape, install 12-gauge-coated copper wire wrapped around the pipe, brought up and tied off at the valve boxes.

A 1-pound magnesium anode will be buried with the sewer line every 1,000 linear feet for cathodic protection of the wire. Toning wire splices and connections to anodes will join wires both mechanically and electrically and will employ epoxy resin or heatshrink tape insulation. Furnishing and installing the tracer wire and anodes will be incidental to pipe installation.

8.00 VACUUM SEWER SYSTEM

8.01 General

Vacuum sewer systems will be required in areas of the Utility where existing vacuum sewer infrastructure exists.

8.02 Design Standards

The design of any sewer extension/ connection shall conform to County standards, Department of Ecology's "Criteria of Sewage Works Design, and any applicable standards as set forth herein. All vacuum sewer system components shall be compatible with the existing vacuum sewer system manufactured by AIRVAC® as approved by Thurston County. The Engineer shall have all work associated with the vacuum sewer reviewed and accepted by AIRVAC®, Inc. See Figures SS-21 through SS-37 for standard details on vacuum sewer.

8.03 Mainline-Vacuum Sewer

Vacuum sewer mains shall be sized for the ultimate development of the tributary area. Nothing shall preclude the Thurston County from requiring the installation of a larger sized main if Thurston County determines a larger size is needed to meet the requirements for future service. All vacuum sewer mains shall be designed and constructed to compatible with the existing vacuum sewer system.

The design is subject to all other design requirements as noted in this Chapter.

A. **Material**. Vacuum sewer main shall be rubber ring joint or solvent weld Schedule 40 or SDR 21 PVC. When using 4", 6", or 10" PVC, SDR 21 shall be used. For rubber ring joint pipe, a certificate shall be provided by the manufacturer stating the pipe has been tested at 22" mercury vacuum in accordance with ASTM D-3139 and is guaranteed for such use.

B. **Fittings:** Fittings for sewers and service laterals shall be Schedule 40 with solvent weld connections in accordance with ASTM D-1784 and ASTM D-2466. Rubber gasket joints on fittings have been used successfully on some projects. The shape of gasket on smaller pipe sizes is of critical importance. For all pipe sizes, the engineer shall satisfy himself/herself that suitable fittings area available to suit the requirements of the vacuum system.

Tee fittings shall not be used for vacuum service.

8.04 Gravity Sewer from the Building

Gravity sewers laid to collect the sewage flow prior to the fiberglass sumps shall be Schedule 40, SDR 21 PVC. Four-inch and six inch diameter sewers may be accommodated in the flat areas of the collection sumps.

A four (4) inch diameter air vent shall be placed near the building. The air vent shall be finished with a gooseneck fitting finished at least twelve (12) inches above finished grade. A screen shall cover the opening of the air vent.

8.05 Installation

All vacuum sewers shall be laid to the line and grade with the use of construction laser beam or comparable equipment. All pipe which has been designed to slope downward will be built to slope continuously downward. There shall be no abrupt sags or bellies in the line. Grade tolerance shall be plus or minus 0.05 feet per 100 feet for all pipe sizes.

All pipes will be installed with continuous tracer tape installed 12 to 18 inches under the proposed finished grade. The marker tape will be marked “sewer” and be plastic, non-biodegradable metal core or backing that can be detected by a standard metal detector. Tape will be Terra Tape “D” or approved equal. In addition to tracer tape, install 12-gauge-coated copper wire wrapped around the pipe, brought up and tied off at the valve boxes.

8.06 Valve and Controller/Sensor General Specification

The vacuum sewage valve shall be vacuum operated on opening and be spring assisted on closing. The valve configuration shall be so arranged that the sewer vacuum ensures positive valve seating. It shall be nominal three-inch (3”) diameter up to 90% of nominal while providing a visual flow through areas of at least 50% of nominal. The plunger and its shaft shall be arranged to be completely out of the flow path when the valve is in its open position. The valve shall be equipped with a vacuum operator of the rolling diaphragm type and of sufficient diameter to overcome all sealing forces and open the valve fully using line vacuum pressure from the downstream side of the valve. The valve shaft shall be provided with an elastomer seal to minimize sewage leakage into the lower housing of the valve vacuum operator. A drain shall be connected to the lower housing of the valve operator which shall remove any shaft seal leakage and suck it into the vacuum sewer each time the valve cycles. A surge tank, fitted with double check valve units, shall be mounted on the vacuum supply to the valve controller. All materials of the valve shall be chemically resistant to sewage.

The valve shall be equipped with a controller/sensor which shall rely on atmospheric air and vacuum pressure from the downstream side of the valve for its operation, thereby requiring no other power source. The controller/sensor shall be capable of taking vacuum pressure from the downstream side of the valve, applying it to the actuator chamber, an fully opening the valve. The controller/sensor shall be capable of maintaining the valve fully open for a fixed period of time. This time period shall be adjustable over a range of 3 to 10 seconds. After the time period has elapsed, the controller/sensor shall be capable of admitting atmospheric air to the actuator chamber and permitting spring assisted closing of the valve. The opening of the valve shall be initiated by the controller/sensor switch shall sense the head of sewage in the collection sump. Activation of the controller/sensor shall be at the factory head setting of 5-6" water gauge.

All materials of the controller/sensor shall be fabricated from a plastic or elastomer that is chemically resistant to sewage and sewage gases.

The valve and controller/sensor shall be capable of operating when submerged in water and/or mud. Under this type of circumstance, the County may require the use of an external flexible breather assembly.

8.07 Valve Pits and Covers

Valve pits shall be manufactured by the filament winding fiberglass process. Pits shall be 3'-0" inside diameter at the bottoms and be conically shaped to allow fitting of a 23-1/2" diameter clear opening cast iron frame and cover. Valve pit depth shall be 3'-6" (may be 2'-6" for shallow valve pits). Wall thickness shall be 3/16". Pits shall be suitable for H20 traffic loading. Pits shall be supplied with the 3" vacuum outlet hole (factory cut).

A molded pit bottom shall be provided for field assembly to the pit by the installation contractor. Valve pit bottoms shall be 0.320" thick with 0.500" reinforcing ribs. Bottoms shall be molded by the liquid molded resin (LMR) process. Valve pit bottoms shall be provided with holes factory cut for the 3" suction, 4" cleanout/sensor pipe, internal sump breather and sump securing bolt holes. All factory cut openings shall include a factory supplied elastomer seal which shall effectively seal all openings from ingress of ground water.

All "coupons" cut by Contractor shall be provided to the inspector at the time of valve testing.

Pits shall be supplied with cast iron covers and frames designed for H20 traffic loading. Frame weight shall be not less than 90 pounds and lid not less than 100 pounds.

If specified by the engineer, valve pits shall be supplied with a light weight cast iron cover which may be fastened to the pit by two bolts (optional). Valve pit cover shall have the words "NON-TRAFFIC" in 1-1/2" letters cast in them.

8.08 Collection Sumps

Each collection sump may serve a maximum of two residences. Collection sumps shall be manufactured from a durable, non-corrosive polymer material and have a wall thickness of approximately 3/16". Sumps shall be approximately 30 inches deep and of 55 gallon capacity and be designed for H20 traffic loading at 2 feet of depth of cover. 54 inch deep sumps may also be used. Elastomer connections shall be provided for the 4" and 6" gravity line(s). Holes for the seals shall be field cut at the positions directed by the engineer. Sealing between the valve pit bottom and tank shall be made in the field using a factory supplied elastomer "O" ring.

8.09 Division Valves

Valves shall be resilient wedge gate valves suitable for service in sewage under both vacuum and/or pressure.

8.10 Gate Valves Specification

Valves shall conform to AWWA C509, Standard for Resilient Wedge gate Valves, as manufactured by Waterous or approved equal.

Valves shall be capable of sustaining a vacuum of 24" Hg, and each valve shall be tested and certified to two and nine tenths (2.9) pounds pressure absolute (24" Hg) by an independent laboratory or by AIRVAC.

Wedge shall be constructed of ductile iron, fully encapsulated in synthetic rubber except for guide and wedge nut areas.

Wedge rubber shall be molded in place and bonded to the ductile iron portion. It shall not be mechanically attached with screws, rivets, or similar fasteners.

Wedge shall seat against seating surfaces arranged symmetrically about the centerline of the operating stem, so that seating is equally effective regardless of direction of pressure unbalance across the wedge.

All seating surfaces in body shall be inclined to the vertical at a minimum angle of 32 degrees (when stem is in a vertical position) to eliminate abrasive wear of rubber sealing surfaces.

The stem shall be sealed by at least two (2) O-rings; all stem seals shall be replaceable while the valve is wide open and while it is subjected to full rate pressure.

Fasteners shall be stainless steel Type 18-8, ASTM F-593, Group 1.

Waterway shall be smooth and shall have no depressions or cavities in its seat area where foreign material can lodge and prevent closure or sealing.

Valve body and bonnet shall be fusion bonded epoxy coated, inside and out.

The valve manufacturer should provide a full 10-year warranty.

8.12 Buried Valves Specification

Buried valves shall be provided with mechanical joint end connections with transition gaskets. Above ground valves two and one half (2-1/2) inches and larger shall be flanged.

Buried valves shall be installed in valve boxes (road boxes) conforming to local standards, and the operating nut of all buried valves shall be extended to within six (6) inches plus or minus three (3) inches of the finished grade.

8.13 Testing

1. Daily Testing – At the completion of each day's work, all sewer mains and lateral connections laid that day shall be tested as follows: Plug all open connections with rubber stoppers or temporary caps, fitted to the pipe by "no-hub" couplings. Apply a vacuum of 22" mercury to the pipes and allow the pressure to stabilize for 15 minutes. There shall be no loss of vacuum in excess of 1% per hour for a two hour test period. As pipe is laid the new section will be tested in addition to the previous laid pipe on that main.

2. Prior to final acceptance, the complete vacuum sewer system including the vacuum collection station shall be subjected to a vacuum of 22" mercury and allowed to stabilize for 15 minutes. There shall be no loss greater than 1% per hour over a four hour test period. This test must be completed prior to the installation of any AIRVAC® valves and must be witnessed by Thurston County or its agents.

Documents referred to and incorporated by reference:

Grand Mound Water System Plan (dated June 1999).

"Standard Specifications for Road, Bridge, and Municipal Construction", Washington State Department of Transportation, 2004 (or most recent edition), M41-10.

Thurston County Road Standards, most recent edition

"Criteria for Sewage Works Design," Washington State Department of Ecology, Water Quality Division, December 1998.

Wastewater Engineering Report and Facility Plan, December 1999

AIRVAC Vacuum System Design Manual (AIRVAC Inc., 2000)

Uniform Plumbing Code (most current edition)

DEVELOPMENT STANDARDS FOR WATER AND SEWER SYSTEMS THURSTON COUNTY, WASHINGTON

APPENDIX A

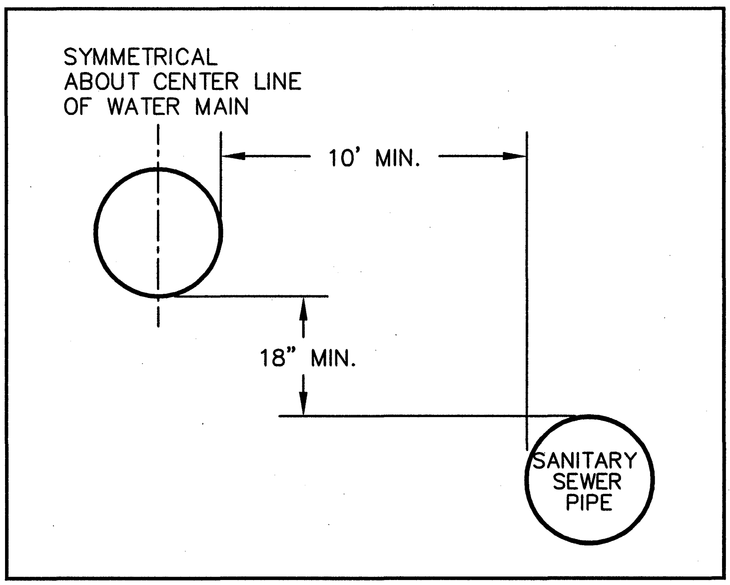
Standard Details – Water

DEVELOPMENT STANDARDS FOR
WATER AND SEWER SYSTEMS
THURSTON COUNTY, WASHINGTON

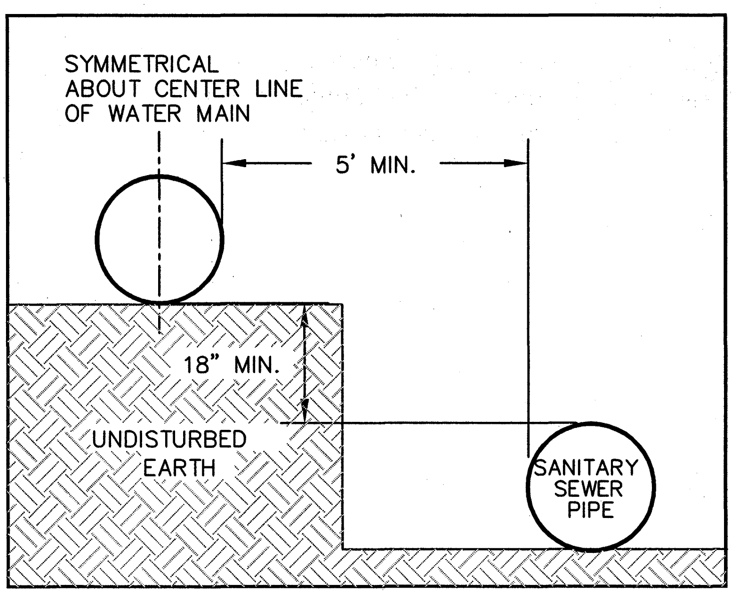
Water Standards

List of Standard Details

THURSTON COUNTY WATER STANDARD DETAIL



REQUIRED SEPERATION BETWEEN WATER LINES AND SANITARY SEWERS, PARALLEL CONSTRUCTION.



REQUIRED SEPERATION BETWEEN WATER LINES AND SANITARY SEWERS, UNUSUAL CONDITIONS PARALLEL CONSTRUCTION.

NOTE:

SOURCE; CRITERIA FOR SEWAGE WORKS DESIGN
STATE OF WASHINGTON DEPARTMENT OF ECOLOGY
DECEMBER 1998 EDITION.

SITUTATIONS NOT ADDRESSED ABOVE SHALL FOLLOW THE CRITERIA AS OUTLINED IN THE ABOVE MENTIONED DOCUMENT, MOST CURRENT EDITION.

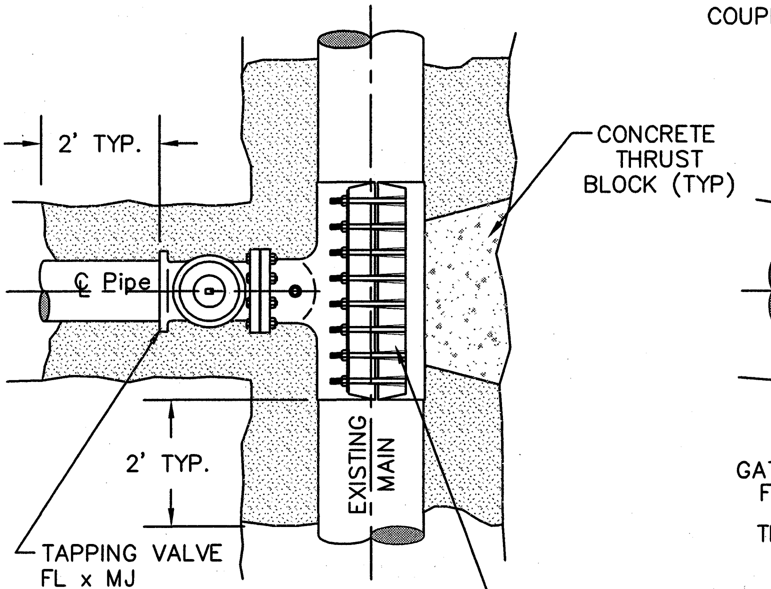
WATER SEWER SEPARATION

APPR. DATE:	REFER:	FIG NO:	WA-01

THURSTON COUNTY WATER STANDARD DETAIL

LIVE TAP

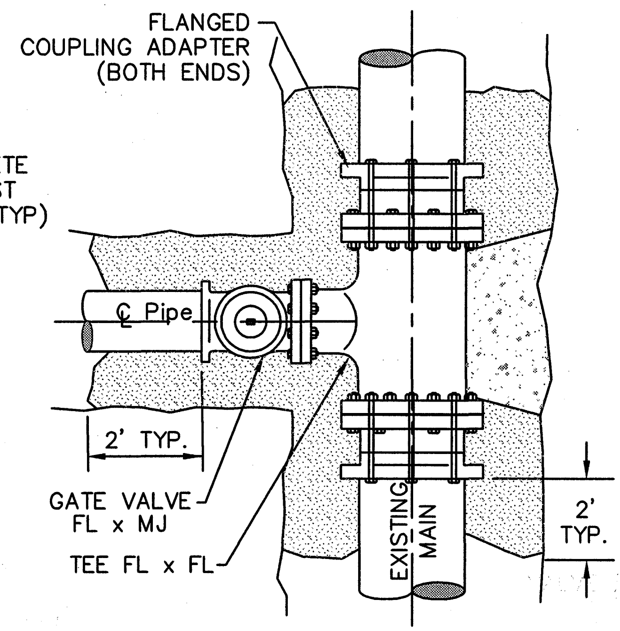
(SIZE LESS THAN EXISTING MAIN SIZE)

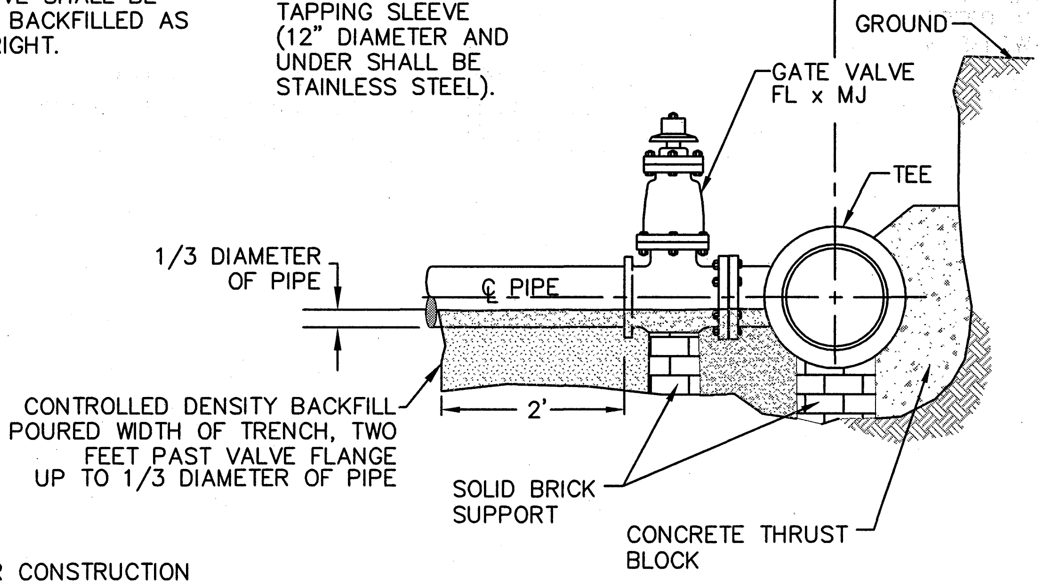


VALVE AND SLEEVE SHALL BE SUPPORTED AND BACKFILLED AS SHOWN BELOW-RIGHT.

CUT-IN-TEE

(SAME SIZE OR LARGER THAN EXISTING MAIN SIZE)





NOTES:

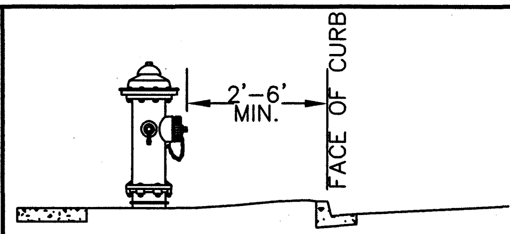
1. 11 MIL PLASTIC OR CONSTRUCTION FABRIC SHALL BE WRAPPED AROUND PIPE AND FITTINGS BEFORE THRUST BLOCK AND BACKFILL ARE POURED.
2. CONTROLLED DENSITY BACKFILL IS A PLANT MIX CONSISTING OF : 3100# SAND, 450# WATER, AND ONE SACK (94#) OF CEMENT.
3. MJ CUT IN TEES SHALL NOT BE PERMITTED.
4. SUPPORT VALVE AND SLEEVE CONTINUOUSLY THROUGH INSTALLATION.

N.T.S.

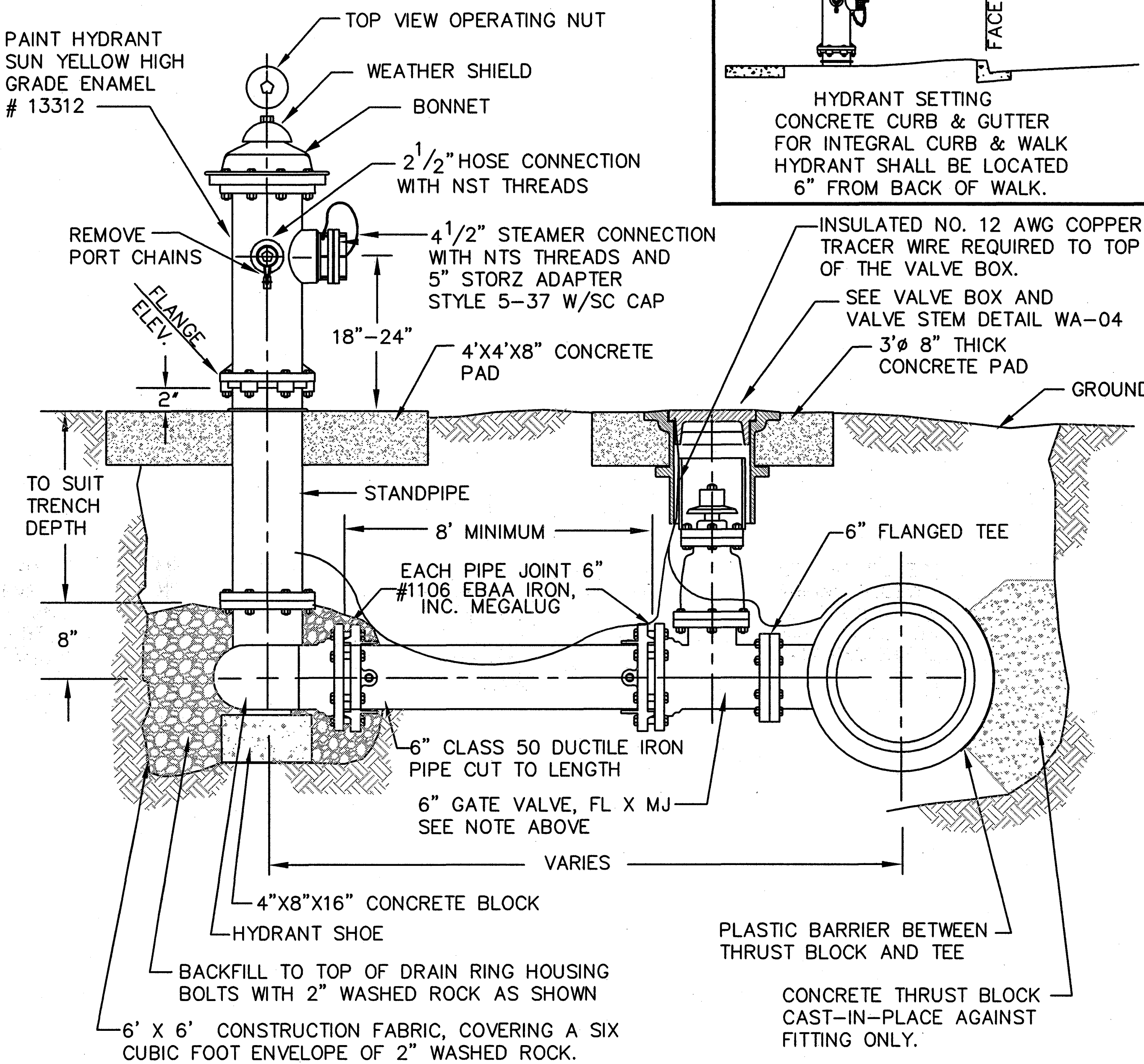
CONNECTION TO EXISTING MAIN

APPR. DATE:		FIG NO: WA-02

THURSTON COUNTY WATER STANDARD DETAIL



HYDRANT SETTING
CONCRETE CURB & GUTTER
FOR INTEGRAL CURB & WALK
HYDRANT SHALL BE LOCATED
6" FROM BACK OF WALK.



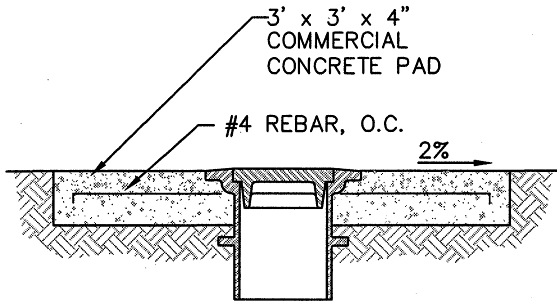
1. HYDRANTS SHALL BE LOCATED WITH A MINIMUM THREE FOOT RADIUS UNOBSTRUCTED WORKING AREA PROVIDED AROUND ALL HYDRANTS. FOUR GUARDPOSTS TO BE INSTALLED IN UNPROTECTED AREAS
2. HYDRANT SHALL BE MUELLER CENTURION OR CLOW F-2500.
3. GATE VALVES SHALL BE RESILENT WEDGE NRS WITH O-RING SEALS. VALVE ENDS SHALL BE MECHANICAL JOINT BY ANSI FLANGES. VALVES SHALL CONFORM TO AWWA 509-80 VALVES SHALL BE MUELLER, M & H OR AMERICAN FLOW CONTROL SERIES 500.
4. THURSTON COUNTY MAY REQUIRE HYDRANTS TO BE PROTECTED BY BOLLARDS. (REF. WA-05)

N.T.S.

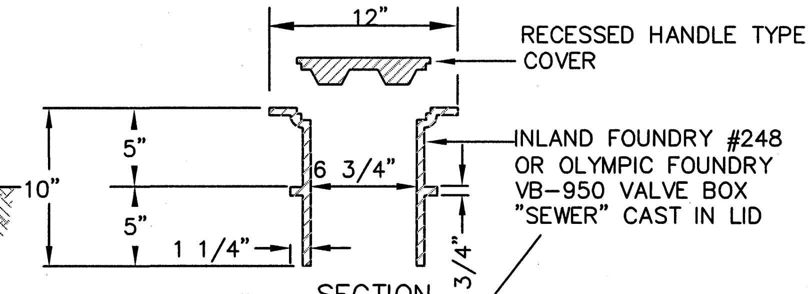
FIRE HYDRANT

APPR. DATE:		FIG NO:	WA-03

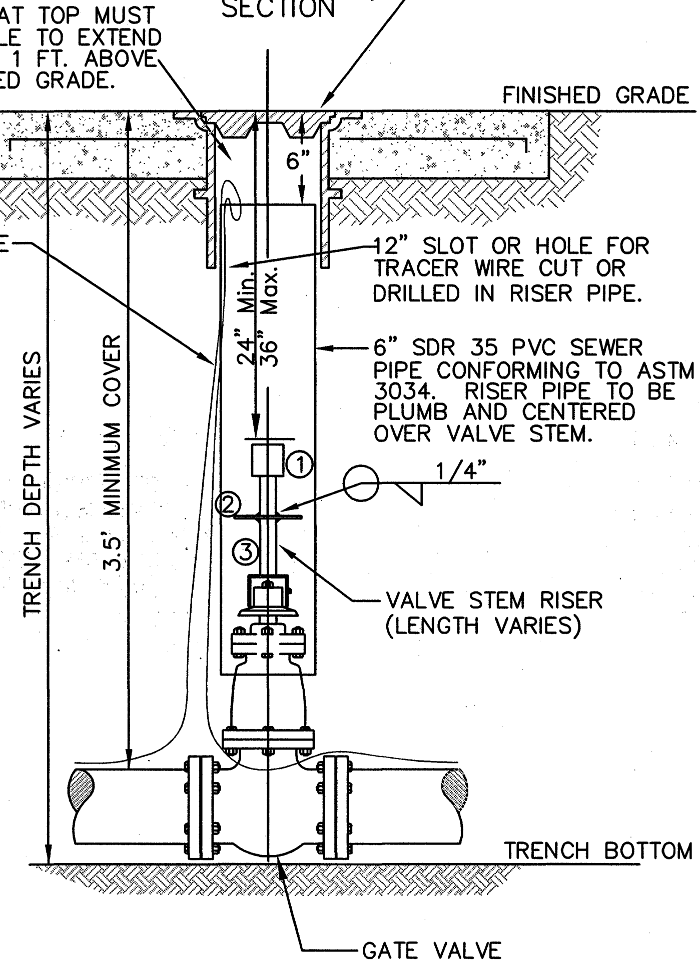
THURSTON COUNTY WATER STANDARD DETAIL

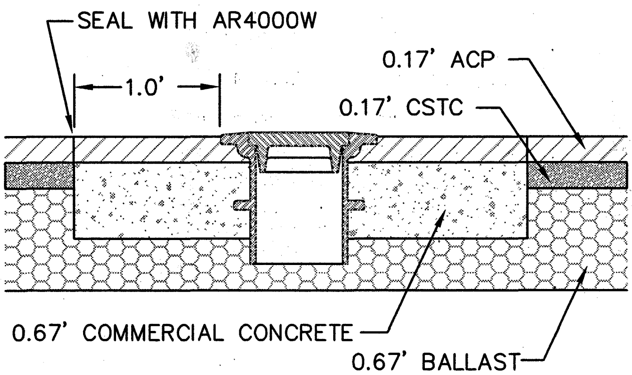


OUTSIDE PAVED AREA



SECTION





INSIDE PAVED ROADWAY

NOTE:

ALL VALVES MUST HAVE 12 GAUGE COATED COPPER TRACER WIRE TIED OFF AT VALVE BODY, EXTENDED OUTSIDE PVC RISER PIPE THEN EXTENDED ONE FOOT TOP OF VALVE BOX.

VALVE STEM EXTENSION LEGEND

1. VALVE OPERATING NUT OR 1 7/8" X 1 7/8" X 2" HIGH GRADE STEEL WELDED TO GUIDE PLATE.
2. 3/16" THICK X 5 1/5" DIA STEEL GUIDE PLATE WELDED TO RISER SHAFT.
3. 2"X2"X 3/16" SQUARE STRUCTURAL STEEL TUBING TO FIT OPERATING NUT. LENGTH AS REQUIRED.

NOTE:

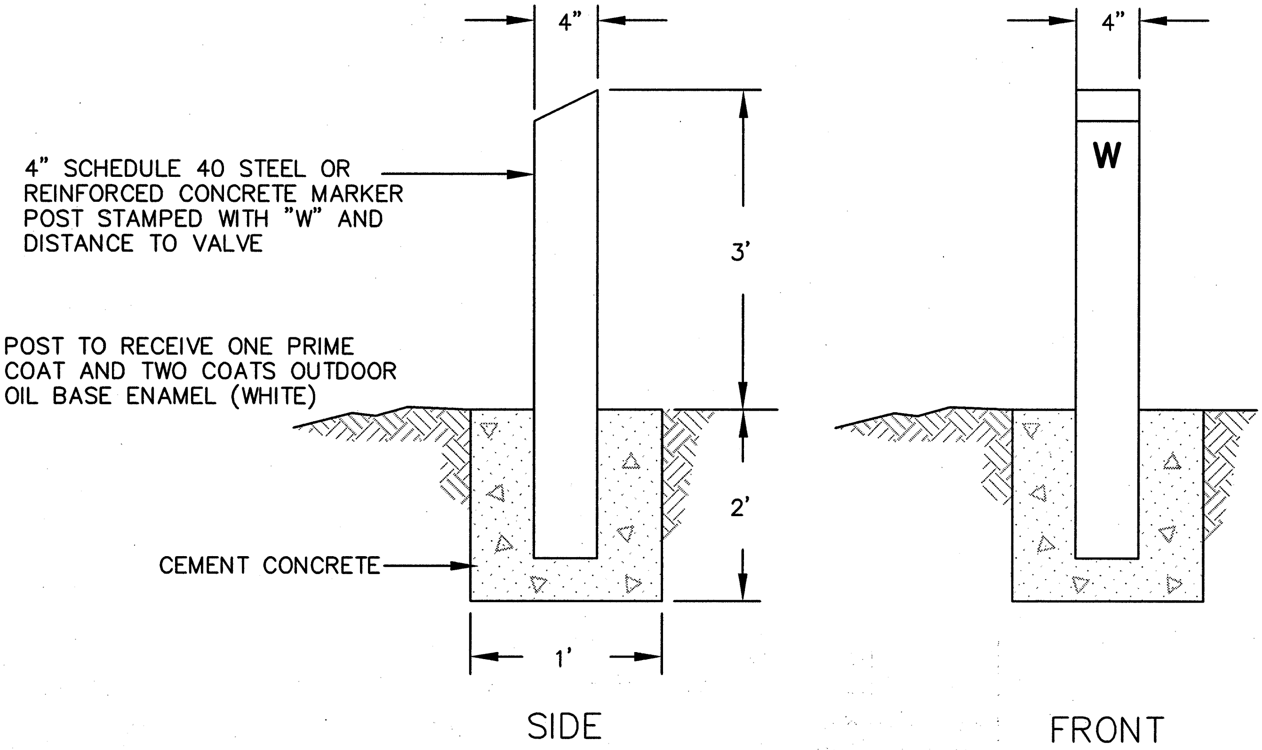
ALL WELDS TO SHAFT SHALL BE FILLET WELD ALL AROUND, AS SPECIFIED ABOVE

STANDARD VALVE BOX

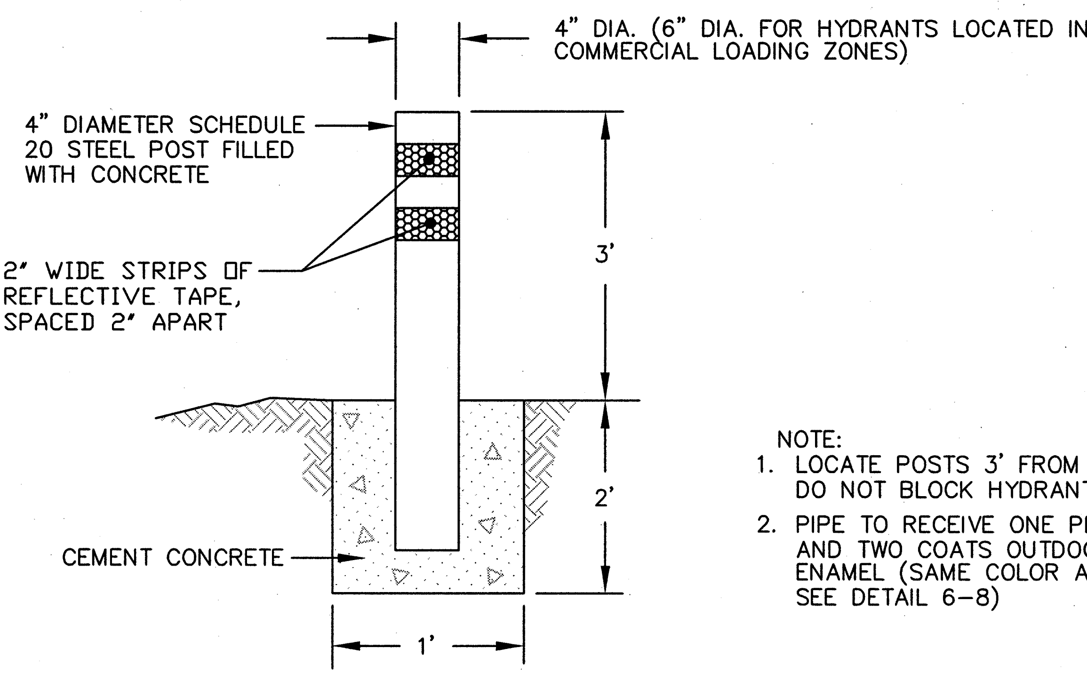
APPR. DATE:		FIG NO:	WA-04

Source; City of Lacey

THURSTON COUNTY WATER STANDARD DETAIL



VALVE MARKER POST



NOTE:
1. LOCATE POSTS 3' FROM HYDRANT DO NOT BLOCK HYDRANT PORTS
2. PIPE TO RECEIVE ONE PRIME COAT AND TWO COATS OUTDOOR OIL BASE ENAMEL (SAME COLOR AS HYDRANT-SEE DETAIL 6-8)

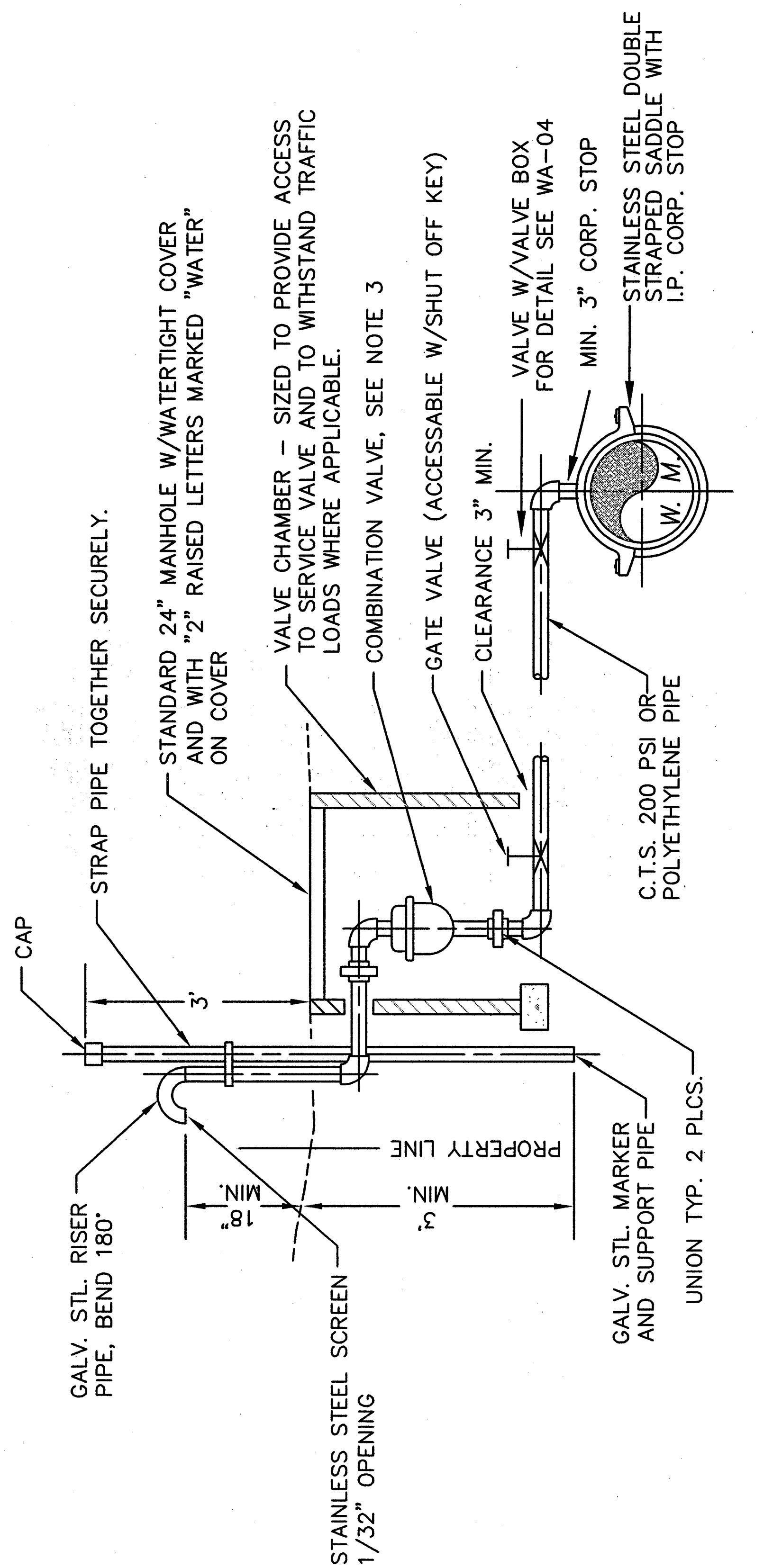
HYDRANT BOLLARD

N.T.S.

VALVE MARKER POST & HYDRANT BOLLARD DETAIL

APPR. DATE:		FIG NO: WA-05

THURSTON COUNTY WATER STANDARD DETAIL



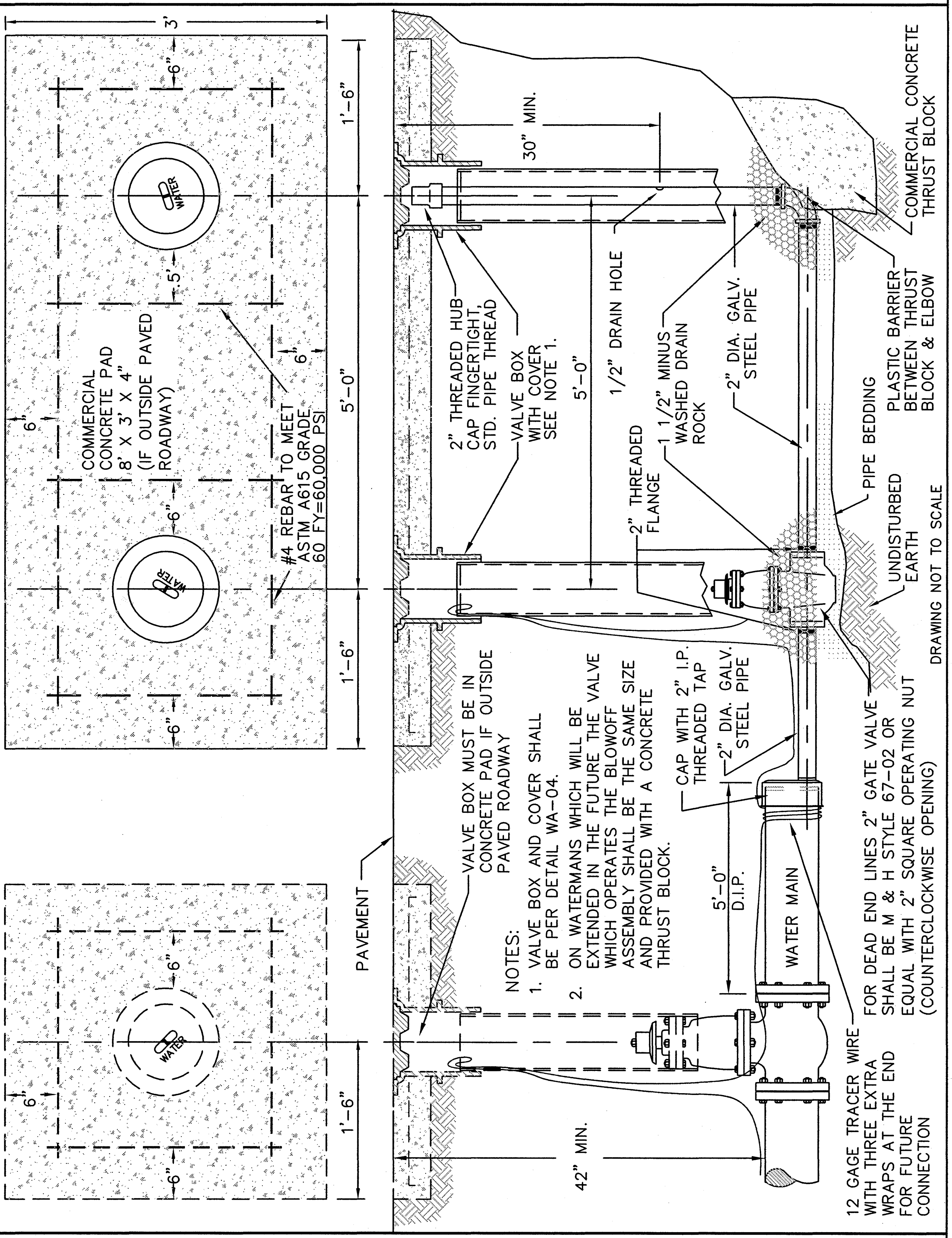
NOTES:

1. IF NOT SPECIFIED, SIZE OF PIPE TO BE SUBMITTED TO THURSTON COUNTY FOR APPROVAL
2. SUBMIT SHOP DRAWINGS OF VALVE CHAMBER FOR APPROVAL
3. COMBINATION A.V./A.R. VALVE SHALL BE VALMATIC 201-C OR EQUAL

COMBINATION AIR VACUUM/AIR RELEASE VALVE

APPR. DATE:		FIG NO:	WA-06

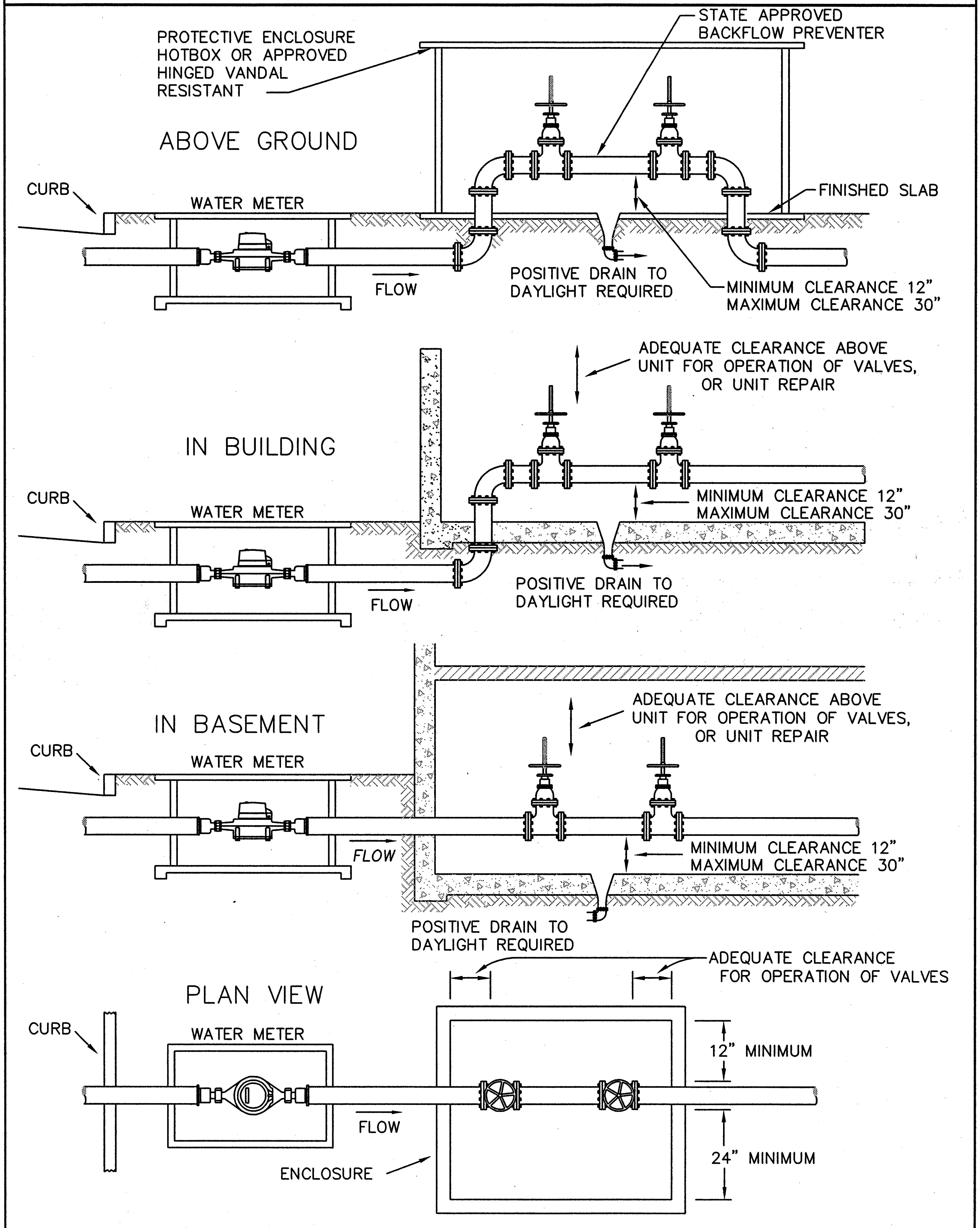
THURSTON COUNTY WATER STANDARD DETAIL



2"-BLOWOFF-ASSEMBLY

APPR. DATE:	REF: CITY OF LACEY	FIG NO: WA-07

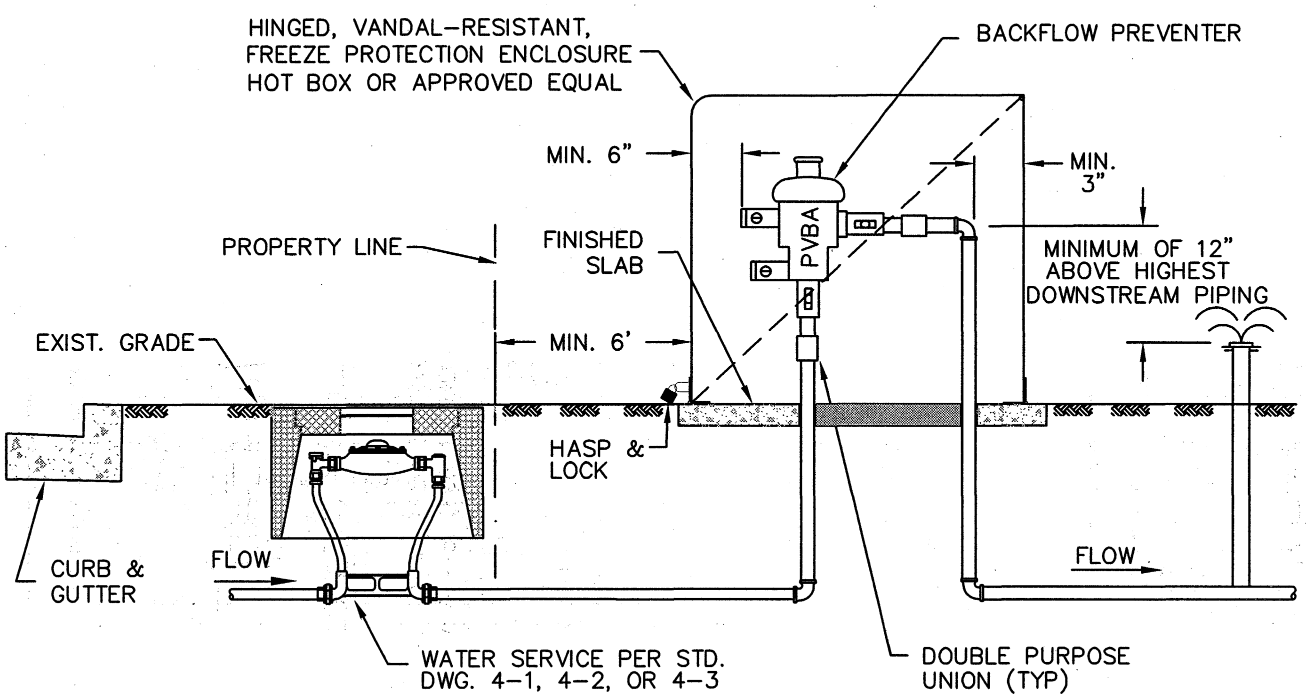
THURSTON COUNTY WATER STANDARD DETAIL



TYPICAL INSTALLATION WITH MINIMUM CLEARANCE & BACKFLOW PREVENTION DEVICE ASSEMBLY

APPR. DATE:		FIG NO:	WA-08

THURSTON COUNTY WATER STANDARD DETAIL



NOTES:

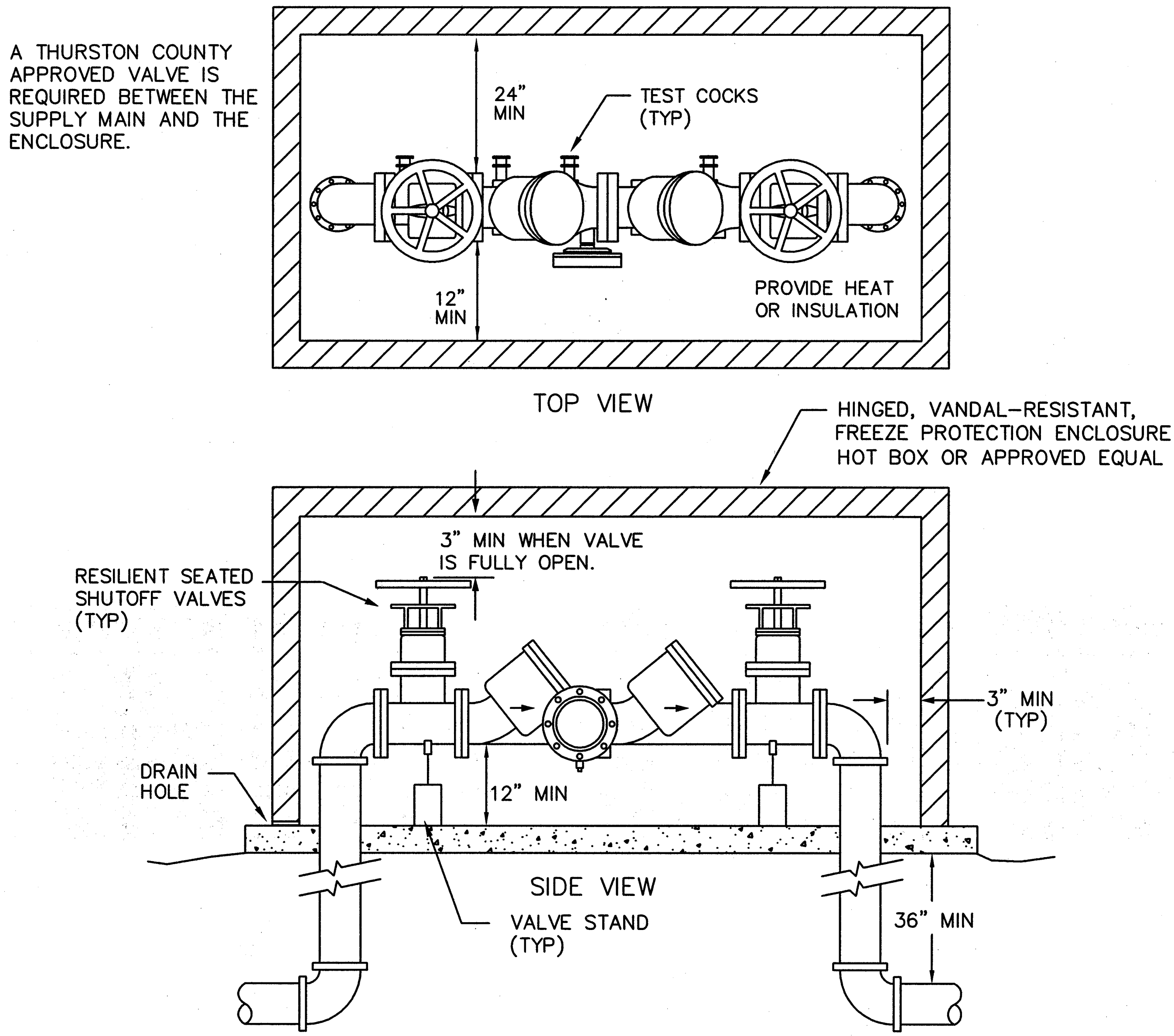
1. BACKFLOW ASSEMBLY SHALL BE WASHINGTON STATE DEPT. OF HEALTH APPROVED MODEL.
2. THE BACKFLOW ASSEMBLY SHALL BE TESTED AFTER INSTALLATION AND PRIOR TO ACCEPTANCE BY A CERTIFIED BACKFLOW ASSEMBLY TESTER. ANNUAL TESTING IS REQUIRED THEREAFTER. TEST RESULTS SHALL BE SENT TO THURSTON COUNTY DEPT. OF WATER AND WASTE MANAGEMENT.
3. ALL MATERIALS TO BE BRASS OR COPPER AS APPROVED BY THURSTON COUNTY.
4. THE BACKFLOW ASSEMBLY SHALL BE PROTECTED FROM FREEZING AND FLOODING.
5. FINISHED SLAB SHALL BE SLOPED TO DRAIN.
6. ALL VAULTS SHALL BE PRE-APPROVED PRIOR TO INSTALLATION.

N.T.S.

1/2"-2" PVBA/SVBA BACKFLOW PREVENTER

APPR. DATE:		FIG NO:	WA-09

THURSTON COUNTY WATER STANDARD DETAIL



ABOVE GROUND INSTALLATION

NOTES:

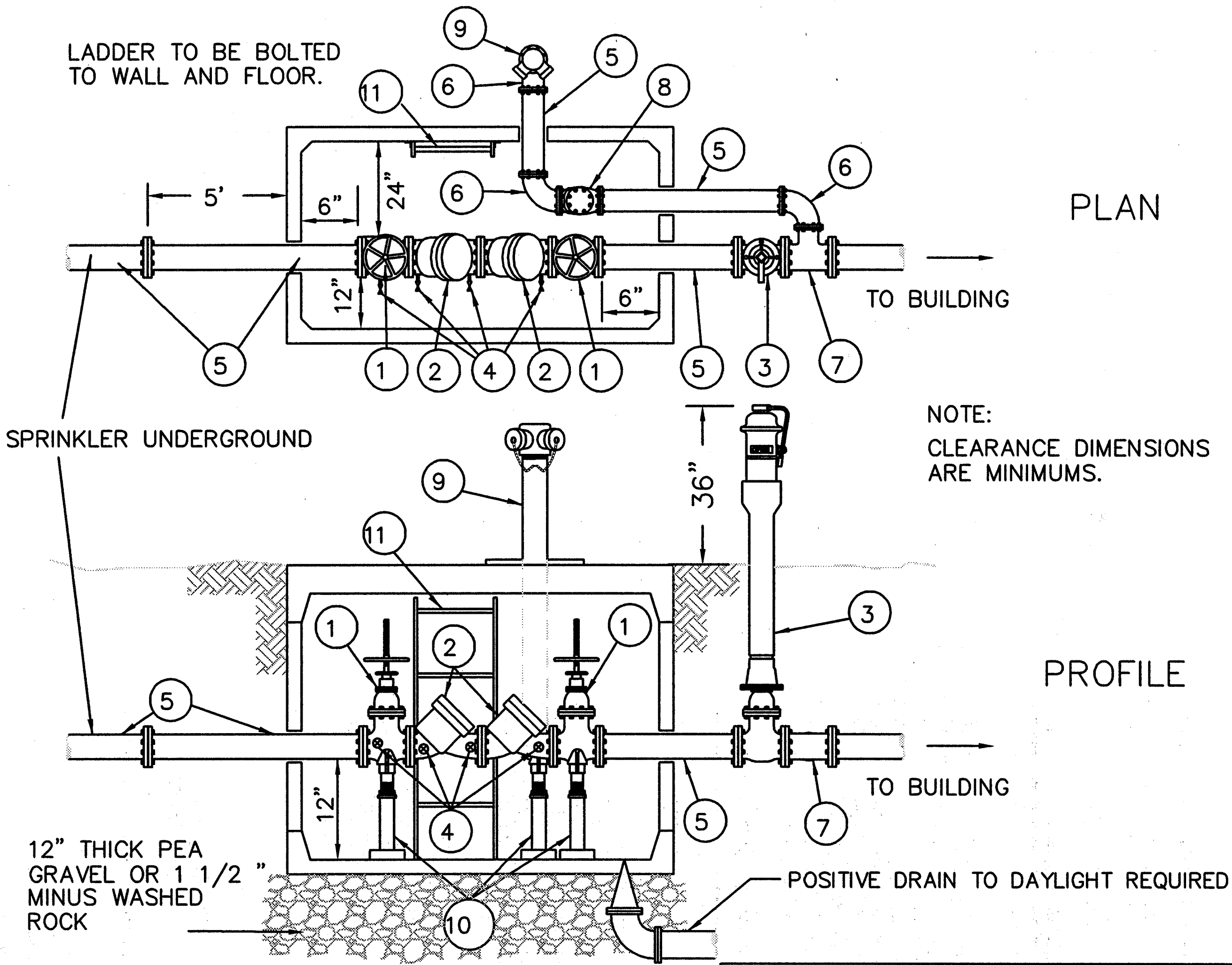
1. BACKFLOW ASSEMBLY SHALL BE A WASHINGTON STATE DEPT. OF HEALTH APPROVED MODEL.
2. APPROVED BACKFLOW ASSEMBLY TO LAY HORIZONTAL ONLY.
3. THE BACKFLOW ASSEMBLY SHALL BE TESTED AFTER INSTALLATION AND PRIOR TO ACCEPTANCE BY A CERTIFIED BACKFLOW ASSEMBLY TESTER. ANNUAL TESTING IS REQUIRED THEREAFTER. TEST RESULTS SHALL BE SENT TO THURSTON COUNTY DEPT. OF WATER AND WASTE MANAGEMENT.
4. ALL PIPE, VALVE, AND FITTING JOINTS FROM THE SUPPLY MAIN, SHALL BE FLANGED AND RESTRAINED.
5. THE WATER LINE SHALL BE DISINFECTED, FLUSHED, AND PRESSURE TESTED PRIOR TO INSTALLING THE BACKFLOW ASSEMBLY.
6. THE BACKFLOW ASSEMBLY SHALL BE PROTECTED FROM FREEZING AND FLOODING.
7. SEAL PIPE ENTRANCE AND EXIT, THROUGH ENCLOSURE, SO AS TO BE WATER TIGHT.
8. ALL ENCLOSURES SHALL BE PRE-APPROVED BY THE COUNTY, PRIOR TO INSTALLATION.
9. ENCLOSURES SHALL BE INSTALLED AT PROPERTY LINE ON OWNERS SIDE.
10. ENCLOSURES SHALL HAVE A MINIMUM OF 3' CLEARANCE FROM ALL STRUCTURES.
11. VALVE STANDS SHALL BE INSTALLED ACCORDING TO MANUFACTURERS RECOMMENDATIONS.
12. TEST COCKS SHALL BE LOCATED SO AS TO FACILITATE ACCESS.

N.T.S.

STANDARD REDUCED PRESSURE BACKFLOW ASSEMBLY 3" OR LARGER

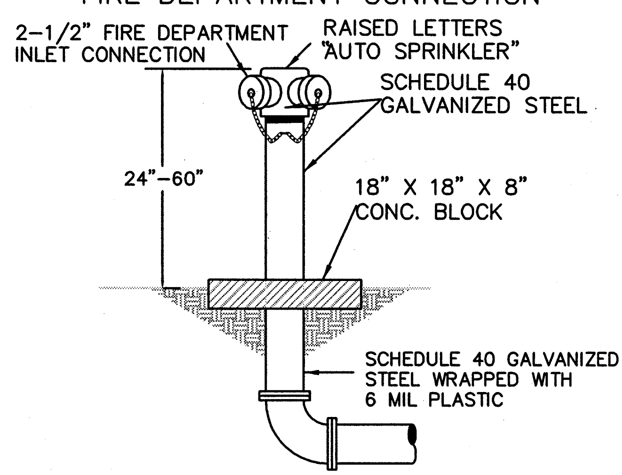
APPR. DATE:		FIG NO: WA-10

THURSTON COUNTY WATER STANDARD DETAIL



NOTE:
CLEARANCE DIMENSIONS ARE MINIMUMS.

FIRE DEPARTMENT CONNECTION



MATERIAL LIST:

1. OS&Y GATE VALVE W/HANDWHEEL FL X FL
2. DSHS APPROVED CHECK VALVE FL X FL
3. POST INDICATOR VALVE
4. TEST COCK – 4 REQUIRED
5. CLASS 52 DI WALL PIPE FL X FL
6. CLASS 52 DI 90° BEND FL X FL
7. CLASS 52 DI TEE FL X FL
8. SWING CHECK VALVE W/BALL DRIP ASSEMBLY
9. FIRE DEPARTMENT CONNECTION
10. VALVE STANDS
11. LADDER

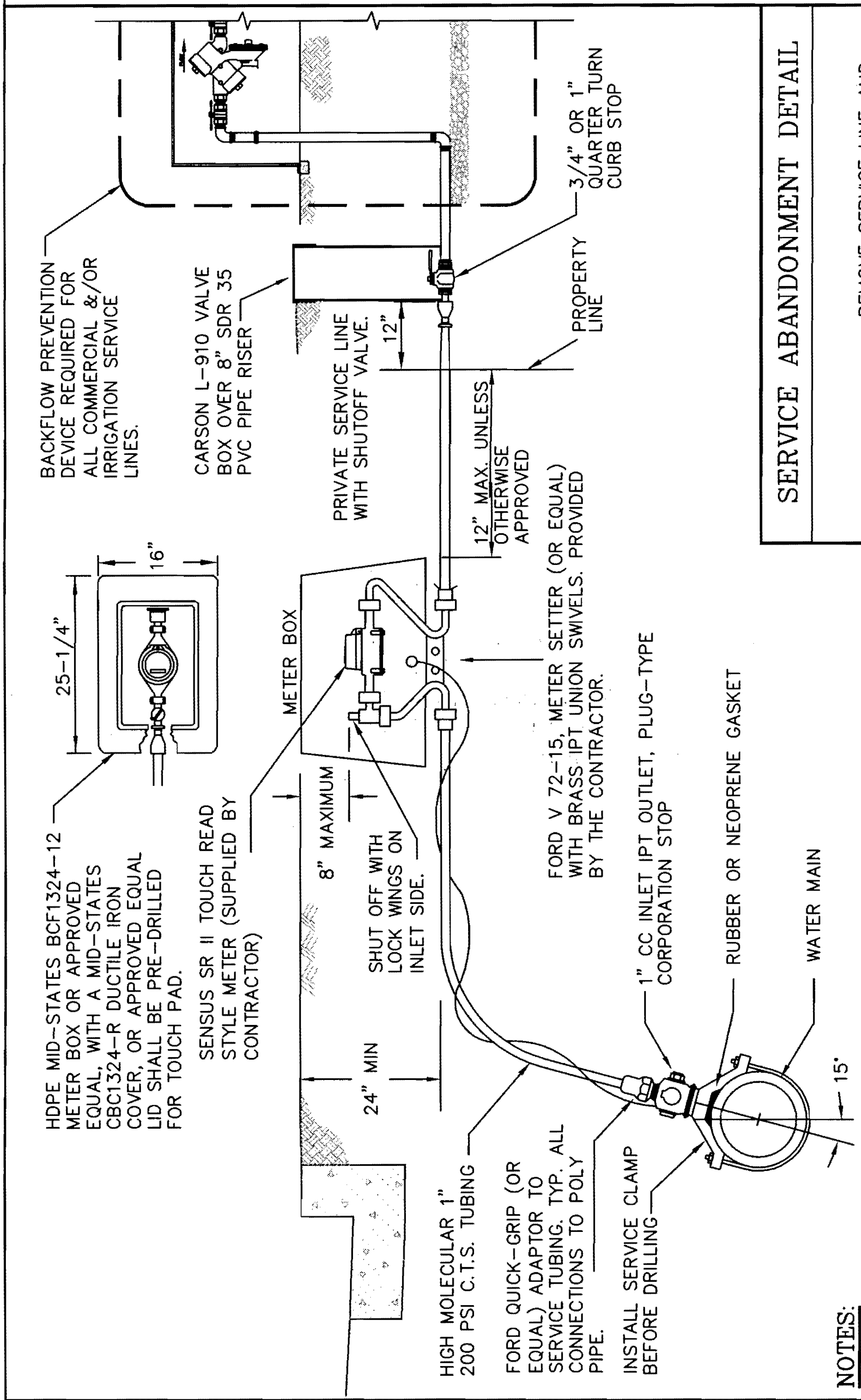
GENERAL NOTES:

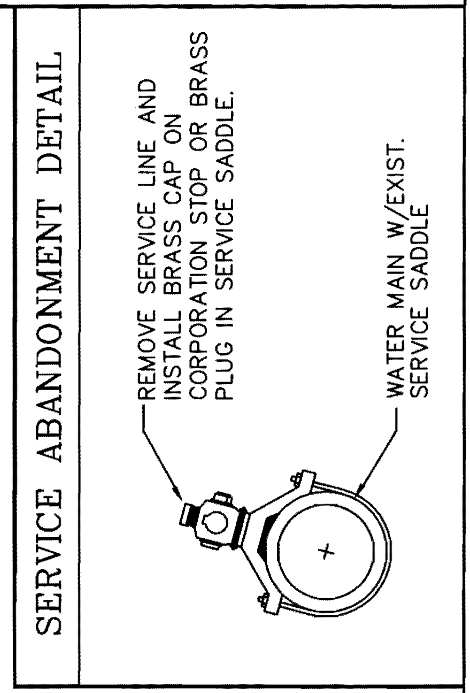
1. THOROUGHLY FLUSH LINES PRIOR TO INSTALLING BACK FLOW ASSEMBLY.
2. PIPE FROM VAULT TO BUILDING SHALL BE CLASS 52 DI.
3. TAMPER SWITCHES SHALL BE INSTALLED ON 1 AND 3 CONNECTED TO BUILDING FIRE ALARM SYSTEM.
4. WHERE PIPING PASSES THROUGH CONCRETE WALL PROVIDE 2" CLEARANCE W/ WATERPROOF MASTIC OR FLEXIBLE SEALANT
5. DIAMETER OF PIPE AND FITTINGS TO BE DETERMINED BY CERTIFIED SPRINKLER DESIGNER.
6. ALL PIPING SHALL BE A MINIMUM OF 4" DIA. AS PER NFPA13.
7. ALL VAULTS SHALL BE EQUIPPED WITH A DRAIN TO DAYLIGHT OR BE INSTALLED ABOVE GROUND.
8. ALL FIRE SPRINKLER LINES UP TO THE FIRST VALVE ON THE DCVA SHALL BE DISINFECTED, PRESSURE TESTED, FLUSHED AND TESTED FOR PURITY PER

SINGLE SERVICE DOUBLE CHECK VALVE ASSEMBLY W/FDC

APPR. DATE:		FIG NO:	WA-11

THURSTON COUNTY WATER STANDARD DETAIL





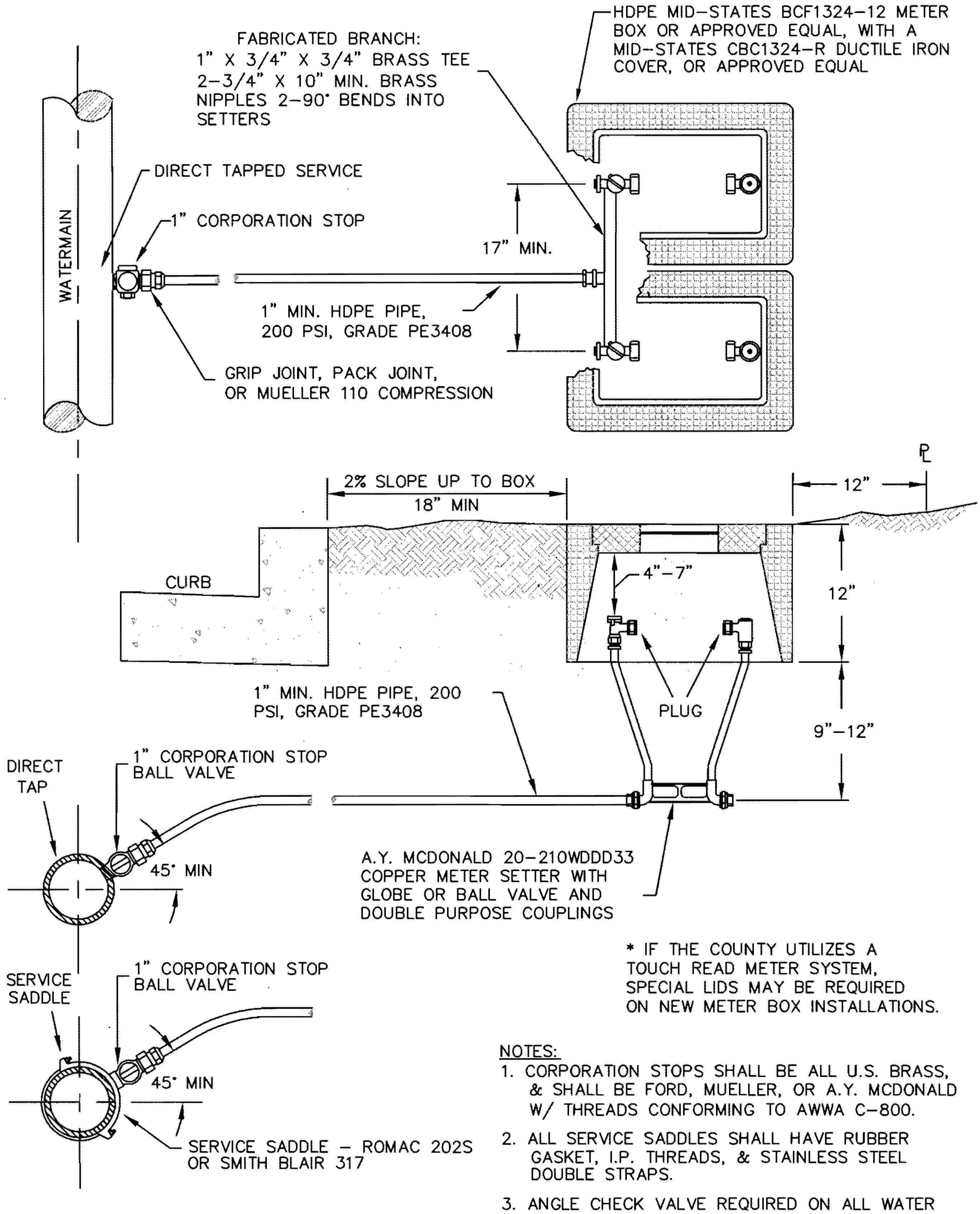
NOTES:

1) SERVICE CLAMPS SHALL BE DOUBLE STRAP. DIRECT TAPS ARE NOT ALLOWED.
2) DOUBLE-INSULATED No. 12 AWG COPPER TRACER WIRE SPLICED TO MAINLINE TRACER WIRE W/DIRECT BURY SPLICE KIT REQ'D ON ALL SERVICE LINES.
3) ALL SERVICE LINE FITTINGS SALL BE BRASS.
4) METER BOX LID MUST ACCOMMODATE TOUCH PAD. SPECIAL LIDS MAY BE REQUIRED.
5) ANGLE CHECK VALVE REQUIRED ON ALL WATER METER OUTLETS

TYPICAL 3/4" & 1" WATER SERVICE AND METER SETTER PLACEMENT

APPR. DATE:		FIG NO: WA-12

THURSTON COUNTY WATER STANDARD DETAIL



* IF THE COUNTY UTILIZES A TOUCH READ METER SYSTEM, SPECIAL LIDS MAY BE REQUIRED ON NEW METER BOX INSTALLATIONS.

NOTES:

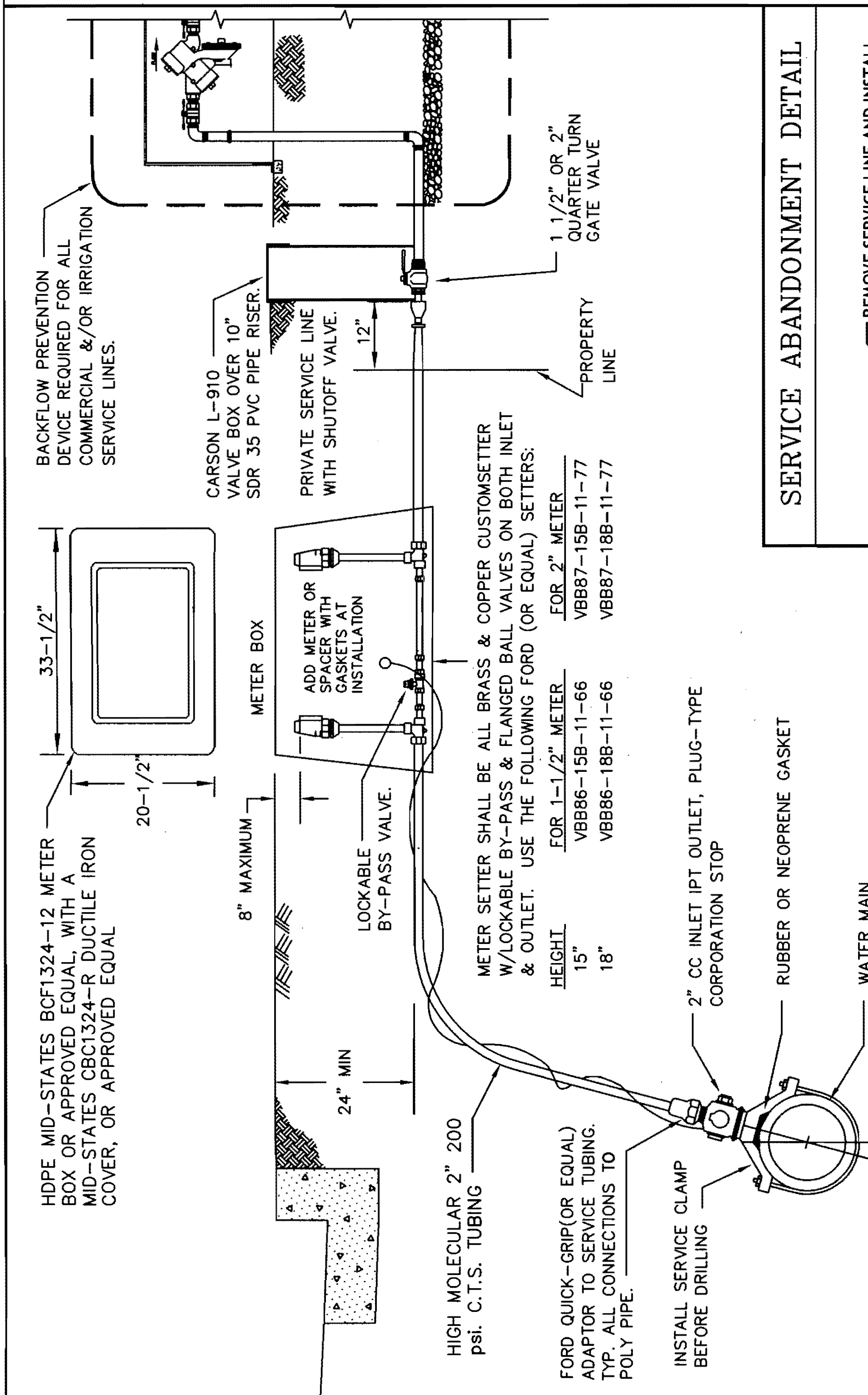
1. CORPORATION STOPS SHALL BE ALL U.S. BRASS, & SHALL BE FORD, MUELLER, OR A.Y. MCDONALD W/ THREADS CONFORMING TO AWWA C-800.
2. ALL SERVICE SADDLES SHALL HAVE RUBBER GASKET, I.P. THREADS, & STAINLESS STEEL DOUBLE STRAPS.
3. ANGLE CHECK VALVE REQUIRED ON ALL WATER METER OUTLETS

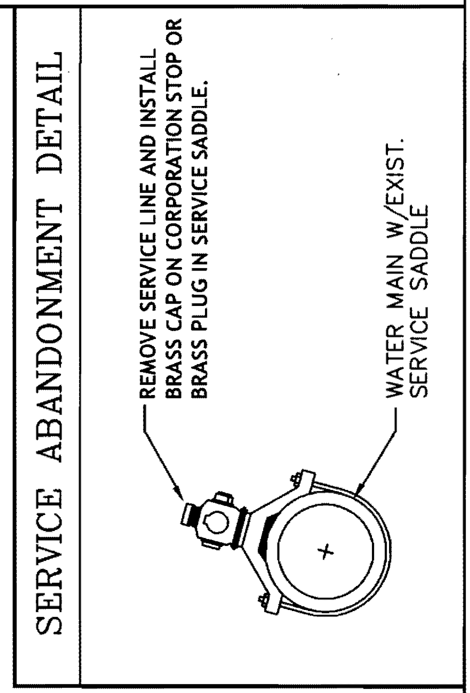
N.T.S.

1" DUAL WATER SERVICE

APPR. DATE:		FIG NO: WA-13

THURSTON COUNTY WATER STANDARD DETAIL





15°

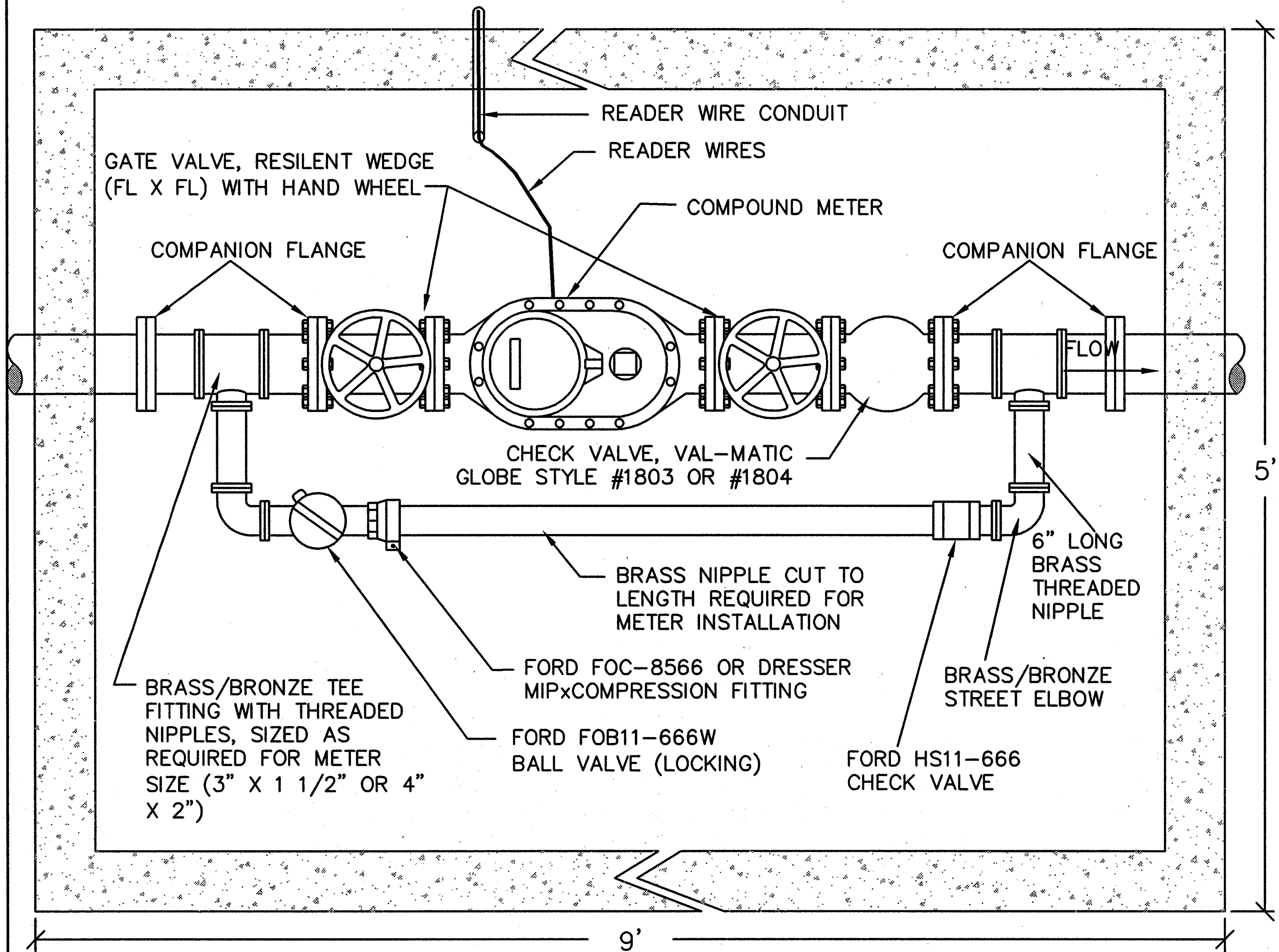
NOTES:

1) SERVICE CLAMPS SHALL BE DOUBLE STAINLESS STRAP FOR 1-1/2" AND 2" SERVICES. DIRECT TAPS ARE NOT ALLOWED.
2) DOUBLE-INSULATED No. 12 AWG COPPER TRACER WIRE SPLICED TO MAINLINE TRACER WIRE W/DIRECT BURY SPLICE KIT REQ'D ON ALL SERVICE LINES.
3) ALL SERVICE LINE FITTINGS SALL BE BRASS.
4) ANGLE CHECK VALVE REQUIRED ON ALL WATER METER OUTLETS

TYPICAL 1-1/2" & 2" WATER SERVICE & METER SETTER PLACEMENT

APPR. DATE:		FIG NO:	WA-14

THURSTON COUNTY WATER STANDARD DETAIL



PLAN VIEW

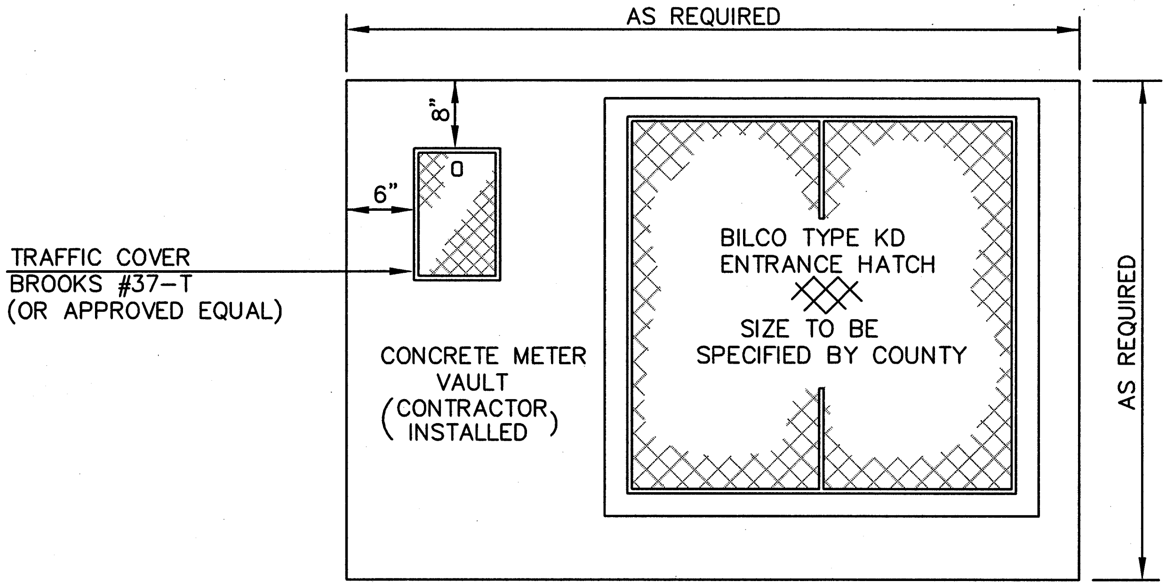
GENERAL NOTES:

1. 3" METERS SHALL HAVE 3" PLUMBING AND 1 1/2" BYPASS PLUMBING.
2. 4" METERS SHALL HAVE 4" PLUMBING AND 2" BYPASS PLUMBING.
3. A MINIMUM OF 10 PIPE DIAMETERS OF STRAIGHT UNOBSTRUCTED PIPE SHALL BE REQUIRED UPSTREAM OF THE INSTALLED METER.
4. THE METER BOX PIT SHALL BE BEDDED WITH 6" DEPTH OF CRUSHED ROCK.
5. USE CONCRETE UTILITY VAULT SIZED ACCORDINGLY WITH TRAFFIC RATED HINGED ACCESS HATCH(S) AND READER LID. VAULT SHALL HAVE CONCRETE BOTTOM WITH DRAIN HOLE. INSIDE DEPTH SHALL NOT EXCEED 4'.
6. BYPASS AND GLOBE STYLE CHECK VALVE NOT REQUIRED FOR IRRIGATION ONLY INSTALLATION.
7. ALL PLUMBING SHALL BE SUPPORTED BY ADJUSTABLE JACK STANDS. THESE STANDS SHALL BE PLACED IN FOUR LOCATIONS TO PROVIDE THE INSTALLATION WITH A FIRM SUPPORT.
8. REMOTE READER ABOVE GROUND BOX SHALL BE INSTALLED. ALLIED MOLDED PRODUCTS # 1056 W/ READER WINDOW.
9. REMOTE METER READER BOX SHALL BE MOUNTED A MIN. 3' ABOVE GROUND ON A 1–1/2" GALVANIZED UNISTRUT POST SET IN CONCRETE.
10. INSTALL 3/4" PVC ELECTRICAL CONDUIT FROM METER VAULT TO REMOTE READER BOX.

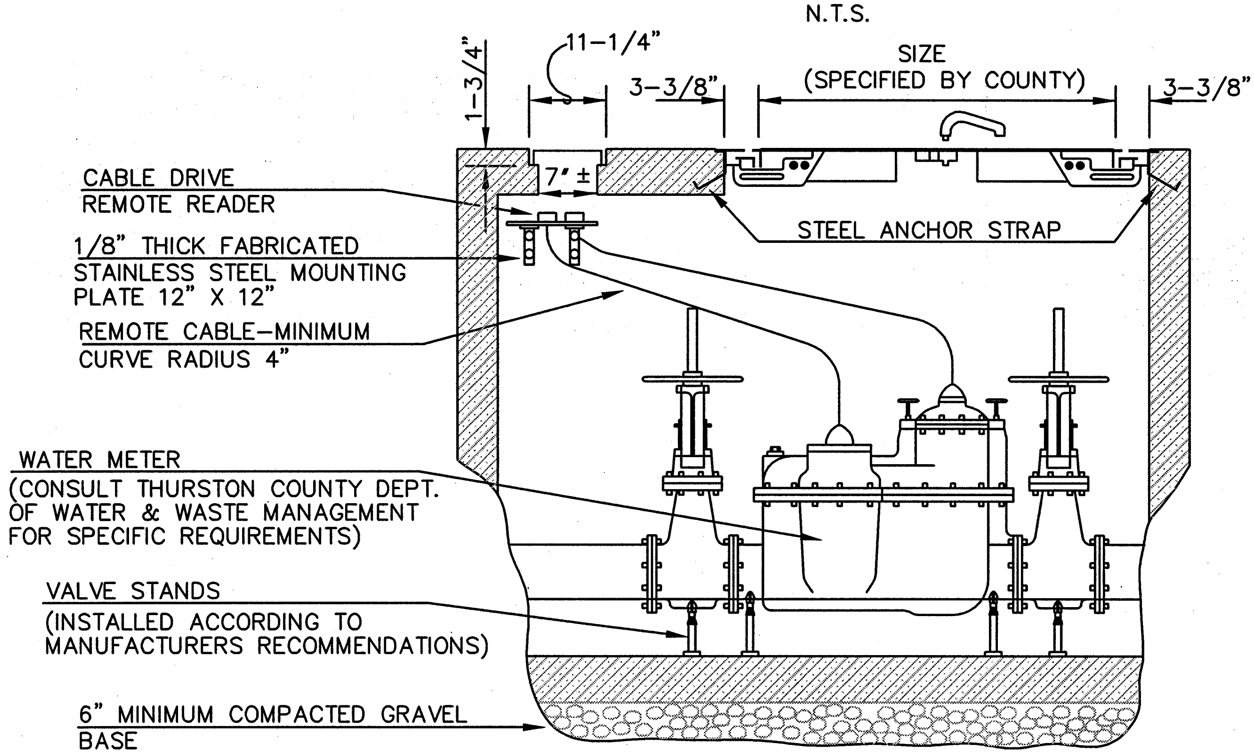
STANDARD PLUMBING CONFIGURATION FOR 3" & 4" METERS

APPR. DATE:		FIG NO: WA-15

THURSTON COUNTY WATER STANDARD DETAIL



PLAN VIEW
N.T.S.



ELEVATION VIEW
N.T.S.

NOTES:

1-VAULT SHALL BE DESIGNED BY A STRUCTURAL ENGINEER LICENSED IN THE STATE OF WASHINGTON

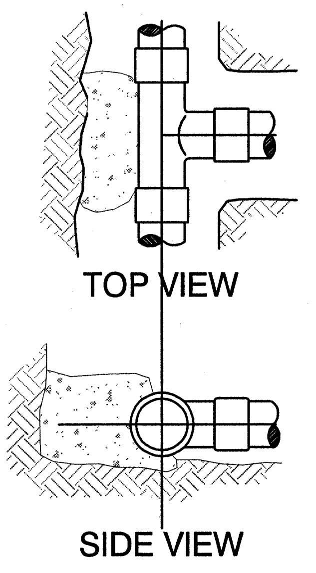
2-MOUNTING PLATE TO BE INSTALLED BY CONTRACTOR SO THAT ALL READING REGISTERS ARE VISIBLE THROUGH TRAFFIC COVER, AND CABLE(S) DO NOT INTERFERE WITH ACCESS TO METER.

N.T.S.

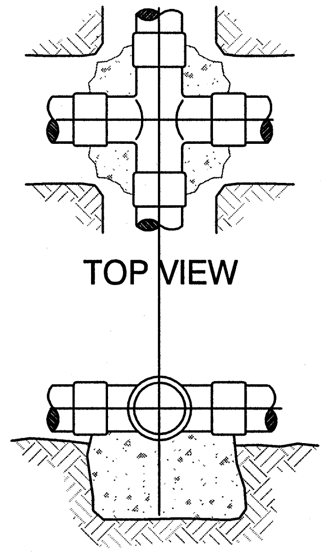
LARGE METER VAULT

APPR. DATE:		FIG NO: WA-16

THURSTON COUNTY WATER STANDARD DETAIL

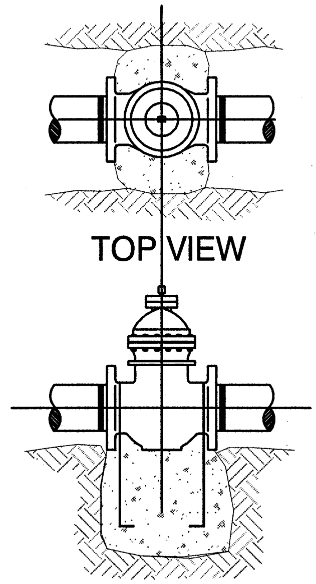


TEE



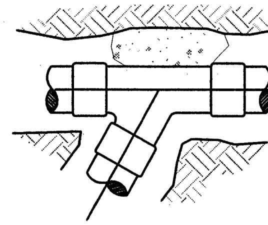
SIDE VIEW

CROSS

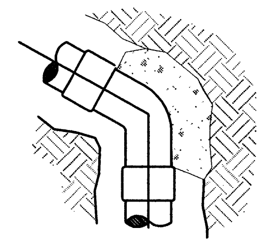


SIDE VIEW

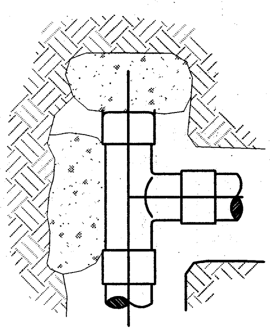
GATE VALVE



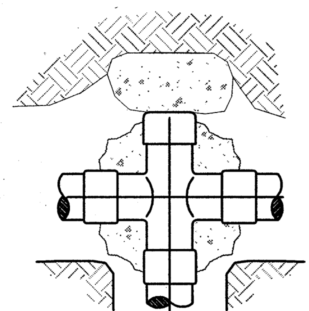
WYE



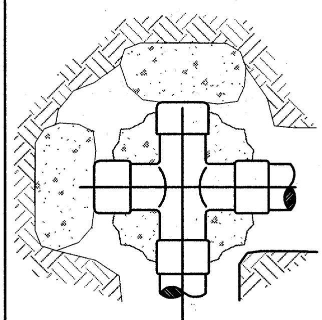
HORIZ. BEND



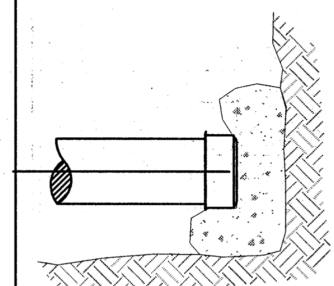
TEE WITH PLUG



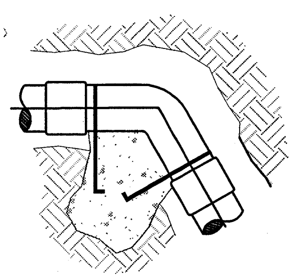
CROSS WITH PLUG



CROSS WITH PLUGS



PLUG OR CAP



45° - 90° VERTICAL BEND

NOTES:

1. CONCRETE THRUST BLOCKING TO BE POURED AGAINST UNDISTURBED EARTH.
2. 11 MIL PLASTIC BARRIER SHALL BE PLACED BETWEEN ALL CONC THRUST BLOCKS & FITTINGS.
3. ANCHOR REBAR SHALL BE #5 ON 12" DIA AND LESS IMBEDDED 30", #5 ON 16"-24" DIAMETER IMBEDDED 36".
4. PLUGS TO BE MINIMUM OF 5' FROM TEE, WYE, CROSS ON VALVE.

STANDARD BLOCKING DETAIL

APPR. DATE:		FIG NO:	WA-17

THURSTON COUNTY WATER STANDARD DETAIL

NOTES:

1. BLOCKING SHALL BE CEMENT CONCRETE CLASS "B" POURED IN PLACE AGAINST UNDISTURBED EARTH. FITTING SHALL BE ISOLATED FROM CONCRETE THRUST BLOCK WITH 11 MIL PLASTIC OR SIMILAR MATERIAL.

2. KEEP CONCRETE CLEAR OF JOINTS AND ACCESSORIES.

3. THE REQUIRED THRUST BEARING AREAS FOR SPECIAL CONNECTIONS ARE SHOWN ENCIRCLED ON THE PLANS; e.g. 15 INDICATES 15 SQUARE FEET BEARING AREA REQUIRED.

4. IF NOT SHOWN ON PLANS REQUIRED BEARING AREAS AT FITTINGS SHALL BE PRESSURE(S) AND ALLOWABLE SOIL BEARING STRESS(ES) STATED IN THE SPECIAL SPECIFICATIONS.

5. BEARING AREAS AND SPECIAL BLOCKING DETAILS SHOWN ON PLANS TAKE PRECEDENCE OVER BEARING AREAS AND BLOCKING DETAILS SHOWN ON THIS STANDARD DETAIL.

BEARING AREA OF THRUST BLOCKS IN SQ. FT.

FITTING SIZE	TEE, WYE PLUG OR CAP	90° BEND PLUGGED CROSS	TEE PLUGGED ON RUN		45° BEND	22-1/2° BEND	11-1/4° BEND
			A_1	A_2			
4"	1.0	1.4	1.9	1.4	1.0		
6"	2.1	3.0	4.3	3.0	1.6	1.0	
8"	3.8	5.3	7.6	5.4	2.9	1.5	1.0
10"	5.9	8.4	11.8	8.4	4.6	2.4	1.2
12"	8.5	12.0	17.0	12.0	6.6	3.4	1.7
14"	11.5	16.3	23.0	16.3	8.9	4.6	2.3
16"	15.0	21.3	30.0	21.3	11.6	6.0	3.0
12"	19.0	27.0	38.0	27.0	14.6	7.6	3.8
14"	23.5	33.0	47.0	33.0	18.1	9.4	4.7
16"	34.0	48.0	68.0	48.0	26.2	13.6	6.8

NOTE:

ABOVE BEARING BASED ON TEST PRESSURE OF 150 psi AND AN ALLOWABLE SOIL BEARING STRESS OF 2,00 POUNDS PER SQUARE FOOT. TO COMPUTE BEARING AREAS FOR DIFFERENT TEST PRESSURE AND SOIL BEARING STRESSES. USE STANDARD PLAN WA-16

THRUST BLOCK AREAS

APPR. DATE:		FIG NO:	WA-18

THURSTON COUNTY WATER STANDARD DETAIL

THRUST LOADS

THRUST AT FITTINGS IN POUNDS AT 200 POUNDS PER SQUARE INCH OF WATER PRESSURE

PIPE DIAMETER	90° BEND	45° BEND	22-1/2° BEND	11-1/4° BEND	DEAD END OR TEE
4"	3,600	2,000	1,000	500	2,600
6"	8,000	4,400	2,300	1,200	5,700
8"	14,300	7,700	4,000	2,000	10,100
10"	22,300	12,100	6,200	3,100	15,800
12"	32,000	17,400	8,900	4,500	22,700
14"	43,600	23,600	12,100	6,100	30,800
16"	57,000	30,800	15,700	7,900	40,300

NOTES:

1. BLOCKING SHALL BE CEMENT CONCRETE CLASS "B" POURED IN PLACE AGAINST UNDISTURBED EARTH. FITTING SHALL BE ISOLATED FROM CONCRETE THRUST BLOCK WITH 11 MIL PLASTIC OR SIMILAR MATERIAL.

2. TO DETERMINE THE BEARING AREA OF THE THRUST BLOCK IN SQUARE FEET (S.F.):
EXAMPLE : 12" – 90° BEND IN SAND AND GRAVEL 32,000 LBS 3000 LB/S.F. = 10.7 S.F. OF AREA

3. AREAS MUST BE ADJUSTED FOR OTHER PIPE SIZE, PRESSURES AND SOIL CONDITIONS.

4. BLOCKING SHALL BE ADEQUATE TO WITHSTAND FULL TEST PRESSURE AS WELL AS TO CONTINUOUSLY WITHSTAND OPERATING PRESSURE UNDER ALL CONDITIONS OF SERVICE.

SAFE SOIL BEARING LOADS

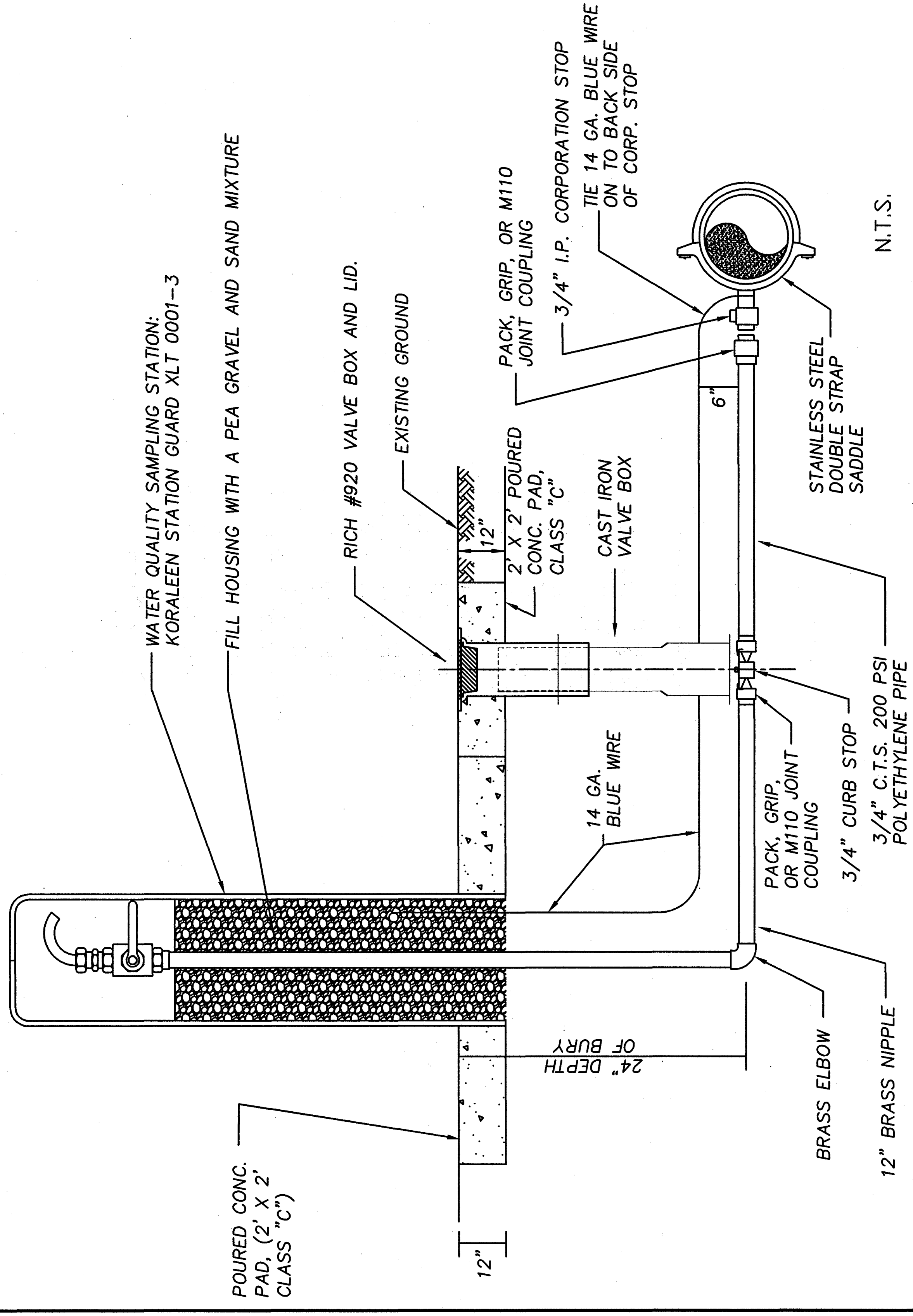
FOR HORIZONTAL THRUSTS WHEN THE DEPTH OF COVER OVER THE PIPE EXCEEDS 2 FEET

SOIL	POUNDS PER SQUARE FOOT
MUCK, PEAT	0
SOFT CLAY	1,000
SAND	2,000
SAND & GRAVEL	3,000
SAND & GRAVEL CEMENTED WITH CLAY	4,000
HARD SHALE	10,000

THRUST LOADS

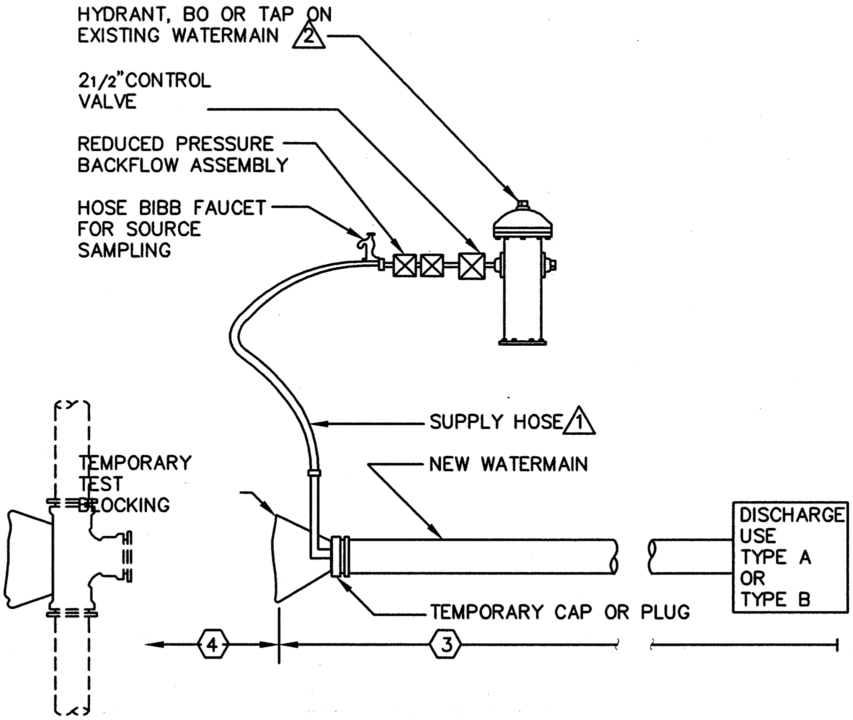
APPR. DATE:		FIG NO:	WA-19

THURSTON COUNTY WATER STANDARD DETAIL



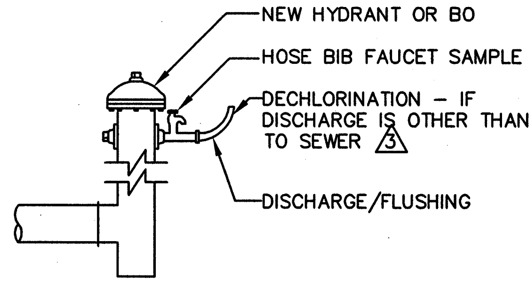
WATER QUALITY SAMPLING STATION

APPR. DATE:	REFER:	FIG NO: WA-20

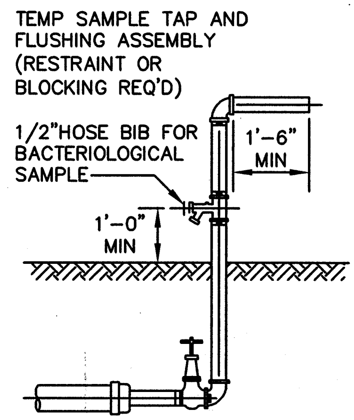


DETAIL 1

TEMPORARY FLUSHING/TESTING CONNECTION



TYPE A



TYPE B

NOTES

1. ALL FITTINGS SHALL BE DUCTILE IRON
2. ALL EXCAVATION SHALL PROVIDE A MINIMUM OF 1'–0" CLEAR AROUND PIPE AND FITTINGS.
3. THESE PLANS ARE FOR DIP AND CIP WATERMAINS 12"OR SMALLER DIA OTHER SIZES AND TYPES SEE PROJECT DRAWINGS
4. REDUCED PRESSURE BACKFLOW ASSEMBLY (RPBA) SHALL BE INSTALLED AS A UNIT (TWO SHUT–OFF VALVES, RELIEF PORT, TWO CHECK VALVES AND FOUR TEST COCKS). WHEN RPBA IS CONNECTED TO HYDRANT AND THE HOSE BIB FAUCET SAMPLE THEY SHALL BE CAPPED WHEN NOT IN USE. ASSEMBLY SHALL BE TESTED WHEN INSTALLED BY A WASHINGTON STATE CERTIFIED BACKFLOW ASSEMBLY TESTER (BAT) AND A CURRENT TEST REPORT SHALL BE ON SITE. FOR INSTALLATION PROCEDURES CALL THE THURSTON COUNTY DEPARTMENT OF WATER & WASTE MANAGEMENT, UTILITY SECTION.

LEGEND

⚠1 CLEAN & DISINFECTED POTABLE WATER HOSE ONLY. SIZE FLUSHING RISER PER STD SPEC SEC 7–091.3(23)

⚠2 HYDRANT PERMIT REQUIRED

⚠3 CHECK WITH SEWER UTILITY BEFORE DISCHARGE TO SEWERS

⟨3⟩ INSTALLED BY CONTRACTOR

⟨4⟩ CONNECTION PIPE: CONTRACTOR FURNISHED AND INSTALLED

WATER TESTING – CHARGING & FLUSHING

APPR. DATE:		FIG NO:	WA-21

DEVELOPMENT STANDARDS FOR
WATER AND SEWER SYSTEMS
THURSTON COUNTY, WASHINGTON

APPENDIX B

Standard Details – Sanitary Sewer

DEVELOPMENT STANDARDS FOR
WATER AND SEWER SYSTEMS
THURSTON COUNTY, WASHINGTON

Sanitary Sewer Standards

List of Standard Details

TITLE	**DRAWING**
Type 1 Manhole	SS-01
Shallow Manhole	SS-02
Manhole Collar	SS-03
Drop Connection	SS-04
Cleanout	SS-05
Sanitary Sewer Lateral Service Connection	SS-06
Air Release Assembly	SS-07
Standard Blocking Detail	SS-08
Thrust Loads	SS-09
Pigg Port Cross Section	SS-10
Pigg Port Plan View	SS-11
Terminus Pigg Launch Port	SS-12
1000 and 1500 Gallon S.T.E.P. Tank	SS-13
S.T.E.P. System Air Release Assembly	SS-14
Typical S.T.E.P. Air Release Manifold Connection Plan View	SS-15
Typical S.T.E.P. Air Release Manifold Connection Section View	SS-16
Cycle Counter, Mounted on Meter Box Wall	SS-17
Typical STEP Main/Force Main Gate Valve 2" or Greater	SS-18
Commercial/Multi-Family S.T.E.P. System Electrical Cabinet Layout	SS-19
Typical Riser Conduit Plan for Commercial/Multi-Family STEP Systems	SS-20
Vacuum Sewer Valve Pit in Narrow R/W	SS-21
Vacuum Sewer Valve Pit with 1 and 2 Connections	SS-22
Vacuum Sewer Valve Pit Prior to Home Hookup	SS-23
Vacuum Sewer Valve Pit After Home Hookup	SS-24
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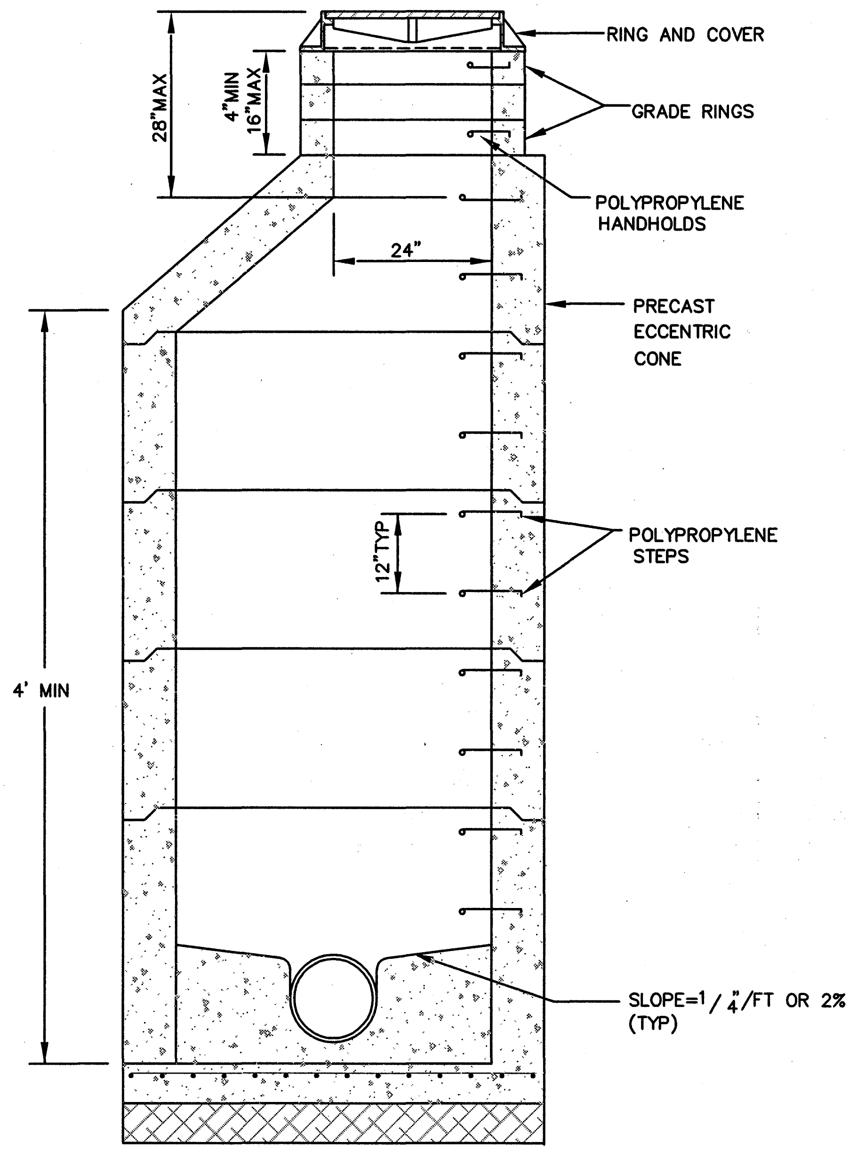
Vacuum Sewer Valve Pit Details	SS-28
Vacuum Sewer Valve Pit Details	SS-29
Vacuum Sewer Valve Pit Details	SS-30
Vacuum Sewer Connections	SS-31
Vacuum Sewer Connections	SS-32

THURSTON COUNTY SANITARY SEWER STANDARD DETAIL



GENERAL NOTES:

THIS DETAIL OUTLINES THURSTON COUNTY MODIFICATIONS TO THE WSDOT TYPE 1 48 INCH, 50 INCH, AND 60 INCH MANHOLE.

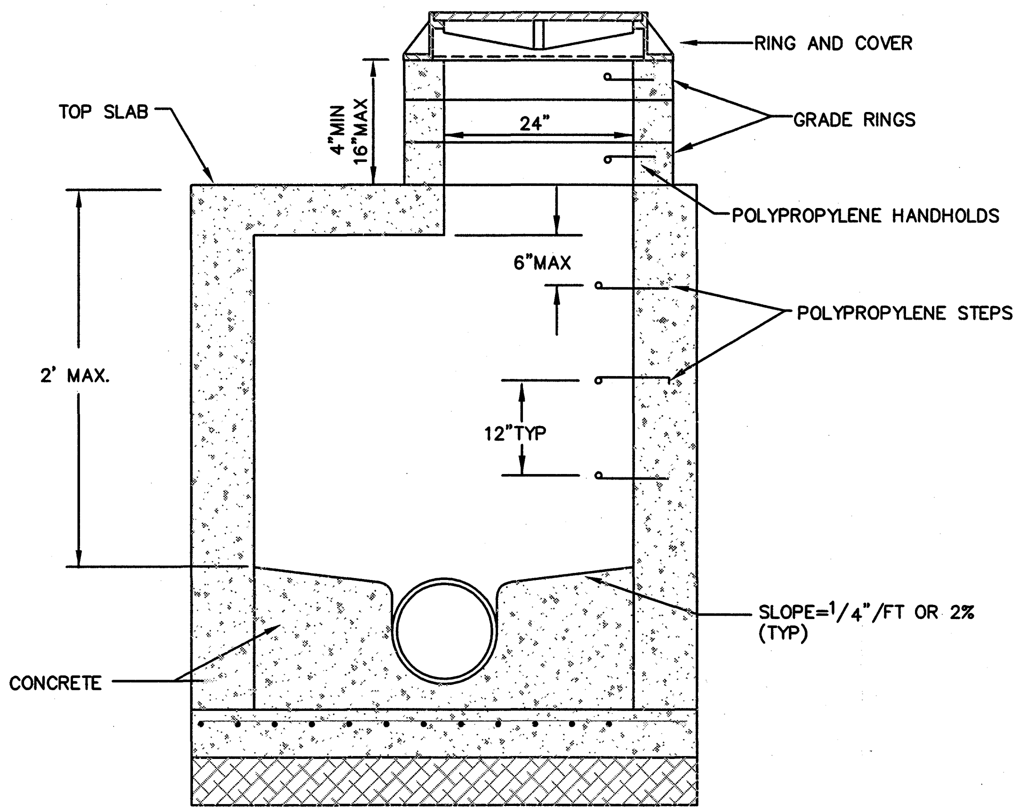
NOTES:

1. PRECAST MANHOLES SHALL MEET THE REQUIREMENTS OF ASTM C478. JOINTS SHALL BE RUBBER GASKETED, CONFORMING TO ASTM C443 AND SHALL BE GROUTED FROM THE INSIDE. LIFT HOLES SHALL BE GROUTED FROM THE OUTSIDE AND THE INSIDE OF THE MANHOLE.
2. THE FIRST STEP OR HANDHOLD SHALL BE A MAXIMUM OF 12" FROM THE TOP OF THE COVER.
3. CONNECTION TO MANHOLE SHALL BE MADE BY KOR-N-SEAL FITTING ONLY. KOR-N-SEAL SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S SPECIFICATIONS. KNOCKOUTS WILL NOT BE ALLOWED.
4. SEE STANDARD PLAN SS-03 FOR MANHOLE COLLLAR INSTALLATION.
5. A "SEWER GUARD" SHALL BE INSTALLED IN ANY MANHOLE SUBJECT TO FLOODING.

TYPE 1 MANHOLE

APPR. DATE: DATE	REF:	FIG NO:	SS-01

THURSTON COUNTY SANITARY SEWER STANDARD DETAIL



GENERAL NOTES:

THIS DETAIL OUTLINES THE CITY OF OLYMPIA MODIFICATIONS TO THE WSDOT TYPE 3 MANHOLE FOR SHALLOW INSTALLATIONS.

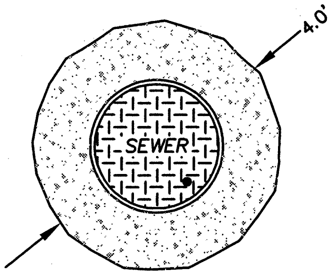
NOTES:

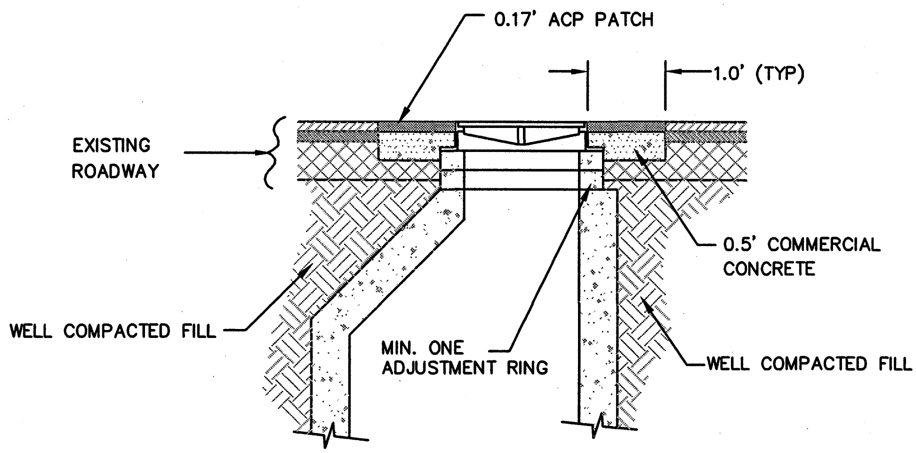
1. PRECAST MANHOLES SHALL MEET THE REQUIREMENTS OF ASTM C478. JOINTS SHALL BE RUBBER GASKETED CONFORMING TO ASTM C443 AND SHALL BE GROUTED FROM THE INSIDE. LIFT HOLES SHALL BE GROUTED FROM THE OUTSIDE AND INSIDE OF THE MANHOLE.
2. THE FIRST STEP OR HANDHOLD SHALL BE A MAXIMUM OF 12" FROM THE TOP OF THE COVER.
3. CONNECTION TO MANHOLE SHALL BE MADE BY KOR-N-SEAL FITTING ONLY. KOR-N-SEAL SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S SPECIFICATIONS. KNOCKOUTS WILL NOT BE ALLOWED.
4. SEE STANDARD PLAN SS-03 FOR MANHOLE COLLAR INSTALLATION.
5. A "SEWER GUARD" AS PRODUCED BY PRECO SHALL BE INSTALLED IN ANY MANHOLE SUBJECT TO FLOODING.

SHALLOW MANHOLE

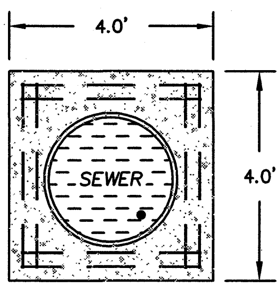
APPR. DATE: DATE	REF:	FIG NO:	SS-02

THURSTON COUNTY SANITARY SEWER STANDARD DETAIL

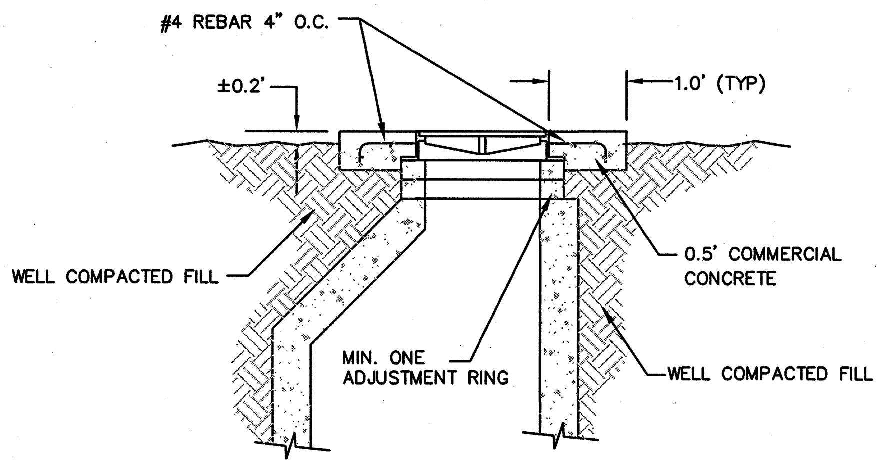




MANHOLE IN ASPHALT



#4 REBAR 4" O.C.



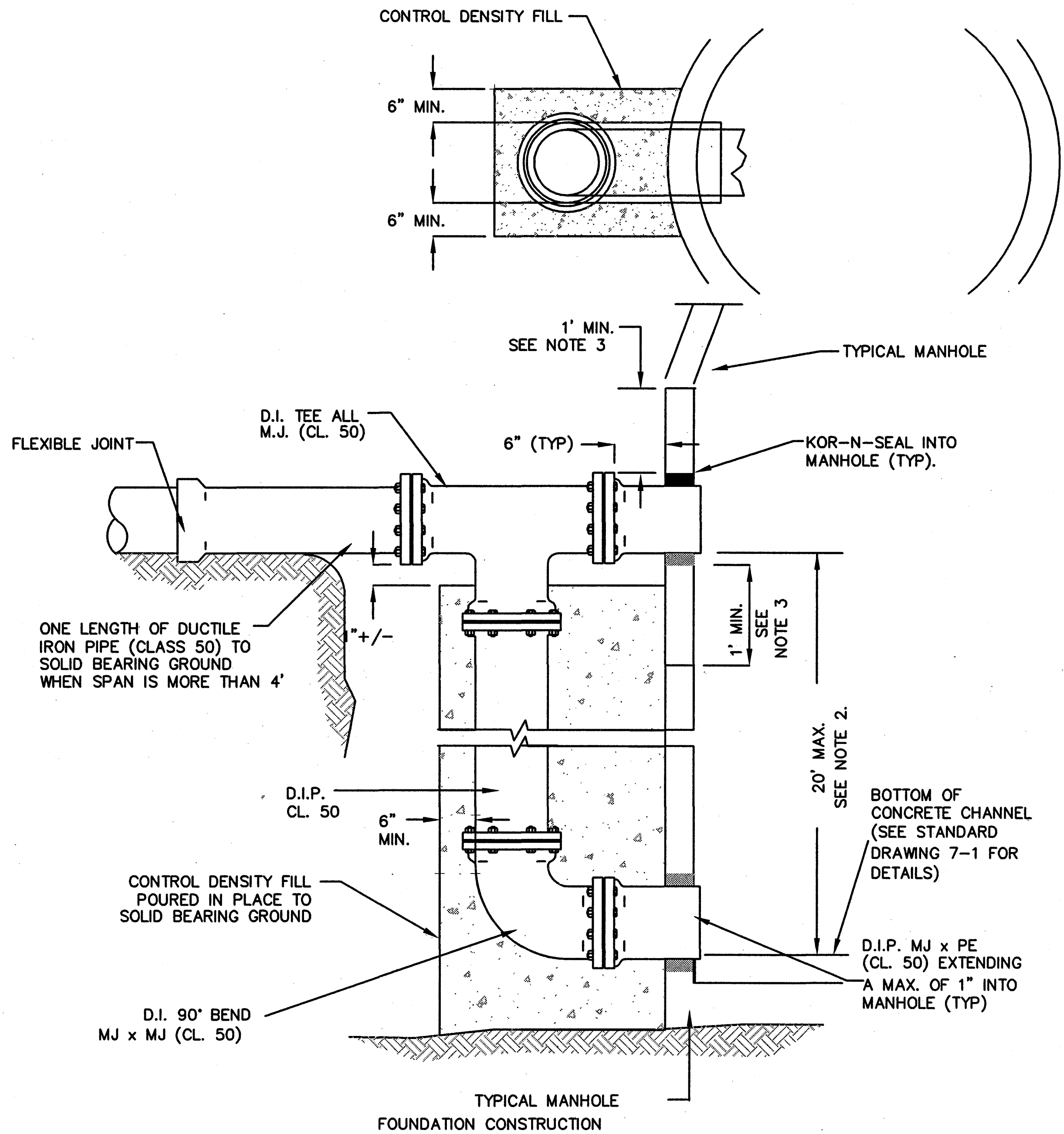
MANHOLE OUTSIDE ASPHALT

NOTE:
1. ON MANHOLE OUTSIDE ASPHALT ADD REINFORCING STEEL AS SHOWN ABOVE. DEFORMED BAR TO MEET ASTM A615 GRADE 60 FY=60,000 P.S.I.
2. OPENING IN LID FOR USE OF MANHOLE HOOK IS REQUIRED.

MANHOLE COLLAR

APPR. DATE: DATE	REF:	FIG NO: SS-03

THURSTON COUNTY SANITARY SEWER STANDARD DETAIL

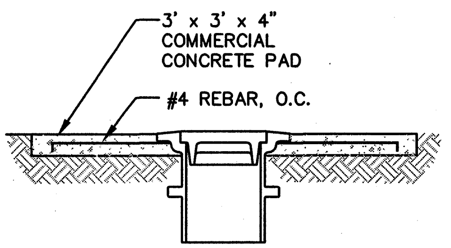


NOTE:
1. THE INTERIOR OF ALL DUCTILE IRON SHALL BE COATED WITH EPOXY, SEWPERCOAT OR TNEMEC 66.
2. DEPTHS OVER 20' MAY BE ALLOWED IF MEGA-LUG JOINTS ARE USED.
3. MAINTAIN A MINIMUM OF 1' BETWEEN MANHOLE JOINTS AND TEE.

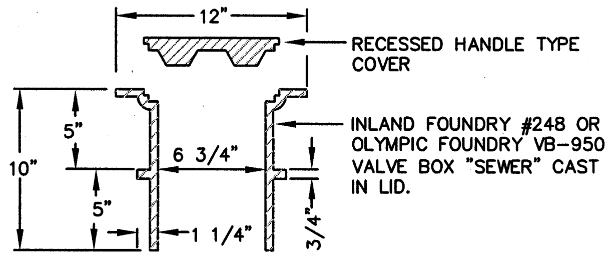
DROP CONNECTION

APPR. DATE: DATE	REF:	FIG NO:	SS-04

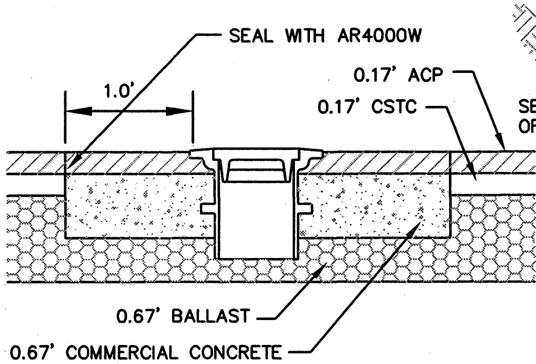
THURSTON COUNTY SANITARY SEWER STANDARD DETAIL



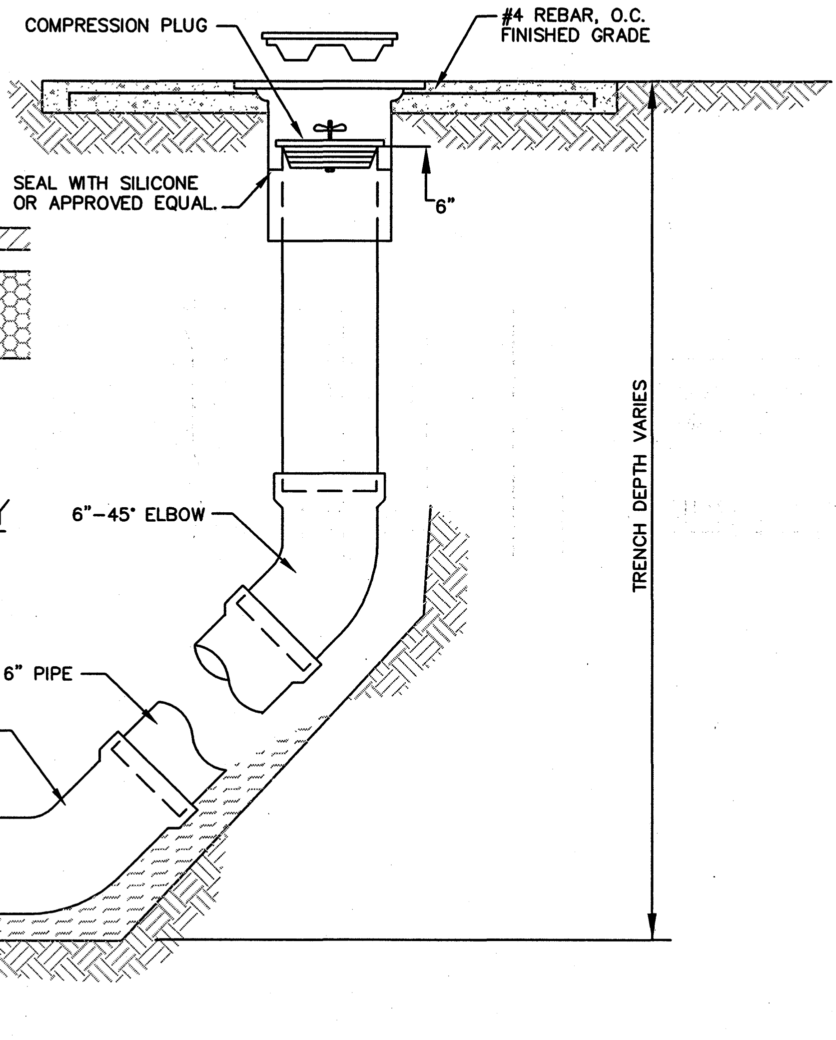
OUTSIDE PAVED AREA



SECTION



INSIDE PAVED ROADWAY



NOTE:

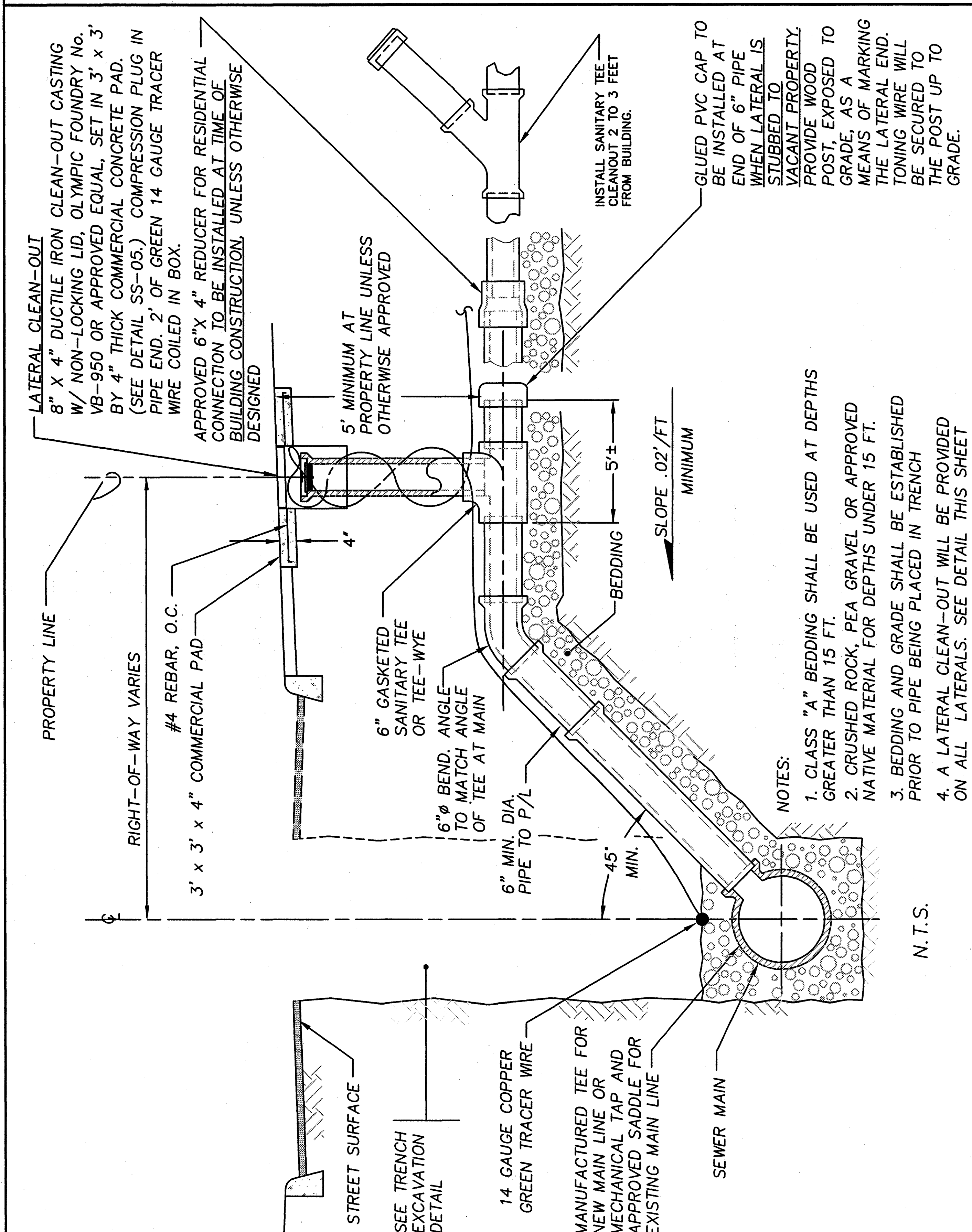
1. ALL SEWER PIPE SHALL BE ASTM 3034 SDR 35

2. LOCATED IN CENTER OF CUL-DE-SAC WHEN APPROPRIATE.

CLEANOUT

APPR. DATE:		FIG NO:	SS-05

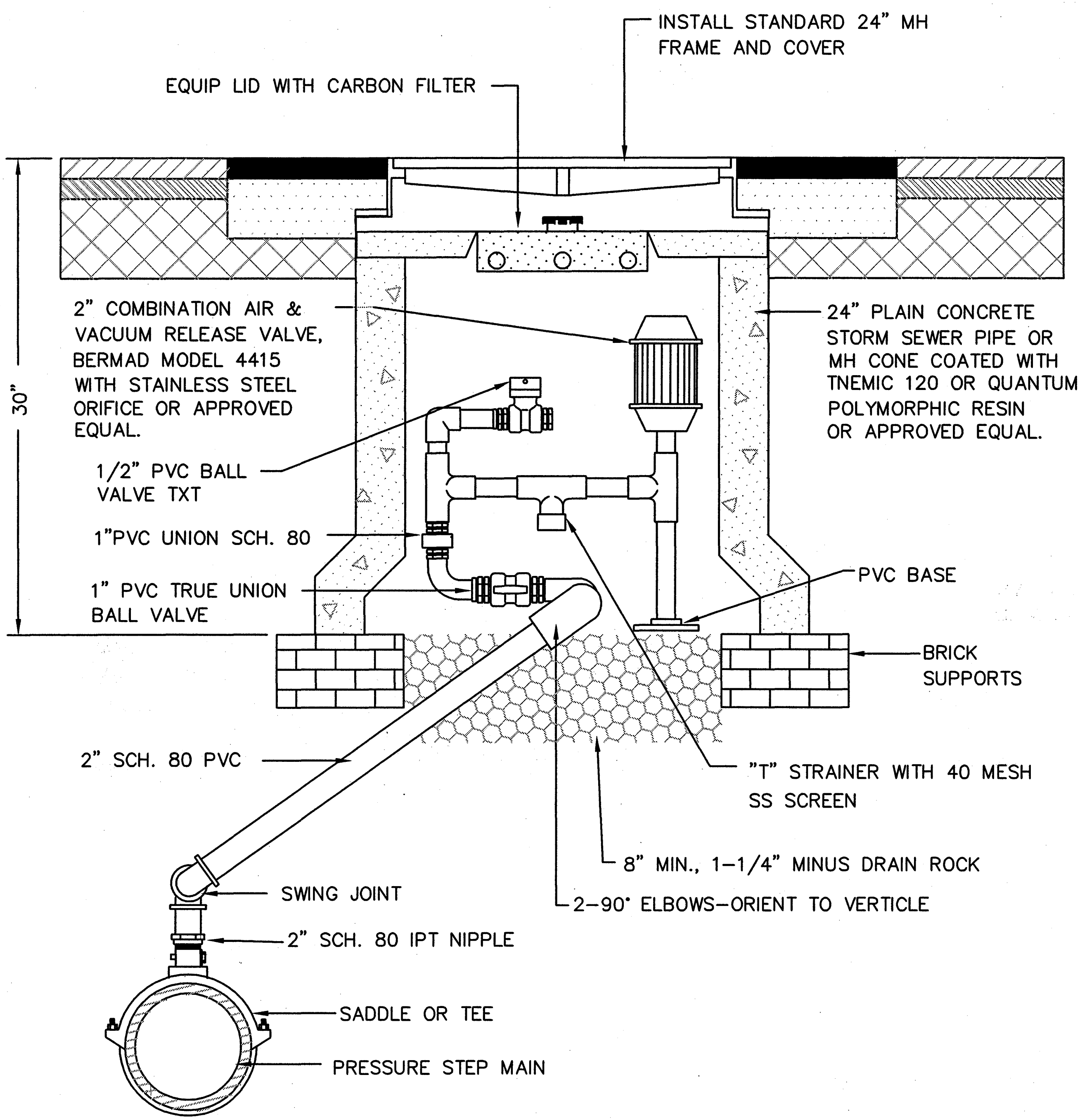
THURSTON COUNTY SANITARY SEWER STANDARD DETAIL



SANITARY SEWER LATERAL SERVICE CONNECTION

APPR. DATE:	REV. DATE: 10-27-2006		FIG NO:	SS-06

THURSTON COUNTY SANITARY SEWER STANDARD DETAIL



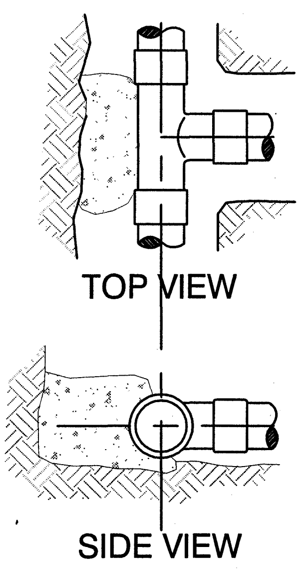
NOTE:

1. LOCATE AIR RELEASE ASSEMBLY IN SIDEWALK WHEN POSSIBLE.

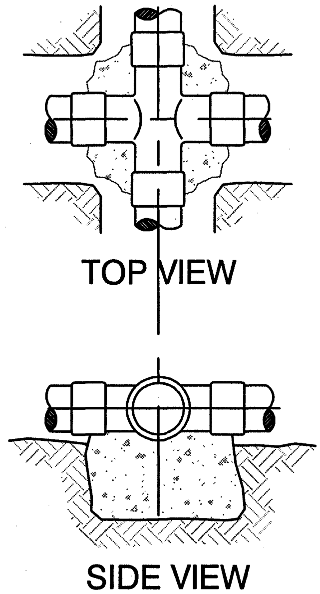
AIR RELEASE ASSEMBLY

APPR. DATE: DATE	REF:	FIG NO:	SS-07

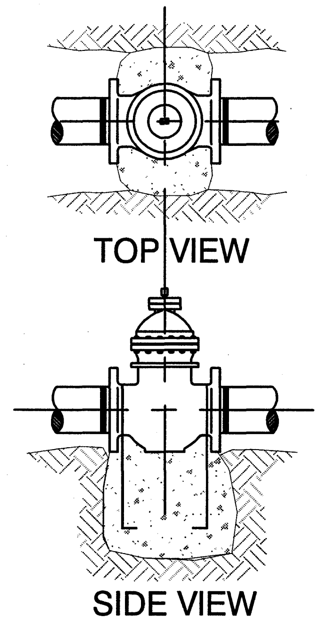
THURSTON COUNTY SANITARY SEWER STANDARD DETAIL



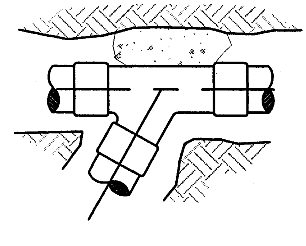
TEE



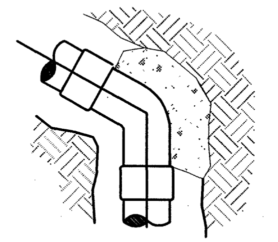
CROSS



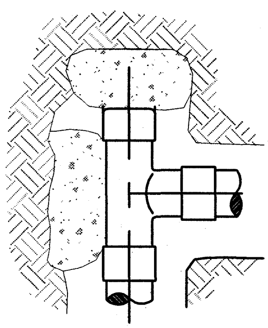
GATE VALVE



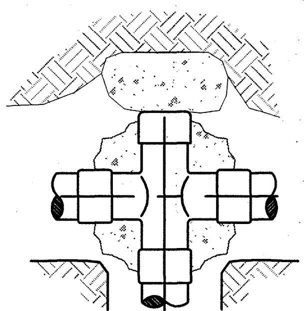
WYE



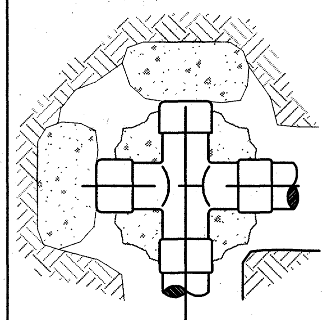
HORIZ. BEND



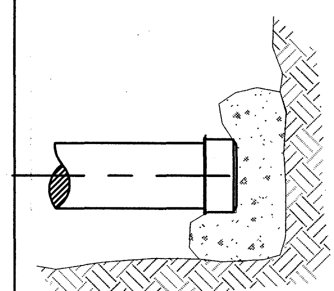
TEE WITH PLUG



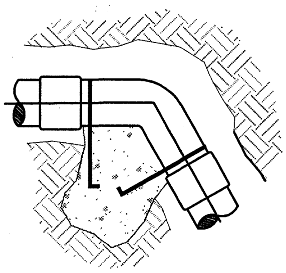
CROSS WITH PLUG



CROSS WITH PLUGS



PLUG OR CAP



45° - 90° VERTICAL BEND

NOTES:

1. CONCRETE THRUST BLOCKING TO BE POURED AGAINST UNDISTURBED EARTH.
2. PLASTIC BARRIER SHALL BE PLACED BETWEEN ALL CONC THRUST BLOCKS & FITTINGS.
3. ANCHOR REBAR SHALL BE #5 ON 12" DIA AND LESS IMBEDDED 30", #5 ON 16"–24" DIAMETER IMBEDDED 36".
4. PLUGS TO BE MINIMUM OF 5' FROM TEE, WYE, CROSS ON VALVE.

STANDARD BLOCKING DETAIL

APPR. DATE: DATE	REF:	FIG NO:	SS-08

THURSTON COUNTY SANITARY SEWER STANDARD DETAIL

THRUST LOADS

THRUST AT FITTINGS IN POUNDS AT 200 POUNDS PER SQUARE INCH OF WATER PRESSURE

PIPE DIAMETER	90° BEND	45° BEND	22-1/2° BEND	11-1/4° BEND	DEAD END OR TEE
4"	3,600	2,000	1,000	500	2,600
6"	8,000	4,400	2,300	1,200	5,700
8"	14,300	7,700	4,000	2,000	10,100
10"	22,300	12,100	6,200	3,100	15,800
12"	32,000	17,400	8,900	4,500	22,700
14"	43,600	23,600	12,100	6,100	30,800
16"	57,000	30,800	15,700	7,900	40,300

NOTES:

1. BLOCKING SHALL BE COMMERCIAL CONCRETE POURED IN PLACE AGAINST UNDISTURBED EARTH. FITTING SHALL BE ISOLATED FROM CONCRETE THRUST BLOCK WITH PLASTIC OR SIMILAR MATERIAL.

2. TO DETERMINE THE BEARING AREA OF THE THRUST BLOCK IN SQUARE FEET (S.F.):

   EXAMPLE : 12" – 90° BEND IN SAND AND GRAVEL
   32,000 LBS ÷ 3000 LB/S.F. = 10.7 S.F. OF AREA

3. AREAS MUST BE ADJUSTED FOR OTHER PIPE SIZE, PRESSURES AND SOIL CONDITIONS.

4. BLOCKING SHALL BE ADEQUATE TO WITHSTAND FULL TEST PRESSURE AS WELL AS TO CONTINUOUSLY WITHSTAND OPERATING PRESSURE UNDER ALL CONDITIONS OF SERVICE.

SAFE SOIL BEARING LOADS

FOR HORIZONTAL THRUSTS WHEN THE DEPTH OF COVER OVER THE PIPE EXCEEDS 2 FEET

SOIL	POUNDS PER SQUARE FOOT
MUCK, PEAT	0
SOFT CLAY	1,000
SAND	2,000
SAND & GRAVEL	3,000
SAND & GRAVEL CEMENTED WITH CLAY	4,000
HARD SHALE	10,000

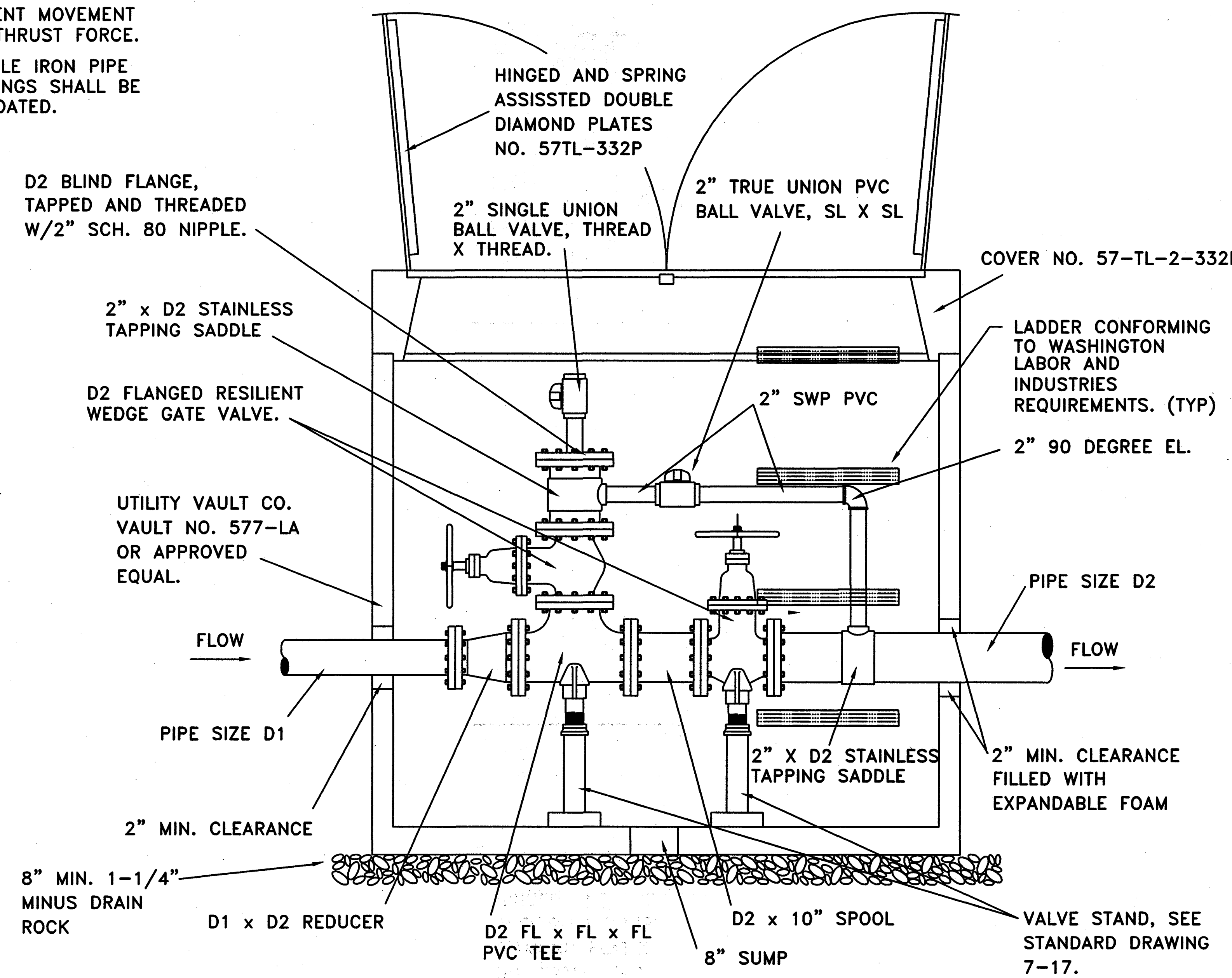
THRUST LOADS

APPR. DATE: DATE	REF:	FIG NO:	SS-09

THURSTON COUNTY SANITARY SEWER STANDARD DETAIL

NOTES:

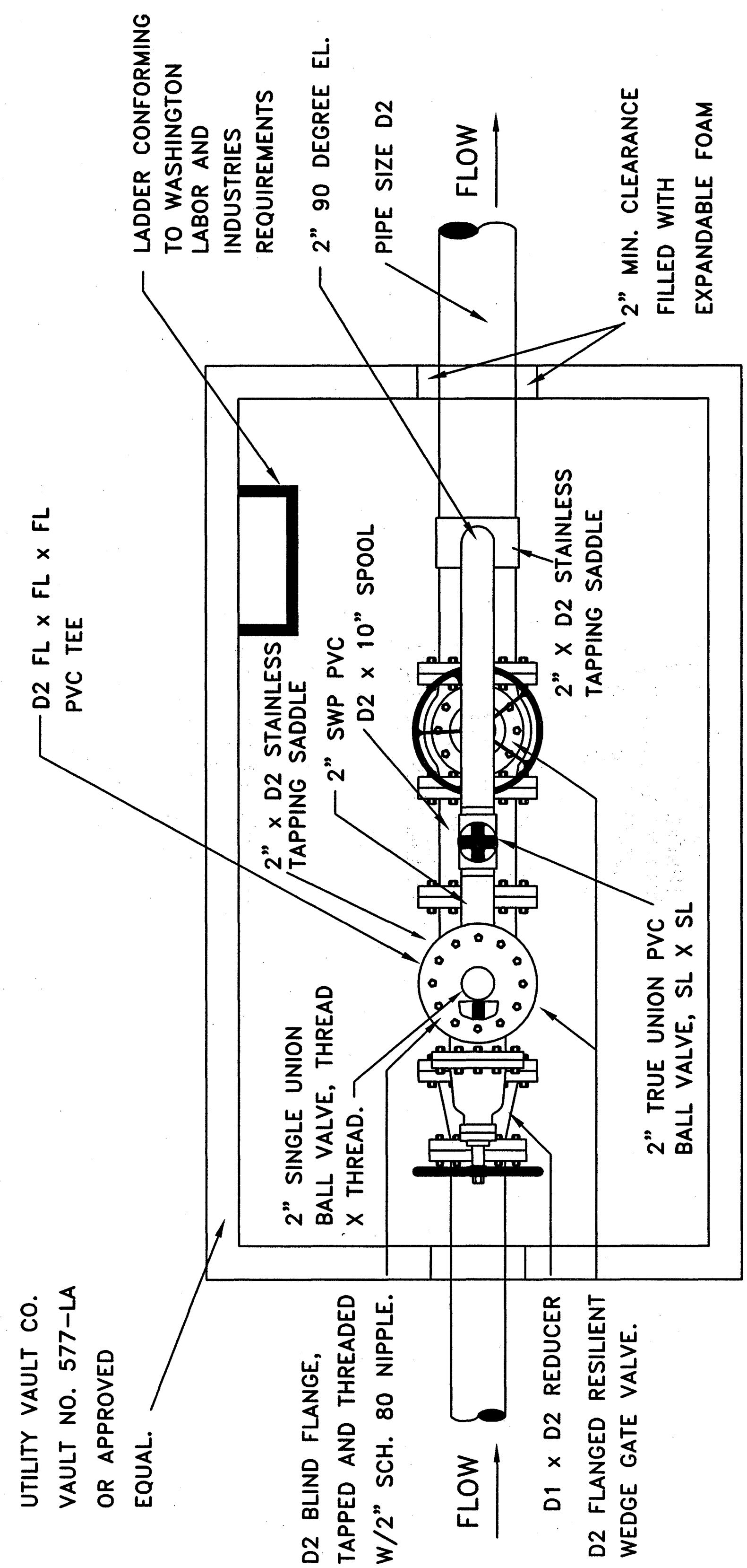
1. THE GATE VALVES SHALL BE RESTRAINED TO VAULT TO PREVENT MOVEMENT DUE TO THRUST FORCE.
2. ALL DUCTILE IRON PIPE AND FITTINGS SHALL BE EPOXY COATED.



PIGG PORT CROSS SECTION

APPR. DATE:		FIG NO:	SS-10

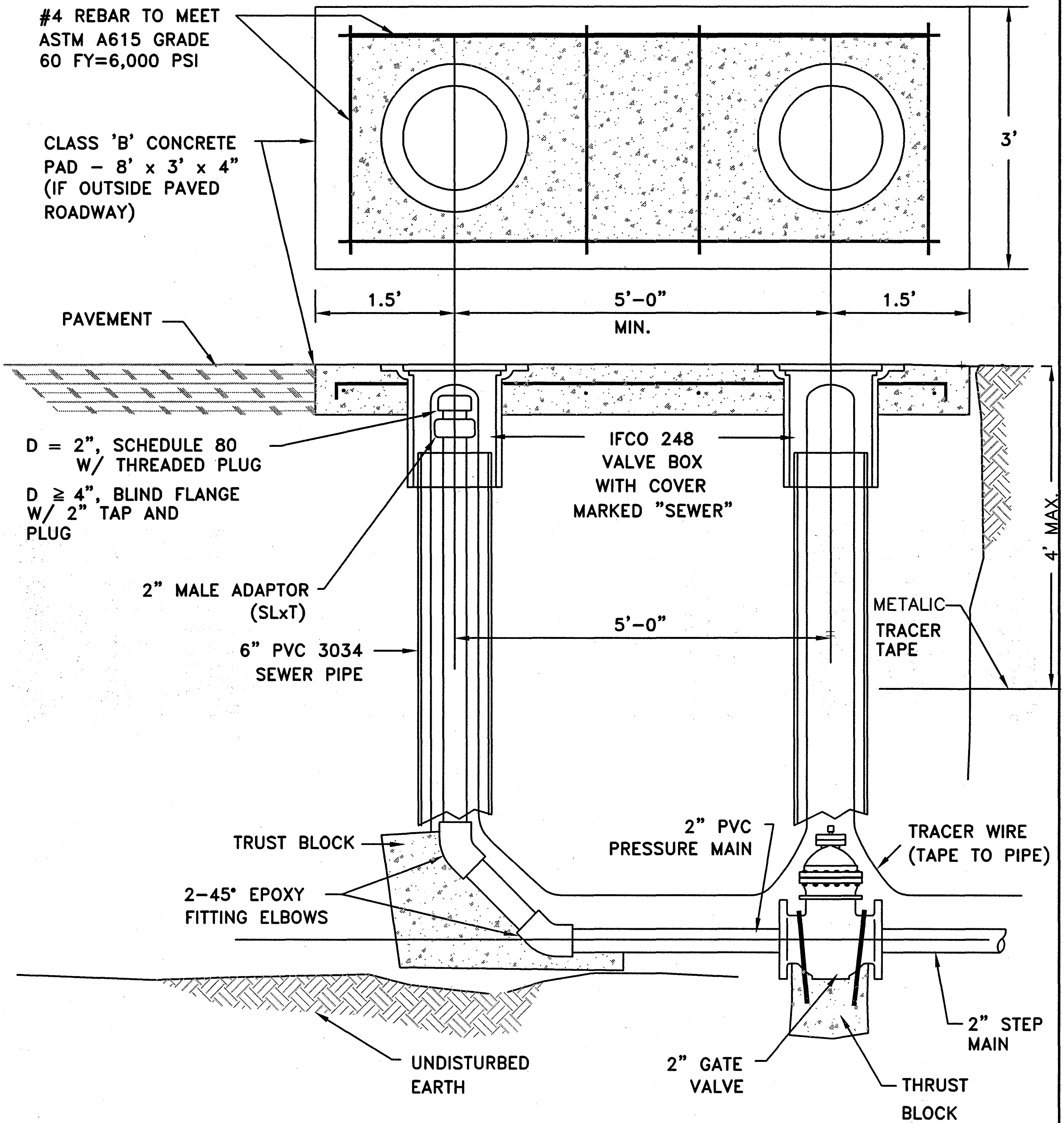
THURSTON COUNTY SANITARY SEWER STANDARD DETAIL



PIGG PORT PLAN VIEW

APPR. DATE:		FIG NO: SS-11

THURSTON COUNTY SANITARY SEWER STANDARD DETAIL



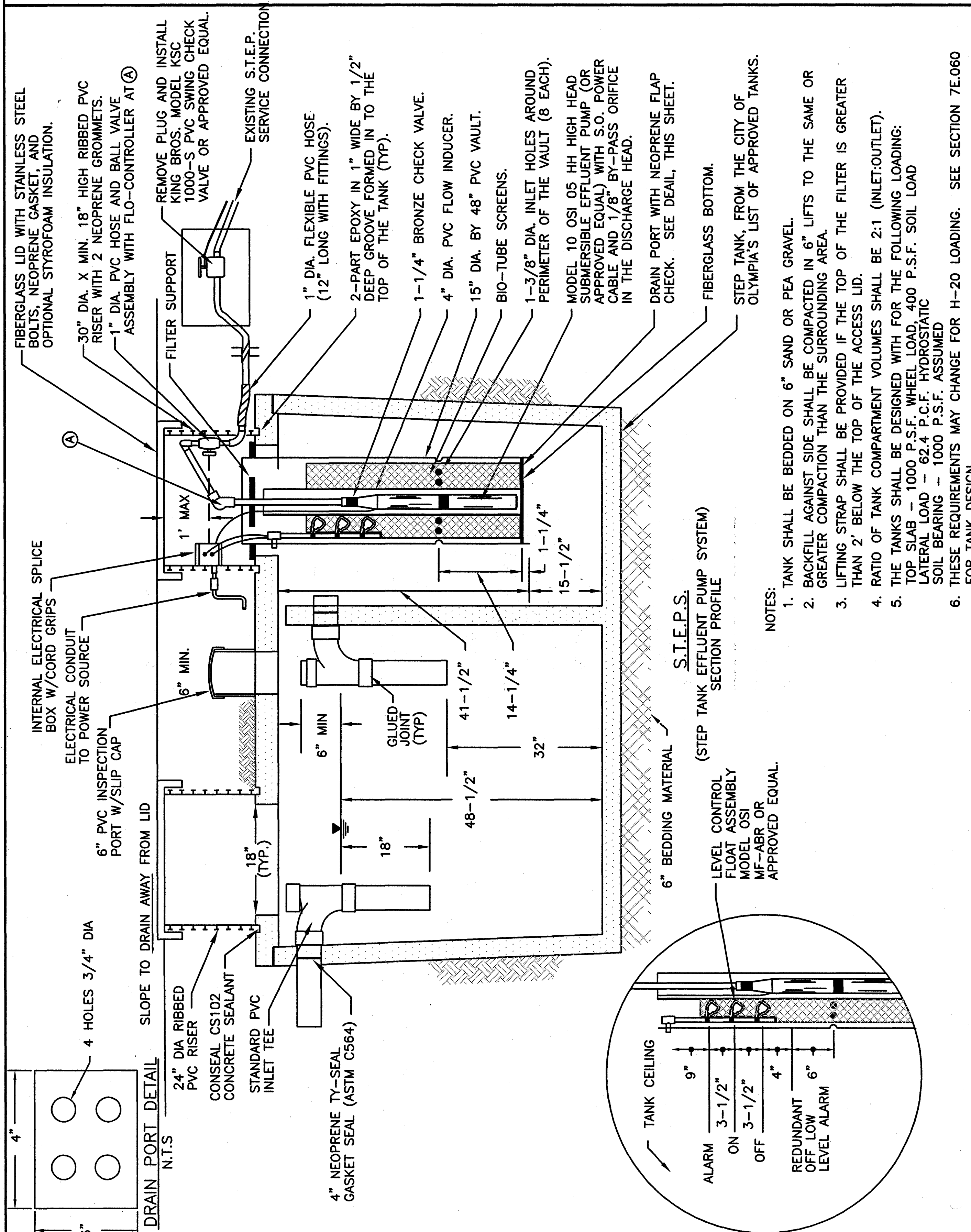
NOTES

1. A PIG PORT DETAIL SHALL BE SUBMITTED TO THE CITY FOR APPROVAL BY THE DIRECTOR OF PUBLIC WORKS WHEN USED WITH STEP MAINS LARGER THAN 2".

TERMINUS PIGG LAUNCH PORT

APPR. DATE:		FIG NO:	SS-12

THURSTON COUNTY SANITARY SEWER STANDARD DETAIL



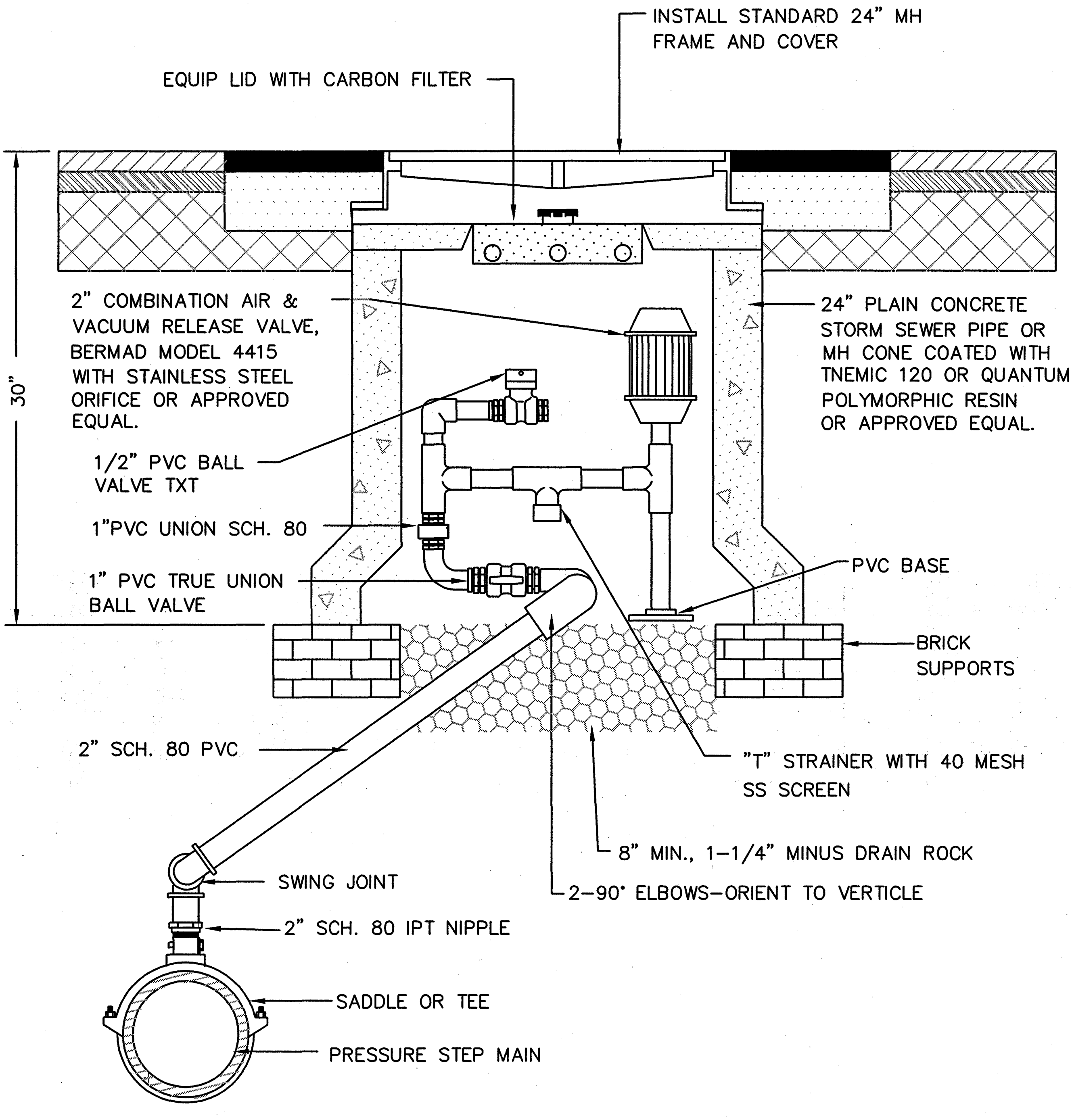
NOTES:

1. TANK SHALL BE BEDDED ON 6" SAND OR PEA GRAVEL.
2. BACKFILL AGAINST SIDE SHALL BE COMPACTED IN 6" LIFTS TO THE SAME OR GREATER COMPACTION THAN THE SURROUNDING AREA.
3. LIFTING STRAP SHALL BE PROVIDED IF THE TOP OF THE FILTER IS GREATER THAN 2' BELOW THE TOP OF THE ACCESS LID.
4. RATIO OF TANK COMPARTMENT VOLUMES SHALL BE 2:1 (INLET:OUTLET).
5. THE TANKS SHALL BE DESIGNED WITH FOR THE FOLLOWING LOADING:
   TOP SLAB - 1000 P.S.F. WHEEL LOAD, 400 P.S.F. SOIL LOAD
   LATERAL LOAD - 62.4 P.C.F. HYDROSTATIC
   SOIL BEARING - 1000 P.S.F. ASSUMED
6. THESE REQUIREMENTS MAY CHANGE FOR H-20 LOADING. SEE SECTION 7E.060 FOR TANK DESIGN.

1000 & 1500 GALLON S.T.E.P. SEPTIC TANK

APPR. DATE:		FIG NO:	SS-13

THURSTON COUNTY SANITARY SEWER STANDARD DETAIL



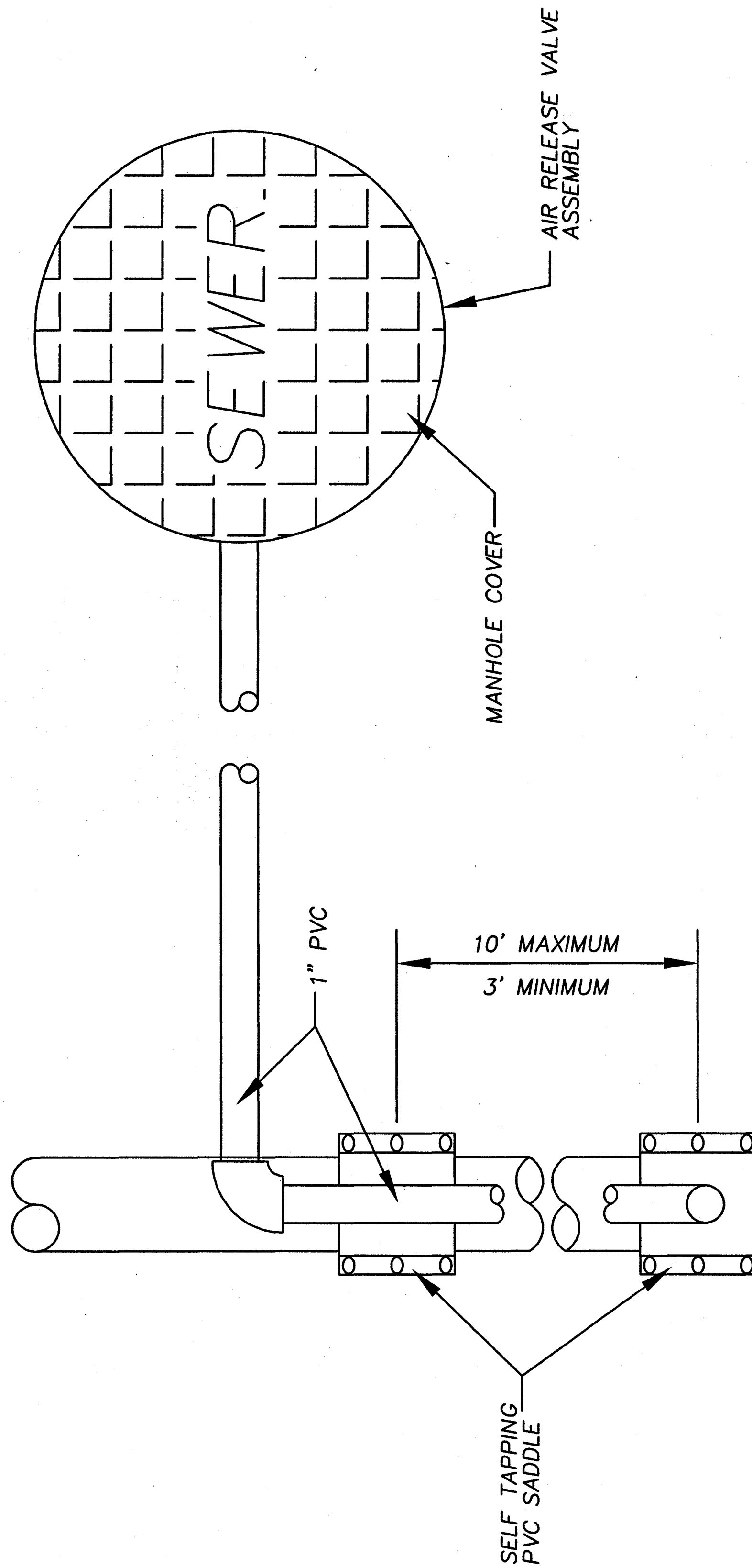
NOTE:

1. LOCATE AIR RELEASE ASSEMBLY IN SIDEWALK WHEN POSSIBLE.

S.T.E.P. SYSTEM AIR RELEASE ASSEMBLY

APPR. DATE:		FIG NO: SS-14

THURSTON COUNTY SANITARY SEWER STANDARD DETAIL



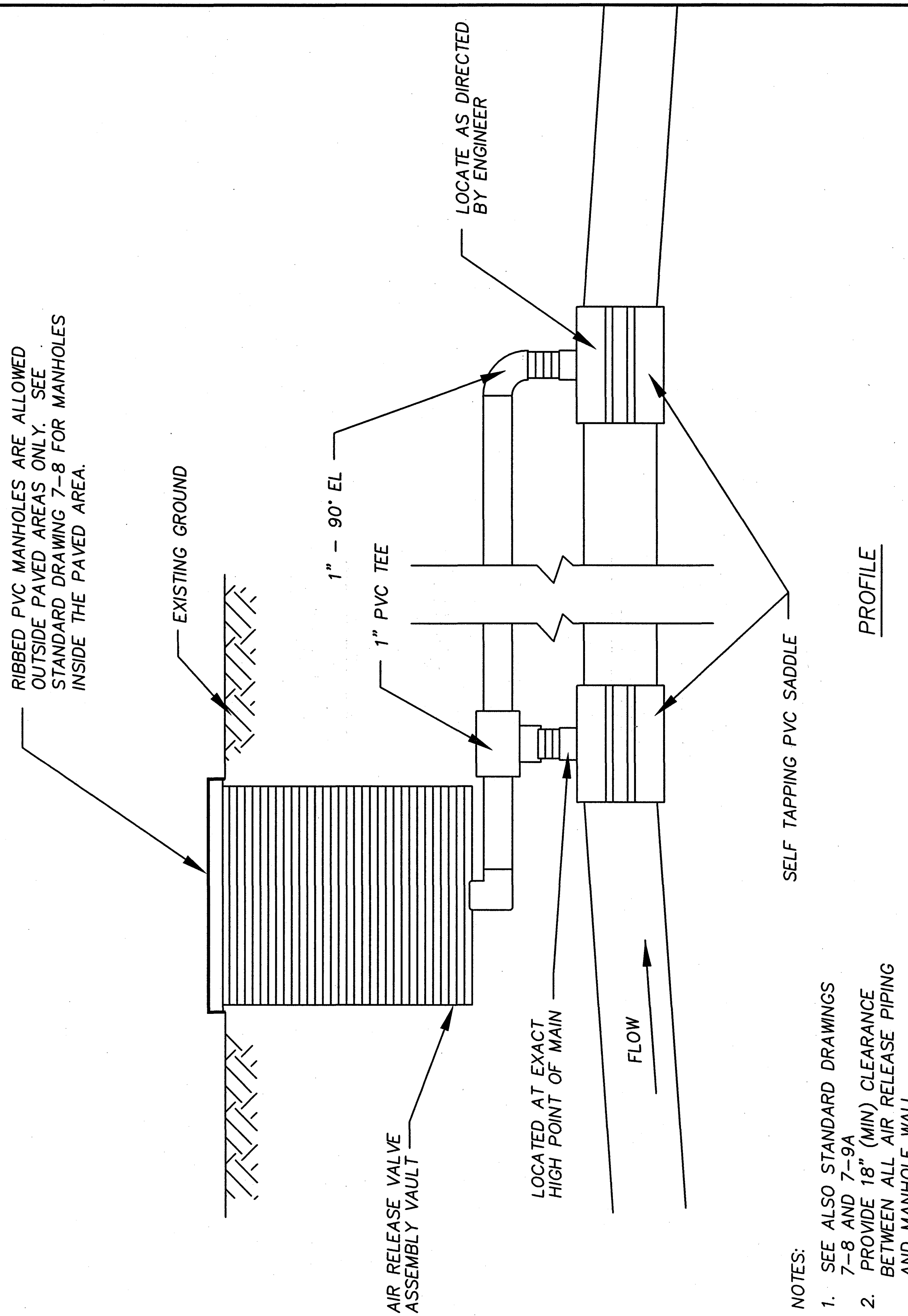
NOTE:

1. SEE ALSO STANDARD DRAWINGS 7–8 AND 7–9B

TYPICAL S.T.E.P. AIR RELEASE MANIFOLD CONNECTION PLAN DETAIL

APPR. DATE:		FIG NO:	SS-15

THURSTON COUNTY SANITARY SEWER STANDARD DETAIL



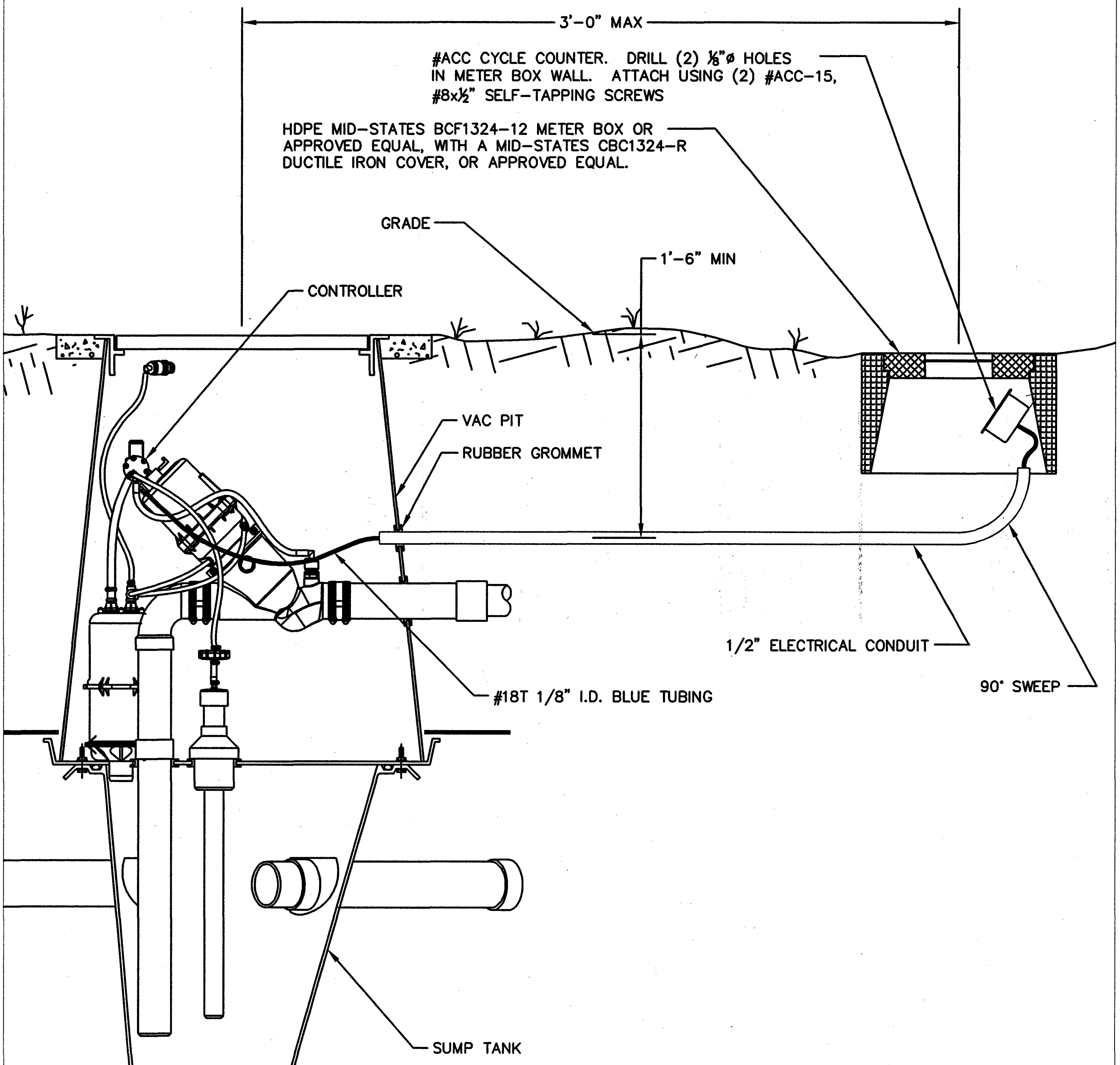
NOTES:

1. SEE ALSO STANDARD DRAWINGS 7-8 AND 7-9A
2. PROVIDE 18" (MIN) CLEARANCE BETWEEN ALL AIR RELEASE PIPING AND MANHOLE WALL.

TYPICAL S.T.E.P. AIR RELEASE MANIFOLD CONNECTION SECTION VIEW

APPR. DATE:		FIG NO:	SS-16

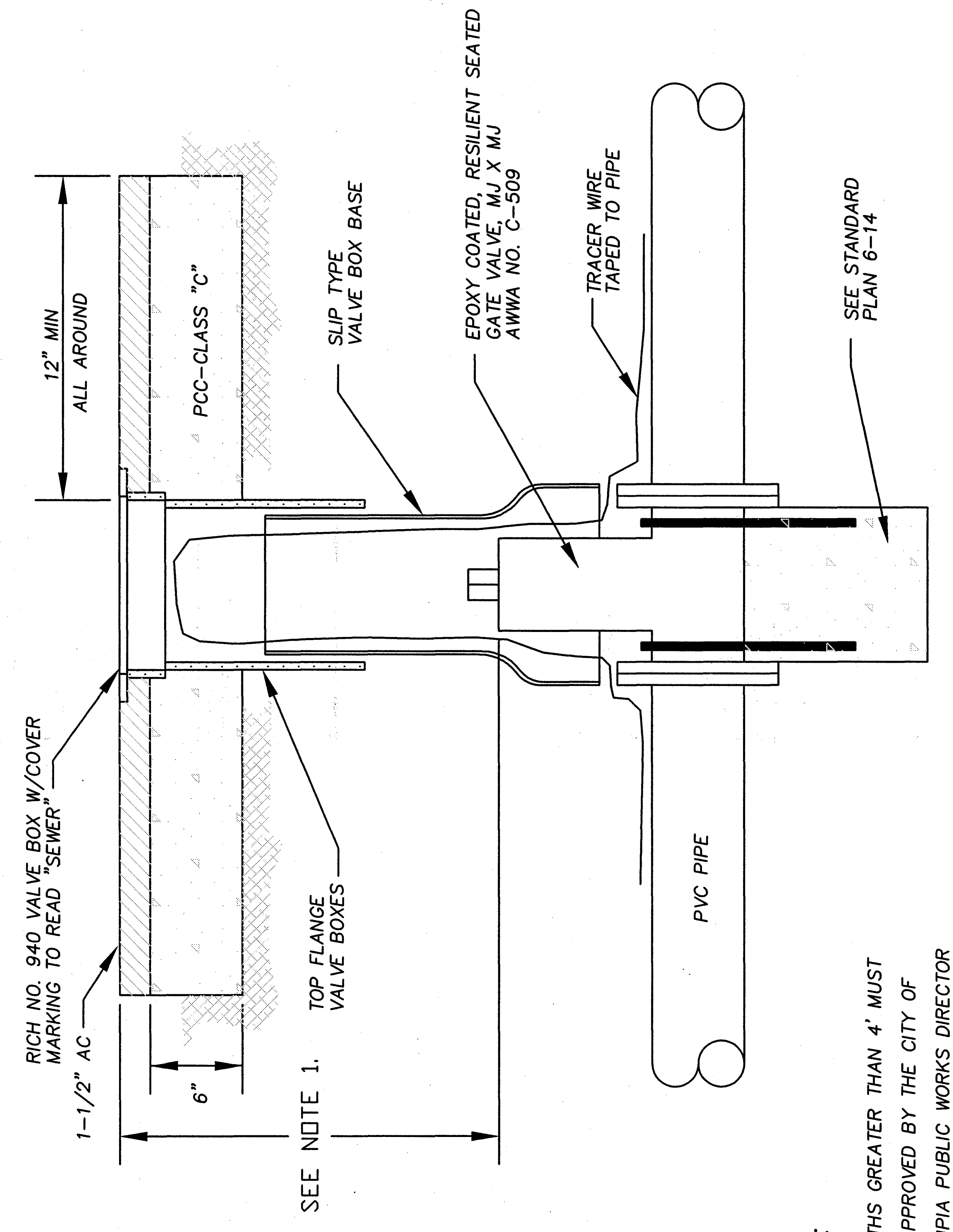
THURSTON COUNTY SANITARY SEWER STANDARD DETAIL



CYCLE COUNTER MOUNTED ON METER BOX WALL

APPR. DATE: DATE	REF:	FIG NO:	SS-17

THURSTON COUNTY SANITARY SEWER STANDARD DETAIL



NOTE:

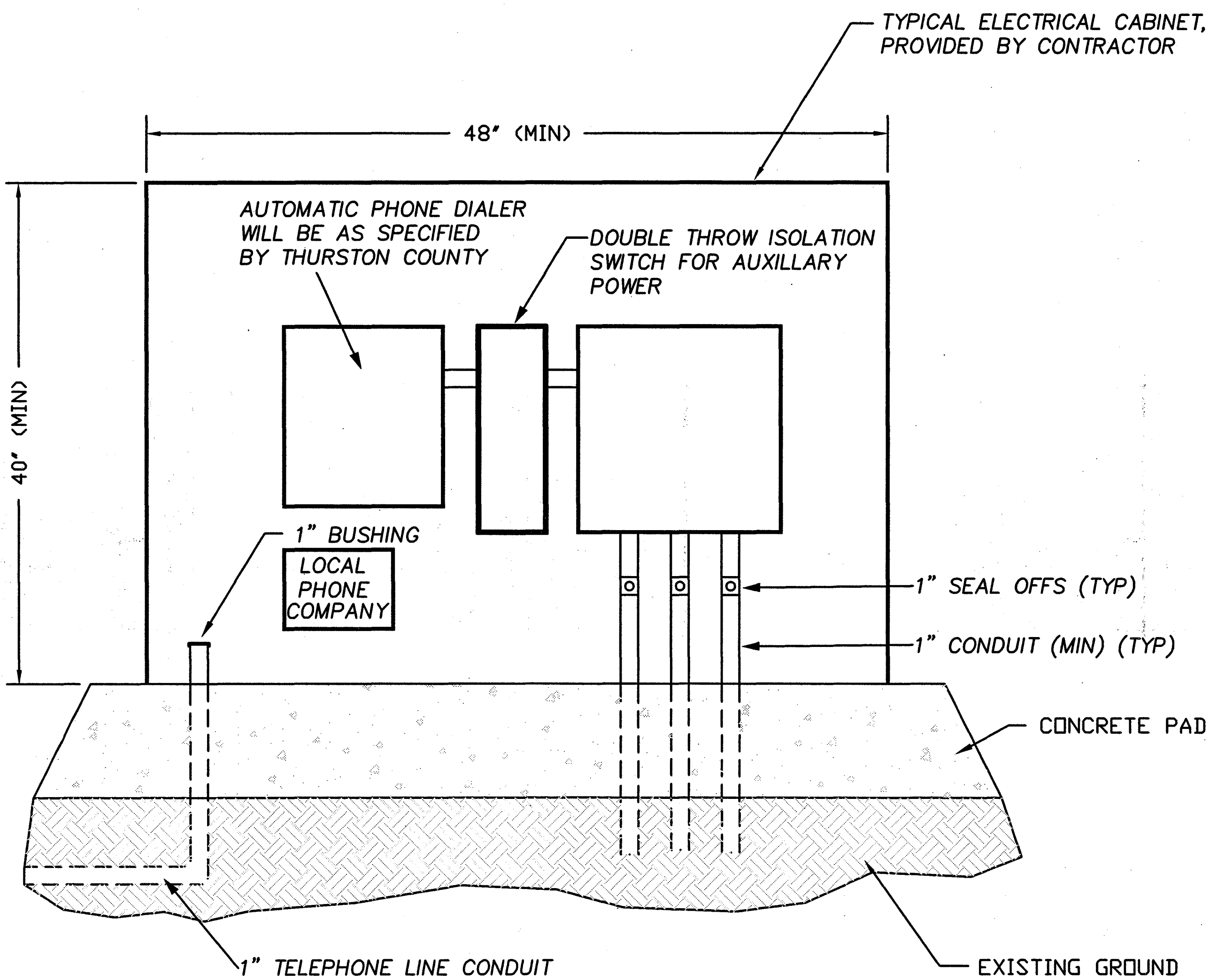
1. DEPTHS GREATER THAN 4' MUST BE APPROVED BY THE CITY OF OLYMPIA PUBLIC WORKS DIRECTOR

TYPICAL S.T.E.P. MAIN/FORCE GATE VALVE 2" OR GREATER

APPR. DATE:		FIG NO:	SS-18

Source; City of Olympia

THURSTON COUNTY SANITARY SEWER STANDARD DETAIL

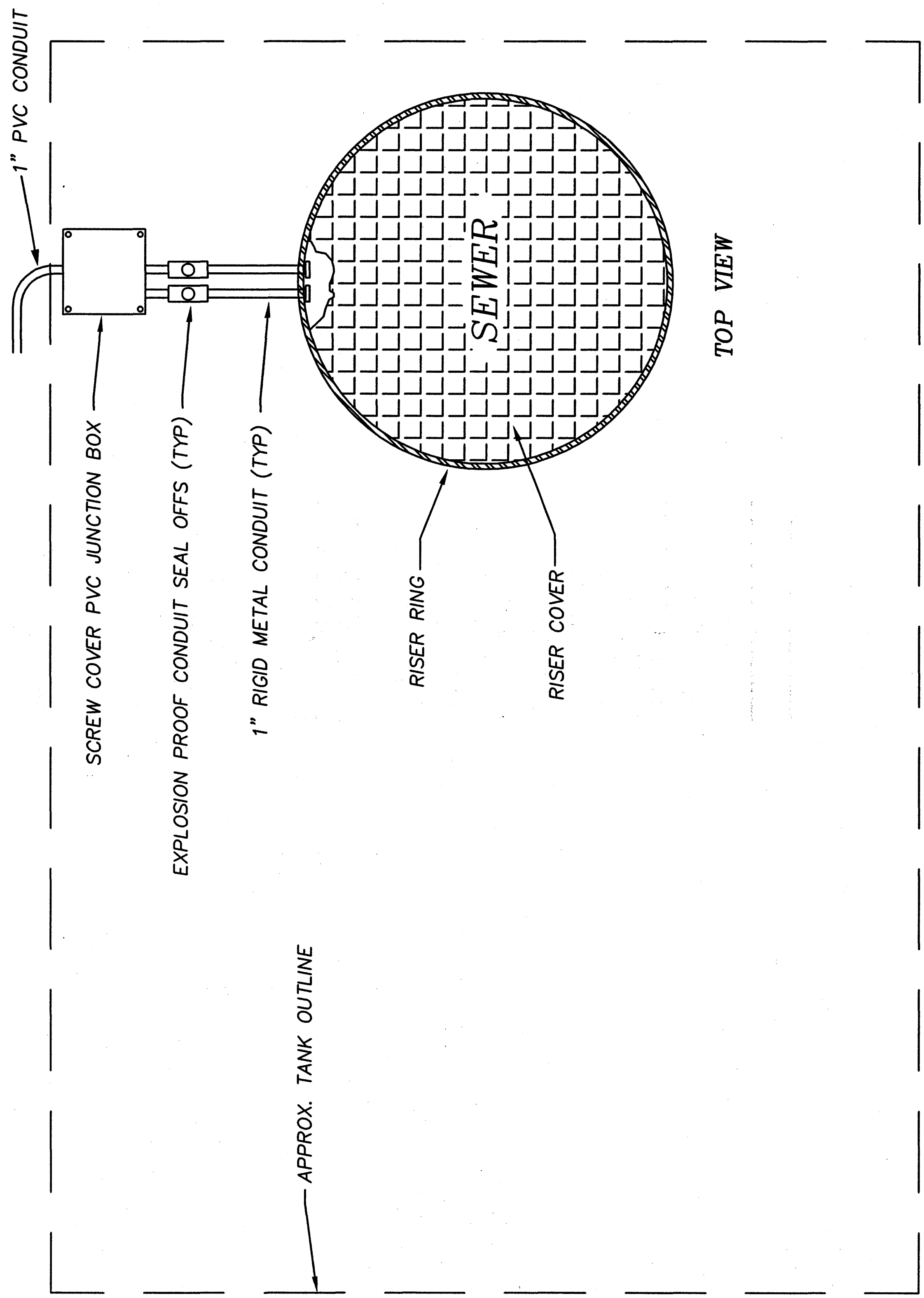


COMMERCIAL/MULTI-FAMILY S.T.E.P. SYSTEM ELECTRICAL CABINET LAYOUT

APPR. DATE:		FIG NO:	SS-19

Source; City of Olympia

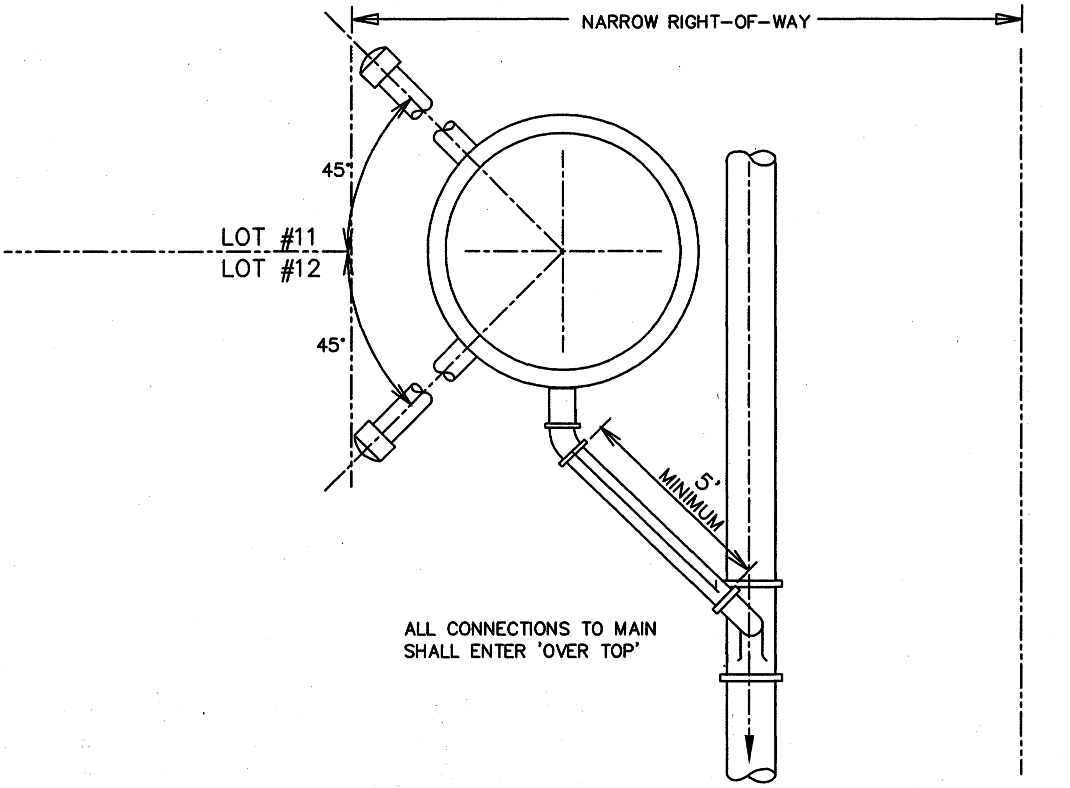
THURSTON COUNTY SANITARY SEWERSTANDARD DETAIL



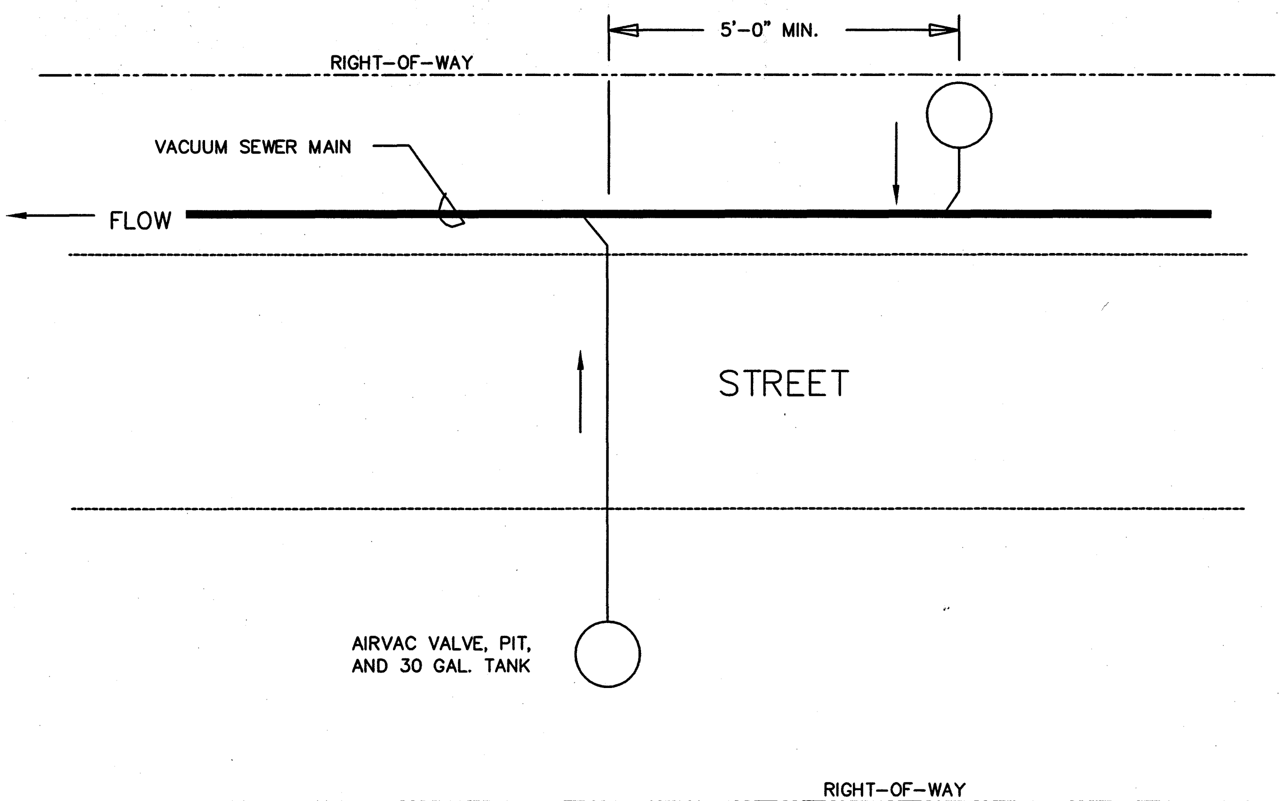
TYPICAL RISER CONDUIT PLAN
FOR
COMMERCIAL/MUTI–FAMILY STEP SYSTEM

APPR. DATE:		FIG NO:	SS-20

THURSTON COUNTY SANITERY SEWER STANDARD DETAIL



VALVE PIT IN NARROW RIGHT-OF-WAY -- SD-14

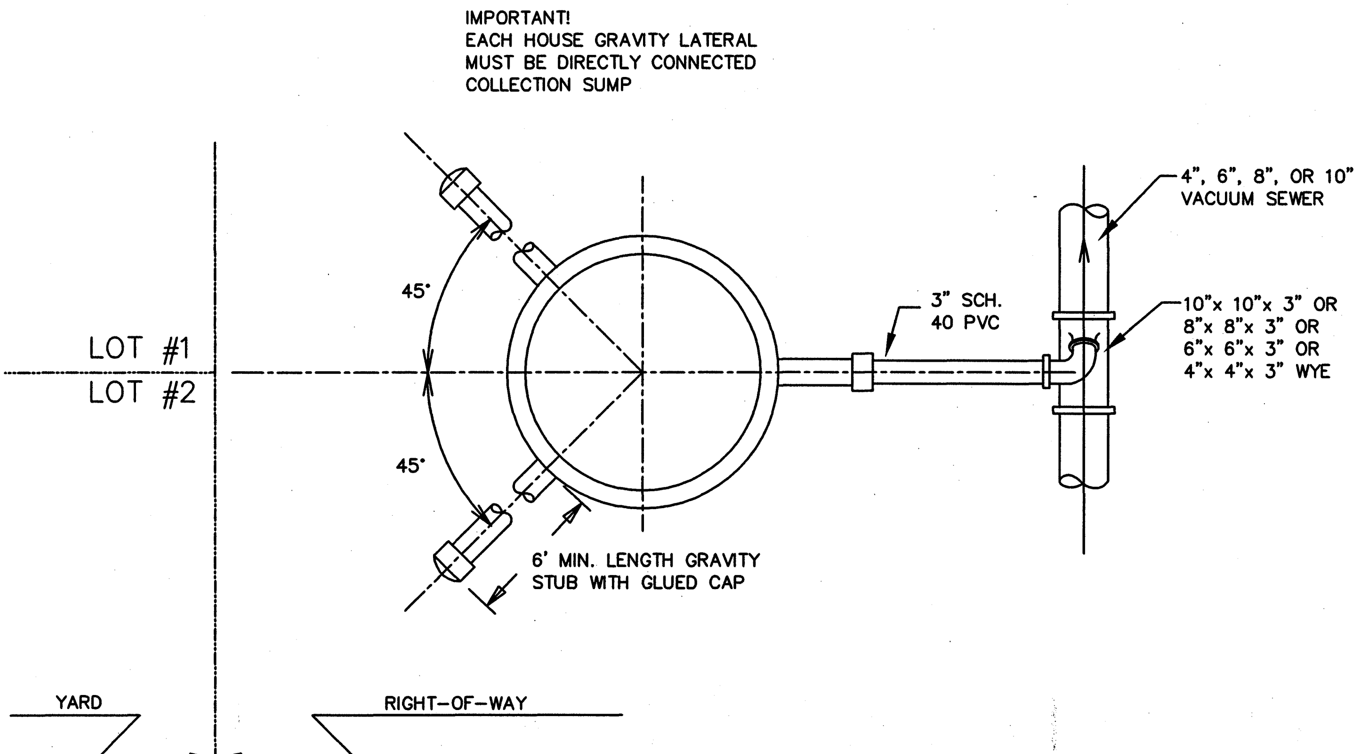


MINIMUM SPACING BETWEEN CONNECTIONS -- SD-15

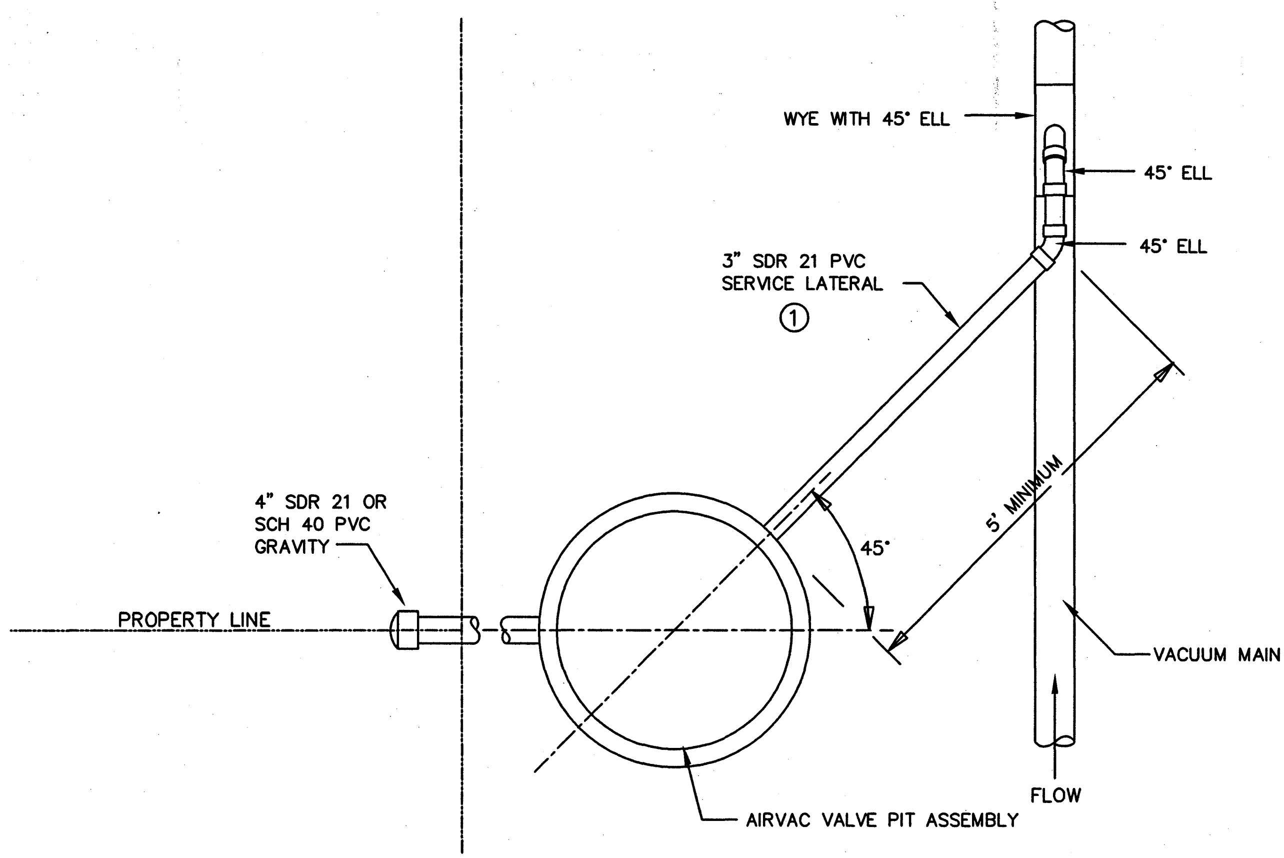
VACUUM SEWER VALVE PIT IN NARROW R/W

APPR. DATE: DATE	REF:	FIG NO:	SS-21

THURSTON COUNTY SANITARY SEWER STANDARD DETAIL



VALVE PIT WITH 2 CONNECTIONS -- SD-13

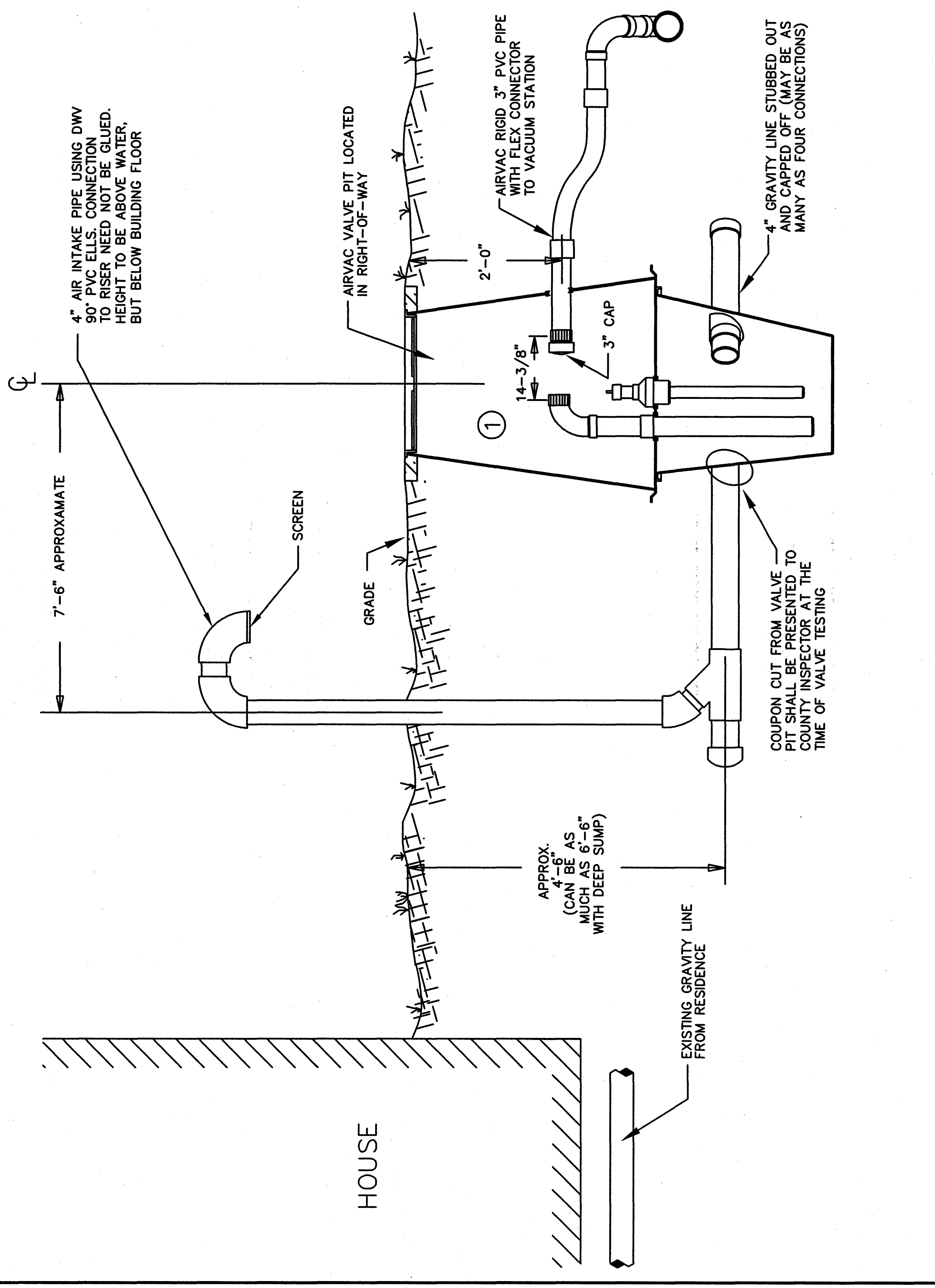


VALVE PIT WITH SINGLE CONNECTION -- SD-16

VACUUM SEWER VALVE PIT WITH 1 & 2 CONNECTIONS

APPR. DATE: DATE	REF:	FIG NO: SS-22

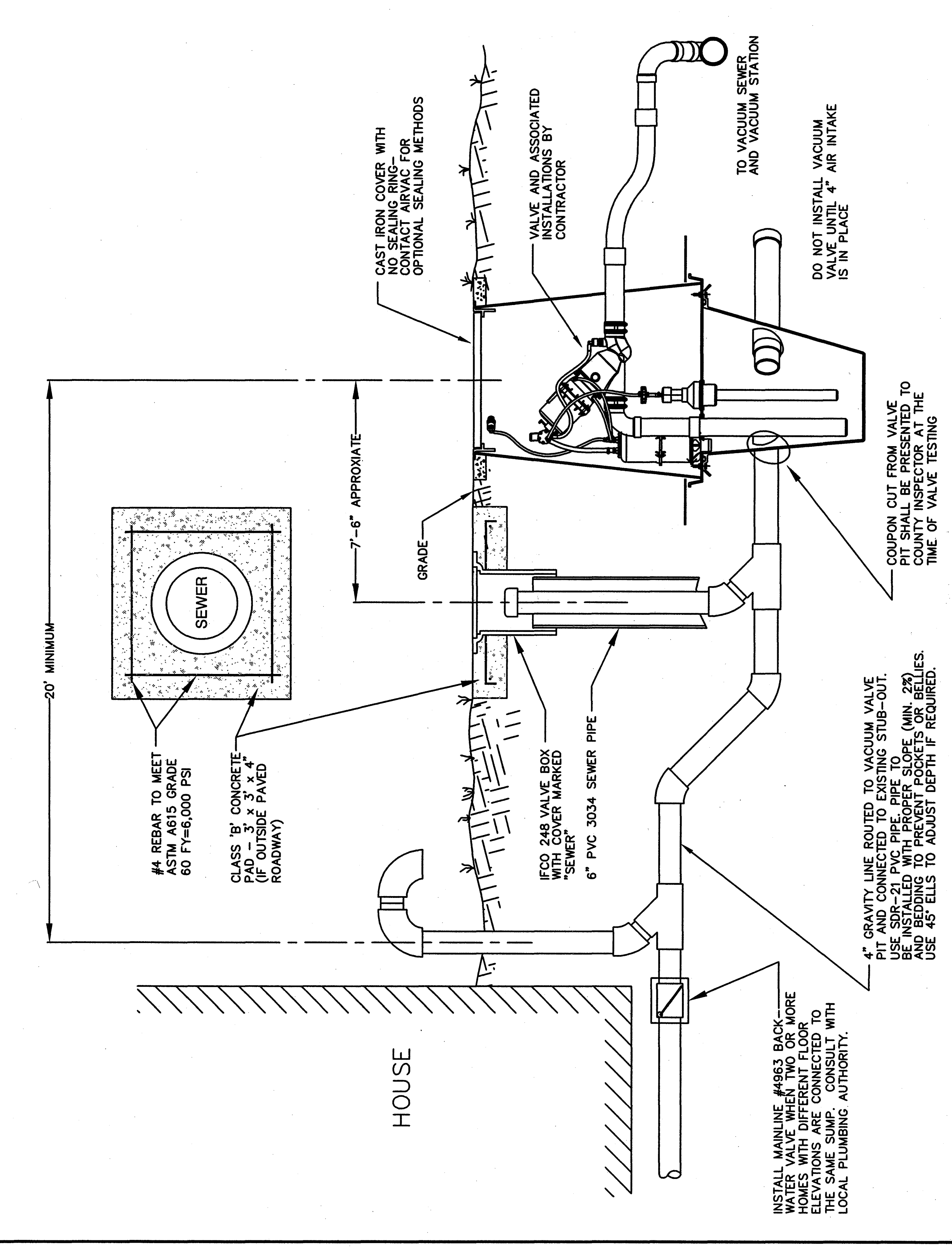
THURSTON COUNTY SANITARY SEWER STANDARD DETAIL



VACUUM SEWER VALVE PIT PRIOR TO HOME HOOKUP

APPR. DATE: DATE	REF:	FIG NO: SS-23

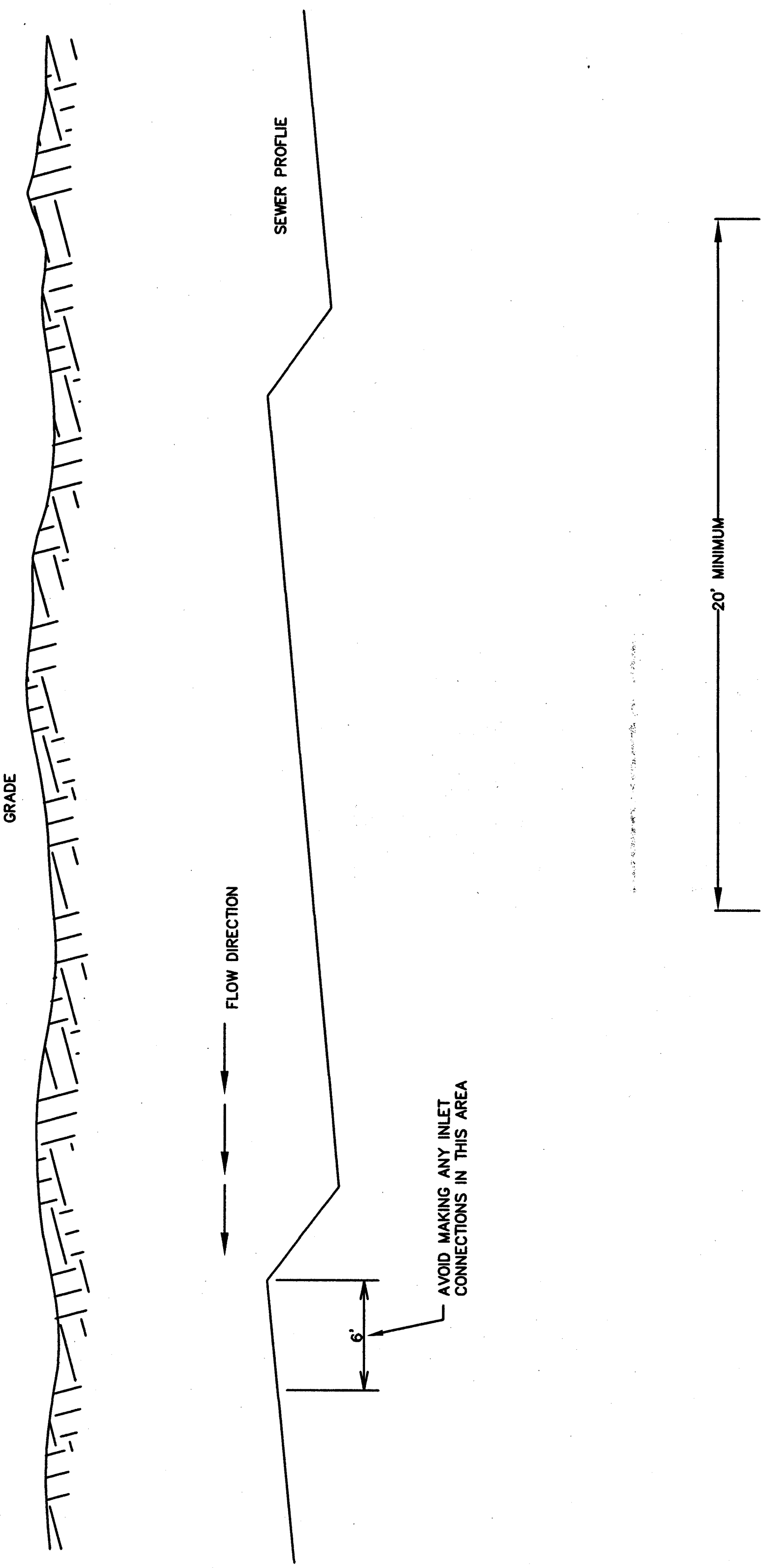
THURSTON COUNTY SANITARY SEWER STANDARD DETAIL



VACUUM SEWER VALVE PIT AFTER HOME HOOKUP

APPR. DATE: DATE	REF:	FIG NO: SS-24

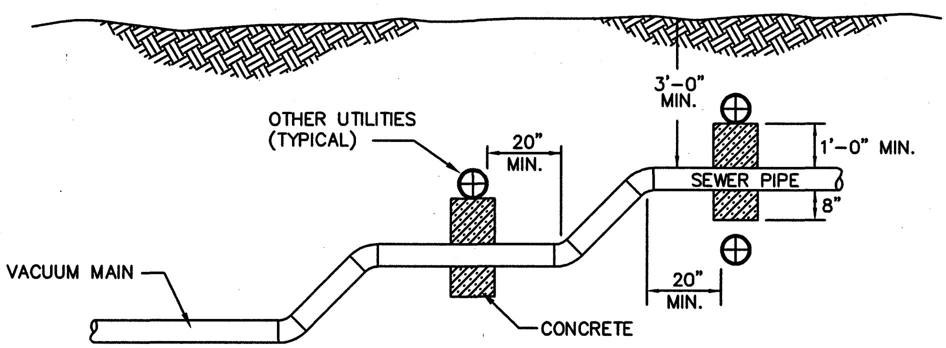
THURSTON COUNTY SANITARY SEWER STANDARD DETAIL



VACUUM SEWER CONNECTION LOCATIONS TO AVOID

APPR. DATE: DATE	REF:	FIG NO: SS-25

THURSTON COUNTY SANITARY SEWER STANDARD DETAIL



TYPICAL UTILITY CROSSING
SD-4

LIFTS:

1. MINIMUM SLOPE BETWEEN LIFTS 0.20% X LENGTH OR 0.25 FT. FALL, WHICHEVER IS GREATER (FOR 4" AND LARGER VACUUM LINES).

2. FOR 3" SERVICE LATERALS, MINIMUM SLOPE BETWEEN LIFTS = 0.2% X LENGTH OR 0.20 FEET FALL, WHICHEVER IS GREATER.

3. MINIMUM SPACING BETWEEN LIFTS – 20'-0".

4. MAXIMUM ELEVATIONS IN ANY ONE LIFT – 3'-0".

GENERAL NOTES: SERVICE LINES

1. MINIMUM LENGTH OF PIPING FROM MAIN TO VALVE PIT = 5'-0".

2. SLOPE FROM VALVE PIT TO MAIN--2" OR 0.20% FALL (WHICHEVER IS GREATER).

3. MINIMUM DISTANCE FROM VALVE PIT TO LIFT IN SERVICE LINE -5'-0".

4. MINIMUM DISTANCE FROM LIFT IN SERVICE LINE TO CROSSOVER CONNECTION-5'-0".

CROSSOVER CONNECTIONS (SERVICE LINE OR BRANCH CONNECTION TO MAIN)

1. MINIMUM SPACING BETWEEN ANY TWO CROSSOVER CONNECTIONS – 5'-0".

2. MINIMUM DISTANCE FROM TOP OF LIFT TO ANY CROSSOVER CONNECTION -- 6'-0".

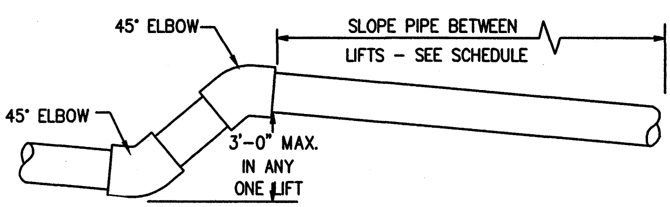
3. ALL CROSSOVER CONNECTIONS MUST ENTER OVER TOP OF THE MAIN (WYE IN VERTICAL POSITION OR 45° ALTERNATE ALIGNMENT

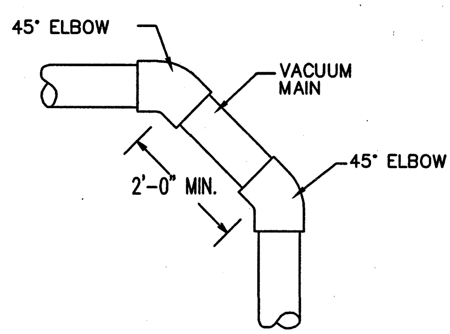
4. LONG TURN 90° PERMITED AS PART OF CROSSOVER TO MAIN CONNECT AT MAIN LINE ONLY.

SLOPE SCHEDULE			
PIPE DIAMETER	MINIMUM FALL	0.2% OF DISTANCE	
3"	0.20 FT	0.2%	100 FT ▲
4"	0.25 FT	0.2%	125 FT ▲
6"	0.25 FT	0.2%	125 FT ▲
8"	0.25 FT	0.2%	125 FT ▲
10"	0.25 FT	0.2%	125 FT ▲

USE WHICHEVER SLOPE IS GREATER BETWEEN LIFTS. ABOVE THIS LENGTH ▲ IN DISTANCE, THE 0.2% SLOPE IS GREATER. ANYTHING SHORTER THAN THIS DISTANCE SHOULD USE MINIMUM FALL INDICATED. WHEN NOT BETWEEN TWO LIFTS, USE 0.2% SLOPE.

LIFT DETAIL AND SLOPE SCHEDULE
SD-5





CHANGE IN DIRECTION
SD-6

VACUUM SEWER DETAILS

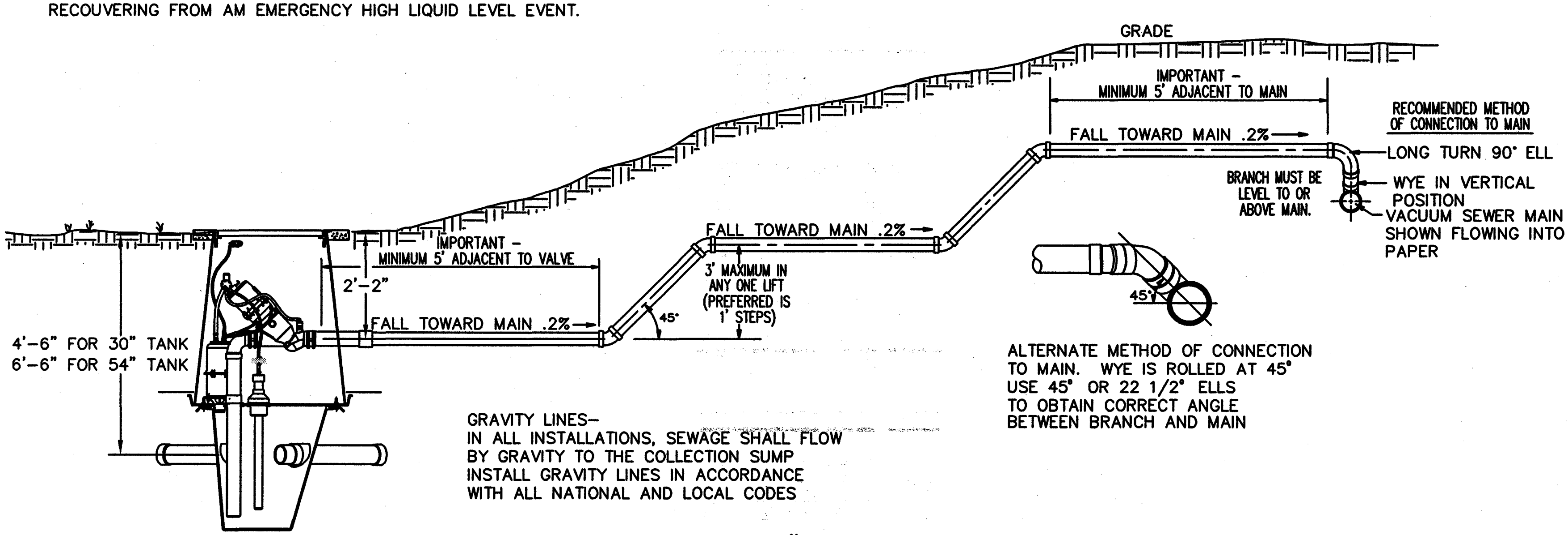
APPR. DATE: DATE	REF:	FIG NO:	SS-26

THURSTON COUNTY SANITARY SEWER STANDARD DETAIL

1. CONTRACTOR SHALL SUPPLY ONE SET OF REPLACEMENT COUPLINGS FOR INLET AND OUTLET OF 3" VACUUM VALVE. ALL COUPLINGS SHALL BE 3" FERNCO P1056-33.

NOTES:

1. ALL GROMMETS FOR VALVE PIT AND SUMP ARE SUPPLIED BY AIRVAC.
2. ALL HOLES IN VALVE PIT AND BOTTOM ARE FACTORY CUT. ALL GRAVITY LINE CONNECTION OPENINGS IN THE SUMP ARE FIELD CUT.
3. ONLY HOMES OR APARTMENTS WHOSE LOWER FLOOR ELEVATIONS ARE THE SAME SHOULD BE CONNECTED TO A COMMON VACUUM VALVE PIT INSTALLATION. SOME LOCAL CODES MAY REQUIRE THE INSTALLATION OF A MAINLINE #4963 BACKWATER VALVE IN THE HOME OWNERS GRAVITY LINES. WITH MULTIPLE FLOOR APPARTMENTS EACH FLOOR LEVEL SHOULD BE SERVICED BY ITS OWN VACUUM VALVE PIT PACKAGE.
4. WHEN INSTALLING ANY PIPE THROUGH A GROMMET USE ONLY WATER OR A MILD DETERGENT AS A LUBTICANT, NEVER USE PIPE JOINT GREASE.
5. DO NOT INSTALL VACUUM VALVE UNTIL HOME GRAVITY LINE IS NEAR COMPLETION AND AIR INTAKE PIPING IS IN PLACE.
6. INTERNAL SUMP BREATHER IS TO BE EQUIPPED WITH AUTOMATIC SHUT OFF DEVICES TO PREVENT LIQUIDE CONTAMINATION OF THE CONTROLER AND INTERFACE VALVE DURING AN EMERGENCY HIGH LIQUID LEVEL EVENT. THESE DEVICES SHALL BE POSITIVE SEALING, SHALL NOT INHIBIT THE VALVE'S PREFORMANCE UNDER NORMAL CONDITIONS AND SHALL RESET AUTOMATICALLY WHEN RECOUVERING FROM AM EMERGENCY HIGH LIQUID LEVEL EVENT.

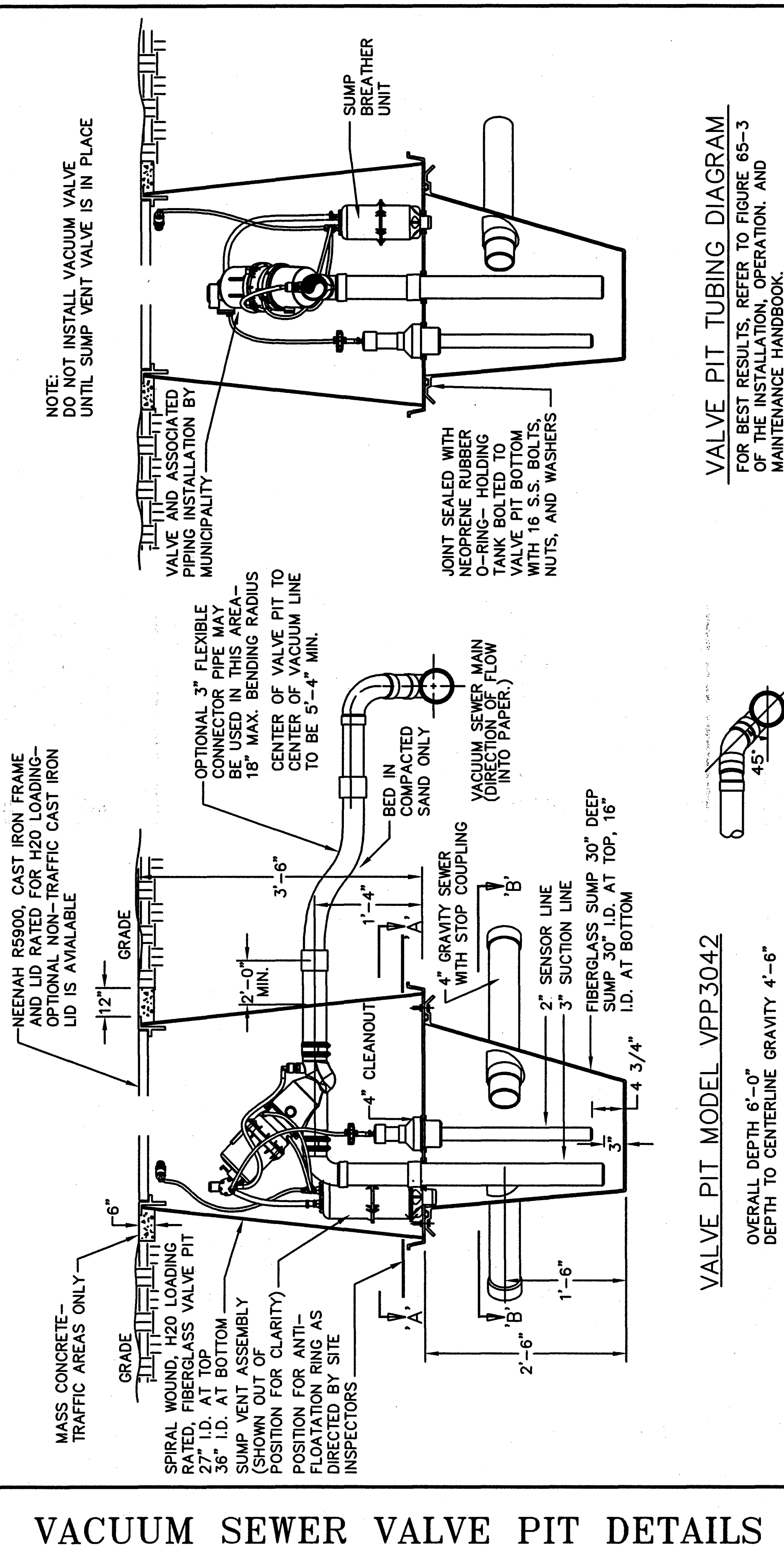


LIFT DETAILS FOR 3" SERVICE LATERAL

VACUUM SEWER DETAILS

APPR. DATE: DATE	REF:	FIG NO: SS-27

THURSTON COUNTY SANITARY SEWER STANDARD DETAIL



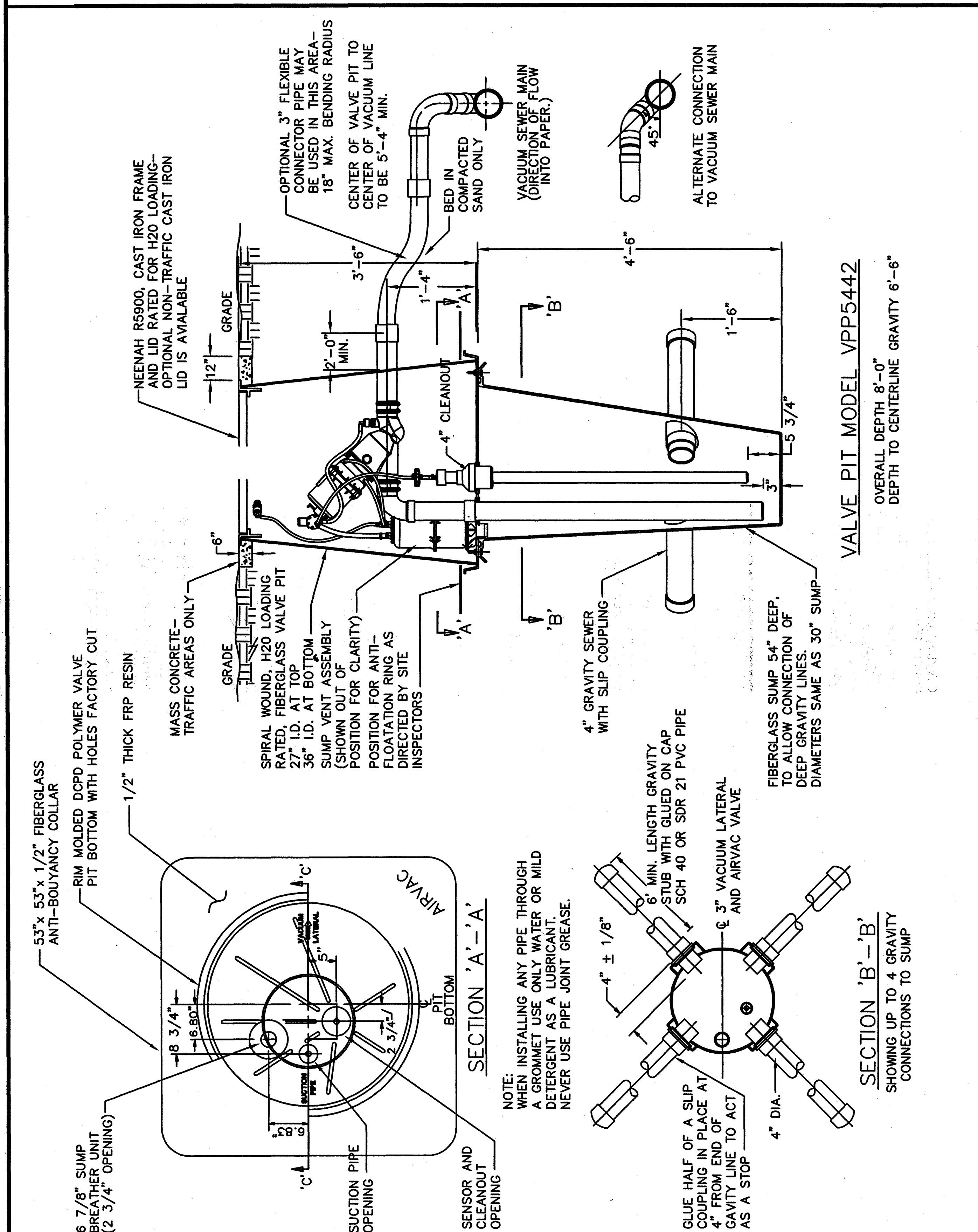
NOTES:

1. CONTRACTOR SHALL SUPPLY ONE SET OF REPLACEMENT COUPLINGS FOR INLET AND OUTLET OF 3" VACUUM VALVE. ALL COUPLINGS SHALL BE 3" FERNCO P1056-33.

VACUUM SEWER VALVE PIT DETAILS

APPR. DATE: DATE	REF:	FIG NO:	SS-28

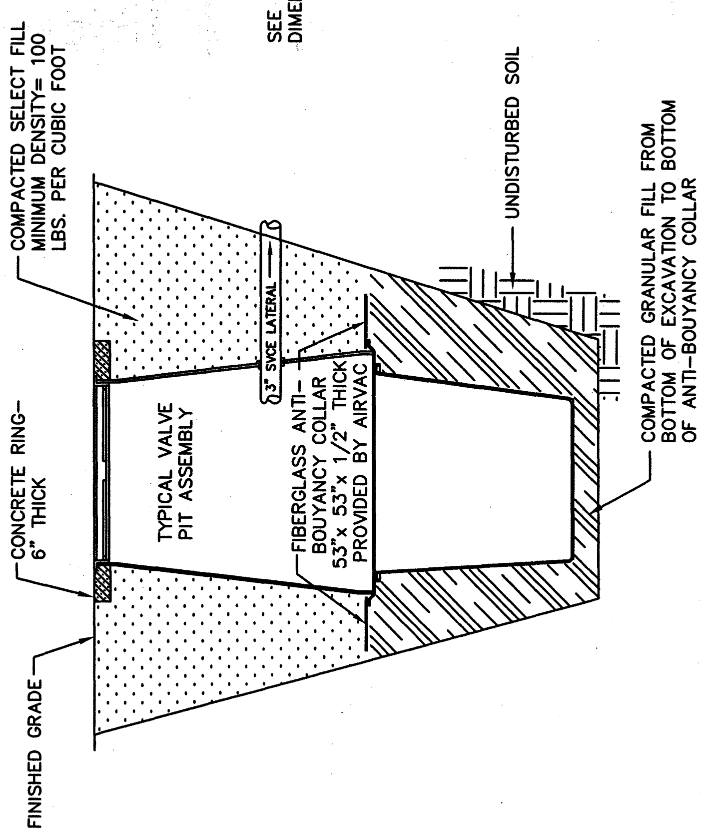
THURSTON COUNTY SANITARY SEWER STANDARD DETAIL



VACUUM SEWER VALVE PIT DETAILS

APPR. DATE: DATE	REF:	FIG NO: SS-29

THURSTON COUNTY SANITARY SEWER STANDARD DETAIL



VALVE PIT BEDDING AND BACK FILL
WITH OPTIONAL FIBERGLASS COLLAR SHOWN

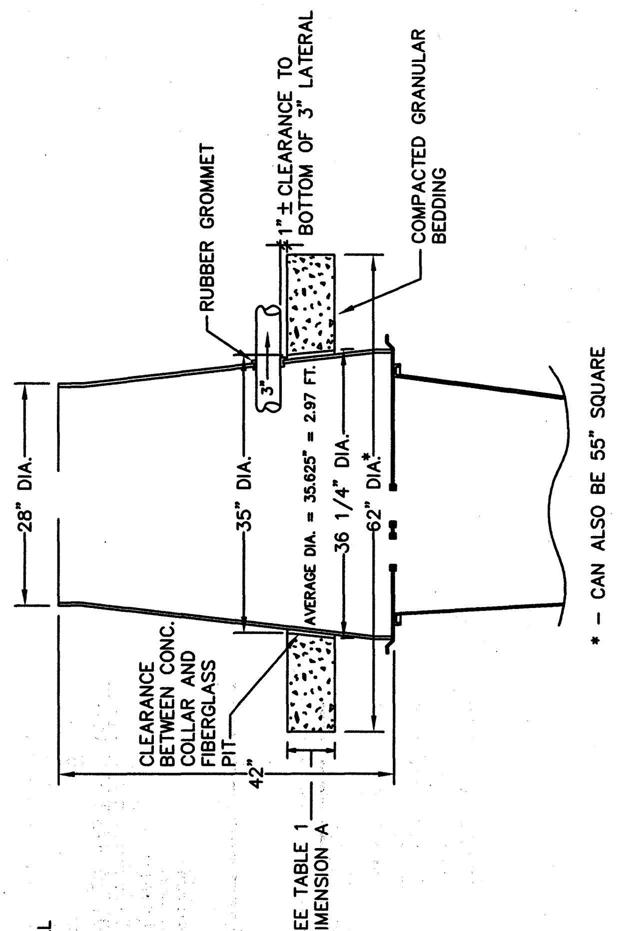


TABLE 1

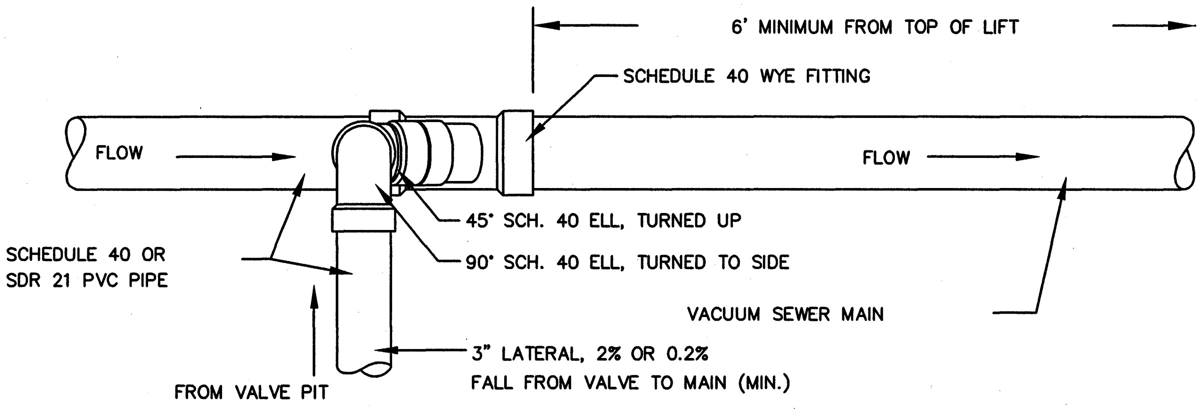
DESCRIPTION	DIM. A
30" SUMP PACKAGE	7 1/2"
54" SUMP PACKAGE	9 1/4"

OPTIONAL CONCRETE ANTI-BOUYANCY COLLAR

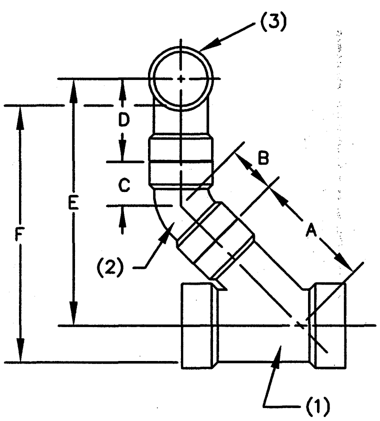
VACUUM SEWER VALVE PIT DETAILS

APPR. DATE: DATE	REF:	FIG NO:	SS-30

THURSTON COUNTY SANITARY SEWER STANDARD DETAIL



VALVE PIT TO MAIN CONNECTIONS



DIMENSIONS BASED ON SPEARS MANUFACTURING

(1) 45 DEG WYE, SOCKET x SOCKET x SOCKET
(2) 45 DEG ELL, SOCKET x SOCKET
(3) 90 DEG ELL, SOCKET x SOCKET

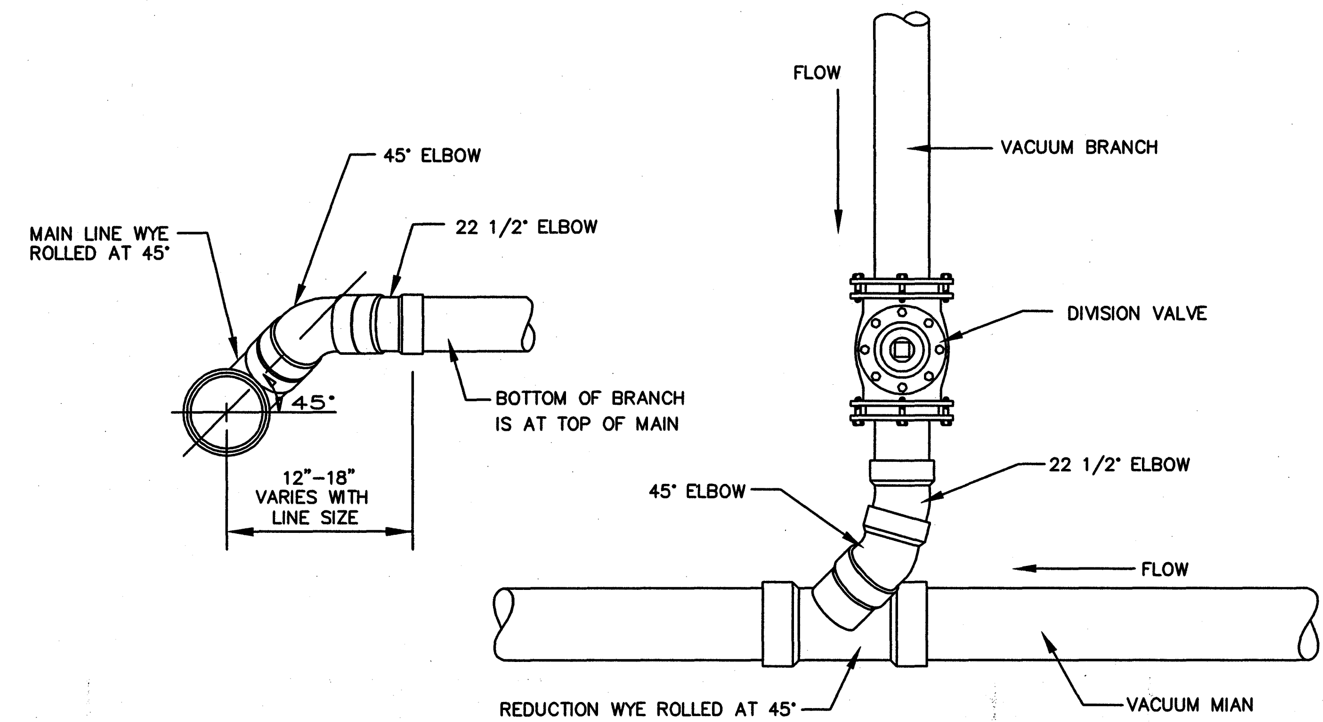
WYE SIZE	A	B	C	D	E	F– INVERT
4 x 4 x 3	9 1/4"	3 1/16"	3 1/16"	3 25/32"	15.55"	1.31'
6 x 6 x 3	10 1/2"	3 1/16"	3 1/16"	3 25/32"	16.43"	1.38'
8 x 8 x 3	13"	3 1/16"	3 1/16"	3 25/32"	18.20"	1.53'
10 x 10 x 3	14 3/8"	3 1/16"	3 1/16"	3 25/32"	19.17"	1.62'

VALVE SERVICE CONNECTIONS
SD–10

VACUUM SEWER CONNECTIONS

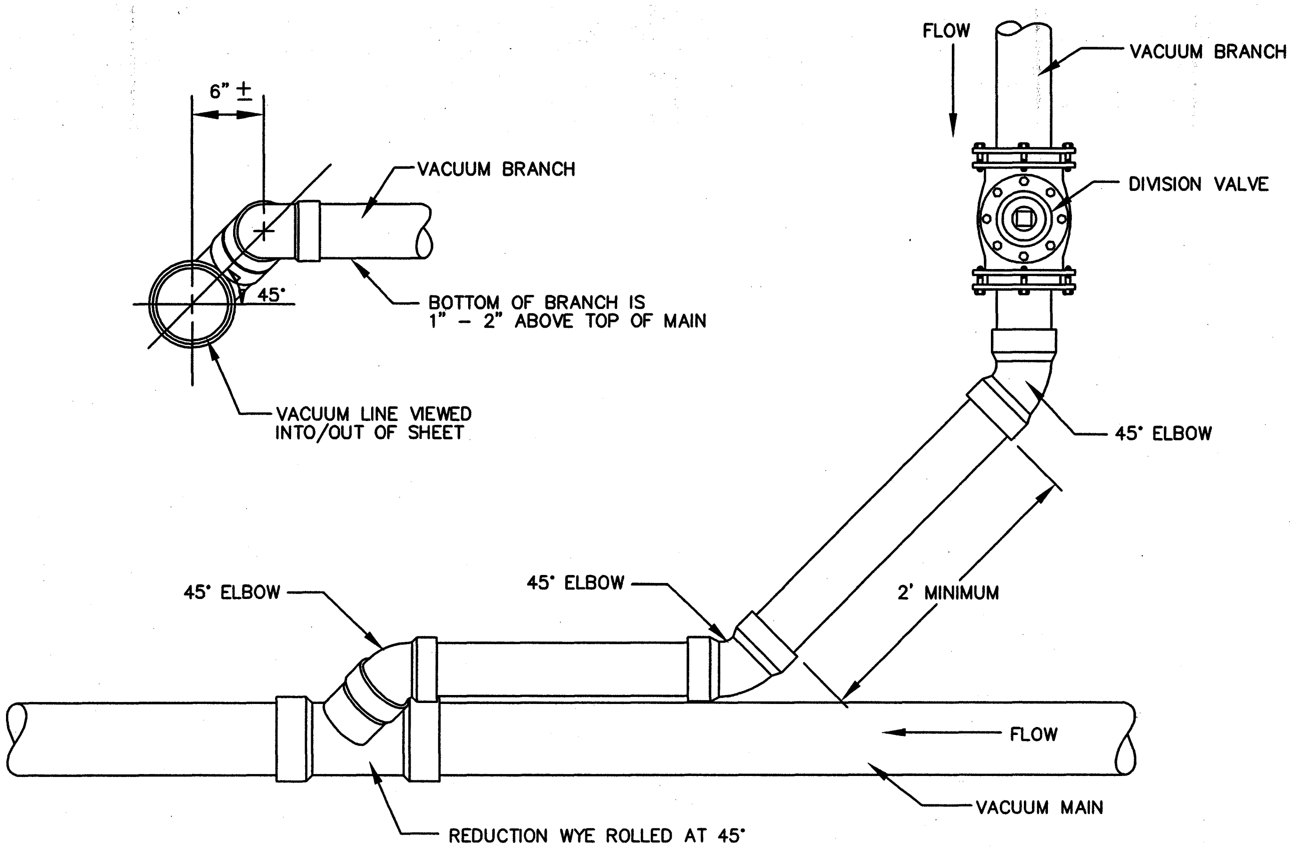
APPR. DATE: DATE	REF:	FIG NO:	SS-31

THURSTON COUNTY SANITARYSEWER STANDARD DETAIL



ALTERNATE VACUUM BRANCH TO MAIN LINE CONNECTION

SD–11



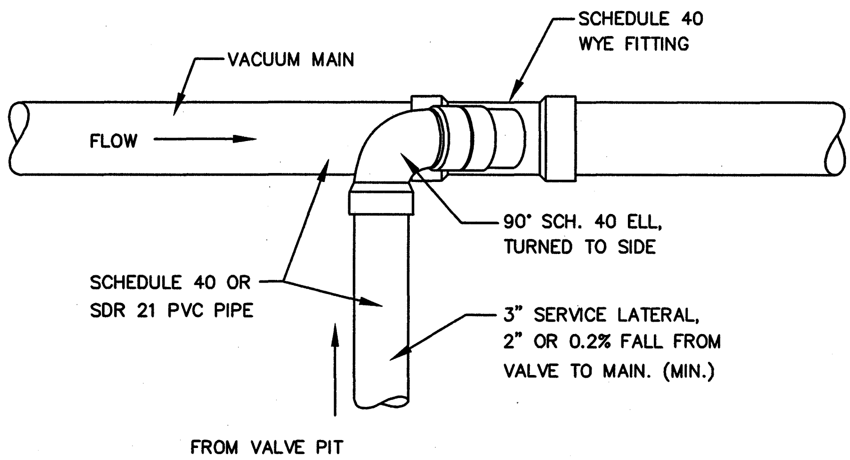
ALTERNATE VACUUM BRANCH TO MAIN LINE CONNECTION

SD–12

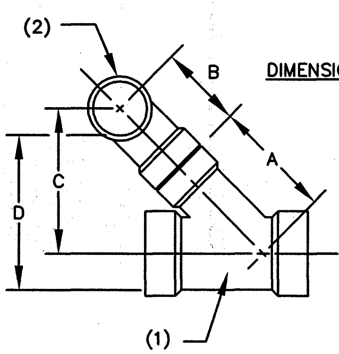
VACUUM SEWER CONNECTIONS

APPR. DATE: DATE	REF:	FIG NO:	SS-32

THURSTON COUNTY SANITARYSEWER STANDARD DETAIL



VALVE PIT TO MAIN CONNECTIONS



DIMENSIONS BASED ON SPEARS MANUFACTURING

(1) 45 DEG WYE, SOCKET x SOCKET x SOCKET

(2) 90 DEG ELL, SOCKET x SOCKET

WYE SIZE	A	B	C	D– INVERT
4 x 4 x 3	9 1/4"	3 25/32"	9.32"	0.78'
6 x 6 x 3	10 1/2"	3 25/32"	10.21"	0.85'
8 x 8 x 3	13"	3 25/32"	11.86"	1.00'
10 x 10 x 3	14 3/8"	3 25/32"	12.84"	1.10'

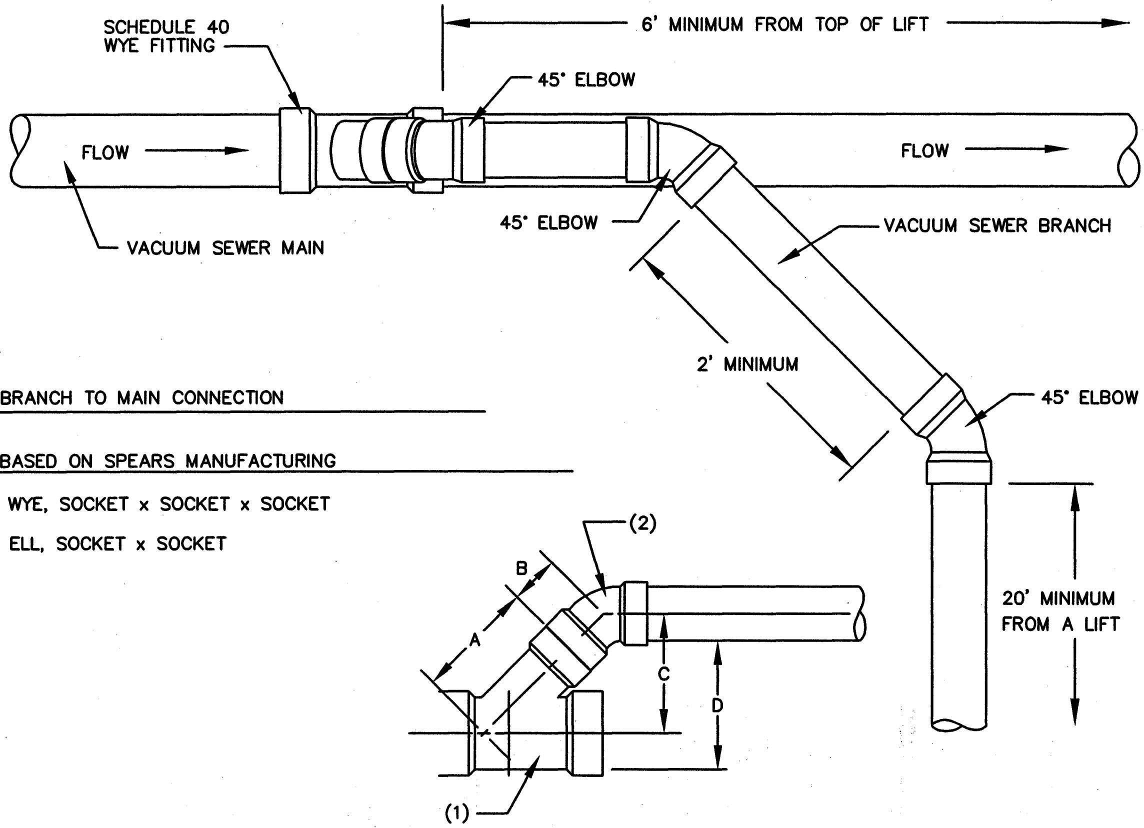
VACUUM SERVICE LATERAL TO MAIN OR BRANCH CONNECTION

SD–9

VACUUM SEWER CONNECTIONS

APPR. DATE: DATE	REF:	FIG NO:	SS-33

THURSTON COUNTY SANITARY SEWER STANDARD DETAIL



VACUUM BRANCH TO MAIN CONNECTION

DIMENSIONS BASED ON SPEARS MANUFACTURING

(1) 45 DEG WYE, SOCKET x SOCKET x SOCKET

(2) 45 DEG ELL, SOCKET x SOCKET

WYE SIZE	A	B	C	D- INVERT
4 x 4 x 4	8 3/4"	3 5/16"	8.53"	0.71'
4 x 4 x 3	9 1/4"	3 1/16"	8.70"	0.73'
6 x 6 x 6	12 1/8"	5 9/16"	12.5"	1.04'
6 x 6 x 4	10"	3 5/16"	9.41"	0.78'
6 x 6 x 3	10 1/2"	3 1/16"	9.59"	0.80'
8 x 8 x 8	18 3/4"	6 13/16"	18.07"	1.52'
8 x 8 x 6	16 1/4"	5 9/16"	15.42"	1.30'
8 x 8 x 4	14 1/4"	3 5/16"	12.42"	1.05'
8 x 8 x 3	13"	3 1/16"	11.36"	0.99'
10 x 10 x 10	22 3/8"	8 19/32"	21.90"	1.89'
10 x 10 x 8	20 1/4"	6 13/16"	19.13"	1.61'
10 x 10 x 6	17 3/4"	5 9/16"	16.46"	1.42'
10 x 10 x 4	15 3/4"	3 5/16"	13.48"	1.18'
10 x 10 x 3	14 3/4"	3 1/16"	12.33"	1.08'

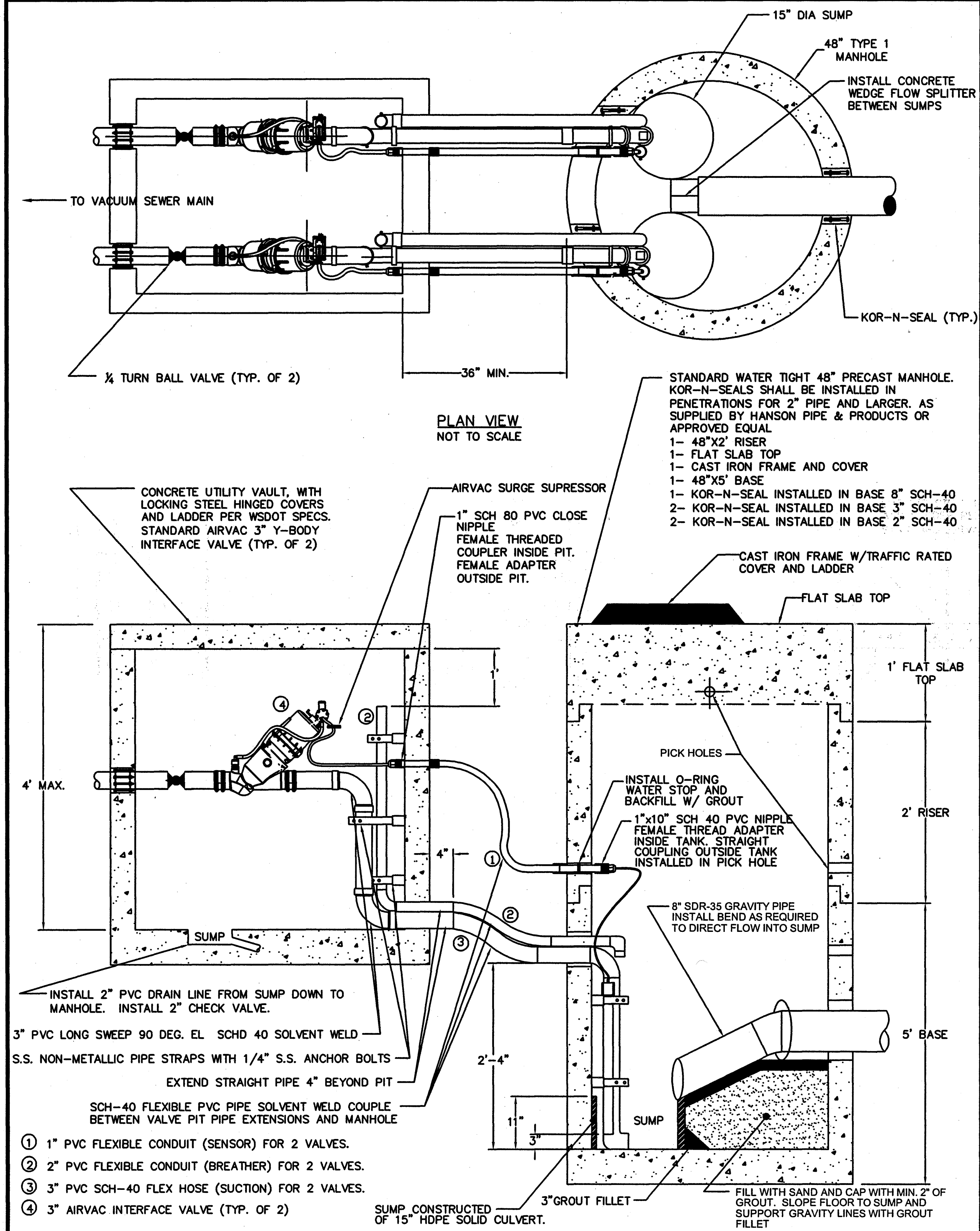
VACUUM BRANCH TO MAIN LINE CONNECTION

SD-8

VACUUM SEWER CONNECTIONS

APPR. DATE: DATE	REF:	FIG NO:	SS-34

THURSTON COUNTY SANITY SEWER STANDARD DETAIL



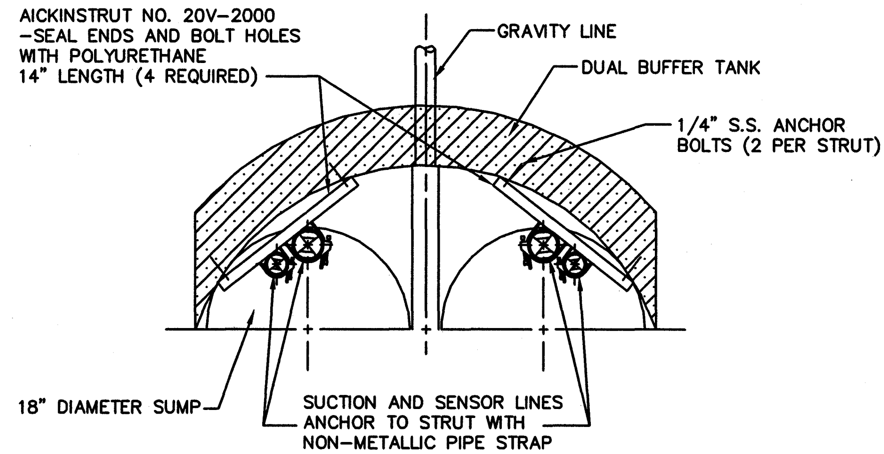
1 1" PVC FLEXIBLE CONDUIT (SENSOR) FOR 2 VALVES.
2 2" PVC FLEXIBLE CONDUIT (BREATHER) FOR 2 VALVES.
3 3" PVC SCH-40 FLEX HOSE (SUCTION) FOR 2 VALVES.
4 3" AIRVAC INTERFACE VALVE (TYP. OF 2)

VACUUM SEWER BUFFER TANK

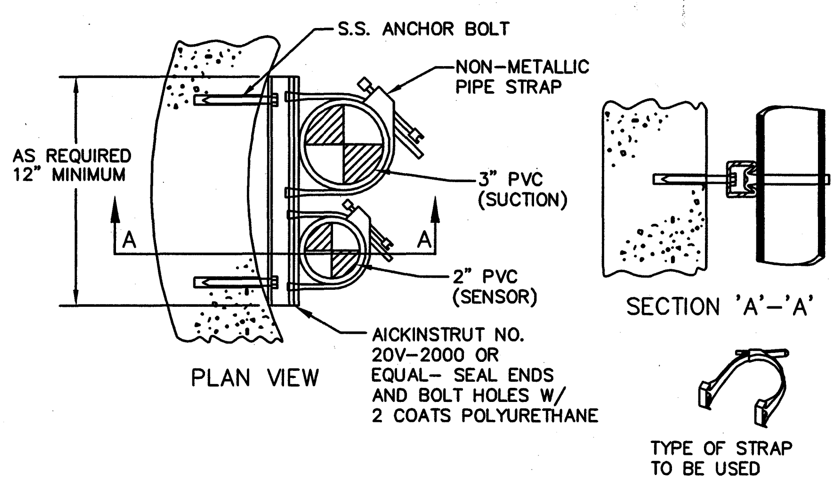
APPR. DATE:		FIG NO:	SS-35

SOURCE: AIRVAC

THURSTON COUNTYSANITARY SEWER STANDARD DETAIL



DUAL BUFFER TANK PIPE ANCHOR
NOT TO SCALE



SINGLE BUFFER TANK PIPE ANCHOR
N.T.S.

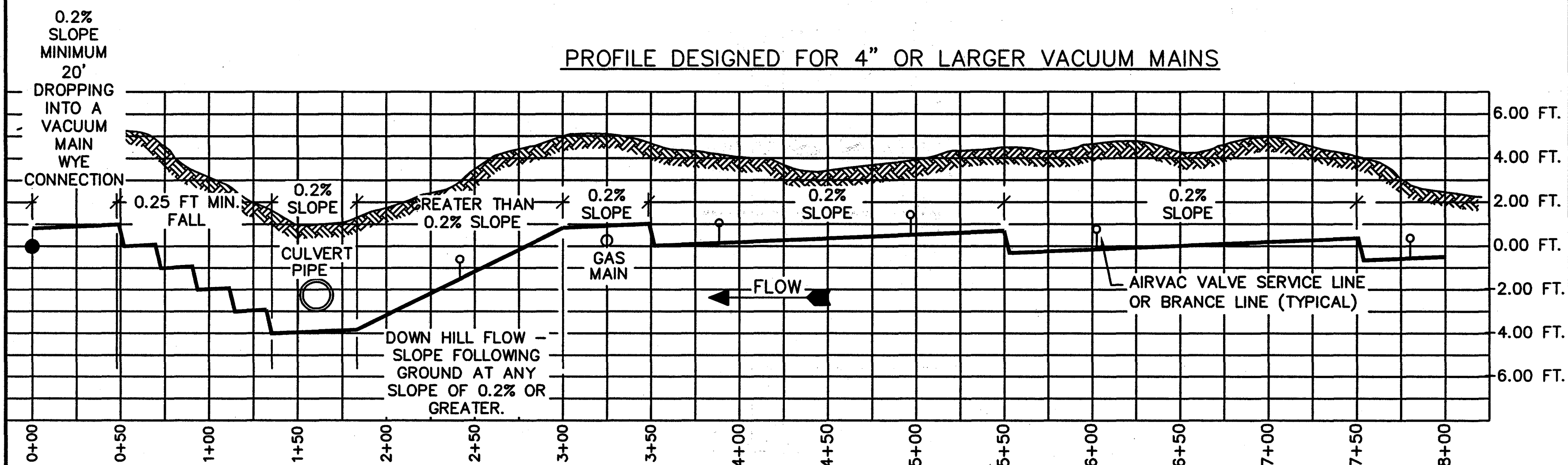
VACUUM SEWER BUFFER TANK

APPR. DATE:		FIG NO:	SS-36

SOURCE; AIRVAC

THURSTON COUNTY SANITARY SEWER STANDARD DETAIL

PROFILE DESIGNED FOR 4" OR LARGER VACUUM MAINS



MAXIMUM OF (5) 1.5' LIFTS CONSECUTIVELY SPACED AT A MINIMUM OF 20' APART WITH 0.25 FT (MIN) OF FALL BETWEEN LIFTS

50' MINIMUM SLOPED AT 0.2% COMING INTO A LIFT

LEVEL AND UPGRADE TRANSPORT

MINIMUM FALL BETWEEN LIFTS:

PIPE DIA.	MIN. FALL	0.2% OF DISTANCE
3"	0.20'	0.2% 100' ▲
4"	0.25'	0.2% 125' ▲
6"	0.25'	0.2% 125' ▲
8"	0.25'	0.2% 125' ▲
10"	0.25'	0.2% 125' ▲

USE WHICHEVER SLOPE IS GREATER BETWEEN ANY 2 LIFTS, ▲ – ABOVE THIS LENGTH IN DISTANCE, THE 0.02% SLOPE IS GREATER. ANYTHING SHORTER THAN THIS DISTANCE SHOULD USE MINIMUM FALL INDICATED. WHEN NOT BETWEEN TWO LIFTS, USE 0.02% SLOPE.

3" SERVICE LATERAL PROFILE DESIGN

3" VALVE SERVICE LINE – MAXIMUM LENGTH 300', 1 VALVE PIT FLOW LIMIT. USE SCHEDULE 40 OR SDR 21 PVC PIPE.

4" OR LARGER MAIN PROFILE DESIGN

4" VACUUM MAIN – MAXIMUM LENGTH 2000'; 38 GPM MAXIMUM FLOW.
6" VACUUM MAIN – NO MAXIMUM LENGTH; 106 GPM MAXIMUM FLOW.
8" VACUUM MAIN – NO MAXIMUM LENGTH; 210 GPM MAXIMUM FLOW.
10" VACUUM MAIN – NO MAXIMUM LENGTH; 375 GPM MAXIMUM FLOE.

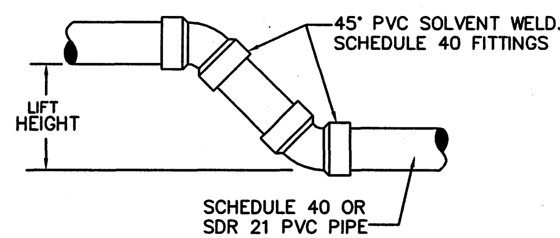
LEVEL AND UPGRADE TRANSPORT

PROFILE CHANGES

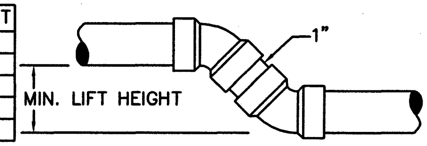
USE 1' LIFTS WHENEVER POSSIBLE. FOR 6" OR LARGER VACUUM LINES USE 1.5' LIFTS IN ANY SERIES OF LIFTS, OTHERWISE 1' LIFTS ARE RECOMMENDED. COSULT AIRVAC REGARDING LIFTS ABOVE 3'.

PROFILE CHANGE CONSTRUCTION

STATIC LIFT FOR CALCULATING LINE LOSSES= LIFT HEIGHT MINUS PIPE DIAMETER, FOR ALL PIPE SIZES.



MINIMUM LIFT HEIGHT	
3" PIPE	.42 FT
4" PIPE	.45 FT
6" PIPE	.71 FT
8" PIPE	.86 FT
10" PIPE	1.07 FT



VACUUM SEWER MAIN PROFILE DETAILS

APPR. DATE: DATE
REF:
FIG NO: SS-37

DEVELOPMENT STANDARDS FOR WATER AND SEWER SYSTEMS THURSTON COUNTY, WASHINGTON

APPENDIX C

General Notes - Water

DEVELOPMENT STANDARDS FOR
WATER AND SEWER SYSTEMS
THURSTON COUNTY, WASHINGTON

APPENDIX C

General Notes (Water Main Installation)

1. All workmanship and material shall be in accordance with the latest edition of the American Water Works Association (AWWA) standards, American Public Works Association (APWA), State of Washington Standard Specifications for Road, Bridge and Municipal construction, latest edition and the Thurston County Road Standards.
2. A preconstruction meeting shall be held with Thurston County prior to the start of construction.
3. Water mains equal to or less than twelve inches in diameter shall be AWWA C900 Class 200, C905 Class 235, or as otherwise required or approved by Thurston County. All water mains larger than 12 inches in diameter shall be AWWA C905, Class 235 or ductile iron cement mortar-lined thickness Class 52.
4. Gate valves shall be resilient wedge, NRS (Non Rising Stem) with O-rings seals. Valve ends shall be mechanical joint or ANSI flanges. Valves shall conform to AWWA 509-80. Gate valves shall be Mueller A2370, M & H Style 3067, American Flow Control Series 500, or as approved by Thurston County. Existing valves shall be operated by Thurston County employees only.
5. Hydrants shall be the dry barrel type and one of the following: Mueller Centurion or Clow F2500. Hydrants shall be bagged until system is approved. All hydrants shall be equipped with Storz adapters.
6. All lines shall be chlorinated and tested in conformance with the above referenced specification (See Note 1 above).
7. All pipe and services shall be installed with 12 gauge coated copper toning wire secured with duct tape to top of pipe to prevent movement during backfilling, brought up and tied off at top of valve box. There shall be two (2) feet of slack exposed in the valve box for connection by locater. The toning wire shall be tested prior to acceptance.
8. Detectable marking tape shall be installed over all water lines. The tape shall be placed twelve (12) inches above the top of the pipe and shall extend its entire length. Detectable marking tape shall meet the requirements of Section 9-15.18 of the Standard Specifications.
9. Provide traffic control plan(s) as required in accordance with MUTCD.
10. All water mains shall be staked for grades and alignment by an engineering or surveying firm capable of performing such work.
11. Call Underground Locate at 1-800-424-5555 a minimum of 48 hours prior to any excavations.
12. Where connections require "field verification, connection points will be exposed by contractor and fittings verified two working days prior to distributing shut-down notices.

13. Taps and other disruptions to the existing water system shall only occur Monday through Thursday between the hours of 8:00 a.m. and 2:00 p.m. each day, and shall not shall occur on Saturday, Sunday, or any holiday recognized by Thurston County, without the approval of Thurston County.

14. At any connection to an existing line where a new valve is not installed, the existing valve must be pressure tested to Thurston County standards prior to connection. If an existing valve fails to pass the test, the contractor shall make the necessary provisions to test the new line prior to connection to the existing system or install a new valve.

15. All community water systems shall comply with the cross-connection control requirements specified in WAC 246-290-490 and the Thurston County Cross Connection Control Program.

16. No lot line watermains are allowed.

17. All watermains shall be placed in a public right-of-way or within an easement dedicated to Thurston County. The minimum width of the easement shall be 12 feet centered along the watermain.

DEVELOPMENT STANDARDS FOR WATER AND SEWER SYSTEMS THURSTON COUNTY, WASHINGTON

APPENDIX D

General Notes – Sanitary Sewer

DEVELOPMENT STANDARDS FOR
WATER AND SEWER SYSTEMS
THURSTON COUNTY, WASHINGTON
APPENDIX D

GENERAL NOTES (SANITARY SEWER MAIN INSTALLATION)

1. All workmanship and materials shall be in accordance with Thurston County standards and the latest edition of the State of Washington Standard Specifications for Road, Bridge and Municipal Construction (WSDOT/APWA) and the Thurston County Road Standards.
2. Thurston County datum shall be used for all vertical control. A benchmark list is available from Thurston County.
3. Drawings shall show existing sanitary sewer manholes within the project area and identify each by the unique identification number provided by Thurston County, obtained from existing record drawings.
4. Drawings shall show all easements, right-of-way limits and address of parcels within or adjacent to the project area.
5. All approvals and permits required by Thurston County shall be obtained by the contractor prior to the start of construction.
6. If construction is to take place in the County right-of-way, the contractor shall notify the County and obtain all the required approvals and permits
7. A preconstruction meeting shall be held with Thurston County Construction Inspector prior to the start of construction.
8. Thurston County Department of Water and Waste Management shall be notified a minimum of 48 hours in advance of a tap connection to an existing main.
9. The contractor shall be fully responsible for the location and protection of all existing utilities. The contractor shall verify all utility locations prior to construction by calling the Underground Locate Line at 1-800-424-5555 a minimum of 48 hours prior to any excavation.
10. Gravity sewer main shall be HDPE pipe conforming to ASTM F714, with heat-fused joints, or PVC, ASTM D 3034 SDR 35 or ASTM F 679 with joints and rubber gaskets conforming to ASTM D 3212 and ASTM F 477.
11. Precast manholes shall meet the requirements of ASTM C 478. Manholes shall be Type 1-48" manhole or larger unless otherwise specified on the plans. Joints shall be rubber gasketed conforming to ASTM C 443 and shall be grouted from the inside. Lift holes shall be grouted from the outside and inside of the manhole.
12. Side sewer services shall be PVC, ASTM D 3034 SDR 35 with flexible gasketed joints. Side sewer connections shall be made by a tap to an existing main or a wye branch from a new main.
13. All sewer mains shall be field staked for grades and alignment by a licensed engineering or surveying firm qualified to perform such work.

14. Bedding of the sewer main and compaction of the backfill material shall be required in accordance with the above mentioned specification (See note 1).

15. All services shall be installed with solid No. 12 AWG insulated copper toning wire, on top of pipe, continuous. Marking tape shall be placed approximately nine inches above the pipe when the trench is backfilled.

16. A 3-foot square by 4-inch thick concrete pad shall be installed around all cleanouts, manholes, division valves and isolation valves, unless otherwise directed by the owner.

17. Temporary street patching may be allowed for as approved by the Thurston County. Temporary street patching shall be provided by placement and compaction of one inch maximum asphalt concrete cold mix. Contractor shall be responsible for maintenance as required.

18. Erosion control measures shall be taken by the contractor during construction to prevent infiltration of existing and proposed storm drainage facilities and roadways.

19. Provide traffic control plan(s) in accordance with the Manual on Uniform Traffic Control Devices (MUTCD) as required.

20. It shall be the responsibility of the contractor to have a copy of approved plans on the construction site at all times.

21. Any changes to the design shall first be reviewed and approved by the project engineer and Thurston County.

22. All lines shall be cleaned and pressure tested in conformance with the above referenced specifications (See note 1). A water test of all manholes in accordance with Thurston County standards is also required. Testing shall take place after all underground utilities are installed and compaction of the roadway subgrade is completed.

23. Prior to backfill, all mains and appurtenances shall be inspected and approved by the Thurston County Construction Inspector. Approval shall not relieve the contractor for correction of any deficiencies and/or failures as determined by subsequent testing and inspections. It shall be the contractors' responsibility to notify Thurston County for the required inspections.

24. All sanitary sewer mains shall be placed in public right-of-way or if in easement areas, provide 12 foot wide paved (six inch ballast, two inch crushed, two inch asphalt) access to all manholes. No lot line sewer mains will be allowed.

25. All pipe connections to manholes shall utilize KOR-N-SEAL fittings.

26. Gravity sewer mains shall meet the following: HDPE pipe conforming to ASTM F714, with heat-fused joints, PVC pipe conforming to ASTM D 3034 SDR 35, ASTM F794, or ASTM F 679 Type 1 with joints and gaskets, conforming to ASTM 3212 and ASTM F 477.

27. Ductile iron pipe, where called for or used as an approved substitute shall be class 52.

28. All mains will be dedicated to Thurston County for maintenance with appropriate bills of sale and easements.

29. Thurston County ownership of the main and lateral will go to the property line or easement if a cleanout exists at this point. If no cleanout exists, County responsibility ends at the limit of the main.

DEVELOPMENT STANDARDS FOR WATER AND SEWER SYSTEMS THURSTON COUNTY, WASHINGTON

APPENDIX E

Construction Completion Reports

DEVELOPMENT STANDARDS FOR
WATER AND SEWER SYSTEMS
THURSTON COUNTY, WASHINGTON

CONSTRUCTION COMPLETION REPORT FOR DISTRIBUTION MAIN PROJECTS

In accordance with WAC 246-290-120(5), a ***Construction Completion Report*** is required for all construction projects. Under the submittal exception process for distribution main projects, designed by a professional engineer but not submitted to DOH for approval, the report does not need to be submitted. **However, the purveyor must keep the Construction Completion Report on file and make it available for review upon request by DOH in accordance with WAC 246-290-125 (2)(b).** Furthermore:

(1) The report form **must** bear the seal, date and signature of a professional engineer (PE) licensed in the state of Washington; and

(2) Per WAC 246-290-120(5)(c), the amount of change in the physical capacity of a system must be documented, if the project results in a change in physical capacity.

Please type or print legibly in ink:

____
Name of Water System

____
Name of Purveyor (Owner or System Contact) ___

____
Mailing Address

____
City State Zip

PROJECT NAME AND DESCRIPTIVE TITLE:
(Include the name of any development project and number of services.)

____

DOH System ID No.:________________

Date Water System Plan that includes
Standard Construction Specifications
Approved by DOH:

____

Date Project or Portions Thereof Completed

____

Professional Engineer's Acknowledgment

The undersigned professional engineer (PE), or his/her authorized agent, has inspected the above-described project that, as to layout, size and type of pipe, valves and materials, and other designed physical facilities, has been constructed and is substantially completed in accordance with construction documents reviewed by the purveyor's engineer. In the opinion of the undersigned engineer, the installation, physical testing procedures, water quality tests, and disinfection practices were carried out in accordance with state regulations and principles of standard engineering practice.

I have reviewed the disinfection procedures, pressure test results, and results of the bacteriological test(s) for this project and certify that they comply with the requirements of the construction standards/specifications approved by DOH.

____
Engineer's Signature

Engineer's Seal

Date ______________________

DOH 331-147 (3/00)

THURSTON COUNTY
WASHINGTON
SINCE 1852

Appendix L

South Thurston County Urban Growth Areas Abbreviated Coordinated Water System Plan

SOUTH THURSTON COUNTY
URBAN GROWTH AREAS
ABBREVIATED
COORDINATED WATER SYSTEM PLAN

JUNE 2000

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
DIVISION OF DRINKING WATER
Airdustrial Center, Bldg. 3 • P.O. Box 47822 • Olympia, Washington 98504-7822
TDD Relay 1-800-833-6388

June 26, 2000

The Honorable Diane Oberquell, Chairman
The Honorable Judy Wilson, Commissioner
The Honorable Kevin O'Sullivan, Commissioner
Board of Thurston County Commissioners
2000 Lakeridge Dr. SW, Bldg. No. 1 Rm. 269
Olympia, Washington 98502-6045

SUBJECT: South Thurston County Abbreviated Coordinated Water System Plan (ACWSP)

Dear ~~Commissioners~~: Diane, Judy, Kevin

The Department of Health (DOH) appreciates the efforts of all those who have participated in the development of the South Thurston County ACWSP. The document is well prepared and provides an excellent mechanism for addressing public water supply issues in the South Thurston County region. All parties involved in the development of the document should be commended.

In accordance with Chapter 246-293-300 WAC, the South Thurston County ACWSP has been reviewed by DOH and is hereby **APPROVED.** The South Thurston County ACWSP may at anytime be updated or revised. The Board of County Commissioners may initiate an update of the document at anytime, but DOH may initiate an update no more frequently than once every five years. An update may encompass all or a portion of the ACWSP.

Please distribute copies of this approval letter to all water utilities that took part in development of the ACWSP. Furthermore, in accordance with the terms of the Referendum 38 contract #N07466, DOH requests four (4) copies of the ACWSP for staff when printed in final form.

If you have any questions on this approval, or if we can be of further assistance, please contact Jim Rioux of our Southwest Regional Office at (360) 664-3952, or me at (360) 236-3110.

Sincerely,

Gregg J. Grunenfelder

GREGG GRUNENFELDER
Director

cc: Bill Liechty, WSDOH
Rich Hoey, WSDOH
Jim Rioux, WSDOH
Phil Brinker, Thurston County Environmental Health
Richard Blinn, P.E. Director Thurston County Water and Waste Management
Tom Clingman, Thurston County Water and Waste Management

South Thurston County Urban Growth Areas
Abbreviated Coordinated Water System Plan

2000

Prepared by Thurston County Department of Water and Waste Management with participation of:

Ken Garmann, Director, Yelm Public Works Department
Dave Dafoe, Director, Tenino Public Works
Ron Gibson, Director, Rainier Public Works
Bob McCool, Director, Bucoda Public Works
Sean Orr, Washington Department of Health Drinking Water Program
Phil Brinker, Thurston County Environmental Health
Fred Knostman, Thurston County Development Services
Richard Blinn, Director, Thurston County Water & Waste Management
Jim Bachmeier, Thurston Co. Water & Waste Management Utility Development
Randy O'Hern, Thurston Co. Water & Waste Management Utility Operations
Tom Clingman, Thurston Co. Water & Waste Management Utility Development principal author

Financial support for this project was provided by Grant # N07466 from the Washington State Department of Health Drinking Water Program

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<u>SOUTH THURSTON COUNTY URBAN GROWTH AREAS</u>
<u>ABBREVIATED COORDINATED WATER SYSTEM PLAN AREA-WIDE SUPPLEMENT</u>

1. ASSESSMENT OF NEED FOR COORDINATED WATER SYSTEM PLANNING

1.1 Purpose of the ACWSP: Linking Urban Growth Management and Water System Coordination

Growth management plans adopted by Thurston County and the south Thurston County municipalities identify the municipal and county water systems as the intended water purveyors within the Urban Growth Areas for Yelm, Rainier, Tenino and Grand Mound. While Bucoda does not have an unincorporated Growth Area, the municipal water system intends to expand within the incorporated area. Designation of these Urban Growth Areas as "Critical Water Supply Service Areas" (CWSSA) under the Public Water System Coordination Act (RCW 70.116) is necessary to ensure coordination of long-term urban-level water service. In specific, CWSSA designation ensures that the municipal utilities and the Thurston County Grand Mound utility have the priority opportunity to provide water throughout their respective UGAs.

Only through CWSSA designation do the Washington Department of Health (DOH) and Thurston County Environmental Health have the authority to require new development in the UGAs to utilize the municipal water systems. This priority status is balanced by the Act's stipulation that service to new development be "timely and reasonable". The Coordination Act process includes a mechanism to allow a new water system only where no other feasible option exists.

Designation under the Coordination Act also provides the foundation for long-term planning and investment by the municipal utilities toward the ultimate objective of service throughout the UGAs. Water System Plans adopted by the individual utilities and approved by DOH will need to reflect this long-term service objective.

The goals of the South Thurston County UGA Coordinated Water System Plan are to:

* Ensure reliable urban-level water service within the designated Urban Growth Areas for Yelm, Rainier, Tenino and Grand Mound.
* Link water service review conducted by State and local health agencies with Urban Growth Area land use and utility planning objectives.
* Avoid proliferation of small, inadequate water systems in the urban growth areas.
* Provide a predictable and timely process for determining water service to new land uses within the UGAs, balancing the interest of property owners in obtaining timely water service with the long-term objectives of growth management policies and water system development plans.

1.2 Accommodating Anticipated Long-Term Growth

Water system coordination for the South Thurston County UGAs is particularly important given the significant future growth that is anticipated in these areas. Thurston County and the municipalities of Yelm, Rainier and Tenino have adopted Joint Plans for the various Urban Growth Areas. Consistent with the Growth Management Act, the various UGAs are intended to be the location of most future development in the region. The Growth Management Act and local growth policies emphasize the need for providing urban-level infrastructure as development occurs.

Significant investments will be required in municipal water system source, storage and transmission lines to accommodate this additional growth. In general, new development will be responsible for extension of water lines and a shared contribution toward basic water system infrastructure, generally through collection of hookup charges or General Facility Charges. Each water system will be responsible to ensure adequate construction standards for the line extensions; install system improvements as identified in Capital Improvement Plans; and plan for ultimate expansion of the system throughout the UGA.

Designation of the municipal utilities as the priority water purveyor within their UGA is essential to long-term coordination of water system development with land development activities.

TABLE 1 – 1

POPULATION PROJECTIONS - SOUTH COUNTY UGAs

Source: TRPC "The Profile", 1999, Table III-20.

	2000 EST. POPULATION	2015 FORECAST	% INCREASE FROM 2000	2025 FORECAST	% INCREASE FROM 2000
RAINIER	1,430	1,910		2,130	
RAINIER UGA	140	170		190	
TOTAL	1,570	2,080	32%	2,320	48%
TENINO	1,500	1,510		1,570	
TENINO UGA	110	170		370	
TOTAL	1,610	1,680	4%	1,940	20%
YELM	3,030	6,680		8,560	
YELM UGA	1,160	1,640		2,830	
TOTAL	4,190	8,320	99%	11,390	172%
GRAND MOUND	1,070	1,700	59%	2,060	93%
BUCODA	610	630	3%	640	5%
TOTAL SOUTH COUNTY UGAs	**9,060**	**14,410**	59%	**18,350**	103%

Estimated 2000 population and forecasts of UGA population for 2015 and 2025 are identified on Table 1-1. These forecasts are from the 1999 Profile prepared by Thurston Regional Planning Council.

Significant increases in population are anticipated for some jurisdictions. The highest growth rate and largest population increase is anticipated for Yelm: TRPC projects nearly 100% population increase by 2015 and significant additional growth by 2025. Rainier and Grand Mound are also projected to experience substantial growth in the coming years.

Table 1-2
RESIDENTIAL DEVELOPABLE LANDS IN SOUTH THURSTON COUNTY GROWTH AREAS, 1998
Source: TRPC "The Profile", 1999, Table III-6.

Jurisdiction	Total Acres	Non-Residential (Commercial, Public, Etc.)	Residential				
			Total Residential Area	Currently Developed Residential Lands		Developable Residential Lands	
		Acres	Acres	Acres	Percent	Acres	Percent
Rainier							
Incorporated	967	328	639	264	41%	375	59%
Rainier UGA	457	110	347	30	9%	317	91%
Total	**1,424**	**438**	**986**	**294**		**692**	
Tenino							
Incorporated	492	324	168	96	57%	72	43%
Tenino UGA	738	140	598	10	2%	588	98%
Total	**1,230**	**464**	**766**	**106**		**660**	
Yelm							
Incorporated	3,567	2,431	1,136	147	13%	989	87%
Yelm UGA	2,464	395	2,069	193	9%	1,876	91%
Total	**6,031**	**2,826**	**3,205**	**340**		**2,865**	
Grand Mound UGA							
UGA #1 Area	**360**						
Outside LID Area	**622**						
Total	**982**	**780**	**202**	**60**	30%	**142**	70%
Bucoda	**275**	**153**	**122**	**62**	51%	**60**	49%
TOTAL SOUTH CO. GROWTH AREAS	**9,582**	**4,661**	**5,281**	**862**		**4,419**	84%

Another view of potential development within the designated urban growth areas is provided by assessment of available vacant land. In 1998, TRPC identified "developable residential lands" within each growth area. Available land for future residential development is identified in Table 1-2. Overall, nearly ½ of the residential lands within the South Thurston County UGAs is still available for development. Developable residential lands exceed 600 acres within both the Rainier and Tenino UGAs. For Bucoda, 60 acres of developable residential lands are included within the existing corporate limits -- nearly ½ the total residential area. In the Grand Mound UGA, there are 142 acres of developable residential land along with extensive vacant lands designated for future industrial and commercial development.

1.3 Source Development Needs

The obligation of the designated utilities to meet future water needs within their designated UGAs is established by the Urban Growth Management Joint Plans, the Water System Plans and this Coordinated Water System Plan. Adequate water source is a critical factor in meeting this obligation.

Conservation will be pursued as envisioned in the water system plans for each jurisdiction. In Yelm, water reuse is a new source for meeting non-potable needs such as irrigation.

In addition, groundwater source development will be critical within some of the UGAs. Timing of need for additional water rights varies with the circumstances of each system, as described in Chapter 3. Population forecasts provide a benchmark for ensuring timely action to ensure development of adequate source. Provision of additional groundwater to meet public water system needs must be balanced with protecting fish habitat and other instream resources.

1.4 Coordinating Development Review and Water Service Review

This ACWSP provides a framework to avoid proliferation of wells and small water systems as the municipalities and growth areas develop. At the time of development review for single-family homes or larger development projects, the priority for water service will be the designated municipal utility.

Coordination is particularly important in the unincorporated growth areas, where one jurisdiction provides development review (Thurston County Development Services) while a different jurisdiction is the designated water service provider (the municipal utilities). Section 4 provides a review process to minimize new wells or small water systems in these designated urban areas, while protecting the interest of property owners where properties are at a significant distance from the existing municipal water system lines.

1.5 Coordination Act Requirements

The Coordination Act establishes requirements for the development and coordination of all public water systems within a designated Critical Water Supply Service Area (CWSSA). In Thurston County, the term Urban Water Supply Service Area (UWSSA) is utilized for both the previously adopted North Thurston County CWSP and this Plan, in recognition of the integration with Urban Growth Management.

A Coordinated Water System Plan (CWSP) Area-Wide Supplement includes the following minimum contents:

1. Design standards including fire flow. For this CWSP, the design standards for each designated water system (which meet or exceed State minimums) are adopted as the minimum standards within each system's future service area.
2. Service area maps for expanding systems. The future service areas defined for this CWSP are the Urban Growth Areas as designated in adopted land use plans.
3. Procedures for authorizing new systems that minimize proliferation. The cities and the County at Grand Mound are the designated future purveyors within their respective Urban Growth Areas.
4. Assessment of potential shared facilities, including intertie and transferring facilities and wheeling of water supplies.
5. Satellite system management requirements; and
6 Policies and procedures that generally address failing water systems for which counties may become responsible under RCW 43.70.195.

1.6 Coordination With Other Planning

The Coordinated Water System Plan was coordinated with relevant growth area planning policies including:

1. **The State Growth Management Act** (RCW 36.70A) stipulates goals and policies related to provision of services within designated growth areas, including the goal to:

"Ensure that those public facilities and services necessary to support development shall be adequate to serve the development at the time the development is available for occupancy and use, without decreasing current service levels below locally established minimum standards." (RCW 36.70A.020(12))

2. **"Thurston County County-Wide Planning Policies"** dated September 8, 1992 address "promotion of contiguous and orderly development and provision of urban services" through the following policies:

"a. Compatible development standards and road/street level of service among adjoining jurisdictions;

"b. Development occurring within unincorporated growth areas shall conform to the development standards of the associated city or town;

"c. No extensions of urban services and facilities, such as sewer and water, beyond urban growth boundaries except to serve existing development in rural areas with public health or water quality problems."

3. **"Joint Comprehensive Plans for Growth Management"** have been adopted by Thurston County and the various municipalities. Each of the Joint Plans identify that the municipal utility is intended to provide water service throughout the unincorporated Urban Growth Area. Dates and resolution numbers for Thurston County adoption of these Joint Plans:

Title	Adopted	County Res #
"Joint Comprehensive Plan for Growth Management in the Tenino Urban Growth Area"	8/22/94	10702
"City of Yelm Comprehensive Plan Joint Plan With Thurston County"	2/27/95	10851
"Joint Comprehensive Plan for Growth Management in the Rainier Urban Growth Area"	4/17/95	10894
"Grand Mound Subarea Plan, Grand Mound Wastewater Comprehensive Plan, and Grand Mound Water System/Project Report"	6/24/96	11219

4. **Individual Water System Comprehensive Plans**. Water system plans are approved for all four systems. All four are approved as expanding systems. This Area wide Supplement is coordinated with provisions of the following Water System Plans. Current connections appear to be within the approved services per the DOH SADIE database.

Water System Plan Title	DOH ID #	Plan approval status	Current service level conforms to DOH approved services
City of Yelm Comprehensive Water System Plan (Skillings - Connolly)	99350	Approved 4/30/96	Yes
City of Tenino Water System Plan (Gibbs & Olson)	87400	Approved 6/2/97	Yes
Town of Rainier Water System Plan (Gray & Osborne)	70980	Approved 2/1/99	Yes
Thurston County Grand Mound Water System Plan (Earth Tech/Thurston Co. Dept. of Water & Waste Management)	WS ID# 07158 SMA ID# 134	Approved 7/26/99	Yes
Bucoda Water System Plan	09100	Approved 9/27/94 (Update due 9/27/00)	Yes

2. WATER SYSTEM DEVELOPMENT POLICIES

The following area-wide policies are intended to meet the objectives of the Public Water System Coordination Act (RCW 70.116), the Growth Management Act (RCW 36.70A) and Comprehensive Plan policies of the involved local jurisdictions.

2.1 UWSSA Water Service Policies

The following polices are intended to guide the water service review procedures detailed in Chapter 4.

2.1.1. Designated UWSSA water systems

The designated water system is assigned a priority right to provide service within their designated Urban Water Supply Service Area (UWSSSA). The UWSSAs for the municipalities of Yelm, Rainier and Tenino are their respective Urban Growth Areas as identified in the Joint Plans adopted by the municipalities and Thurston County. The UWSSA for Grand Mound is the UGA identified in the Thurston County Grand Mound Sub-Area Plan. For the Grand Mound UWSSA, Thurston County is the designated water purveyor as there is no municipality associated with this Growth Area. Bucoda is the designated water system within their incorporated area.

The UWSSA is the area intended to be ultimately served by the designated utility. This service will be provided through planned facilities identified in each designated utility's Water System Plan and through interim service measures such as satellite service.

2.1.2. Existing non-expanding public water systems

To the extent allowed by hookup policies of the designated water utility, other existing public water systems within a UWSSA may continue to exist in accordance with State and County water system regulations. These non-expanding water systems may only provide service within their existing service areas.

Over time, existing small public water systems should generally be incorporated into the designated utility to ensure adequate fire flow to protect structures and public safety and provide professional water system operation and management. Wells that are no longer used must be properly decommissioned to reduce risk of groundwater contamination and allow full development of these areas. Timing of incorporation into the designated system will depend on connection requirements of the individual water systems. For example, see the summary chart at Appendix 2 summarizing the Connection Policy Guidelines for the Grand Mound water utility.

2.1.3. Proposed Rural-density development in Long-Term UGAs for Rainier, Tenino and Yelm

Land use policies allow development at rural densities in unincorporated portions of the long-term Yelm, Rainier and Tenino UGAs. Permits for this type of development should be routed to the municipality for comment.

The municipal utilities should examine proposed interim Rural-density development, including proposed individual wells, to ensure consistency with long-term utility extension plans. Pre-existing development can pose an obstacle to future extension of municipal water system pipelines. In some cases, it may be in the public interest to provide water service from the municipal system to Rural-density development within the long-term UGA. Another option may be placing conditions on the development permit, such as waiver of protest for a future ULID.

Proposed Rural-density subdivisions of land or other multiple dwelling projects should be considered for satellite service under auspices of the designated utility. See Section 4.2.2 for discussion of the satellite service concept.

2.1.4. Proposed individual wells within city limits or the Grand Mound UGA

Proliferation of individual wells within the UWSSA is contrary to the intent of the Coordination Act. New individual wells will only be allowed where service of service process described in Chapter 4 and Section 5.1.1 Thurston County Sanitary Code. Where service is not available from the designated utility and new individual wells are appropriate, the utility should consider measures to ensure consistency with long-term water system extension.

2.1.5. Proposed new public water systems within city limits or the Grand Mound UGA

Where service from the designated water system is available on a timely and reasonable basis, no new public water systems will be allowed.

Particularly within the Yelm city limits and the Grand Mound UGA, some proposed developments might be distant from the existing water system pipelines. In these situations, the designated UWSSA water system should consider creative solutions such as a satellite system under the direct operation or oversight of the designated utility.

2.2 Water System Design Standards for the South Thurston County UWSSAs

The design standards adopted by each water system are designated as the design standards for each system's future service area, provided these meet or exceed State minimums including provision of fire flow.

2.3 UWSSA Water Source Development Objectives

It is the objective of this CWSP to secure and protect adequate water sources to meet long-range requirements of residential, commercial and industrial development in each UWSSA. The 20-year population projections in the "Joint Comprehensive Plans with Thurston County for Growth Management" and the Grand Mound Sub-Area Plan, and the service projections in the utility Water System Plans, provide benchmarks for development of water sources. This long-range source development objective will be achieved through conservation programs, water rights applications and other measures identified in the six-year Water System Plans.

Local jurisdiction coordination with the Department of Ecology Water Resources Program will be crucial to addressing water source development needs. In particular, additional source development will need to be coordinated with conservation programs approved by the Department of Health and comprehensive water resource management strategies developed through Watershed Plans for Water Resource Inventory Areas (WRIAs).

As the cities and County develop Wellhead Protection Area (WHPA) plans, there will be a need to coordinate protection of capture areas that extend into unincorporated Growth Area and Rural designated areas. Wellhead capture areas should be considered in review of land use applications; in work programs for outreach programs including the Moderate Risk Waste Program, on-site system public education efforts and the Conservation District Farm Plan program; and in outreach by utilities to property owners in the wellhead areas.

3. WATER SYSTEM STATUS AND PROJECTIONS

3.1 Tenino Urban Water Supply Service Area

a. Existing City of Tenino water service

The City of Tenino water utility was established prior to 1940. Currently, the system provides service throughout the 500-acre town and to a small area of adjacent unincorporated development. The system currently has 639 residential services and 84 commercial customers. The Department of Health classifies the system as expanding, with a status of "green". DOH records identify a current residential service population of 1,550.

Fire flow is provided to most areas at the Fire District #12 requirement of 1,500 gallons per minute (gpm). Ample storage for the next 20 years is provided in a new twin-tank 550,000-gallon reservoir.

Improvements identified in the 1997 Water System Plan include:

* Replacement of remaining small water mains (mains 4 inches or under);
* Improved fire flow to a few specific areas; and
* Installation of about 13 fire hydrants to achieve a maximum distance of 350 feet to a hydrant; and
* Consideration of a new well at a different location (separate wellhead capture area) to improve system flexibility and reliability.

b. Future service area boundaries and target population

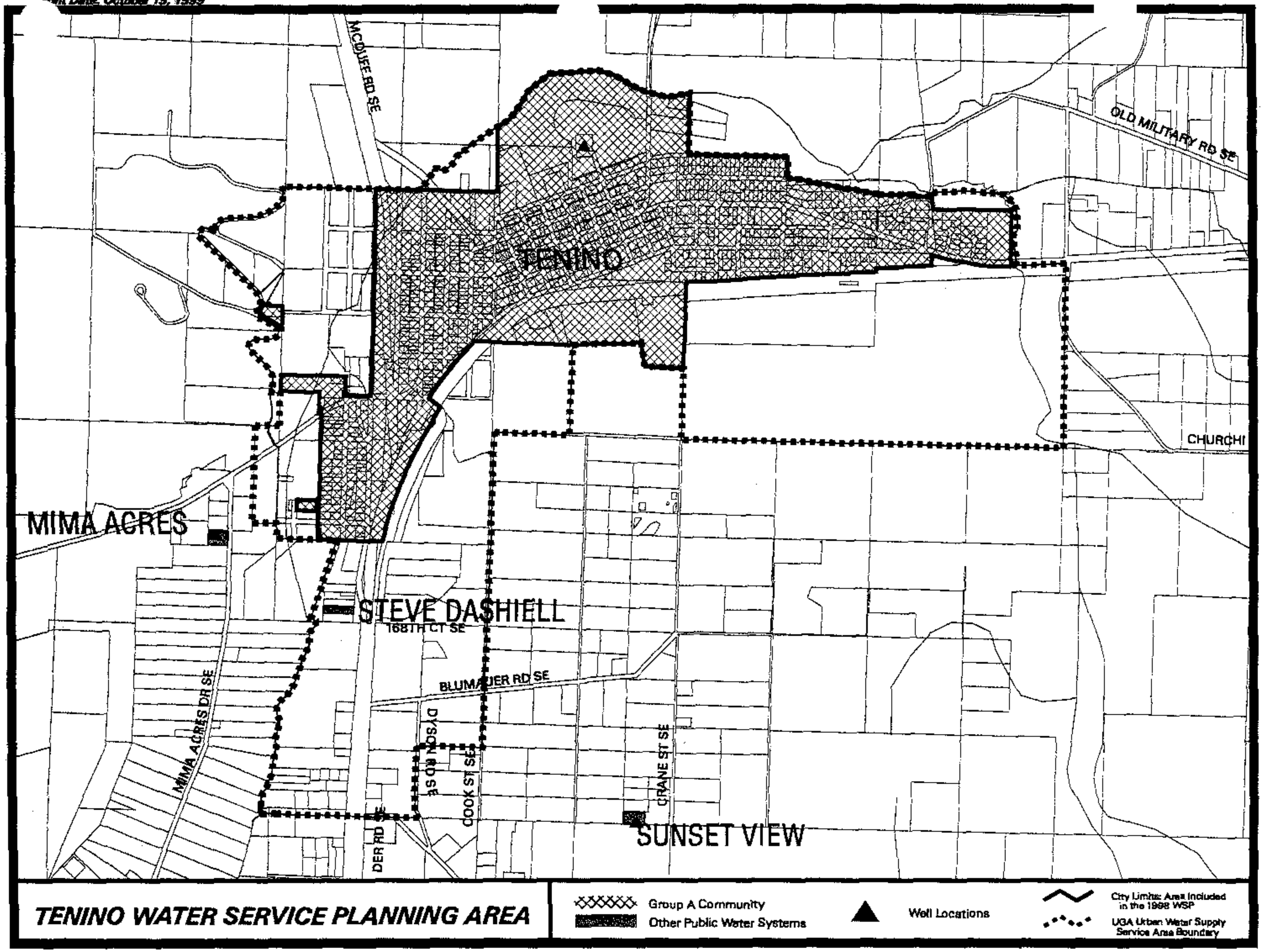
Tenino is identified as the future water service provider within the designated UGA in the "City of Tenino Joint Comprehensive Plan with Thurston County for Urban Growth Management" adopted in 1994. This UGA boundary is utilized in the Coordinated Water System Plan to identify the future water service area for the City of Tenino: See Figure 3-1. DOH records indicate that the system is considered "expanding" with a total of 797 approved connections.

The unincorporated Urban Growth Area totals about 740 acres, mainly southwest of the municipal limits along Highway 507 and in the southeast area of the town. This area is about 1½ times the size of the existing municipality. As stipulated by the Joint UGA Plan, the unincorporated portion of the UGA is in a "holding zone" of 1 unit per 5 acres. Development at higher densities will occur through annexation and rezoning. Water service is also anticipated to be extended into the UGA following or concurrent with annexation. The UGA policy linkage of urban-level development with annexation should facilitate logical extension of Tenino water service. Population projections by the Thurston Regional Planning Council assume a modest growth rate for Tenino. Over the coming 25 years, TRPC projects a total population increase of about 20% for the Tenino UGA, to a 2025 population of 1,940 (see Table 1-1.) The designated UGA has capacity to accommodate a substantially greater population increase. TRPC identified 660 "developable" residential acres within the current municipal limits and the adopted UGA – compared to 106 currently developed residential acres within this area.

Among the many factors that will influence future development patterns is sewerage service. Currently, all development in Tenino is served by on-site septic systems, as the City does not operate a sewage treatment facility. Provision of off-site sewage treatment and disposal could significantly increase densities of development and the rate of conversion of the currently undeveloped UGA to urban land uses.

FIGURE 3-1

Print Date: October 19, 1999



MAP MADE BY THE THURSTON GEODATA CENTER

SCALE: 1 Inch = 1700 Feet

/users/klb/wells/tenino8x11.aml

c. Water rights

It appears that Tenino has sufficient water rights for the next decade or two, depending on the actual rate of growth that occurs. Additional rights will be necessary to accommodate full development of the designated long-term UGA.

The City of Tenino has rights for 88 million gallons per year, with a maximum instantaneous withdrawal of 700 gallons per minute. In the record year of usage (1989), 77 million gallons (88% of the rights) were used. Tenino's three existing wells can produce in excess of 668 gpm.

The 1997 City of Tenino Water System Plan is based on 2015 projections of 1,728 population in the service area and consumption of 79.5 million gallons projects. Using the WSP population projections, existing rights and the developed well capacity are sufficient for the planning period ending in 2015 (Gibbs and Olson, 1997). The population estimate used for the Water System Plan is slightly higher than current projections from the Thurston Regional Planning Council (see Table 1-1).

d. Source of supply and wellhead protection

The city's wells are located on the north side of town near the middle school. An initial Wellhead Protection plan was included in the 1997 Water System Plan. A fixed radius capture area was estimated: This is intended to be supplemented in the future with an analytical model which will consider direction and rate of flow in identifying wellhead capture zones.

The key wellhead protection issue identified in the 1997 Water System Plan is susceptibility to contamination from on-site septic systems. As described in the Plan:

> "Since Tenino has no sewer system, all houses have septic systems. Most of these septic systems are becoming aged and prone to failure.

Should this occur, Tenino's wells could quickly become contaminated (as the city's three wells are closely clustered on the north side of town). Tenino has passed an aquifer protection ordinance to limit development congestion and land use in the aquifer protection area. These facts support the idea of the establishment of another City well, on City property, but removed from the existing wells. This would allow system flexibility and a continued supply of high quality water should the existing aquifer become contaminated."

e. Other public water systems

Because the city water system was established in the early years of the municipality, the City of Tenino water system supplies nearly all development within the Growth Area. One Group B system (Dashiell) serves 3 lots in the Growth Area south of the current city limits. There are no adjacent Group A public water systems. See Table 3-1 and Figure 3-1 for public water systems in the general vicinity.

The proposed Silverbrook Estates development directly west of the city is a potential major issue for land use changes and for water service in the Tenino vicinity. This proposed project includes a 10-year build out of 520 dwelling units (eventually accommodating roughly the same population as Tenino in the early 1990's). The proposed project is anticipated to utilize 178 acre feet of potable water and 181 acre feet of non-potable irrigation water at the 10-year build out condition (Silverbrook Estates Draft EIS, Table 3). However, at this time the proposed development is outside the UGA, is not designed for urban-level densities and is proposed to utilize independent non-municipal water and sewer utilities.

05/10/2000

TABLE 3-1
OTHER PUBLIC WATER SYSTEMS
TENINO VICINITY

NAME	GRP	TYPE	SEC	TNSHP	RNG	OPERATOR	PHONE	RESIDENTIAL CONNECTIONS	NONRES CONNECTIONS
MIMA ACRES #1 WATER SYSTEM	B		25	16	02W	JAN DODGE	3602642258	5	0
SUNSET VIEW ESTATES	B		30	16	01W	JEFFREY HURT	3602644731	4	0
DASHIELL, STEVE	B		30	16	01W	STEVE DASHIELL	3602642123	3	0

TNC = Trancient Non-Community
COM = Community (i.e. residential)
SOURCE: Washington Department of Health/access/pwswells.mdb
ss/excell/thpubwtr/tenino.xls

3.2 Rainier Urban Water Supply Service Area

a. Existing Town of Rainier water service

Nearly the entire Town of Rainier is served by the municipal water system. In addition, about 24 residences outside the incorporated area are also served by the municipal system. See service area map at Figure 3-2. Reflecting the makeup of the community, over 75% of water service connections are residential. 1998 estimated population within the Town is 1,560 (see Table 3 - 2.)

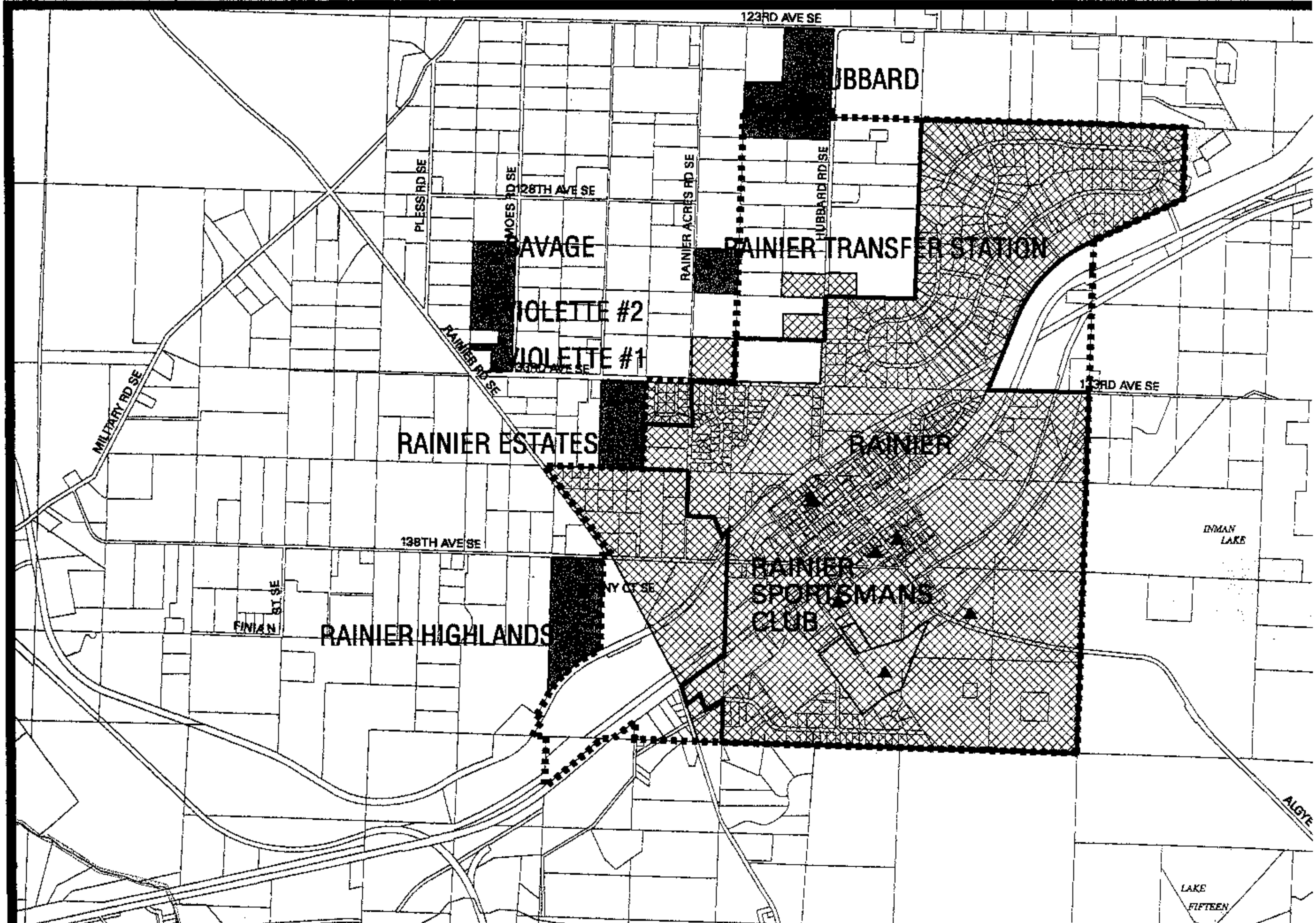
The Rainier water system was established in 1950 (two years after incorporation) through Town purchase of a private water system. Significant improvements have been made in the past decade to source and storage facilities, through new construction and major repair of existing facilities.

Department of Health data indicates that the system currently has 601 services with a service population of 1,421. The system is approved as an expanding system. As identified in the current Water System Plan, until a new reservoir is constructed Rainier is limited to a total of 725 ERUs.

Fire flow targets of 1,500 gpm in commercial areas and 750 gpm in residential areas were met in most areas during tests and modeling performed for the 1997 Water System Plan. However, nodes did not meet these targets in the northeast commercial area and on Charm Lane west of the town limits.

Print Date: October 19, 1999

FIGURE 3-2



RAINIER WATER SERVICE PLANNING AREA

Group A Community
Other Public Water Systems
Well Locations
City Limits
UGA Urban Water Supply Service Area Boundary

P MADE BY THE THURSTON GEODATA CENTER

:1 Inch = 1950 Feet

/u

/wells/rainier8x11.aml

b. Future service area boundaries and population

The Urban Growth Area boundaries and policies related to future development are contained in the "Town of Rainier Joint Comprehensive Plan with Thurston County" adopted in 1995. These policies identify Rainier as the intended water purveyor within the UGA. For the Coordinated Water System Plan, the adopted UGA is the designated future service area for the Rainier municipal water utility. See Figure 3-2.

The unincorporated portion of the UGA is in a "holding zone" of 1unit per 5 acres. Development at higher densities will occur through rezoning which will accompany annexation. Water service is also anticipated to be extended into the UGA following or concurrent with annexation.

The 2015 water service population projection utilized for the 1997 Town of Rainier Water System Plan is 2,868. This projection is somewhat higher than the current TRPC 2015 population projections for the Rainier UGA (see Table 1 - 1).

Total "build-out" population of the UGA is estimated at about 4,200. This is based on estimated population capacity of the vacant developable area within the total UGA of 2,700 (Thurston County Comprehensive Plan Table 2-1). The 1999 residential developable lands study by TRPC identified a total of 692 developable residential acres within the future growth area, divided about equally between the existing incorporated areas and the designated UGA. The "developable" areas are over twice the currently developed residential lands in the Rainier growth area. A current development rates, full build-out population will not be reached for several decades.

c. Water rights

Water rights appear sufficient for about 15 years of anticipated growth (to a service population of approximately 2,680). Water rights documented in the 1997 Water System Plan total 332.2-acre feet/year. These rights are projected to be capable of supporting a service population of approximately 2,680. This population is anticipated to be reached in about 2013 (1997 Water System Plan).

Full build-out of the future water service area (to a population exceeding 4,000) will eventually require significant additional rights. Based on the consumption estimates used in the 1997 Water System Plan and the projections of full UGA build out population discussed above, it appears that roughly 160 acre feet of additional water rights may be required in the coming decades to accommodate full development of the designated UGA (new rights required beginning about 2013).

d. Source of supply and wellhead protection

The town has several wells located in the "core" area near SR 507. The 1997 Water System Plan recommends abandoning Wells 1, 2 and 5 due to concerns for community health and safety. Water rights from these wells would be transferred to Well 3, located south of the town in a site with lower vulnerability to contamination than Wells 1, 2 and 5. Maintaining the existing intertie with the Rainier Sportsman's Club is also recommended as a emergency alternate source.

e. Key system development issues

Storage is currently the limiting element for the Rainier water system. Additional facilities are required to meet storage requirements and improve pressure in the upper part of the town. The Six-Year Water Utility Capital Improvement Plan estimates project cost for needed reservoir and transmission main improvements at $1,000,000. In addition, corrosion control facilities are recommended for Wells 3 and 6, at an estimated cost of $125,000.

f. Other public water systems

The only Group A Community system within the Rainier service area is the Rainier Sportsman's Club. A few Group B water systems are located in or near the Rainier future water service area: See Table 3 - 2 and Figure 3-2. The 1997 WSP identifies that an intertie exists with the Rainier Sportsman's Club. However, this intertie has been disconnected upon advice of the town's consulting engineer.

TABLE 3-2
OTHER PUBLIC WATER SYSTEMS
RAINIER VICINITY

NAME	GRP	WITHIN UWSSA?	SEC	TNSHP	RNG	OPERATOR	PHONE	RESIDENTIAL CONNECTIONS	NONRESIDENTIAL CONNECTIONS
HUBBARD FAMILY WATER SYSTEM	B	WITHIN UGA	05	16	01E		0	3	0
RAINIER ESTATES	B	ADJACENT	08	16	01E	JIM MAYTHER	3607548636	2	0
RAINIER HIGHLANDS	B	ADJACENT	08	16	01E	DOUG BLOOM	3604463083	5	0
RAINIER SPORTSMAN'S CLUB	B	WITHIN UGA	09	16	01E	DAVID ENGLUND	3604467712	0	4
RAINIER TRANSFER STATION	B	ADJACENT	05	16	01E	THURSTON COUNTY	3603572491	0	1
SAVAGE	B	NO	05	16	01E	ARTHUR LARSEN	3604467162	3	0
VIOIETTE, LEO	B	NO	05	16	01E	TOM STONE	3604463121	3	0
VIOLETTE #2	B	NO	05	16	01E	MICHAEL PEOPLES	3604460077	3	4

TNC = Trancient Non-Community
COM = Community (i.e. residential)
SOURCE: Washington Department of Health/access/pwswells.mdb
'cell/thpublwtr/rainier.xls

3.3 Yelm Urban Water Supply Service Area

a. Existing City of Yelm water service

The city provides service to nearly all developed areas of the city plus some limited service into the unincorporated UGA. North of the City of Centralia Power, Yelm water service has been extended beyond the adopted Urban Growth Area to serve existing residential development.

Current DOH water system records identify a total of 1,000 connections and a residential population of 2,750. The estimated 2000 population of Yelm is 3,030. An additional 1,160 are estimated to currently reside in the unincorporated Yelm UGA (see Table 1-1).

Minimum fire flow provided by the system is 750 gallons per minute at 20 psi or as required by Yelm Fire District 2. Based on modeling of the entire system, increased line sizing and looping has been pursued to improve fire flow especially in commercial areas.

b. Future service area boundaries and population

The future Yelm water service area for this Coordinated Water System Plan is defined by the adopted Urban Growth Area boundaries. See Figure 3-4. These boundaries were identified in the City of Yelm Comprehensive Plan: Joint Plan with Thurston County adopted by the two jurisdictions in February 1995. The incorporated area of Yelm constitutes 3,567 acres, with an additional 2,464 acres in the unincorporated Urban Growth Area (see TRPC data on Table 1-2.) The southwest quadrant of the incorporated area is essentially undeveloped.

Significant future development is anticipated for Yelm. Thurston Regional Planning Council projects that population will nearly double by 2015, to a projected 8,320 within the UGA (see Table 1-1). The 1996 Yelm Water

System Plan projects even higher rates of growth: The WSP projects a 2015 service area population of about 19,000.

The adopted Yelm UGA has a substantial capacity to accommodate future growth. The TRPC study summarized on Table 1-2 identified 2,865 acres of developable residential lands within the Yelm UGA – compared to a 1998 estimate of 340 developed residential acres in the area. About 2/3 of the developable residential acres are in the currently unincorporated UGA.

Based on the adopted Joint Plan polices for the Yelm UGA, future growth should be well coordinated with water system development. The Joint Plan provides that undeveloped land will remain in a Rural 1 Unit/5 Acre designation throughout the UGA until the land is incorporated and sewer service from the Yelm system is approved. This growth strategy will provide opportunity to coordinate the extensive improvements in source and other water system components that will be required to serve future development.

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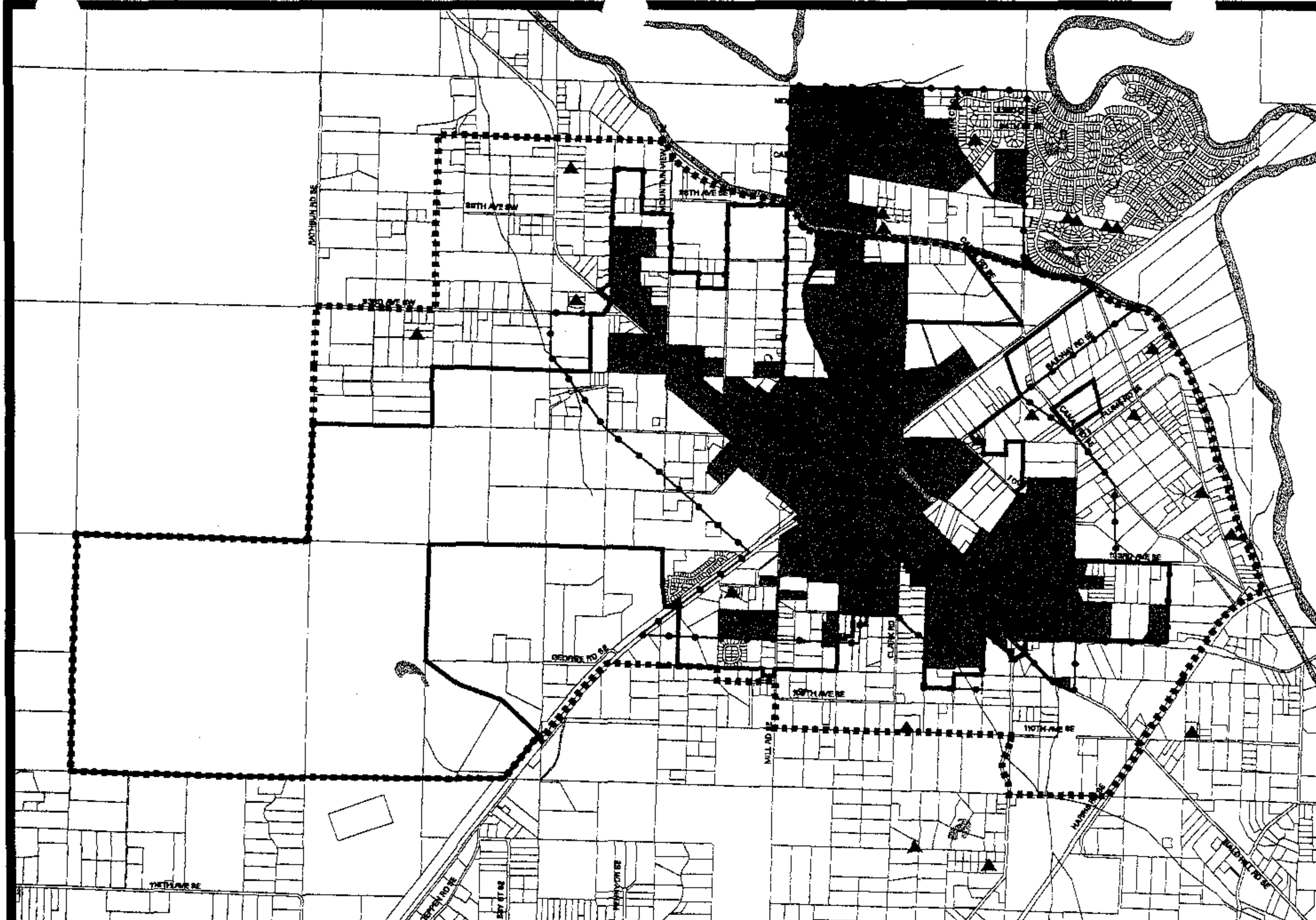
FIGURE 3-3



YELM WATER SERVICE PLANNING AREA

Current Yelm Water Service

City Limits

UGA Urban Water Supply Service Area Boundary

Area Included in the 1996 Water System Plan

Well Locations

MAP MADE BY THE THURSTON GEODATA CENTER

Scale: 1 Inch = 2970 Feet

/users/klb/wells/yelm8x11.aml

c. Water rights

The City of Yelm Comprehensive Water Plan approved in 1996 identifies the need for additional water rights as a priority issue. The current water rights of 501 acre feet per year are adequate for design flows to serve about 1,140 connections. 1996 Water System Plan data indicates that predicted annual consumption will equal or exceed existing rights in the near future.
The Department of Health position as identified in the approval letter for the 1996 Water System Plan is as follows:

> "The WSP demonstrates that the City has approached and in 1996 will exceed allowable water rights. Due to this situation DOH will be unable to approve construction documents that increase capacity and/or are growth related until additional water rights are granted by the Department of Ecology. The WSP is being approved because it has defined that the City is currently in the process to obtain additional rights."

The city has filed several applications for additional water rights. The city's projected 20-year requirement for additional rights, including reclaimed water reuse from the city's new wastewater treatment facilities and conservation, totals 4,500 AFY. The wastewater reuse program was initiated in August 1999, providing irrigation to several public and private sites. Aquifer recharge is anticipated to be an important component of the reuse program.

d. Key system development issues

DOH water system data indicates that existing water system pumping and storage capacity can accommodate 1,989 services. This is a substantial addition to the 1,000 services existing at this time. However, securing additional water rights is an existing critical need, as discussed above.

In the longer-term future, the extensive growth anticipated within the adopted Urban Growth Area will require significant additions to the water system.

e. Other public water systems in the vicinity

Due to development that occurred prior to Yelm water availability, there are a number of other public water systems in and adjoining the Yelm Urban Water Supply Service Area. Figure 3-4 illustrates location of several of the Group A Community and Group B systems in the vicinity. Parcel-specific mapping of the residential systems on Figure 3-4 is available at the Thurston County Geodata website at www.geodata.org.

Attached Table 3-3 lists over 20 public existing public water systems within the designated future Yelm water service area (Urban Water Supply Service Area). These include systems serving commercial uses and smaller residential systems serving up to 30 residences. Over time, some of these systems may be incorporated into the Yelm municipal system.

Table 3-4 identifies several systems in the Yelm vicinity but outside the UWSSA. Two larger systems are directly adjacent to the northeast boundary of the existing Yelm service area. These are Nisqually Pines, with a total of 689 connections, and the South Sound Utilities Andrews First system with 112 connections.

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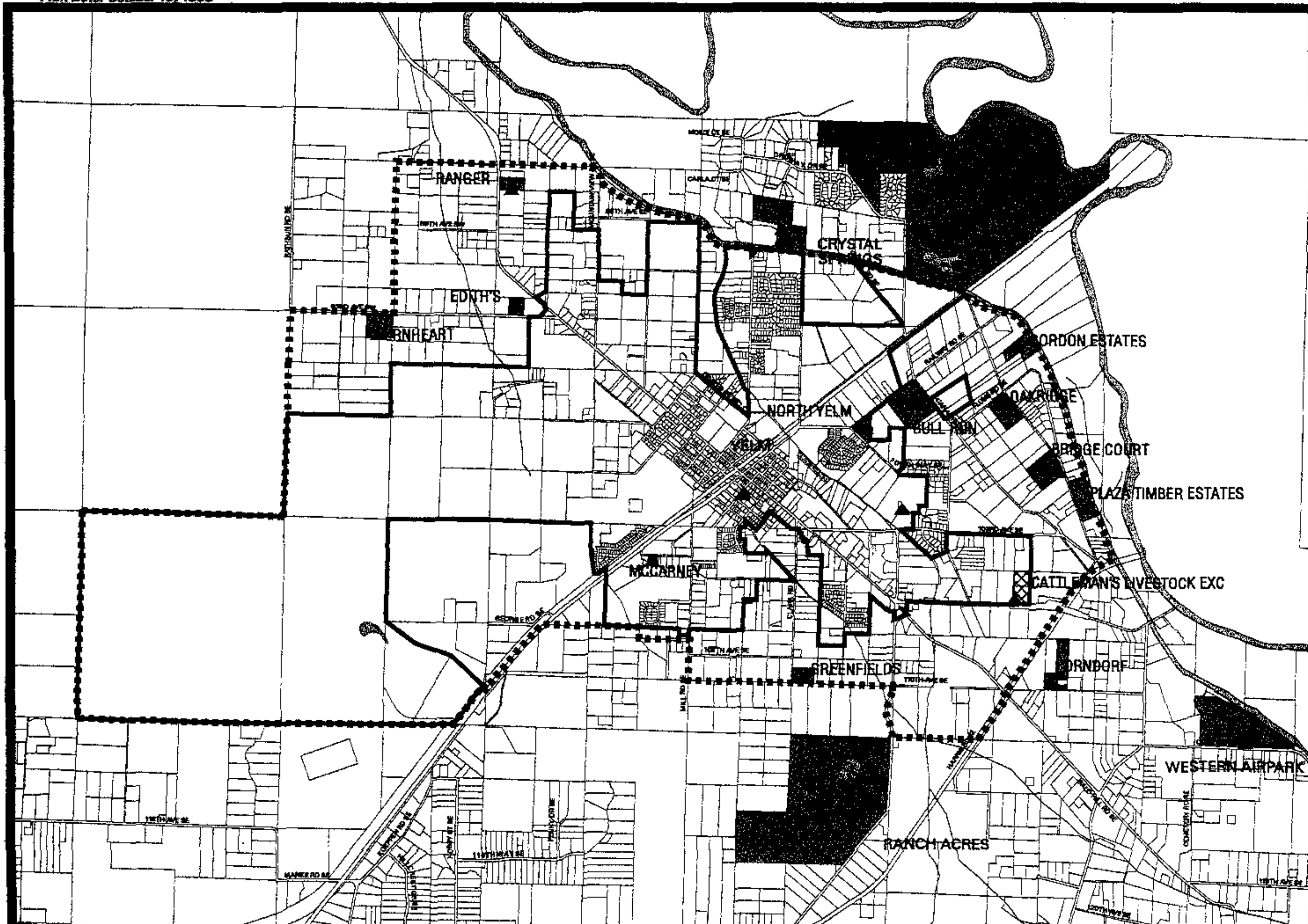
FIGURE 3-4



YELM - OTHER PUBLIC WATER SYSTEMS

Group A Community
Other Public Water Systems
City Limits
UGA Urban Water Supply Service Area Boundary
Well Locations

MADE BY THE THURSTON GEODATA CENTER

Sc... 1 Inch = 3400 Feet

/user... alis/yelm8x11.aml

TABLE 3-3
OTHER PUBLIC WATER SYSTEMS
WITHIN THE YELM URBAN WATER SUPPLY SERVICE AREA

NAME	GRP	TYPE	SEC	TNSHP	RNG	OPERATOR	PHONE	RESIDENTIAL CONNECTIONS	NONRES CONNECTIONS
BRIDGE COURT WATER SYSTEM	B		20	17	02E	PHIL PETTIT	2538479846	9	0
BULL RUN WATER SYSTEM	B		20	17	02E	ROBERT G. LOPER	3604587922	4	0
CATTLEMEN'S LIVESTOCK EXCHANGE	A	TNC	29	17	02E	ED FLOOD	3604583427	3	1
DAD'S WATER SYSTEM	B		14	17	01E	BRUCE RANGER	3604585599	2	0
EDITH'S WATER SYSTEM	B		13	17	01E	EDITH DELATUSH	3604581913	4	0
ERNHEART WATER SYSTEM	B		23	17	01E	DENNIS WHALEN/BEACON PROP	8005720930	9	0
GORDON ESTATES WATER SYSTEM	B		20	17	02E	PHIL PETTIT	2538479846	1	0
GREENFIELDS MOBILE HOME PARK	B		30	17	02E	JOE HUBBELL	3604583046	8	0
HULL, LINDA M. WATER SYSTEM	B		29	17	02E	LINDA HULL	3604585737	1	2
KINGS MEADOW MOBILE HOME PARK	A	COM	18	17	02E	GARY REMLINGER/VERN TILLMAN	4254518740	30	0
MC CARNEY	B		25	17	01E	DOUGLAS L CAMERON	3604587049	4	0
MEADOWLARK TRAILER PARK	B		20	17	02E		0	0	0
NISQUALLY VALLEY GOLF COURSE	A	COM	24	17	01E	CHARLES J BROWN	3604583332	20	5
NISQUALLY VALLEY MOOSE #1905	A	TNC	24	17	01E	RICK KOLILIS	3604583381	0	1
NISQUALLY VALLEY REST-LOUNGE	A	TNC	24	17	01E	CHARLES BROWN	3604583332	0	3
NORTH YELM WATER COMPANY	B		17	17	02E	HERB BATTELL	3608476733	3	0
OAKRIDGE WATER SYSTEM	B		20	17	02E	PHIL PETTIT	2538479846	7	0
PLAZA TIMBER ESTATES WATER SYSTEM	B		20	17	02E	JAMES S. WITT III P.E.	3604587735	4	0
PRAIRIE ELEMENTARY	A	NTNC	29	17	02E	JOHN THOMSON	3604586128	1	1
RANGER	B		13	17	01E	ED RANGER	3604585571	3	0
WITT WATER SYSTEM_LL-0249	B		20	17	02E	RICHARD L. SHARP	3604582313	9	0

TNC = Trancient Non-Community
COM = Community (i.e. residential)
SOURCE: Washington Department of Health/access/pwswells.mdb
ss/excell/thpubwtr/yelm.xls

TABLE 3-4
OTHER PUBLIC WATER SYSTEMS
YELM VICINITY (OUTSIDE UWSSA)

WATER SYSTEM NAME	GRP	TYPE	SEC	TNSHP	RNG	OPERATOR	PHONE	RESIDENTIAL CONNECTIONS	NONRES CONNECTIONS
ANDREWS FIRST	A	COM	18	17	02E	WASHINGTON WATER SERVICE CO.	3604913760	112	0
CLARY WATER ASSOCIATION	B		13	17	01E	BOARD MEMBERS/GAITHER	3604587556	10	0
CRYSTAL SPRINGS DEVELOPMENT INC	A	COM	18	17	02E	MELVIN E. HOUSEHOLDER	3604585432	16	0
NISQUALLY PINES COMMUNITY CLUB	A	COM	17	17	02E	SCOTT FORBES	3604587393	628	96
ORNDORF WATER SYSTEM	B		29	17	02E	VINCENT CAJIGAL	2535350719	4	0
WESTERN AIRPARK	A	COM	28	17	02E	GREG BRUCE		30	0
ZEBRAS AQUEOUS SUBSTANCE	A	TNC	14	17	01E	MATTHEW SCHUBART	3608940919	1	1

TNC = Trancient Non-Community
COM = Community (i.e. residential)
SOURCE: Washington Department of Health/access/pwswells.mdb
ss/excell/thpubwtr/yelm.xls

3.4 Grand Mound Urban Water Supply Service Area

a. Existing water service

The Thurston County Grand Mound Water System began service in 1999. The initial customers are existing commercial uses in the Grand Mound Urban Growth Area in the vicinity of Old 99 and SR 12. Funding for the initial phase water system facilities was largely provided by a ULID on the property owners in the initial service area (see Figure 3-5). Formation of the Grand Mound water and sewer ULIDs was an explicit condition of the Urban Growth Area zoning approved by the Board of County Commissioners in 1997. Thurston County is the water purveyor as there is no established municipality at Grand Mound (unlike the other UGAs in Thurston County.)

Initial storage and source facilities installed in 1998, comprised of Wells 1 and 2 and 470,000 gallon Storage Tank 1. With the current facilities, DOH has approved service for up to 1,000 equivalent residential units.

b. Future water service

The Urban Water Service Supply Area for the Thurston County Grand Mound System is the adopted Urban Growth Area. See Figure 3-6. The UGA encompasses a total of about 982 acres including right-of-way and other non-buildable areas. The area included in the initial ULID encompasses about 360 acres.

Most development in the Grand Mound UGA is anticipated to be for commercial and industrial purposes. "Full development" estimated flows identified in the 1998 Water System Plan are about 370,000 gallons per day for Industrial/Commercial uses. About 200 acres are designated for residential uses. An estimated 142 acres of developable residential lands were identified in the Thurston Regional Planning Council study (see Table 1-

2). Full development of the residential area is anticipated to require about 90,000 gallons per day to serve residential uses.

c. Source of supply and water rights

The Thurston County Grand Mound Water System wells are located in the vicinity of 201st and Tea Street, west of the Grand Mound UGA. A Wellhead Protection Plan is included in the Water System Plan approved by DOE in 1999.

Water rights obtained for the water system are projected to be adequate for a number of years. The right provides for 521 acre-feet of water per year at a maximum flow rate of 870 gallons per minute.

d. Key system development issues

Protection of source water is a key issue for the Grand Mound system. The Scatter Creek aquifer is highly productive but also highly susceptible to contamination due to the extremely porous soils. Lateral groundwater movement is also very rapid. The 2-year capture area for Well 2 extends over 4 miles to the northeast; the 6-month capture zone extends about 1 mile into the core of the designated commercial and industrial zoning in the UGA. Agricultural uses have created documented problems within and proximate to the estimated capture zone. In some cases, improved manure management and other improved practices have led to documented improvement in water quality in a relatively short period, due to the rapid aquifer recharge. As industrial and commercial activity increases, attention to proper practices to avoid contamination from various materials will be vital to success in protecting the groundwater source of the Thurston County Grand Mound Water System.

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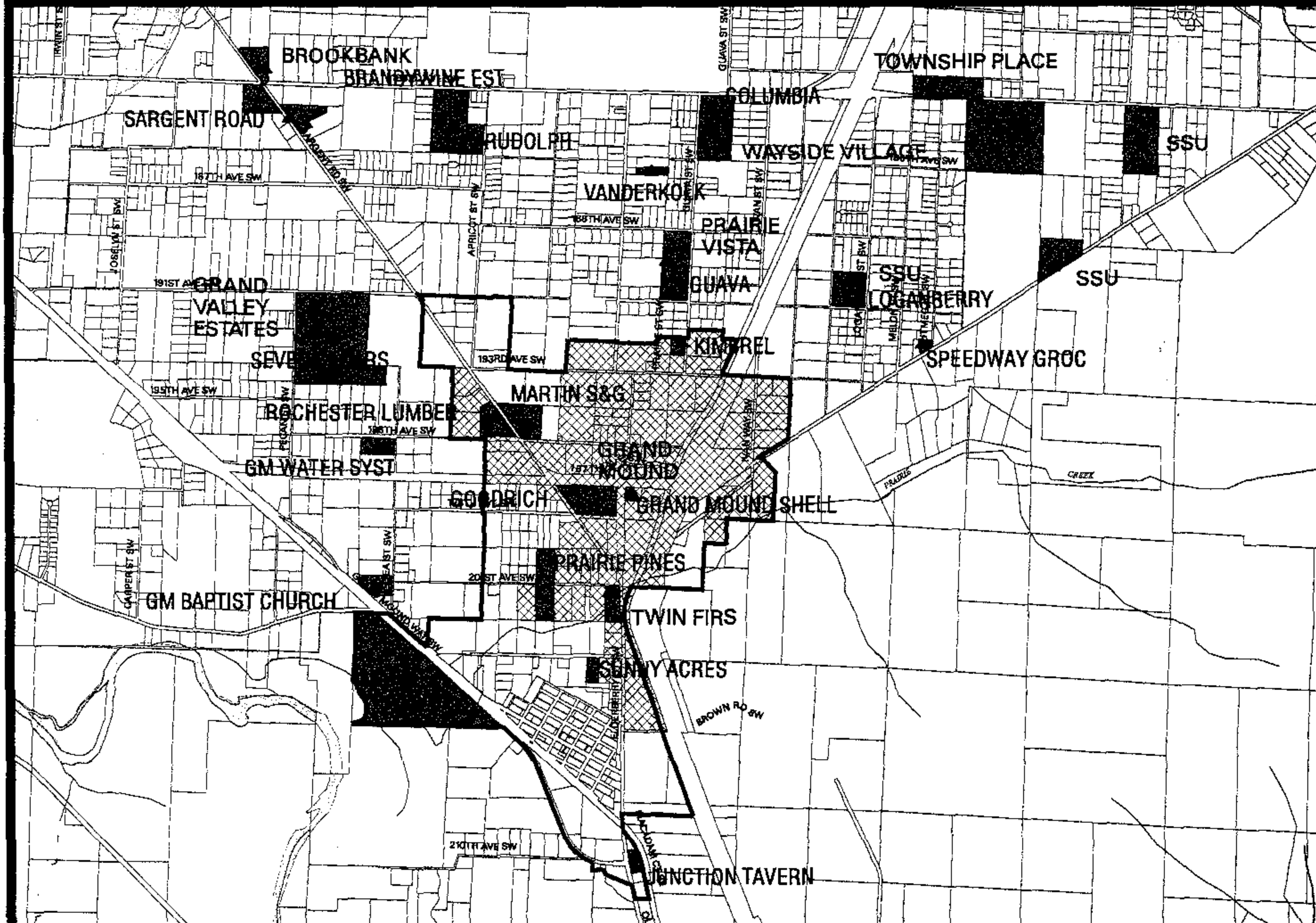
FIGURE 3-5



GRAND MOUND WATER SERVICE PLANNING AREA

Initial ULID Area

Public Water Systems

UGA Urban Water Supply Service Area Boundary

Well Loc

MAP MADE BY ... THURSTON GEODATA CENTER

Scale: 1 Inch = 2450 Feet

/users/ldb/wells/grmound8x11.aml

e. Other public water systems

Existing commercial uses in the Grand Mound area were generally served by one-service "public" water systems. Several mobile home parks are served by their own existing water systems. The Maple Lane School correctional facility is now served by Thurston County Grand Mound Utility sewer but retains its own water system, under special arrangement with Thurston County. Existing public water systems in the Grand Mound Urban Water Supply Service Area are listed on Table 3-5. Service areas of the Group A Community and residential Group B systems are indicated on Figure 3-5.

Some existing systems have already been incorporated into the County Grand Mound system. Over time, it is anticipated that the remaining small water systems serving commercial uses within the UGA will be decommissioned in favor of Thurston County Grand Mound Water System service. Some property owners may elect to maintain the wells for irrigation uses. The other wells should be properly abandoned to reduce potential contamination of the aquifer.

The extensive UGA area beyond existing water service lines may pose a challenge to future water system development. The Grand Mound UGA Sub-Area Plan allows development throughout the UGA, with the condition that areas not provided with urban sewer and water will be designed to ultimately achieve urban levels of density. There may be interim-density development proposals that are too distant for service from the existing water system. Creative solutions such as satellite systems operated under the "wing" of the County water utility may meet property owner desires while allowing eventual Thurston County Grand Mound water service throughout the long-term service area.

The vicinity surrounding the Grand Mound UGA contains numerous small public water systems (see Table 3-5.) In the long run, there may be mutual benefit in exploring intertie opportunities with systems with storage capacity, such as Rochester High School (78,000 gallon storage capacity per DOH records) and Maple Lane School.

TABLE 3-5
OTHER PUBLIC WATER SYSTEMS
GRAND MOUND URBAN WATER SUPPLY SERVICE AREA

NAME	GRP	TYPE	SEC	TNSHP	RNG	OPERATOR	PHONE	RESIDENTIAL CONNECTIONS	NONRES CONNECTIONS
ATLAS CONCRETE PRODUCTS	B		02	15	03W	ROD LISETH	3607367642	0	2
C & D PROPANE	B		14	15	03W	DAVID GERTS	3609436318	1	1
GRAND MOUND JUNCTION MOBILE HOME PK	B		13	15	03W	ROY GORUD	2065421539	7	7
GRAND MOUND SHELL	A	TNC	11	15	03W	GARY MELLEMA	3604233300	0	1
JUNCTION TAVERN, THE	B		13	15	03W	WALLACE J. TUBBS	3602737586	1	1
KEY BANK GRAND MOUND BRANCH	B		12	15	03W	RENAE THOMPSON	3602735955	0	1
KIMBREL	B		01	15	03W	MICHAEL G. KIMBREL	3602739202	1	1
MAPLE LANE SCHOOL	A	COMM	14	15	03W	LONNIE J. BAUMAN	3602733182	12	7
MARTIN SAND & GRAVEL WATER SYSTEM	B		11	15	03W	DOUG MARTIN	3607362851	0	2
PRAIRIE PINES MOBILE ESTATES	A	COMM	11	15	03W	DIANA TORRES	3602735148	64	0
ROCHESTER DAIRY QUEEN	A	TNC	11	15	03W	MIKE MCKINNON	3603522004	0	1
ROCHESTER LUMBER COMPANY	B		11	15	03W	FRANK FOSNACHT	3602735213	0	1
SHORT STOP MINI MART	A	TNC	11	15	03W	CANDICE GEPPERT	3602738208	1	2
SUNNY ACRES MOBILE HOME PARK	A	COMM	14	15	03W	BARBARA BRADSHAW	2539527011	16	0
TWIN FIRS MOBILE HOME PARK	A	COMM	13	15	03W	AARON JONES	3602736943	16	0
HOUSING MART AT 193RD	A	TNC	12	15	3W	GARY STOSKOPF	3602738812	1	1

TNC = Transient Non-Community
COM = Community (i.e. residential)
SOURCE: Washinton Department of Health/pwswells.mdb
ss/excell/thpubwtr/grandmo.xls

TABLE 3-6
OTHER PUBLIC WATER SYSTEMS
GRAND MOUND VICINITY (OUTSIDE UWSSA)

NAME	GRP	TYPE	SEC	TNSHP	RNG	OPERATOR	PHONE	RESIDENTIAL CONNECTIONS	NONRES CONNECTION
187TH STREET SW WATER	B		02	15	03W		0	4	0
AL'S BEEF SHOP	A	TNC	11	15	03W	AL MARTIN	3602739911	1	1
BRANDYWINE ESTATES #1	B		02	15	03W	H & R WATERWORKS	3603573277	6	0
BRANDYWINE ESTATES #2	B		02	15	03W	H & R WATERWORKS	3603573277	6	0
BRANDYWINE ESTATES #3	B		02	15	03W	H & R WATERWORKS	3603573277	6	0
BRANDYWINE ESTATES #4	B		02	15	03W	H & R WATERWORKS	3603573277	3	0
BROOKBANK	B		34	16	03w	ROCHESTER WATER ASSOCIATION	3602739688	4	0
CHEHALIS WELL DRILLING WATER SYSTEM	B		02	15	03W	TERRY GAVIN	3607368884	0	1
COLUMBIA WELL	B		12	15	03W	A.J. CONWELL	3602739380	4	0
GRACE BAPTIST CHURCH	B		01	15	03W	GRACE BAPTIST CHURCH	3602739240	1	1
GRAND MOUND BAPTIST CHURCH	A	TNC	11	15	03W	JIM PACE	3602736411	1	1
GRAND MOUND ELEMENTARY	A	NTNC	10	15	03W	ROCHESTER SCHOOL DISTRICT	3602736940	425	TRANSIENT
GRAND MOUND WATER SYSTEM	B		11	15	03W	H & R WATERWORKS	3604919438	4	
GRAND VALLEY ESTATES	A	COMM	2	15	03w	ROCHESTER WATER ASSOCIATION	3602739688	42	0
GUAVA ST A - WEST	B		01	15	03W	SCOTT CAMERON	3602737971	2	0
GUAVA ST B - EAST	B		01	15	03W	SCOTT CAMERON	3602737971	2	0
HOSS, THEODORE SPORTS COMPLEX	A	TNC	11	15	03W	JACK HASKINS	3602739592	0	1
LENETS MOBILE ESTATES	A	COMM	02	15	03W	ROBERT WHITE	2538432764	27	0
LOGANBERRY "A"	B		01	15	03W	WASHINGTON WATER SERVICE CO.	3604913760	1	0
LOGANBERRY "B"	B		01	15	03W	WASHINGTON WATER SERVICE CO.	3604913760	1	0
PRAIRIE VISTA	A	COMM	1	15	03w	ROCHESTER WATER ASSOCIATION	3602739688	21	0
ROCHESTER HIGH SCHOOL	A	NTNC	10	15	03W	ROCHESTER SCHOOL DISTRICT	3602736940	425	TRANSIENT
RUDOLPH WATER SYSTEM	B		02	15	03W		3609438340	6	0
SARGENT ROAD - 234	B		02	15	03W	AMERICAN WATER RESOURCES INC.	3609786178	5	0
SEVEN CEDARS MOBILE HOME PARK	B		11	15	03W	MILTON POLMATEER	3602739300	14	0
SPEEDWAY GROCERY & STATION	A	TNC	12	15	03W	ROSEMARY HENDRICKS	3602737151	1	1
VANDERKOLK	B		01	15	03W	DAN VANDER KOLK	3607366078	4	0

TNC = Transient Non-Community
COM = Community (i.e. residential)
SOURCE: Washinton Department of Health/pwswells.mdb
ss/excell/thpubwtr/grandmo out.xls

3.5 Bucoda Urban Water Supply Service Area

a. Existing water service

The Bucoda water system provides service throughout the town. According to DOH water system data, there are 239 existing connections with a residential population of 645.

b. Future water service

Based on existing source and storage facility capacity, the Bucoda water system is approved by the Department of Health for a total of 393 services. This would accommodate about 150 additional future connections.

Thurston Regional Planning Council population projections anticipate a very low rate of growth for Bucoda (see Table 1-1). By 2025, population is projected to increase by only 5% over current levels.

A different view of potential future growth in Bucoda is provided by the "developable residential lands" study conducted by TRPC. As shown on Table 1-2, the study identified 60 acres of developable residential land – nearly equal to the currently developed residential area of 62 acres. This available area has the potential to accommodate a significant increase in population and in water service from the Bucoda water system.

c. Source of supply and water rights

Water system improvements in the mid-1990s include an additional well and storage capacity of 120,000 gallons including fire flow.

The Bucoda water system has a groundwater right for 157 acre-feet per year of withdrawal. This appears to be sufficient to support existing and anticipated future development of the water system. This includes the total of 393 services currently approved by DOH based on existing source and storage facilities.

d. System development issues

The utility is striving to replace aging and undersized water lines, particularly in the south end of town. As described above, both source and storage are adequate for projected needs at this time.

e. Other public water systems in the vicinity

There are no other public water systems within or adjacent to Bucoda. As shown on Table 3-7, DOH data indicates that there are two systems located over 1 mile north of Bucoda, serving a store and a mobile home park. There are no potential opportunities for intertie or arrangements with other public water systems in the Bucoda vicinity.

TABLE 3-7
PUBLIC WATER SYSTEMS
BUCODA VICINITY

NAME	GRP	TYPE	SEC	TNSHP	RNG	CONTACT	PHONE	ADDRESS	RES CON	NONRES CON
D J'S COUNTRY STORE	A	TNC	06	15	01W	DANIEL W. CRAKER		18419 BUCODA HWY SE	1	1
FROST PRAIRIE MOBILE HOME PARK	B		06	15	01W	DANIEL CRAKER		18419 HWY 507	12	0
BUCODA WATER DEPT	A	COMM	07	15	01W	BOB MCCOOL		600 N. MAIN STREET	239	0

TNC = Trancient Non-Community
COM = Community (i.e. residential)
SOURCE: Washington Department of Health/access/pwswells.mdb
ss/excell/thpubwtr/yelm.xls

4. WATER SERVICE REVIEW PROCEDURE

4.1 Water Service Objectives

The long-term vision of this Plan is that service will eventually be extended from the central water system throughout each designated long-term service area. Development of new individual wells or small public water systems within an Urban Water Supply Service Area is strictly limited as the last-priority service option, to ensure the highest possible water quality and service to the public. The designated utility may need to pursue creative solutions where proposed new development is distant from the existing water lines. Alternative solutions discussed in this Plan include "satellite" service through a new well or interim service from an existing adjoining public water system.

The designated water utilities will need to be involved throughout the land development process. Table 4 - 1 summarizes the general types of utility commitment anticipated at the various points in the development process.

Table 4 - 1: Utility Commitment To Service

UTILITY COMMITMENT	POINT IN DEVELOPMENT PROCESS	PROPERTY OWNER RESPONSIBILITY
1. Preliminary information on water service availability, conditions, costs.	Presubmission conference or direct property owner contact with utility	Provide preliminary information on development proposal (generally no fee for presubmission conference)
2. Conditions of Service from utility. Establishes commitment to serve new lots/new development provided financial commitment and other conditions are met.	Preliminary approval of plat, short plat or site plan; may also be used to establish conditions when a property owner proposes to extend water lines for new services.	Payment of fees, construction of water lines extensions and other site-specific conditions of approval. All conditions must be met prior to final plat approval.
3. Confirmation of Water Availability and Service Connection	Building permit issuance	Payment of GFCs and other fees (if not previously paid). Depending on water use of the proposed occupancy, may require additional GFCs.

4.2 Priority Level 1: Water Service From the Designated Water System

Table 4 - 2: Water Priority of Service Process For New Development

<table>
<tr><td colspan="6">Applicant submits development permit application including proposed water service.
(In unincorporated areas: Utilize "Priority of Service" form from Environmental Health)

Municipal Utility action options:
⇓</td></tr>
<tr><td colspan="2" rowspan="3">1. Direct service offered: Conditions of water service may include water line extension, hookup fee payment and other conditions to be met by applicant (Section 4.2.1).
⇓</td><td colspan="2" rowspan="3">2. Alternative service offered: If development is too distant from existing lines for timely service, utility may propose satellite service to allow water provision through a separate system, with ultimate incorporation into the municipal system. Another option is interim service from an existing adjoining public water system with capacity to serve (Section 4.2.2)
⇓</td><td colspan="2">3. Utility declines to provide water service: Applicant contacts neighboring public water systems regarding opportunities for service (Section 4.3.1)
⇓</td></tr>
<tr><td colspan="2">Neighboring system options:
⇓</td></tr>
<tr><td>Neighboring water system has capacity, provides terms of service
⇓</td><td>No other option. New water system is allowed (4.3.2)
⇓</td></tr>
<tr><td colspan="5">Applicant action options:
⇓</td><td rowspan="3">Water System Plan and construction plans submitted to State DOH/Env Health for approval
⇓</td></tr>
<tr><td rowspan="2">Negotiate and accept water service conditions. Utility provides conditional commitment to serve.
⇓</td><td colspan="4">Applicant appeals water service conditions via the jurisdiction's administrative appeal process (see Section 4.4). Hearing Body options:
⇓</td></tr>
<tr><td colspan="2">Confirm terms of service
⇓</td><td>Identify items to renegotiate
⇓</td><td>Allow applicant to seek other service ⇑</td></tr>
<tr><td colspan="6">Water service approved
⇓</td></tr>
<tr><td colspan="6">Development approval and construction; water hookup</td></tr>
</table>

Table 4-2 illustrates the key steps in water service review for proposed new development.

In most cases, it is anticipated that the designated municipal water system will provide timely service to new development. "Timely" service is defined for this CWSP as water service available within 120 days of the time of anticipated project development. The time of project development cannot precede the projected time that building permits could be issued for the project.

4.2.1 Direct Service From the Designated System

1. Proposed development within municipalities: For new development occurring inside the municipal boundaries, conditions of water service will be included in approvals for Preliminary Plats or other development projects. The municipality's combined responsibility for land use planning and utility provision should simplify the process of water service review for new development.

2. Proposed development within unincorporated UGAs: In unincorporated UGA areas surrounding the municipalities and in the Grand Mound UGA, development applications are submitted to Thurston County Development Services. Water service is coordinated with development review through the following process:

    (1) The Priority of Water Service form from Thurston County Environmental Health is provided to the applicant at the earliest opportunity.

    (2) The proponent contacts the designated water utility. The submittal will include anticipated time of project development and required information on anticipated water service requirements.

    (3) The Priority of Water Service form is completed by the utility and returned to the applicant. Designated utility offer of service and proponent agreement to terms is the anticipated outcome in most cases.

Where the proposed development is distant from existing water lines, creative solutions such as satellite service may be needed. See the following section for discussion of alternatives where development is too distant for timely and reasonable extension of the central water system.

(4) The applicant submits the completed Priority of Water Service form to Thurston County Development Services. The water service form is necessary to achieving a "complete application" for the proposed development. The stipulated conditions of water service are then incorporated into approval of the Preliminary Plat, Preliminary Site Plan or other development approval process.

4.2.2 Alternative service under authority of the designated water system

Depending on the location and scale of development, it may not be financially feasible for the development to extend water lines from the existing central water system. Particularly for Grand Mound and Yelm, the UGA extends significantly beyond the current area of water service. Creative alternatives, which may ensure timely service to new development while retaining municipal water service authority, include:

1. Satellite service: Under the satellite system concept, a development may require water service within the future water service area of a city or the county, but may be too distant for feasible extension of water mains to directly serve the development. In this case, a "satellite" water system may be the best option. This situation may particularly apply to Grand Mound, as land use regulations allow development throughout the UGA.

   A satellite system could be owned and operated by the city or county, provided the utility has been approved by DOH as a Satellite Management Agency. Alternately, another SMA water system operator could be approved to serve the property in question, with an agreement for future interconnection with the city or county water system.

The assumption is that by permitting this form of operation, the designated water system will eventually interconnect all of the satellite systems within its future service area into one larger coordinated water system better able to serve the public need.

2. Interim service from another water system: In certain circumstances, the most feasible option may be to authorize interim service from a neighboring existing public water system to the proposed new development. Conditions of interim service include:

    (1) The adjacent water system must have adequate approved system capacity to serve the proposed development from the existing water system; and

    (2) A written agreement is required between the interim purveyor and the designated future water system defining responsibilities for interim service and long-term water service, including provision for future incorporation into the designated water system. A notice to future property owners shall reference the agreement and the location where a copy can be obtained. The agreement must be filed with the County Auditor.

4.3 Service Declined by Municipal System: Priority of Service Process

If the designated water system declines to provide service to the proposed development, the priority of service process will continue as follows (see Table 4-2, third column):

4.3.1 Service from Neighboring System

Neighboring public water systems will be identified by the Environmental Health Department for the applicant to contact. The applicant will contact the neighboring public water systems regarding their capacity and interest in providing service to the proposed development. If a neighboring public water system has capacity and interest in long-term service to the new development, the applicant will negotiate terms from the system and submit the Priority of Service Form to Environmental Health. The conditions of service are incorporated into development approvals as described above.

If the parties cannot agree to terms, the applicant may appeal the water service conditions as described in Section 4.4.

Under this concept, after final approval from the Department of Health and Environmental Health, the service area boundaries of the municipal utility and the neighboring system will be adjusted to reflect the change in water system service areas.

4.3.2 New Independent Water System or Individual Well

Establishment of a new water system or individual well(s) to serve the development may be proposed only if 1.) Thurston County Environmental Health determines that water service is not available from any existing public water systems, or 2.) On appeal, the Hearing Body determines that conditions of service from all other available water system(s) are not reasonable. The approval process for a public new water system includes the following:

(1) In conformance with DOH requirements, the new system must be operated by an approved satellite management agency (SMA) if one is available. Written indication of unavailability must be provided from each SMA approved for operation in Thurston County if the applicant desires to establish a new independent water system.

(2) The applicant must then prepare and a water system plan and construction documents for the system following the regular procedures of DOH.

(3) DOH and the County must approve the water system plan and adjustment must be made in the service area boundaries of any affected water systems. Pursuant to RCW 70.116.070(2), disputes regarding service area boundaries may be appealed or referred to the Secretary of DOH for resolution.

Use of individual wells must be approved by Environmental Health, including provision of a sanitary radius around the wellhead.

4.4 Appealing Conditions of Service

If an applicant considers that the terms of water service fail to meet requirements for timely and reasonable service, an appeal may be submitted as described below. Appeals may be filed relating to cost of required facilities to complete a water system extension, but not hookup fees or rates. The process is summarized as follows:

4.4.1. Hearing body

(1) Disputes within incorporated areas: Water service appeals related to proposed development within incorporated areas will be addressed through the city's administrative decision appeals procedures.

(2) Appeals within unincorporated Growth Areas: Appeals of conditions of water service within the Grand Mound UGA and unincorporated portions of other UGAs will be submitted to the Thurston County Hearings Examiner pursuant to Title 2.06 of the Thurston County Code.

4.4.2 Criteria for "timely and reasonable service"

Criteria considered for appeals of water service conditions, in addition to any other requirements of the prescribed appeal process, shall include consideration of:

(1) Consistency with DOH "timely and reasonable service" guidance criteria;

(2) Consistency with the South Thurston County UGA Coordinated Water System Plan and the designated system's water system plan;

(3) Consistency with Urban Growth Area Joint Plan land use and utility service policies and objectives; and

(4) Ensuring that reasonable use of the property is allowed under the proposed terms of service.

4.4.3 Hearing body action

The body hearing the appeal of water service conditions has three options for action:

(1) Confirm the terms of service proposed by the designated water system;

(2) Identify specific items where the proposed terms of service do not satisfy criteria of timely and reasonable service, and return the issue to the parties for further negotiation; or

(3) Advise Environmental Health that the terms offered by the designated system are unreasonable; that no agreement among the parties is feasible; and that the applicant should be free to proceed with the next alternative method of supplying water to his development.

Under this option, the Environmental Health Department will proceed with the Priority of Service process described in Section 4.3. The next priority for service is extension from an existing neighboring public water system. Only in the last resort will a new independent water system be allowed.

4.5 Existing Small Water Systems

Minimizing the number of separate water systems is a long-term objective of the Public Water System Coordination Act. Incorporating existing small systems into municipal systems is consistent with this objective. State legislation [RCW 70.116.050(4)(g)] stipulates that a Coordinated Water System Plan "include policies and procedures that generally address failing water systems for which counties may become responsible under RCW 43.70.195." Policies are discussed below addressing two types of situations: Opportunities to incorporate existing small systems into the central water system; and response to crises situations in management or operation of existing small systems.

4.5.1 Incorporating existing small systems within the various UGA service areas

Particularly at Yelm and Grand Mound, the designated UWSSA's contain several existing "public" water systems (see maps and tables in Section 3). Some of these systems serve a single existing business. As these businesses and neighborhoods hook up to the sewer systems at these two communities, they will also generally become water customers for potable water service.

Decommissioning an existing public water system requires coordination with several State and County agencies to ensure that regulations are met and databases are updated. See Appendix B for a draft procedure from the Thurston County Grand Mound system to ensure a smooth incorporation of existing small systems into the designated expanding water system. Three key steps are:

(1) Notify the Washington Department of Health Drinking Water Program to inactivate the previous water system and add the new service to the municipal system;

(2) Coordinate with Thurston County Environmental Health to ensure that the well is properly abandoned (or is provided with the required sanitary radius surrounding the wellhead); and

(3) Consolidate water rights into the municipal rights through action of the Washington Department of Ecology or the Thurston County Water Conservancy Board.

Inadequate attention to these procedural details may result in problems such as:

* Notices of sampling noncompliance from DOH to the former water system operator - even though they are no longer in the water business;
* Lack of timely action to properly abandon wells. This may result in unused wells having protective radius compromised by new development or other conflicts with intended uses of the land.

4.5.2. Designated system response in event of small water system failure

There is the potential that certain existing small water systems within UWSSAs will encounter significant problems in source of supply, source protection, or operational viability.

It will generally be preferable for these small water systems to be integrated into the designated water system, provided financing and other conditions of the designated system are met. Through this approach, it should be possible to avoid or greatly reduce the potential that any water system would go into formal receivership. Receivership is a court action, which occurs when there is serious failure of the water system operator to perform (see RCW 43.70.195). However, the receivership process is very difficult for all participants and is not the preferred route for resolving small water system problems.

5. PROSPECTS FOR JOINT FACILITIES AND MANAGEMENT PROGRAMS WITHIN THE SOUTH THURSTON COUNTY UGA URBAN WATER SUPPLY SERVICE AREA

5.1 Potential for Joint Activities Between the Purveyors

Due to the distance between the various UGA service areas, development of joint facilities is not feasible. Joint management efforts may evolve in the future, such as efforts to improve water rights processing within the region or within specific basins.

5.2 Emergency interties

Emergency intertie between the municipal and county purveyors included in the South Thurston County ACWSP is not feasible due to distance between service areas. Such emergency interties should be considered in individual water system planning. The tables in Chapter 3 identify other public water systems within or in the general vicinity of the UGA water systems. While opportunities are limited by the small number and/or limited size of most other water systems in the various UGA service areas, the larger Group A Community systems may achieve mutual benefit from emergency intertie to increase reliability of service. One example is the existing intertie between the Town of Rainier water system and the Rainier Sportsman's Club system.

6. PLAN IMPLEMENTATION AND REVIEW

6.1 Water System Plans

Water system plans update is an on-going process. Prior to approval by DOH, Thurston County Environmental Health will review and comment on each comprehensive plan to ensure consistency with the recommendations of the Area-Wide Supplement and growth management policies related to water system coordination. This review will insure the maximum coordination of water system planning within the Urban Water Supply Service Area.

6.2 Revision of Future Service Areas

External boundaries of the Urban Water Supply Service Area (UWSSA) should be revised at the same time as future revisions to the Urban Growth Area (UGA) boundaries, to ensure coordination of growth management planning with water utility planning.

County Commissioner and city council/commission public hearing process on revision of a UGA should specifically include concurrent consideration of the UWSSA boundaries. This parallel revision should be noted in legal notices and public information. Final action taken by resolution or ordinance should concurrently revise the UGA boundary and the external boundaries of the UWSSA.

APPENDIX A: GLOSSARY OF ACRONYMS AND TERMS

Acronyms:

CWSP: South Thurston County UGA Coordinated Water System Plan

DOH: Washington State Department of Health

UGA: Urban Growth Area designated by mutual agreement of the affected municipality and Thurston County

UWSSA: Urban Water Supply Service Area

Terms:

"Area-wide Supplement"

Supplementary provisions addressing area wide water system concerns of the Coordinated Water System Plan. Contents as stipulated in RCW 70.116.050(4) and WAC 246-293 include:

Assessment of related adopted plans;

Identification of future service areas for expanding systems;

Minimum area wide water system design standards including fire flow;

Procedures for authorizing new water systems in the Critical Water Supply Service Area;

Assessment of potential shared facilities or programs including agency interties;

Satellite system management requirements; and

Policies and procedures generally addressing failing water systems for which counties could become responsible under RCW 43.70.195.

"Abbreviated Coordinated Water System Plan (ACWSP)"

This is a plan for public water systems within a critical water supply service area as identified through the Public Water System Coordination Act (RCW 70.116.) The Plan consists of the approved Water System Plans for systems within the designated area plus an Area wide Supplement. These documents identify the present and future water system concerns and set forth a means for meeting these concerns in the most efficient manner possible, as stipulated in WAC 246-293-110.

"Designated water system"

The designated water system is the water purveyor identified to provide service to a given service area. When willing to provide the service in a timely and reasonable manner, the designated water system is assigned a priority right to provide public water service to the area. Expanding designated water systems must have an approved future service area identified in the Area wide Supplement and an approved Water System Plan incorporating the future service area. Non-expanding water systems will be the designated water system within their existing area of water distribution.

"Interim Water Service"

Interim water service is allowed within the UWSSA where water is not available in a timely manner by direct service from the designated utility. The assumption is that the designated utility will eventually incorporate the interim system into the central water system. The designated water system, an adjoining existing water system or an approved satellite system operator may provide interim service.

"South Thurston County UGA Urban Water Supply Service Area (UWSSA)"

This is the area where efficient and orderly urban-level development may best be achieved through coordinated planning by public water systems in the area. The boundaries of the South Thurston County UWSSA are the growth management areas for Yelm, Rainier, Tenino and Grand Mound and the incorporated area of Bucoda.

"Public Water System Coordination Act (Coordination Act)"

Regulations contained in RCW 70.116 and WAC 246-293 establishes a process to coordinate the planning of public water supplies.

"Time of project development"

The time of project development is the projected time that water service will be required to serve the occupants of a proposed development. The project proponent as part of the development review process will identify this, with confirmation by the Health Department. The "time of project development" cannot precede the projected time that building permits could be issued for the project.

APPENDIX B GRAND MOUND WATER AND SEWER UTILITY: PROPOSED CONNECTION POLICY

The Board's intent is:

1. Require existing commercial, industrial and residential uses which exceed allowable density on septic to connect to the sewer and water system: The volume and strength of waste generally associated with these uses warrants centralized sewage system collection and treatment, to reduce exposure of ground water to contamination from on-site septic systems.
2. Allow flexibility for existing low-density residential uses to continue using individual wells and on-site systems provided groundwater quality or public health is not endangered: On-site systems must continue to meet all operating requirements.
3. Provide flexibility to defer connection to sewer and water where existing unoccupied commercial or industrial structures are slated for removal or renovation.
4. Recognize that a single public water supply for the Grand Mound area will meet public interest by enhancing reliability of service and management of groundwater resources. Thus, connection to water will be required at the time of connection to sewer.
5. Ensure compliance with State and local regulations regarding well abandonment, cross-connection and other concerns regarding groundwater protection and public health.

Summary of connection requirements:

	LAND USE							
ZONING	**Single-Family Residential**		**Multi-Family**		**Commercial**		**Industrial**	
	Existing	New	Existing	New	Existing	New	Existing	New
Residential 3-6 Units/Acre and 4-16 Units/Acre	Defer connection until on-site failure or redevelopment	Required connection	Required connection if above allowable density for on-site; otherwise defer until on-site failure or redevelopment	Required connection	Required connection unless vacated within 24 months	Not allowed	Required connection unless vacated	Not allowed
Arterial Commercial	Defer connection until on-site failure or redevelopment	Not allowed	Same as above	Required connection	Required connection unless vacated	Required connection	Required connection unless vacated	Not allowed
Planned Industrial District and Light Industrial	Defer for non-conforming residences (must connect caretaker quarters)	Caretakers residences only: Connection required	Not applicable	Not allowed	Required connection unless vacated	Required connection	Required connection unless vacated	Required connection

Note: This simplified table does not address every situation. Detailed regulations are contained in the utility ordinance.

APPENDIX C: CONVERSION OF EXISTING "PUBLIC" WATER SYSTEMS TO GRAND MOUND WATER SYSTEM

Note: The following draft procedure was prepared for the Thurston County Grand Mound Water System in conjunction with DOH and Environmental Health staff. The procedure identifies actions to ensure a smooth transition from a small "public" water system to the designated UWSSA utility. Inadequate attention to the details discussed below may result in problems such as:
** Notices of sampling noncompliance from DOH to the former water system operator;*
** Lack of timely action to properly abandon wells. This may result in unused wells having protective radius compromised by new development or other conflicts with intended uses of the land.*

Extending Thurston County Grand Mound (TCGM) water service to existing commercial uses will generally involve inactivation of a previously existing "public" water system. There are several steps in the process that need to be followed to avoid confusion and ensure compliance with State requirements.

1. **Inactivate the previous public water system; AND add a new service to the TCGM water system** (commercial and multi-user residential systems only). W&WM notifies Rich Hoey at Washington Department of Health (DOH) concerning a change in water system status with:
   a) Statement that TCGM water system is to serve property that previously operated an independent "public" water system;
   b) Documentation that cross contamination has been eliminated through either:
      (1) Disconnecting the well from plumbing and pulling pump facilities; or,
      (2) Installing a backflow device;
   c) Request to inactivate previous water system WFI (include water system i.d. number); and add water service data to TCGM WFI; and,
   d) Request that DOH provide a copy of the WFI following inactivation for our files.
2. **Abandonment or Conversion of Existing Well**: Property owner notifies Phil Brinker at Thurston County Environmental Health (TCEH) that the existing well is to be abandoned OR converted to irrigation use (see WAC 173-160-381). Applies to all existing development connecting to the TCGM system.
   IF well is to be abandoned:
   a) Prior to work: Driller (or property owner) submits Start Notice to DOE and Notice of Intent to Drill to TCEH prior to work (72 hours minimum).
   b) Following work: Driller submits Driller's Report to DOE.
   IF well is to be converted:
   a) Property owner submits evidence of 100-foot protective radius to Phil Brinker, TCEH.
3. **Annual Submittal to DOE for Consolidation of Water Rights**: Application to consolidate the water rights for sources that have been replaced by TCGM service will be periodically submitted to DOE. Both formal water rights and exempt sources may be requested for consolidation to the TCGM water right. Information sources for W&WM staff in completing the application for water right consolidation:
   a) WFI's of inactivated systems: From W&WM files or DOH SADIE system. Documents the population served and location of the former use. SADIE includes source information.
   b) Driller's Reports of properly abandoned wells: From TCEH. Submit request to Phil Brinker for Driller's Reports by tax parcel number and former water system name.

APPENDIX D: NON-PROJECT ENVIRONMENTAL CHECKLIST

1. Proponent (c): Board of Thurston County Commissioners Address: 2000 Lakeridge Dr SW Olympia WA 98502 Phone: (360) 357-2491 **2. Representative:** Tom Clingman Address: Thurston County Water & Waste Mgt. 921 Lakeridge Dr SW Room 100 Olympia WA 98503 Phone: (360) 357-2491 **3. Property Address or location (e):** Designated Urban Growth Areas of Grand Mound, Rainier, Tenino and Yelm in southern Thurston County **4. 1/4 S/T/R (f):** n/a **5. Tax Parcel # (g):** n/a **6. Total Acres:** Grand Mound UGA - 890 acres Rainier UGA - 1,430 acres Tenino UGA - 1.230 acres Yelm UGA - 6,030 acres **7. Permit Type:** Non-project policy adoption of Coordinated Water System Plan **8. Zoning:** n/a **9. Shoreline Environment:** n/a **10. Water Body:** n/a	* * * * * OFFICIAL USE ONLY * * * * * SEPA # (A): ______ Case # (b): ______ Related Cases: ______ Date Received: ______ Submittal: Complete ____ Incomplete ____ Information Requested: ______ ______ Proposal (d): ______ ______ ______ ______ ______ ______ ______ ______ * * * * * OFFICIAL USE ONLY * * * * *

11. **Brief Description of the Proposal and Project Name:** Designation of the Grand Mound, Tenino, Rainier and Yelm Urban Growth Areas as Critical Water Supply Service Areas under the Public Water System Coordination Act (RCW 70.116); and adoption of an Abbreviated Coordinated Water System Plan Area-Wide Supplement for the South Thurston County Urban Growth Areas.

12. **Did you attend a presubmission conference for this project?** Yes n/a No __________
If yes, when?______________________________

13. **Estimated Completion Date:** Adoption anticipated in late 1999 or early 2000.

14. **List of all Permits, Licenses or Government Approvals Required for the Proposal (federal, state and local--including rezones):** Approval of the Board of County Commissioners and the Washington Department of Health pursuant to RCW 70.116.

15. **Do you have any plans for future additions, expansion or further activity related to or connected with this proposal? If yes explain**: See following question.

16. **Do you know of any plans by others which may affect the property covered by your proposal? If yes, explain**: Adoption and revision of Water System Plans for the designated utilities addressing water service within the long-term service areas; expansions of the designated water systems to serve the identified growth areas.

17. **Proposed timing or schedule (including phasing, if applicable):** n/a

18. **List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.** Environmental Impact Statements were prepared for the Joint Comprehensive Plans for Growth Management for Yelm, Rainier and Tenino. See also the Environmental Impact Statement for the Grand Mound Urban Growth Area Sub-Area Plan.

ENVIRONMENTAL ELEMENTS

1. **Earth**

a. General description of the site (circle one): Flat, rolling, hilly, steep slopes, mountainous, other __________.

Not applicable

b. What is the steepest slope on the site (approximate percent slope)?

Not applicable

c. What general types of soils are found on the site (for example, clay, sand gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime farmland.

Not applicable

d. Are there surface indicators or history of unstable soils in the immediate vicinity? If so, describe.

Not applicable

e. Describe the purpose, type and approximate quantities of any filling or grading proposed. Indicate source of fill.

Not applicable

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

Not applicable

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

Not applicable

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:
Development-related impacts from anticipated land uses within the designated Urban Growth Areas are not considered in this Checklist. The proposed Coordinated Water System Plan does not designate additional areas of future growth. The CWSP is in response to the existing designation of the Urban Growth Areas through the Comprehensive Planning processes of the jurisdictions and provisions of the State Growth Management Act. Policy-level consideration of growth impacts on the environment was conducted as part of the Comprehensive Plan adoption processes.

The CWSP links the adopted Urban land use designations with provision of long-term water service appropriate for urban levels of development. The proposed Plan provides a framework for ensuring reliable, timely service through designating the municipal water utilities of Yelm, Rainier and Tenino and the Thurston County Grand Mound water utility as the priority water purveyor within their respective Growth Areas.

2. **Air**

a. What types of emissions to the air would result from the proposal (i.e., dust, automobile, odors, industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known.

Not applicable

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

Not applicable

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

Not applicable

3. **Water**

a. **Surface**

(1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

Not applicable

(2) Will the project require any work over, in or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

Not applicable

(3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

Not applicable

(4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

No

(5) Does the proposal lie within a 100-year flood plain? If so, note location on the site plan.

Not applicable

(6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

Not applicable

b. Ground

(1) Will ground water be withdrawn, or will water be discharged to ground water. Give general description, purpose, and approximately quantities if known.

For domestic water service purposes, the Water System Plans for the affected utilities project the following water usage (in millions of gallons per year):

Current Usage		2015 Usage
Tenino	189,000 gpd (1995)	218,000 gpd
Rainier	170,000 gpd	353,000 gpd (2017)
Yelm	886,000 gpd	6,240,000 gpd (2014)
Grand Mound	(service initiated 1999)	324,309 gpd
(Phase I build out)		

(2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: domestic sewage; industrial, containing the following chemicals . . .; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

Not applicable

c. Water Runoff (including stormwater)

(1) Describe the source of runoff (including stormwater) and method of collection and disposal, if any (include quantities, in known). Where will this water flow? Will this water flow into other waters? If so, describe.

Not applicable

(2) Could waste material enter ground or surface water? If so, generally describe.

Not applicable

d. Proposed measures to reduce or control surface, ground, and runoff water impacts, if any:

Implementation of conservation plans and other measures identified in CWSP and Water System Plans related to prudent use of water sources. General impacts of growth are not pertinent to this Checklist. See response to Question 1(h).

4. Plants

a. Check or circle types of vegetation found on the site:

- ____ **Deciduous tree: alder, maple, aspen, other**
- ____ **Evergreen tree: fir, cedar, pine, other**
- ____ **Shrubs**
- ____ **Grass**
- ____ **Pasture**
- ____ **Crop or grain**
- ____ **Wet soil plants: cattail, buttercup, bulrush, skunk cabbage, other**
- ____ **Water plants: water lily, eelgrass, milfoil, other**
- ____ **Other types of vegetation**

Not applicable

b. What kind and amount of vegetation will be removed or altered?

Not applicable

c. List threatened or endangered species known to be on or near the site.

Not applicable

d. **Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, it any:**
Not applicable

5. **Animals**

a. **Circle any birds and animals which have been observed on or near the site or are known to be on or near the site:**

Birds: hawk, heron, eagle, songbirds, other:
Mammals: deer, bear, elk, beaver, other:
Fish: bass, salmon, trout, herring, shellfish, other:

Not applicable

b. **List any threatened or endangered species known to be on or near the site.**
Not applicable

c. **Is the site part of a migration route? If so, explain.**
Not applicable

d. **Proposed measures to preserve or enhance wildlife, if any:**
See response to Question 1(h).

6. **Energy and Natural Resources**

a. **What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.**
Not applicable

b. **Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.**
Not applicable

c. **What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:**
Not applicable

7. **Environmental Health**

a. **Are there are any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.**
Not applicable

(1) **Describe special emergency services that might be required.**
Not applicable

(2) **Proposed measures to reduce or control environmental health hazards, if any:**
See response to Question 1 (h).

b. **Noise**

(1) **What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?**
Not applicable

(2) **What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.**

Not applicable

(3) **Proposed measures to reduce or control noise impacts, if any:**

Not applicable

8. Land and Shoreline Use

a. **What is the current use of the site and adjacent properties?**

Urban level development in core areas. Outlying portions of UGAs have low-density development at this time.

b. **Has the site been used for agriculture? If so, describe.**

Not applicable

c. **Describe any structures on the site.**

Not applicable

d. **Will any structures be demolished? If so, what?**

Not applicable

e. **What is the current zoning classification of the site?**

Various urban-level residential and commercial zones apply within the areas currently intended for urban development. Low-density "holding" zones (1 Unit/5 Acres) apply to nearly all of the unincorporated portions of the Tenino, Rainier and Yelm UGAs: These areas are anticipated for future rezone to Urban designations at the time of annexation to the municipalities. A small area of unincorporated UGA is zoned for commercial development at Yelm and Rainier based on existing commercial uses at these sites.

The entire Grand Mound UGA has urban-level zoning classifications.

f. **What is the current comprehensive plan designation of the site?**

All areas subject to the proposed Coordinated Water System Plan are designated as Urban Growth Areas in the applicable Comprehensive Plans. Yelm, Tenino and Rainier each have a UGA Joint Plan adopted by the municipality and Thurston County. Grand Mound UGA policies are contained in the Grand Mound Sub-Area Plan.

See question above for a general discussion of the various land use designations within the UGAs.

g. **If applicable, what is the current Shoreline Master Program designation of the site?**

Not applicable

h. **Has any part of the site been classified an "environmentally sensitive" area? If so, specify.**

Not applicable

i. **Approximately how many people would reside or work in the completed project?**

Not applicable

j. **Approximately how many people would the completed project displace?**

Not applicable

k. **Proposed measures to avoid or reduce displacement impacts, if any?**
Not applicable.

l. **Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:**

The Comprehensive Plans for each of the Urban Growth Areas idenify the municipalities (and Thurston County at Grand Mound) as the intended suppliers of urban-level water service. The proposed Coordinated Water System Plan would ensure that water service review for new development by State and County health agencies prioritizes service from these designated water utilities.

The CWSP also emphasizes the obligation of the designated utilities to plan for ultimate service throughout their adopted future service areas, which are the designated UGAs. This will help guide updates of 6-year improvement strategies in Water System Plans. The CWSP will also help guide longer-term activities such as securing adequate water rights to meet long-term water service obligations of the designated Urban Growth Area utilities.

9. <u>Housing</u>

a. **Approximately how many units would be provided, if any? Indicate whether high-, middle-, or low-income housing.**
Not applicable

b. **Approximately how many units, if any, would be eliminated? Indicate whether high-, middle-, or low-income housing.**
Not applicable

c. **Proposed measures to reduce or control housing impacts, if any:**
Not applicable

10. <u>Aesthetics</u>

a. **What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?**
Not applicable

b. **What views in the immediate vicinity would be altered or obstructed?**
Not applicable

c. **Proposed measures to reduce or control aesthetic impacts, if any:**
Not applicable

11. <u>Light and Glare</u>

a. **What type of light or glare will the proposal produce? What time of day would it mainly occur?**
Not applicable

b. **Could light or glare from the finished project be a safety hazard or interfere with views?**
Not applicable

c. **What existing off-site sources of light or glare may affect your proposal?**
Not applicable

d. **Proposed measures to reduce or control light and glare impacts, if any:**
Not applicable

12. **Recreation**

a. **What designated and informal recreational opportunities are in the immediate vicinity?**
Not applicable

b. **Would the proposed project displace any existing recreational uses? If so, describe.**
Not applicable

c. **Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:**
See response to Question 1 (h).

13. **History and Cultural Preservation**

a. **Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe.**
Not applicable

b. **Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site.**
Not applicable

c. **Proposed measures to reduce or control impacts, if any:**
Not applicable

14. **Transportation**

a. **Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.**
Not applicable

b. **Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?**
Not applicable

c. **How many parking spaces would the completed project have? How many would the project eliminate?**
Not applicable

d. **Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private).**
Not applicable

e. **Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.**
Not applicable

f. **How many vehicular trips per day would be generated by the completed projects? If known, indicate when peak volumes would occur.**
Not applicable

g. **Proposed measures to reduce or control transportation impacts, if any:**
See response to Question 1 (h).

15. **Public Services**

a. **Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe.**

Not applicable

b. **Proposed measures to reduce or control direct impacts on public services, if any.**
See response to Question 1(h).

16. Utilities

a. **Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other.**

Water service is currently provided within the municipal limits of Yelm, Tenino and Rainier by their respective municipal water utilities, with a small amount of service to adjoining unincorporated development. A few other public water systems exist within each UGA. These are described in the Plan.

b. **Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.**

The municipal utilities of Yelm, Rainier and Tenino are the proposed designated water purveyors within their respective Urban Growth Areas, with Thurston County the designated system for the Grand Mound UGA.

Over time, extension of the water systems into the Growth Area will occur as development proceeds. In general, water line extensions will be installed by the developer per the standards of the designated water system. To meet long-term service demands, each utility will also need to develop additional water rights, wells and storage facilities as defined in their Water System Plans.

SIGNATURE

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Date Submitted: ____________________

Signature: ____

SUPPLEMENTAL SHEET FOR NON-PROJECT ACTIONS(do not use this sheet for project actions)

Non- project proposals are those which are not tied to a specific site, such as adoption of plans, policies, or ordinances.

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment. When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. **How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?**

   The CWSP provides coordination of water service in response to anticipated growth as envisioned in the adopted Urban Growth Area plans. Coordination of water service will not itself create the growth-related impacts listed above. Environmental review of impacts from anticipated urban development was included in the Comprehensive Plan process that led to designation of each Urban Growth Area.

   Proposed measures to avoid or reduce such increases are:

   As described above, environmental review related to avoiding or reducing anticipated impacts from urban development was included in the Comprehensive Plan process related to each Urban Growth Area included in the proposed CWSP.

2. **How would the proposal be likely to affect plants, animals, fish, or marine life?**
   See response to Question 1 regarding general issues of growth-related impacts.

   Development of additional water source will be necessary in each UGA to provide long-term service throughout the designated Growth Areas. Potential affects from capture of surface water by wells will be carefully considered during the planning and permitting process, especially where there is possible continuity between the groundwater resource proposed for use and surface waters with low-flow fish habitat concerns.

   Proposed measures to protect or conserve plants, animals, fish, or marine life are:

   These measures will be identified during planning and permitting of specific groundwater withdrawals and other water system development activities.

3. **How would the proposal be likely to deplete energy or natural resources?**
   See response to Question 2.

   Proposed measures to protect or conserve energy and natural resources are:

   Conservation targets and activities will be identified in approved Water System Plans. Measures to protect instream resources will be identified during planning and permitting of specific groundwater withdrawals

4. **How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, flood plains, or prime farmlands?**
   See response to Question 1.

   Proposed measures to protect such resources or to avoid or reduce impacts are:
   See response to Question 1.

5. **How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?**
See response to Question 1.

Proposed measures to avoid or reduce shoreline and land use impacts are:
See response to Question 1.

6. **How would the proposal be likely to increase demands on transportation or public services and utilities?**

The proposed Coordinated Water System Plan does not create increased demand for water service. The Plan establishes a framework for *response* to the anticipated growth as forecast in the Urban Growth Area Comprehensive Plans, to ensure that adequate urban-level water service is provided to support the anticipated land uses.

Proposed measures to reduce or respond to such demand(s) are:

The CWSP links the land use plans adopted by the local governments with water service review conducted by the State and local health authorities. The municipalities (and the County at Grand Mound) are designated as the priority purveyors throughout their respective Growth Areas, to provide clarity regarding service to new development and clarity regarding the long-term responsibilities of the designated utilities to plan for ultimate service extension throughout the UGA.

7. **Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.**

The proposed Plan responds to the need for timely provision of urban-level services within designated Urban Growth Areas, as stipulated in the Growth Management Act and local growth management policies. The proposed Abbreviated Coordinated Water System Plan follows the format and procedure delineated by the Water System Coordination Act.

In the long term, each of the designated utilities appears to require additional source to meet their obligation to provide service throughout their UGA. Source development will need to be pursued with attention to possible conflicts with surface water management, particularly concerns about low-flow conditions as defined by Instream Resource Protection Programs, WRIA Watershed Plans or other plans.

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THURSTON COUNTY
WASHINGTON
SINCE 1852

Appendix M

Thurston County Code Section 15.10 and 15.12

Chapter 15.10 WATER SYSTEMS

15.10.010 - Purpose.

This chapter establishes regulations for water systems operated by the county.

(Ord. 13989 § 2 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 2, 12-15-2008; Ord. No. 14318, § 2, 12-15-2009)

15.10.020 - Definitions.

As used in this chapter, unless the context indicates otherwise:

"Additional capacity charge" is a charge to properties outside the Grand Mound Utility Local Improvement District 96-2, to fund expansion of the water pumping, storage, and transmission infrastructure to accommodate new development outside the original ULID.

"Cross-connection" means a physical arrangement connecting a public water system, directly or indirectly with anything other than another potable water system, and capable of contaminating the public water system.

"Delinquent" means not paid by the due date, i.e. the 25th of the month or the following Monday.

"Department" means the department of public works.

"Director" means the director of the department of public works, or his or her designee or successor.

"Equivalent service extension charge" is a charge to properties outside the Grand Mound Utility Local Improvement District 96-2, and outside the Grand Mound Urban Growth Area that is equivalent to the assessment on properties within the ULID to fund water system infrastructure improvements.

"General facility charge" is a connection charge that represents a portion of the costs associated with the capital plant and facilities.

"Mains" mean water lines and appurtenances designed or used to serve more than one premises.

"Person" or "owner" means and includes persons, associations, partnerships and/or corporations.

"Premises" means a contiguous tract of land, building or group of adjacent buildings under a single control with respect to use of water and responsibility for payment thereof.

"Relinquishment" means the surrendering of previously allocated water or sewer connection capacity as detailed in documents forming ULID Nos. 1 and 2 for the Boston Harbor Utilities.

"Retail service area" means the geographic area described in the Grand Mound Water System Plan approved by the Washington State Department of Health as required by WAC 246-290-100, where the water system has a duty-to serve in timely and reasonable manner as defined in the South Thurston County Abbreviated Coordinated Water System Plan.

"Service connection" means that portion of the public water system connecting a premises to the water distribution main including the tap into the main, the water meter, appurtenances and the service line from the main to the meter.

"Service extension charge" is a charge to properties outside the Grand Mound Utility Local Improvement District 96-2 as determined by the Special Benefit Study 2002 (on file with the department), which is equivalent to the assessment on properties within the ULID to fund water system infrastructure.

"Six-year future service area" means a planning area identified in the Grand Mound Water System Plan approved by the Washington Department of Health as required by WAC 246-290-100. The water system does not have a statutory duty to serve in the six-year future service area until such time as the future service area or portions thereof are annexed into the retail service area through an amendment to the water system plan.

"Standard specifications" means the "Standard Specifications for Road, Bridge and Municipal Construction" as published by the Washington State Department of Transportation, current edition; as supplemented by "Development Standards for Water and Sewer Systems," Thurston County, Washington, current edition design standards.

"UGA" means urban growth area, the unincorporated area contained within the final urban growth area boundaries identified in the Thurston County Comprehensive Plan on Map M-14. The Grand Mound urban growth area means the area identified in the Grand Mound Subarea Plan for the Grand Mound Urban Growth Area (Map 6), dated July 1996, or successor document.

"Valid water right" means a water right that the applicant has transferred to Thurston County through the rules established in RCW 90.03.380. The transfer or change of use application must receive approval from the State Department of Ecology and a Water Right Certificate or Water Right Claim must be issued by Ecology to the applicable Thurston County water system prior to transfer.

"Water system" means a system of withdrawal, treatment and distribution of potable water to premises.

(Ord. 13989 § 2 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 2, 12-15-2008; Ord. No. 14318, § 2, 12-15-2009)

15.10.030 - Connection allowed when.

A.

Premises located within an established county retail service area may be allowed to connect to the public water system provided there is sufficient capacity and consistent with the current coordinated water system plan.

B.

Premises outside of the retail water service area may apply to the county to connect to the water system if:

(1)

The property is located in within the six-year future service area pursuant to the Grand Mound water system plan, on file with the department,

(2)

The owner meets the conditions set out in Sections 15.10.210 and 15.10.220

(3)

The connection is consistent with the current coordinated water system plan, and

(4)

The owners pays all applicable fees and charges pursuant to Sections 15.12.010 and 15.12.037

C.

If a well serving an existing single-family residence within the Grand Mound service area is determined to be failing by the owner, and the owner connects to the water system pursuant to subsection A of this section, the water portion of the service extension charge (SEC), specified in Section 15.12.010, may be deferred at the option of the property owner until the property is subdivided pursuant to 15.09.040(B)(1). If the SEC is waived, a notice of waiver of service extension charge on the property shall be recorded with the auditor's office, and the SEC shall be payable prior to preliminary plat approval.

(Ord. 13989 § 2 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 2, 12-15-2008; Ord. No. 14318, § 2, 12-15-2009)

15.10.040 - Connection required when.

Connection to the county water system is required as a condition of connection to the county sewer system.

(Ord. 13989 § 2 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 2, 12-15-2008; Ord. No. 14318, § 2, 12-15-2009)

15.10.050 - Application for service.

A.

All applications for water service connections to any premises shall be made to the department of development services. Every application for service shall be made by the owner of the premises to be furnished and shall include all applicable fees and charges as required pursuant to Chapter 15.12

B.

The application must include all water service uses. Modification of the water use will require the applicant to submit a new application for water service.

C.

Applications shall be accompanied by design drawings and specifications pursuant to the standard specifications and prepared by and bearing the signature and seal of a civil engineer, licensed to practice in the state of Washington. Plans and specifications shall be submitted to the county for review and construction authorization. When authorized by the county, the owner may construct the project.

(Ord. 13989 § 2 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 2, 12-15-2008; Ord. No. 14318, § 2, 12-15-2009)

15.10.060 - Water use.

A.

No person shall use water for purposes other than those stated in the application and approved by the department.

B.

No person shall knowingly use water from a water system for lawn or garden sprinkling/irrigation while a fire is being extinguished within the water system service area.

(Ord. 13989 § 2 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 2, 12-15-2008; Ord. No. 14318, § 2, 12-15-2009)

15.10.070 - Cross-connections.

The director shall adopt a cross connection control plan pursuant to Chapter 246-290 WAC subject to the approval of the board of county commissioners.

(Ord. 13989 § 2 (part), 2007: Ord. 13697 § 1 (part), 2006)

(Ord. No. 14156, § 2, 12-15-2008; Ord. No. 14318, § 2, 12-15-2009)

15.10.080 - Construction and material standards.

A.

The director shall adopt standard specifications for water service construction and material standards, subject to the approval of the board of county commissioners, for the construction and location of water systems.

The standard specifications shall be on file at the department and be made available to applicants.

B.

The standard specifications may require the location of service connections on private property if the director finds that special conditions exist which are peculiar to the property, so that placement of the water meter in the right-of-way would subject it to damage from traffic or maintenance activity or subject the meter reader to undue hazard in the performance of his or her duties. In these situations the owner will be required to grant a utility easement to the county.

C.

Failure to comply with the standard specifications shall be deemed a violation of this chapter.

D.

A utility encroachment permit must be obtained pursuant to Chapter 13.56 prior to doing an installation on or under a county right-of-way.

E.

A licensed contractor shall undertake construction. Before the county will accept the project and provide utility service, the applicant's professional engineer shall verify in writing that the project was built in strict accordance with the authorized plans and specifications and shall also prepare and give to the county three sets of "as constructed" plans. Two sets of the as constructed plans shall be paper and the third set shall be electronic in .pdf file format.

F.

The ownership of all mains and service connections in public streets or utility easements shall be vested solely in the county and the person responsible for the construction of such mains shall relinquish, by bill of sale, all interest in the ownership of such mains and service connections upon acceptance by the county.

G.

The applicant shall also provide a bond or other acceptable form of guarantee providing for the repair or replacement of defects in the project for a period of two years after its acceptance.

(Ord. 13989 § 2 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 2, 12-15-2008; Ord. No. 14318, § 2, 12-15-2009)

15.10.090 - Water mains and service connections, inspection, appeals.

A.

Location. All mains and service connections shall be separated from sanitary sewers as required by the Washington State Department of Ecology publication Criteria for Sewage Works Design (Orange Book), a copy of which is on file with the department.

B.

Connections. All connections to existing water mains and any extension from a water main shall be inspected by authorized department personnel before being accepted for county use.

C.

Inspections. The department shall inspect all construction done within the county rights-of-way for the extension or connection of the water system which will be accepted by the county. A minimum of two working days' notice for necessary inspection shall be provided to the department by the owner requesting the inspection.

D.

Appeal Process. A property owner who objects to a department decision regarding the owner's application for water or sewer service shall follow the process provided for in subsection G of this section.

(Ord. 13989 § 2 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 2, 12-15-2008; Ord. No. 14318, § 2, 12-15-2009)

15.10.100 - Maintenance responsibility.

The county will operate and maintain all authorized and accepted mains and service connections in public streets or utility easements. The owner will maintain the water lines from the meter to the premises.

(Ord. 13989 § 2 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 2, 12-15-2008; Ord. No. 14318, § 2, 12-15-2009)

15.10.120 - Access to premises for inspection.

A.

Whenever necessary to make an inspection to enforce any of the provisions of this chapter, the director or his or her authorized representative may enter such premises at all reasonable times to inspect the same or to perform any duty imposed on the director by this chapter.

B.

If the premises are occupied, the director or his or her authorized representative shall first present proper identification and request entry.

C.

If the premises are unoccupied, the director or his or her authorized representative shall first make a reasonable effort to locate the owner or other persons having control of the premises and request entry.

D.

If entry is refused, the director or his or her authorized representative shall have recourse to every remedy provided by law to secure entry.

(Ord. 13989 § 2 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 2, 12-15-2008; Ord. No. 14318, § 2, 12-15-2009)

15.10.130 - Damage to water system prohibited.

No person shall willfully disturb, break, deface or damage any water system component, appurtenance, structure or improvement.

(Ord. 13989 § 2 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 2, 12-15-2008; Ord. No. 14318, § 2, 12-15-2009)

15.10.140 - Temporary service connections.

Persons desiring temporary water service from a fire hydrant shall make application to the county's department of public works. The applicant shall sign the application form, agree to the provisions and requirements listed on the application form, and agree to pay the charges as established by Section 15.12.010 "temporary water use fee" and "hydrant meter monthly service charge" application. If the fire hydrant or hydrant meter assembly is damaged or stolen, the applicant shall be responsible for repairs or replacement as determined solely by the department. Appeals of such decisions may be made only at the county's claims division of the department of human resources.

(Ord. 13989 § 2 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 2, 12-15-2008; Ord. No. 14318, § 2, 12-15-2009)

15.10.150 - Common meter.

The department may authorize water service through a common meter upon finding that service through individual meters is impractical. Where such service is through a common meter, the application shall include a detailed description of the premises to be served, the owner's name, the conditions or circumstances precluding service by individual meters and other necessary information.

(Ord. 13989 § 2 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 2, 12-15-2008; Ord. No. 14318, § 2, 12-15-2009)

15.10.160 - Interruption of service—Allowed when.

A.

Emergency. Individual water service may be interrupted whenever public health or safety is threatened and emergency corrective work must be accomplished. Reasonable attempts will be undertaken to notify all premises affected by the interruption and such interruption shall be kept to a minimum.

B.

Routine. Interruptions for routine maintenance, line extensions or service connections will be scheduled to provide a minimum of two working days' notice to all affected premises by telephone contact with the owner or occupant, mailing to the owner or occupant, or posting at the premises.

C.

Nonpayment. If a water or sewer billing is at least sixty days delinquent, notice of interruption of water service shall be mailed to the owner and posted at the premises. Seven days after notification, service will be discontinued to the premises. Reconnection of service will be allowed only after all delinquent charges plus any interest and penalties and the reconnection fee have been paid. The reconnection fee shall include all notification and disconnection costs.

D.

Cross Connection. When a cross-connection is found by the county's cross-connection control specialist or designee, water service will be interrupted and not restored until the cross connection has been eliminated as verified by inspection of the cross-connection control specialist.

(Ord. 13989 § 2 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 2, 12-15-2008; Ord. No. 14318, § 2, 12-15-2009)

15.10.200 - Grand Mound water connection charges.

Premises receiving permanent water service by connection to the Grand Mound water system shall be required to pay a connection charge which shall represent the purchase of a portion of the capital plant and facilities. Such connection charge, called a general facilities charge (GFC), shall be paid prior to a building permit being issued and at the rate and method prescribed by Chapter 15.12.

(Ord. 13989 § 2 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 2, 12-15-2008; Ord. No. 14318, § 2, 12-15-2009)

15.10.210 - Additional charges and water right requirements for Grand Mound water utility connections outside ULID No. 96-2.

A. Property or portions thereof in the Grand Mound retail service area located outside the ULID shall be assessed additional charges in order to connect to the water system. Such charges, which are listed below and set out in Chapter 15.12, shall be paid after preliminary approval of a project and prior to construction approval.

1. A service extension charge.

2. An additional capacity charge pays the cost of expanding the capital plant and facilities.

3. At the director's discretion, the applicant shall do one of the following:

a. Transfer to the county valid water rights equal in quantity to the amount of annual average water needed by the proposed new facility. Such transfer shall occur before the applicant receives preliminary project approval from the county; or

b. Pay a water rights acquisition fee of five hundred dollars which pays the cost of acquiring valid water right; or

c. Transfer a valid water right and pay a water rights acquisition fee that in total would equal the annual average water needed by the proposed facility.

4. The director shall consult the board of county commissioners prior to authorizing such connections at anytime that the Grand Mound water system reaches eighty percent of its authorized service capacity as indicated in the Grand Mound Water System Plan.

(Ord. 13989 § 2 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 2, 12-15-2008; Ord. No. 14318, § 2, 12-15-2009)

15.10.220 - Grand Mound water utility connections outside ULID No. 96-2.

A.

If water lines have not yet been constructed to the furthest limit of the subject property to be served, the owner shall:

1.

Submit an application for service and pay all applicable fees and charges pursuant to Section 15.09.050, including an additional capacity charge and water rights acquisition fee required by Section 15.10.210

2.

Design the necessary infrastructure;

3.

Submit an application for a latecomers agreement with the department pursuant to Chapter 15.13; and

4.

Construct the project.

B.

If water lines are already constructed to the most distant corner of the subject property to be served, the owner shall:

1.

Submit an application for service and pay all applicable fees and charges pursuant to Section 15.09.050, including an additional capacity charge required by Section 15.09.200

2.

Pay the water portion of the SEC listed in the table referenced in Section 15.12.025 or pay the latecomer fee for the benefited property established in the latecomer agreement on file with the department or whichever is the highest.

(Ord. 13989 § 2 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 2, 12-15-2008; Ord. No. 14318, § 2, 12-15-2009)

15.10.230 - Grand Mound water utility connections outside the UGA and within the six-year future service area.

A.

Connection to the Grand Mound water system from outside the urban growth area will require: (1) if the project is not within the retail service area, amendment of the water-system plan and comprehensive plan prior to the project's preliminary approval; (2) payment of an equivalent service extension charge per gross square foot of property served and additional capacity charge, as set out in Chapter 15.12; and (3) the transfer of water rights to the county.

B.

If water lines have not already been constructed to the furthest most limit of the subject property to be served, the owner shall:

1.

Transfer to the county valid water rights equal in quantity to the amount of annual average water needed by the proposed new facility. Such transfer shall occur before the applicant receives preliminary project approval from the county;

2.

Submit an application for service and pay all applicable fees and charges pursuant to Section 15.10.050, including an additional capacity charge required by Section 15.10.210

3.

Design the infrastructure;

4.

Submit an application for a latecomers agreement pursuant to Chapter 15.13; and

5.

Construct the project.

C.

If water lines are already constructed to the furthermost limit of the subject property to be served, the owner shall:

1.

Transfer to the county valid water rights equal in quantity to the amount of annual average water needed by the proposed new facility. Such transfer shall occur before the applicant receives preliminary project approval from the county;

2.

Submit an application for service and pay all applicable fees and charges pursuant to Section 15.10.050 including an additional capacity charge;

3.

Pay the equivalent service extension charge computed according to Section 15.12.035; and

4.

Pay the latecomer fee for the benefited property established in the latecomers agreement on file with the department.

(Ord. 13989 § 2 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 2, 12-15-2008; Ord. No. 14318, § 2, 12-15-2009)

15.10.250 - Connection charges for Boston Harbor water utility connections outside the ULID.

A.

Premises located outside the ULID and receiving permanent water service by connection to the Boston Harbor water system shall be required to pay the following additional charges.

B.

A connection charge which shall represent the purchase of a portion of the capital plant and facilities. Such connection charge, called a general facilities charge, shall be paid at the rate and method prescribed by Chapter 15.12. The charge will be used to retire the assessment debt against the originally assessed parcel plus any interest owed.

C.

An administrative fee equal to five percent of the general facilities charge.

(Ord. 13989 § 2 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 2, 12-15-2008; Ord. No. 14318, § 2, 12-15-2009)

15.10.260 - Boston Harbor water utility connections outside ULID No. 2.

A.

Water service outside ULID No. 2 may be provided to those properties that front on an existing main line or to properties located within islands of the original ULID No. 2 boundary. Property owners requesting service may be required to inter-tie or loop an existing dead-end water main line. The loop or inter-tie will be a new water main line which may front on the property that can be served.

B.

An on-site sewage system design must be approved and a permit must be obtained from the Thurston County environmental health department before a new water service connection may be granted. A water service connection cannot be granted without an approved septic system.

C.

The grant of a new water service connection by the county does not imply sewer service can, or will be provided. Sewer service outside the sewer service boundary shall only occur to address failing septic systems located near the boundary which were permitted prior to September 1, 1994, and in cases where no other option is available.

D.

Property owners who are reallocated capacity must pay all costs for engineering, construction and inspection of any system improvements or main line reallocation necessary to serve the parcel(s).

E.

The department is the only agency authorized to approve the relinquishment, reallocation or assigning of new water service connections.

F.

Prior to approval of a relinquishment capacity from a parcel, all the outstanding balance of the account of the parcel (both operations and maintenance and the ULID assessment) must be paid in full. This may occur as a simultaneous transaction with the reallocation of capacity to a parcel.

G.

Relinquishment of capacity from a parcel shall be permanent. Concurrent with the relinquishment, a boundary line adjustment and/or additional documents required by the county must be executed and recorded.

H.

The sale or reallocation of water capacity to a parcel shall occur only upon payment of the general facilities charge. An additional administration fee of five percent will be charged for handling water capacity reallocation.

I.

The current capacity is necessary to serve all potential originally assessed parcels and shall not be grounds for increasing or decreasing densities above or below that allowed by existing zoning as of September 1, 1994.

J.

For community benefits, the North Olympia Fire Substation No. 72 shall receive water through the Boston Harbor water service at no charge.

K.

All facility charges collected shall be deposited in Fund 424 (Boston Harbor Water Capital Improvement Fund).

(Ord. 13989 § 2 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 2, 12-15-2008; Ord. No. 14318, § 2, 12-15-2009)

15.10.300 - Penalty for violation.

A.

Any person who violates or fails to comply with any provision of this chapter shall be guilty of a misdemeanor, and upon conviction thereof shall be punishable by a fine in a sum not to exceed five hundred dollars for each violation.

B.

The prosecuting attorney is authorized to bring actions by any appropriate means to enforce the provisions of this chapter.

(Ord. 13989 § 2 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 2, 12-15-2008; Ord. No. 14318, § 2, 12-15-2009)

15.10.310 - Payment responsibility.

The owner of the property which is provided with the water service shall be responsible for all water bills. The owner may designate to the department his or her desire to have the water bill conveyed to a third party, such as a renter, lessee or property manager, however the owner of property is and shall be liable for all water charges until the department is notified in writing of a change in ownership. If a water billing is at least thirty days delinquent, water service may be interrupted pursuant to Section 15.10.160.

A.

A deposit in the sum of one hundred dollars shall be prepaid by each residential owner or owner's designee for accounts to serve premises that are occupied, rented out, or used by the property and billed to the property owner. A deposit of one hundred fifty dollars shall be paid by the owner of each commercial water customer's premises. Such deposit shall be paid at the time of application for service connection or the request for a service account. Each deposit will be retained by public works in the designated utility fund. Each deposit will be refunded to the person paying the deposit within fifteen days of the original account being closed, less any amount due for water or sewer service rates, charges, or fees, including delinquency charges. Public works may waive the deposit if the new utility customer can provide a letter from an established utility (e.g. City of Olympia, City of Lacey, Puget Sound Energy, etc) which states "Customer is in good standing for at least 12 months" and the new utility customer signs up for automatic utility payment services.

B.

Any deposit not refunded to the owner or designee or applied to sewer account of such owner or designee when the account is closed shall be deemed unclaimed property and shall pass to the state of Washington Department of Revenue, in accordance with the mandates of the Uniform Unclaimed Property Act of 1983, as currently exists or is hereafter amended.

(Ord. 13989 § 2 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 2, 12-15-2008; Ord. No. 14318, § 2, 12-15-2009)

15.10.320 - Billing due dates and rates.

A.

Charges for water base rate and water use shall be billed on a monthly basis. All water billings shall be due and payable on or before the 25th of the following month or the following Monday.

B.

If an initial service connection is made after the first of the month, that month's water base rate will be prorated.

C.

Use rates will be based on an average monthly consumption for the last year when a meter is out of order and fails to register accurately.

(Ord. 13989 § 2 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 2, 12-15-2008; Ord. No. 14318, § 2, 12-15-2009)

15.10.330 - Interest and penalties.

A.

Interest at eight percent per annum shall be charged on all water billings from thirty days after the billing date.

B.

There shall be imposed a penalty of ten percent of the amount of any water billing which is thirty days delinquent.

(Ord. 13989 § 2 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 2, 12-15-2008; Ord. No. 14318, § 2, 12-15-2009)

15.10.340 - Liens.

The county shall have a lien against the premises for all charges for water that become ninety days or more delinquent plus interest and penalties. The director shall certify periodically the delinquencies to the county auditor, at which time the lien shall attach. Upon the expiration of sixty days after the attachment of the lien, the county may bring suit in foreclosure by civil action in Thurston County superior court in accordance with RCW 36.94.150.

Chapter 15.12.010 WATER AND SEWER RATES

15.12.010 - Water and sewer charges, rates and fees.

Regular rates and charges for the furnishing of service shall be as set out in the following table. All rates subject to utility taxes.

Table 15.12.010

Thurston County Water and Sewer Utilities Rates and Charges in 2011

			Monthly Charges		Other Utility Fees and Services			
Utility		General Facilities Charges per ERU See Note 6 below	Fixed Service Charges Per ERU See Note 6 below	Water Consumption Rate $/100CF	Inspection Fees	Temporary Connection Fee Hydrant Meter Each Occurrence See Note 10, 11 below	Hydrant Meter Monthly Service Charge See Note 11 below	Reconnection Each Occurrence
Tamoshan See Note 1, 2 below	Water		$59.70 Annual	$1.98	See Section 15.12.037	$160.00	$52.00	$55.00
Tamoshan/Beverly Beach See Note 1 below	Sewer		$104.94		See Section 15.12.037			
Boston Harbor See Note 1, 4 below	Water	See Section 15.12.041	$21.74	$1.63	See Section 15.12.037	$160.00	$52.00	$55.00
	Sewer	See Section 15.12.051	$75.95		See Section 15.12.037			
Grand Mound See Note 1, 5 below	Water	$2,089.00 See Note 9 below	$30.26	$1.72	See Section 15.12.037	$160.00	$52.00	$55.00
	Sewer	$2,404.00	$65.49		See Section 15.12.037			
Olympic View See Note 1, 3 below	Sewer		$74.70					

Table 15.12.010 (Cont.)

Thurston County Water and Sewer Utilities Rates and Charges in 2011

For Utility Services in Grand Mound Outside ULID No. 96-2

			Inside the UGA Boundary			Outside the UGA Boundary			
Utility		Inside and Outside the ULID Latecomers Agreement Application Fee	Service Extension Charges	Additional Capacity Charges Per E.R.U. See Note 6 below	Water Rights Mitigation	Equivalent Service Extension Charges	Additional Capacity Charges Per E.R.U. See Note 6 below	Water Rights Mitigation	Water System Modeling Fee
Grand Mound [1, 5]	Water	See Section 15.12.037	See Section 15.12.025	$327.00	See Note 7 below	See Section 15.12.035	$327.00	See Note 7 below	$690.00
	Sewer	See Section 15.12.037	See Section 15.12.025	$1,142.00		N/A	N/A		

Notes:

1. Properties in these utility areas are subject to utility local improvement district (ULID) property assessments. Assessments are paid separately to the county treasurer.

2. Tamoshan Division I, as recorded in Volume 18 of Plats, page 41, and within Tamoshan Division II, as recorded in Volume 19 of Plats, page 42, Thurston County, Washington.

3. Recorded in Volume 13 of Plats, page 46, and within Olympic View, First Addition, as recorded in Volume 14 of Plats, page 73, Thurston County, Washington.

4. Thurston County Utility Local Improvement District Nos. 1 and 2 and any other property connected to the Boston Harbor water system.

5. Thurston County Utility Local Improvement District No. 96-2 and any other property connected to the Grand Mound water and/or sewer system(s).

6. Equivalent residential unit (E.R.U) is defined in Section 15.12.012.

7. Valid water rights of a quantity adequate to support the planned development must be deeded to the county. See Section 15.10.210.

8. Not used.

9. General Facilities Charges include a two hundred dollar surcharge to fund a water quality improvement project and Fixed Service Charge to include a surcharge of two dollars (2006 - 2012).

10. File application for service and pay non-refundable connection and hydrant meter set fees listed in Section 15.12.010.

11. Applicant for temporary water service for hydrant meters pay monthly service fee for operation and maintenance of hydrant and/or hydrant meter as listed in Section 15.12.010. Water usage shall be charged at a rate of $0.15 per one hundred cuft of water after the first four hundred units (or forty thousand cuft); metered or logged on County supplied daily trip log sheets.

12. Miscellaneous fees of thirty dollars for NSF checks.

(Ord. 13999 § 1, 2007: Ord. 13989 § 3 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13486 § 1, 2005: Ord. 13479 § 1 (part), 2005: Ord. 13441 Exh., 2005; Ord. 13278 § 1 (part), 2004: Ord. 13105 § 1, 2003: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 3, 12-15-2008; Ord. No. 14318, § 4, 12-15-2009; Ord. No. 14446, § 6, 12-14-2010)

15.12.012 - Equivalent residential unit defined.

An equivalent residential unit (E.R.U.) means:

A.

One separate single-family residence; or

B.

With respect to residential multi-family structures, one per single-family unit;

C.

With respect to mobile home or trailer park having more than two single-family residential units or spaces and served through a common meter(s), one per single-family unit or space for the first two and, thereafter, one E.R.U. shall be equal to two single-family units or spaces; or

D.

With respect to uses other than residential, except for Grand Mound, one E.R.U. shall be designated for each nine hundred cubic feet per month of water consumed or sewerage discharged as measured at the source; provided that the minimum charge per service account shall not be less than one E.R.U.

E.

For Grand Mound, an E.R.U. shall be designated for each seven hundred cubic feet per month of water consumed or sewerage discharged as measured at the meter; provided, that the minimum charge per service account shall not be less than one E.R.U.

F.

For Grand Mound commercial customers they may petition Thurston County Public Works for the installation of sewer flow meters. Installation of a sewer flow meter (s) shall be at the expense of the property owner's. Flow meter, meter installation and location of flow meter has to be approved by Thurston County Public Works Engineering and Utility Services. Sewer flow meters shall be billed at a rate which is established by Thurston County Code 15.12.012 (E). Thurston County may also require installation of sewer flow meters to enforce 15.09.060 Discharge limitations (B).

(Ord. 13989 § 3 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 3, 12-15-2008; Ord. No. 14318, § 4, 12-15-2009; Ord. No. 14446, § 7, 12-14-2010)

15.12.015 - Equivalent residential unit capacity calculations for Grand Mound.

A.

The department will use the following table to determine general facility charges (GFCs) pursuant to Sections 15.09.200 and 15.10.200 for commercial and industrial uses in Grand Mound.

Type of Establishment	Calculation	Per Unit	Equals E.R.U*
1. Restaurant	1000	Square feet	3
2. Pub/tavern	1000	Square feet	2.2
3. General office	1000	Square feet	0.4
4. Medical/dental	1000	Square feet	0.3
5. Hair salon	1000	Square feet	0.5
6. Laundry	1000	Square feet	5
7. Car wash—automatic	1	Each bay	20
8. Car wash—hand	1	Each bay	2
9. Auto service—gas plaza	1000	Square feet	1.8
10. Auto service—repair shop	1000	Square feet	0.5
11. Auto service—mini mart	1000	Square feet	0.5

12. Auto sales	1000	Square feet	0.3
13. Bank	1000	Square feet	0.3
14. Grocery store	1000	Square feet	1
15. Retail store	1000	Square feet	0.2
16. Nursing/rest home	1000	Square feet	1.3
17. Retirement apartments/assisted care	1000	Square feet	0.9
18. Warehouse or manufacturing (without production flows)	1000	Square feet	0.1
19. Storage unit/warehouse	1000	Square feet	0.1
20. Hotel or motel	1000	Square feet	2
21. School—elementary	1000	Square feet	0.2
22. Church	1000	Square feet	0.4

Pursuant to Sections 15.09.200(D) and 15.10.200(D), "the minimum service charge per account shall not be less than one E.R.U."

B.

Review and Adjustment. The department will review usage annually after connection. If the review shows the average monthly use, for months where use exceeded three hundred fifty cubic feet per month (volume of 1/2 ERU) is above the purchased E.R.U.(s), the user's connection charge shall be adjusted to require payment for any averaged E.R.U.(s) above the currently purchased E.R.U.s. The average E.R.U.(s), shall be rounded up to the next E.R.U. when an averaged increase occurs. Rounding up or down shall occur only when there is an averaged remainder E.R.U. that is fifty percent or higher.

(Ord. 13989 § 3 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 3, 12-15-2008; Ord. No. 14318, § 4, 12-15-2009)

15.12.025 - Service extension charges—Grand Mound.

The department has on file a table listing parcels outside the ULID and the respective service extension charge for each parcel. Seventy-two percent of a parcel's SEC must be paid to the county before connecting to the sewer system. Twenty-eight percent of a parcel's SEC must be paid to the county before connecting to the water system.

(Ord. 13989 § 3 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 3, 12-15-2008; Ord. No. 14318, § 4, 12-15-2009)

15.12.035 - Equivalent service extension charge—Grand Mound.

An equivalent service extension charge applies to connection to the Grand Mound water system from outside the service area and will be computed based on the table below.

Equivalent Service Extension Charges for Customers Outside the UGA

Zoning Type	ESEC per Square Foot
Arterial Commercial	$0.0665
Light Industrial	$0.0485
Planned Industrial	$0.0528
Residential 3-6/1	$0.0374

Residential 4-16/1	$0.0789

(Ord. 13989 § 3 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 3, 12-15-2008; Ord. No. 14318, § 4, 12-15-2009)

15.12.037 - Plan review and inspection fees—Boston Harbor, Grand Mound and Tamoshan.

Proponents constructing sewer and water systems within the Boston Harbor, Grand Mound and or Tamoshan service area shall pay to the county the applicable fees identified on the approved fee schedules, which are adopted by reference.

Boston Harbor, Grand Mound and Tamoshan Water and Sewer Plan Check and Inspection Fee Schedule Commercial, Residential and Subdivision

Boston Harbor, Grand Mound Water and Tamoshan Water and Sewer

Plan Check and Inspection Fee Schedule

Commercial, Residential and Subdivision

Service	Fee Schedule
Presubmission Conference	$260
Plan Check	
[1] Preliminary Review/Will Serve Letter	$204
[2] Water Plan Check	$520
[3] Sewer Plan Check	$520
Preliminary Review and Plan Check Sub Total	$1,504
Resubmittal	$104 per hour
Water Construction Inspections	
Preconstruction	$185
Bedding and excavation	$185
Main Tap	$185
Pressure Test and Bacteriological Test	$185
Final	$185
Water Inspection Sub Total	$925
Reinspection	$74 per hour
Sewer Construction Inspection	
Preconstruction	$185
Bedding and excavation	$185
Main Tap, Vacuum and STEP Inspection	$185
[3] Vacuum Pit Inspections. This inspection is not required for gravity sewers.	$185.00 minimum plus $74.00 per hour
Final	$185

Sewer Inspection Sub Total	$555/925
Reinspection	$74 per hour
[4] Final Review and Process	
As Builts Plan Check	$312
Financial Surety Posted	$416
Bill of Sale	$104
As Builts Mapping	$208
Final Review Sub Total	$1040
Re-inspection/Re-submittal Latecomers Application fee if applicable	$74.00 per hr. $520 plus $104 per hr for every hr in excess of five hours

1 Preliminary review and Will Serve Letter Fees are due to development services at application.

2. Plan checks that require more than 2frax;1;2; hours will be billed at the hourly rate of $104.00 per hour.

3. The number of vacuum pits is determined by the number of residential units. Inspectors will charge an hourly rate for vacuum pit inspections. For example, it's estimated that it will take 30 minutes to inspect a vacuum pit. Therefore, 18 vacuum pits at 30 minutes per inspection results in nine hours of inspection. At $74.00 per hour for nine hours the total vacuum pit inspection fee will be $667.00.

4. Final review and processing fees are due when final plat is requested by the applicant.

Boston Harbor, Grand Mound and Tamoshan Water and Sewer Plan Check and Inspection Fee Schedule Residential and Individual Service

Service	Fee Schedule
[1] Single Family Plan Review/Issue Certificate of Water Availability (COWA)	$204
[2] Water Connection/Inspection	$148
[2] Sewer Connection/Inspection	$148
Reinspection	$74 per hour

1. Plan review and certificate fees are due to development services at applications.

2. Inspection fees will be billed during the monthly billing cycle by public works.

(Ord. 13989 § 3 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 13341 § 4, 2005)

(Ord. No. 14156, § 3, 12-15-2008; Ord. No. 14318, § 4, 12-15-2009)

15.12.041 - Boston Harbor water utility general facilities charges for connections outside ULID No. 2.

Year	General Facilities Charge
2003	$8,584.91
2004	$8,885.39
2005	$9,196.38
2006	$9,518.25
2007	$9,851.39
2008	$10,196.19

2009	**$10,553.05**
2010	**$10,922.41**
2011	**$11,304.69**
2012	**$11,700.36**
2013	**$12,109.87**
2014	**$12,533.72**
2015	**$12,972.40**
2016	**$13,426.43**

(Ord. 13989 § 3 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 3, 12-15-2008; Ord. No. 14318, § 4, 12-15-2009)

15.12.051 - Boston Harbor sewer utility general facilities charges for connections outside ULID No. 1.

The general facilities charge shall be an amount equal to the ULID No. 1 assessment for capital construction costs for sewer capacity, plus any interest on assessments paid to date, together with such interest becoming due through the next installment date, plus any service fees paid from January 1, 1991, to the date of reallocation.

(Ord. 13989 § 3 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 3, 12-15-2008; Ord. No. 14318, § 4, 12-15-2009)

15.12.070 - State utility tax.

Water and sewer rates do not include applicable Washington State Utility Tax. This tax will be included separately on each utility billing.

(Ord. 13989 § 3 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 12878 § 1 (part), 2002)

(Ord. No. 14156, § 3, 12-15-2008; Ord. No. 14318, § 4, 12-15-2009)

15.12.080 - Charges, rate and fee adjustments.

Each year, the county will adopt adjusted water and sewer rates based on the following:

A. General Facilities Charges.

1. Grand Mound. Each year the general facilities charge will increase five and one-quarter percent above the previous year's level until the year 2018 or until bond debt associated with constructing the wastewater treatment plant, wells, and reservoir is retired. This section shall not preclude additional increases if necessary to meet operational and maintenance costs.

2. Boston Harbor. See Section 15.12.041

B. Monthly Charges, Rates and Fees.

1. For water and sewer utilities other than Grand Mound, each year during budget preparation, the county will meet with each utility advisory committee to review and seek input on the coming year's level of service and associated expenditures. Once the expenditures are decided upon, the county, with input from the utility advisory committees, will develop a structure of charges, rates and fees that will ensure all expenditures, including expenditures from fund reserves, are met for the approaching budget year; including changes in total salaries and wages, including COLAs, step increases, management technical plan performance rewards, dental and medical insurance premium adjustments and other salary overheads, and for changes in non-labor-related cost including indirect charges to the utility outside the control of the department.

2. Grand Mound.

   a. Water and sewer rates will be adjusted annually to compensate for changes in total salaries and wages, including COLAs, step increases, management technical plan performance rewards, dental and medical insurance premium adjustments and other salary overheads, and for changes in non-labor-related costs including indirect charges to the utility outside the control of the department.

   b. Other utility service fees, including inspection, temporary connection, meter deposit and reconnection fees will be adjusted to be consistent with those for the other utilities.

3. Utility Services in Grand Mound outside ULID No. 96-2.

   a. Service extension charges are fixed in a table available from the department.

   b. Additional capacity charges will be adjusted annually consistent with the Construction Cost Index published by Engineering News Record.

   c. The water rights acquisition fee will be adjusted pursuant to available, documented data, which represents a bona fide, recorded exchange of water rights in the upper and middle reaches of the Chehalis River basin as defined by the Washington State Department of Ecology.

4. Equivalent service extension charges are fixed as published in Section 15.12.035

5. The water system modeling fee shall be adjusted annually to compensate for changes in total salaries and wages, including COLAs, step increases, management technical plan performance rewards, dental and medical insurance premium adjustments and other salary overheads.

6.

Service Call Charges for Posting Notices—Service calls involving posting delinquent water/sewer shut off notices shall be charged a fee of fifteen dollars.

7.

After Hour Service Charges—Non-emergency call outs between the hours of three p.m. and seven a.m. may be charged a fee of one hundred dollars.

(Ord. 13989 § 3 (part), 2007: Ord. 13697 § 1 (part), 2006: Ord. 13479 § 1 (part), 2005: Ord. 13278 § 1 (part), 2004: Ord. 13105 § 2, 2003: Ord. 12878 § 1 (part), 2002)

THURSTON COUNTY
WASHINGTON
SINCE 1852

Appendix N

Inventory of Water System Critical Components

Water Logs and Water Well Reports

Inventory of Water System Critical Components

Component	Number & Location (if applicable)	Description
Source Water Type		
Ground Water	Well S01 – 201st Street (.01 miles NW of chlorination facility@ 20248 Grand Mound Way S02 Tea St & 201st Street	Wells (source S01 & S02)
Surface Water	N/A	N/A
Ground Water Under Direct Influence of Surface Water	N/A	N/A
Mixed Ground and Surface Water	N/A	N/A
Purchased	N/A	N/A
Treatment Plant		
Buildings	Chlorine & Sodium Hypochlorite - 20248 Grand Mound Way Grand Mound, WA	Chlorine room for disinfection – Gas chlorination 150 lbs cylinder & 300 gallon storage tank bldg for Sodium Hypochlorite
Pumps	Sodium Hypochlorite – 20248 Grand Mound Way Grand Mound, WA	LMI stroke/pulse type Sodium Hypochlorite
Treatment Equipment (e.g., basin, clearwell, filter)	Chlorine & Sodium Hypochlorite - 20248 Grand Mound Way Grand Mound, WA	Chlorine for disinfection & Sodium Hypochlorite for pH adjustment (Corrosion control)
	N/A	N/A
	N/A	N/A
	N/A	N/A
Process Controls	N/A	HACH Testing Equip.
Treatment Chemicals and Storage	Gas Chlorine – 63rd Ave & Copper Point Rd, Olympia, WA	Chlorine for disinfection 150 lbs cylinder Liquid Hypochlorite solution pH adjustment
Laboratory Chemicals and Storage	20248 Grand Mound Way Grand Mound, WA	HACH reagents for testing chlorine
Storage		
Storage Tanks	**63rd Ave & Copper Point Rd, Olympia, WA**	**60,000 gallon storage tank**
Pressure Tanks	**N/A**	**N/A**
Power		
Primary Power	20248 Grand Mound Way Grand Mound, WA	Puget Sound Energy – 888-225-5773
Auxiliary Power	20248 Grand Mound Way Grand Mound, WA	150KW diesel generator
Distribution System		
Pumps	N/A	N/A
Pipes		PVC, AC & Galvanize 2" – 14"
Valves		2" – 14" Gate valves
Appurtenances (e.g., flush hydrants, backflow preventers, meters)		CLOW Fire hydrants, 2" blow off assemblies

Other Vulnerable Points	N/A	N/A
Offices		
Buildings	20248 Grand Mound Way Grand Mound, WA	Lab and treatment bldgs
Computers	20248 Grand Mound Way Grand Mound, WA 2404 A1 Heritage Crt SW, Olympia, WA	Utility Technician II office Utility Managers office
Files	20248 Grand Mound Way Grand Mound, WA 2404 A1 Heritage Crt SW, Olympia, WA	Water quality, as-built, maps, customer service, DOH
Transportation/ Work Vehicles	N/A	Yes
Communications		
Telephone	N/A	Yes
Cell Phone	N/A	Yes
Radio	N/A	Yes
Computer Control Systems (SCADA)	N/A	Yes

Security Vulnerability Self-Assessment for Water Systems

General Questions for the Entire Water System

The first 13 questions in this vulnerability self-assessment are general questions designed to apply to all components of your system (wellhead or surface water intake, treatment plant, storage tank(s), pumps, distribution system, and offices). These are followed by more specific questions that look at individual system components in greater detail.

QUESTION	ANSWER	COMMENT
1. Do you have a written emergency response plan (ERP)?	Yes XX No ☐ N/A ☐	It is essential that you have an ERP. If you do not have an ERP, you can obtain a sample from RCAP or your drinking water primacy agency.

		As a first step in developing your ERP, you should develop your Emergency Contact List. A plan is vital in case there is an incident that requires immediate response. Your plan should be reviewed at least annually (or more frequently if necessary) to ensure it is up-to-date and addresses security emergencies. **Insert Comments Here**
2. Is access to the critical components of the water system (i.e., a part of the physical infrastructure of the system that is essential for water flow and/or water quality) restricted to authorize personnel only?	Yes XX No ☐N/A ☐	You should restrict or limit access to the critical components of your water system to authorized personnel only. This is the first step in security enhancement for your water system. Consider the following: • Issue water system photo identification cards for employees, and require them to be displayed within the restricted area at all times. • Post signs restricting entry to authorized personnel and ensure that assigned staff will escort people without proper ID. **Insert Comments Here**
QUESTION	**ANSWER**	**COMMENT**
3. Are facilities fenced, including well houses and pump pits, and are gates locked where appropriate?	Yes XX No ☐N/A ☐	Ideally, all facilities should have a security fence around the perimeter.

		The fence perimeter should be walked periodically to check for breaches and maintenance needs. All gates should be locked with chains and a tamper-proof padlock that at a minimum protects the shank. Other barriers such as concrete "jersey" barriers should be considered to guard certain critical components from accidental or intentional vehicle intrusion. **Insert Comments Here**
4. Are your doors, windows, and other points of entry such as tank and roof hatches and vents kept closed and locked?	Yes XX No ☐N/A ☐	Lock all building doors and windows, hatches and vents, gates, and other points of entry to prevent access by unauthorized personnel. Check locks regularly. Dead bolt locks and lock guards provide a high level of security for the cost. A daily check of critical system components enhances security and ensures that an unauthorized entry has not taken place. Doors and hinges to critical facilities should be constructed of heavy-duty reinforced material. Hinges on all outside doors should be located on the inside. To limit access to water systems, all windows should be locked and reinforced with wire mesh or iron bars, and bolted on the inside or install alarms. Systems should ensure that this type of security meets with the requirements of any fire codes. **Insert Comments Here**

QUESTION	ANSWER	COMMENT
5. Is there external lighting around the critical components of your water system?	Yes XX No ☐N/A ☐	Adequate lighting of the exterior of water systems' critical components is a good deterrent to unauthorized access and may result in the detection or deterrence of trespassers. Motion detectors that activate switches that turn lights on or trigger alarms also enhance security. **Insert Comments Here**
6. Are warning signs (tampering, unauthorized access, etc.) posted on all critical components of your water system? (For example, well houses and storage tanks.)	Yes XX No ☐N/A☐	Warning signs are an effective means to deter unauthorized access. "Warning - Tampering with this facility is a federal offense" should be posted on all water facilities. These are available from your state Rural Water Association. "Authorized Personnel Only," "Unauthorized Access Prohibited," and "Employees Only" are examples of other signs that may be useful. **Insert Comments Here**
7. Do you patrol and inspect your source intake, buildings, storage tanks, equipment, and other critical components?	Yes XX No ☐N/A ☐	Frequent and random patrolling of the water system by utility staff and local law enforcement agency may discourage potential tampering. It may also help identify problems that may have arisen since the previous patrol. **Insert Comments Here**

8. Is the area around the critical components of your water system free of objects that may be used for breaking and entering?	Yes XX No ☐N/A ☐	When assessing the area around your water system's critical components, look for objects that could be used to gain entry (e.g., large rocks, cement blocks, pieces of wood, ladders, valve keys, and other tools). **Insert Comments Here**

QUESTION	ANSWER	COMMENT
9. Are the entry points to your water system easily seen?	Yes XX No ☐N/A ☐	Trim or avoid landscaping that will block your view or permit trespassers to hide, conduct unnoticed suspicious activities, or allow easy access to your system's critical components If possible, park vehicles and equipment in places where they do not block the view of your water system's critical components. **Insert Comments Here**
10. Do you have an alarm system that will detect unauthorized entry or attempted entry at critical components?	Yes ☐ No XX N/A ☐	Consider installing an alarm system that notifies the proper authorities or your water system's designated contact for emergencies when there has been a breach of security. You should also have an audible alarm at the site as a deterrent and to notify neighbors of a potential threat. **Insert Comments Here** Alarm point will be added to the capital improvement project and complete this task in the next 12 months
11. Do you have a key control and accountability policy?	Yes XX No ☐N/A☐	Keep a record of locks and associated keys, and to whom the keys have been assigned. This record will facilitate lock replacement and key management (e.g., after employee turnover or loss of keys). Vehicle and building keys should be kept in a lockbox when not in use. You should have all keys stamped (engraved) "DO NOT DUPLICATE." **Insert Comments Here**

12. Are entry codes and keys limited to water system personnel only?	Yes XX No ☐N/A ☐	Suppliers and personnel from co-located organizations should be denied access to codes and/or keys. Codes should be changed frequently if possible. Entry into any building should always be under the direct control of water system personnel. **Insert Comments Here**
13. Do you have a neighborhood watch program for your water system?	Yes XX No ☐ N/A ☐	Watchful neighbors can be very helpful to a security program. Make sure they know who to call in the event of an emergency or suspicious activity. **Insert Comments Here** Reservoir on private property, well#2 on private properties and well #1 at treatment plant site. Each site and in general the community provides detail updates with suspicious happenings around our site.

Water Sources

In addition to the above general checklist for your entire water system (questions 1-13), you should give special attention to the following issues, presented in separate tables, related to various water system components. Your water sources (surface water intakes or wells) should be secured. Surface water supplies present the greatest challenge. Typically they encompass large land areas. Where areas cannot be secured, steps should be taken to initiate or increase law enforcement patrols. Pay particular attention to surface water intakes. Ask the public to be vigilant and report suspicious activity.

QUESTION	ANSWER	COMMENT
14. Are your wellheads sealed properly?	Yes XX No ☐ N/A ☐	A properly sealed wellhead decreases the opportunity for the introduction of contaminants. If you are not sure whether your wellhead is properly sealed, contact your well drilling/maintenance company, your drinking water primacy agency, or other technical assistance providers. **Insert Comments Here**
15. Are well vents and caps screened and securely attached?	Yes XX No ☐ N/A☐	Properly installed vents and caps can help prevent the introduction of a contaminant into the water supply. Ensure that vents and caps serve their purpose, and cannot be easily breached or removed. **Insert Comments Here**

16. Are observation/test and abandoned wells properly secured to prevent tampering?	Yes XX No ☐N/A☐	All observation/test and abandoned wells should be properly capped or secured to prevent the introduction of contaminants into the aquifer or water supply. Abandoned wells should be destroyed according to state regulations. **Insert Comments Here**
17. Is your surface water source secured with fences or gates? Do water system personnel visit the source?	Yes ☐ No ☐ N/A XX	Surface water supplies present the greatest challenge to secure. Often, they encompass large land areas. Where areas cannot be secured, steps should be taken to initiate or increase patrols by water utility personnel and law enforcement agents. **Insert Comments Here**

Treatment Plant and Suppliers

Some small systems provide easy access to their water system for suppliers of equipment, chemicals, and other materials for the convenience of both parties. This practice should be discontinued.

QUESTION	ANSWER	COMMENT
18. Are deliveries of chemicals and other supplies made in the presence of water system personnel?	Yes XX No ☐ N/A ☐	Establish a policy that an authorized person, designated by the water system, must accompany all deliveries. Verify the credentials of all drivers. This prevents unauthorized personnel from having access to the water system. **Insert Comments Here**
19. Have you discussed with your supplier(s) procedures to ensure the security of their products?	Yes XX No ☐ N/A ☐	Verify that your suppliers take precautions to ensure that their products are not contaminated. Chain of custody procedures for delivery of chemicals should be reviewed. You should inspect chemicals and other supplies at the time of delivery to verify they are sealed and in unopened containers. Match all delivered goods with purchase orders to ensure that they were, in fact, ordered by your water system.

		You should keep a log or journal of deliveries. It should include the driver's name (taken from the driver's photo I.D.), date, time, material delivered, and the supplier's name. **Insert Comments Here**
20. Are chemicals, particularly those that are potentially hazardous or flammable, properly stored in a secure area?	Yes XX No ☐ N/A ☐	All chemicals should be stored in an area designated for their storage only, and the area should be secure and access to the area restricted. Access to chemical storage should be available only to authorized employees. You should have tools and equipment on site (such as a fire extinguisher, drysweep, etc.) to take immediate actions when responding to an emergency. **Insert Comments Here**
QUESTION	**ANSWER**	**COMMENT**
21. Do you monitor raw and treated water so that you can detect changes in water quality?	Yes XX No ☐ N/A ☐	Monitoring of raw and treated water can establish a baseline that may allow you to know if there has been a contamination incident. Some parameters for raw water include pH, turbidity, total and fecal coliform, total organic carbon, specific conductivity, ultraviolet adsorption, color, and odor. Routine parameters for finished water and distribution systems include free and total chlorine residual, heterotrophic plate count (HPC), total and fecal coliform, pH, specific conductivity, color, taste, odor, and system pressure. **Insert Comments Here**
22. Are tank ladders, access hatches, and entry points secured?	Yes XX No ☐ N/A ☐	The use of tamper-proof padlocks at entry points (hatches, vents, and ladder enclosures) will reduce the potential for unauthorized entry.

		If you have towers, consider putting physical barriers on the legs to prevent unauthorized climbing. **Insert Comments Here**
23. Are vents and overflow pipes properly protected with screens and/or grates?	Yes XX No ☐ N/A ☐	Air vents and overflow pipes are direct conduits to the finished water in storage facilities. Secure all vents and overflow pipes with heavy-duty screens and/or grates. **Insert Comments Here**
24. Can you isolate the storage tank from the rest of the system?	Yes XX No ☐ N/A ☐	A water system should be able to take its storage tank(s) out of operation or drain its storage tank(s) if there is a contamination problem or structural damage. Install shut-off or bypass valves to allow you to isolate the storage tank in the case of a contamination problem or structural damage. Consider installing a sampling tap on the storage tank outlet to test water in the tank for possible contamination. **Insert Comments Here**

Distribution

Hydrants are highly visible and convenient entry points into the distribution system. Maintaining and monitoring positive pressure in your system is important to provide fire protection and prevent introduction of contaminants.

QUESTION	ANSWER	COMMENT
25. Do you control the use of hydrants and valves?	Yes XX No ☐ N/A ☐	Your water system should have a policy that regulates the authorized use of hydrants for purposes other than fire protection. Require authorization and backflow devices if a hydrant is used for any purpose other than fire fighting. Consider designating specific hydrants for use as filling station(s) with proper backflow prevention (e.g., to meet the needs of construction firms). Then, notify local law enforcement officials and the public that these are the only sites designated for this use.

		Flush hydrants should be kept locked to prevent contaminants from being introduced into the distribution system, and to prevent improper use. **Insert Comments Here**
26. Does your system monitor for, and maintain, positive pressure?	Yes XX No ☐ N/A ☐	Positive pressure is essential for fire fighting and for preventing backsiphonage that may contaminate finished water in the distribution system. Refer to your state primacy agency for minimum drinking water pressure requirements. **Insert Comments Here**
27. Has your system implemented a backflow prevention program?	Yes XX No ☐ N/A ☐	In addition to maintaining positive pressure, backflow prevention programs provide an added margin of safety by helping to prevent the intentional introduction of contaminants. If you need information on backflow prevention programs, contact your drinking water primacy agency. **Insert Comments Here**

Personnel

You should add security procedures to your personnel policies.

QUESTION	ANSWER	COMMENT
28. When hiring personnel, do you request that local police perform a criminal background check, and do you verify employment eligibility (as required by the Immigration and Naturalization Service, Form I-9)?	Yes XX No ☐ N/A ☐	It is good practice to have all job candidates fill out an employment application. You should verify professional references. Background checks conducted during the hiring process may prevent potential employee-related security issues.

QUESTION	ANSWER	COMMENT
		If you use contract personnel, check on the personnel practices of all providers to ensure that their hiring practices are consistent with good security practices. **Insert Comments Here**
29. Are your personnel issued photo-identification cards?	Yes XX No ☐ N/A ☐	For positive identification, all personnel should be issued water system photo-identification cards and be required to display them at all times. Photo identification will also facilitate identification of authorized water system personnel in the event of an emergency. **Insert Comments Here**
30. When terminating employment, do you require employees to turn in photo IDs, keys, access codes, and other security-related items?	Yes XX No ☐ N/A ☐	Former or disgruntled employees have knowledge about the operation of your water system, and could have both the intent and physical capability to harm your system. Requiring employees who will no longer be working at your water system to turn in their IDs, keys, and access codes helps limit these types of security breaches. **Insert Comments Here**

31. Do you use uniforms and vehicles with your water system name prominently displayed?	Yes XX No ☐ N/A ☐	Requiring personnel to wear uniforms, and requiring that all vehicles prominently display the water system name, helps inform the public when water system staff is working on the system. Any observed activity by personnel without uniforms should be regarded as suspicious. The public should be encouraged to report suspicious activity to law enforcement authorities. **Insert Comments Here**
32. Have water system personnel been advised to report security vulnerability concerns and to report suspicious activity?	Yes XX No ☐ N/A ☐	Your personnel should be trained and knowledgeable about security issues at your facility, what to look for, and how to report any suspicious events or activity. Periodic meetings of authorized personnel should be held to discuss security issues. **Insert Comments Here**
33. Do your personnel have a checklist to use for threats or suspicious calls or to report suspicious activity?	Yes XX No ☐ N/A ☐	To properly document suspicious or threatening phone calls or reports of suspicious activity, a simple checklist can be used to record and report all pertinent information. Calls should be reported immediately to appropriate law enforcement officials. Checklists should be available at every telephone. Also consider installing caller ID on your telephone system to keep a record of incoming calls. **Insert Comments Here**
Information storage/computers/controls/maps		

Security of the system, including computerized controls like a Supervisory Control and Data Acquisition (SCADA) system, goes beyond the physical aspects of operation. It also includes records and critical information that could be used by someone planning to disrupt or contaminate your water system.

QUESTION	ANSWER	COMMENT
34. Is computer access "password protected?" Is virus protection installed and software upgraded regularly and are your virus definitions updated at least daily? Do you have Internet firewall software installed on your computer? Do you have a plan to back up your computers?	Yes XX No ☐ N/A ☐	All computer access should be password protected. Passwords should be changed every 90 days and (as needed) following employee turnover. When possible, each individual should have a unique password that is not shared with others. If you have Internet access, a firewall protection program should be installed on your computer. Also consider contacting a virus protection company and subscribing to a virus update program to protect your records. Backing up computers regularly will help prevent the loss of data in the event that your computer is damaged or breaks. Backup copies of computer data should be made routinely and stored at a secure off-site location. **Insert Comments Here**
35. Is there information on the Web that can be used to disrupt your system or contaminate your water?	Yes ☐ No XX N/A ☐	Posting detailed information about your water system on a Web site may make the system more vulnerable to attack. Web sites should be examined to determine whether they contain critical information that should be removed. You should do a Web search (using a search engine such as Google, Yahoo!, or Lycos) using key words related to your water supply to find any published data on the Web that is easily accessible by someone who may want to damage your water supply. **Insert Comments Here**
QUESTION	**ANSWER**	**COMMENT**

36. Are maps, records, and other information stored in a secure location?	Yes XX No ☐ N/A ☐	Records, maps, and other information should be stored in a secure location when not in use. Access should be limited to authorized personnel only. You should make back-up copies of all data and sensitive documents. These should be stored in a secure off-site location on a regular basis. **Insert Comments Here**
37. Are copies of records, maps, and other sensitive information labeled confidential, and are all copies controlled and returned to the water system?	Yes XX No ☐ N/A ☐	Sensitive documents (e.g., schematics, maps, and plans and specifications) distributed for construction projects or other uses should be recorded and recovered after use. You should discuss measures to safeguard your documents with bidders for new projects. **Insert Comments Here**
38. Are vehicles locked and secured at all times?	Yes XX No ☐ N/A ☐	Vehicles are essential to any water system. They typically contain maps and other information about the operation of the water system. Water system personnel should exercise caution to ensure that this information is secure. Water system vehicles should be locked when they are not in use or are left unattended. Remove any critical information about the system before parking vehicles for the night. Vehicles also usually contain tools (e.g., valve wrenches) that could be used to access critical components of your water system. These tools should be secured and accounted for daily. **Insert Comments Here**

Public Relations

You should educate your customers about your system. You should encourage them to be alert and to report any suspicious activity to law enforcement authorities.

QUESTION	ANSWER	COMMENT
39. Do you have a program to educate and encourage the public to be vigilant and report suspicious activity to assist in the security protection of your water system?	Yes ☐ No XX N/A ☐	Advise your customers and the public that your system has increased preventive security measures to protect the water supply from vandalism. Ask for their help. Provide customers with your telephone number and the telephone number of the local law enforcement authority so that they can report suspicious activities. The telephone number can be made available through direct mail, billing inserts, notices on community bulletin boards, flyers, and consumer confidence reports. **Insert Comments Here** Reservoir on private property, well#2 on private properties and well #1 at treatment plant site. Each site and in general the community provides detail updates with suspicious happenings around our site.
40. Does your water system have a procedure to deal with public information requests, and to restrict distribution of sensitive information?	Yes XX No ☐ N/A ☐	You should have a procedure for personnel to follow when you receive an inquiry about the water system or its operation from the press, customers, or the general public. Your personnel should be advised not to speak to the media on behalf of the water system. Only one person should be designated as the spokesperson for the water system. Only that person should respond to media inquiries. You should establish a process for responding to inquiries from your customers and the general public. **Insert Comments Here**
	Yes XX	It is critical to be able to receive information about

41. **Do you have a procedure in place to receive notification of a suspected outbreak of a disease immediately after discovery by local health agencies?**	No ☐ N/A ☐	suspected problems with the water at any time and respond to them quickly. Procedures should be developed in advance with your drinking water primacy agency, local health agencies, and your local emergency planning committee. **Insert Comments Here**
QUESTION	**ANSWER**	**COMMENT**
42. **Do you have a procedure in place to advise the community of contamination immediately after discovery?**	Yes XX No ☐ N/A ☐	As soon as possible after confirming contamination, you should notify testing personnel and your laboratory of the incident. In incidences caused by microbial or chemical contaminants, it is critical to discover the type of contaminant and its method of transport (water, food, etc.). Active testing of your water supply will enable your laboratory, working in conjunction with public health officials, to determine if there are any unique (and possibly lethal) chemicals or disease organisms in your water supply. It is critical to be able to get the word out to your customers as soon as possible after discovering a health hazard in your water supply. In addition to your responsibility to protect public health, you must also comply with the requirements of the Public Notification Rule. Some simple methods include announcements via radio or television, door-to-door notification, a phone tree, and posting notices in public places. The announcement should include accepted uses for the water and advice on where to obtain safe drinking water. Call large facilities that have large populations of people who might be particularly threatened by the outbreak: hospitals, nursing homes, the school district, jails, large public buildings, and large companies. Enlist the support of local emergency response personnel to assist in the effort. **Insert Comments Here**
	Yes ☐ No XX	It is critical to be able to respond to and quickly

43. Do you have a procedure in place to respond immediately to a customer complaint about a new taste, odor, color, or other physical change (oily, filmy, burns on contact with skin)?	N/A ☐	identify potential water quality problems reported by customers. Procedures should be developed in advance to investigate and identify the cause of the problem, as well as to alert local health agencies, your drinking water primacy agency, and your local emergency planning committee if you discover a problem. **Insert Comments Here** At this time Utility workers take customers concerns as priority and respond to their needs as necessary. Issues that require additional oversight is done by the Utility Operations manager

Now that you have completed the "Security Vulnerability Self-Assessment Guide for Water Systems," review your needed actions and then prioritize them based on the most likely threats. A table to assist you in prioritizing actions is provided in Attachment 1.

Attachment 1. Prioritization of Needed Actions

Once you have completed the "Security Vulnerability Self-Assessment Guide for Drinking Water Systems," review the actions you need to take to improve your system's security. Note the questions to which you answered "no" on this worksheet. You can use it to summarize the areas where your system has vulnerability concerns. It can also help you prioritize the actions you should take to protect your system from vulnerabilities. Make sure to prioritize your actions based on the most likely threats to your water system and the magnitude of their risks to public health.

Question Number	Needed Action	Scheduled Completion

Attachment 3: Certificate of Completion

I certify to the United States Department of Agriculture, Rural Development (USDA/RD) that this community water system has completed a Security Vulnerability Assessment (SVA), and that the results will be incorporated into an Emergency Response Plan for the system.

I certify that this document was prepared under my direction or supervision. I am aware that there are significant penalties for submitting false information (Safe Drinking Water Act (42U.S.C. 300f et seq.).

Mail the completed certificate only (do not send your SVA or ERP) to the appropriate USDA Rural Development office.

Public Water System ID Number: 07158O

System Name: Grand Mound

Address: 2404 A1 Heritage Crt S.W. Olympia, WA 98502

Print Name of Person Authorized to Sign this Certification on behalf of the System:

Mark A. Petrie **Title:** Utility Operations Manager

Signature: ______________________

Phone: 360-754-2930 **Fax:** 360-786-5582 **Email:** petriema@co.thurston.wa.us

Received Technical Assistance from the following:

☐ Rural Community Assistance Partnership (CRG, Great Lakes RCAP/WSOS, MAP, RCAC, RCAP Solutions, Southeast RCAP)

☐ Rural Water Association

Have completed the following:

xx Security Vulnerability Assessment
☐ Emergency Response Plan

Disclaimer

This document contains information on how to plan for protection of the assets of your water system. The work necessarily addresses problems in a general nature. You should review local, state, tribal (if applicable), and federal laws and regulations to see how they apply to your specific situation.

Knowledgeable professionals prepared this document using current information. The authors make no representation, expressed or implied that this information is suitable for any specific situation. The authors have no obligation to update this work or to make notification of any changes in statutes, regulations, information, or programs described in this document. Publication of this document does not replace the duty of water systems to warn and properly train their employees and others concerning health and safety risks and necessary precautions at their water systems.

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Washington, D.C. 20005
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File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. W 16360
UNIQUE WELL I.D. # ACK 136
Water Right Permit No. G2-28527

(1) OWNER: Name Thurston County Address 921 Lakeridge Dr. SW Rm 100 Oly 98502-6045

LOCATION OF WELL: County Thurston SW 1/4 SE 1/4 Sec 11 T. 15 N., R 03 WM

(2) STREET ADDRESS OF WELL (or nearest address) 201 ST Av. SW

(3) PROPOSED USE: ☐ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☑ Municipal ☑ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) TW-1
Abandoned ☐ New well ☑ Deepened ☐ Reconditioned ☐ Method: Dug ☐ Cable ☑ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 8 inches.
Drilled 97 feet. Depth of completed well 87.5 ft.

(6) CONSTRUCTION DETAILS:
Casing Installed: Welded ☑ Liner installed ☐ Threaded ☐
~~[illegible]~~ " Diam. from ~~[illegible]~~ ft. to ~~[illegible]~~ ft.
8 " Diam. from 0 ft. to 62 ft.
" Diam. from ft. to ft.

Perforations: Yes ☐ No ☑
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☑ No ☐
Manufacturer's Name JOHNSON
Type STAINLESS STEEL Model No. Telescopic
Diam. 8 Slot size 0.150 in from 62 ft. to 71 ft.
8 Slot size 0.080 from 71 ft. to 84 ft.

Gravel packed: Yes ☐ No ☐ Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☑ No ☐ To what depth? 27 ft.
Material used in seal High Solids Bentonite
Did any strata contain unusable water? Yes ☐ No ☑
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name —
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level Approx. 160 ft.
Static level 20.36 ft. below ~~top of well~~ 9.5 Date 6/17/96
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☑ No ☐ If yes, by whom? Pacific Groundwater Group
Yield: 430 gal./min. with 20.39 ft. drawdown after 38.5 hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

See Hydrogeologic Report, PGG, 1996

Date of test 6/11/96 : 6/17/96
Bailer test gal./min. with ft. drawdown after hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water 11.4°C Was a chemical analysis made? Yes ☑ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Dk. brown, organic rich, fine to medium SAND	0	3
Gray-brown, slightly silty, fine to medium SAND	3	7
Gray to olive gray, slightly silty GRAVEL : coarse SAND	7	15
Gray to olive gray, very silty GRAVEL : coarse SAND	15	22.5
~~Olive to brown-gray, gravelly medium to coarse SAND~~	~~22.5~~	~~32.5~~
Olive ~~[illegible]~~ gray, slightly silty, medium to coarse sandy GRAVEL (water 22.5 to 89)	22.5	32.5
Olive to brown-gray, gravelly, medium to coarse SAND	32.5	38.5
Brown to olive-gray, fine to medium SAND	38.5	50
Olive to brown-gray, medium to coarse S:G	50	64
Olive to brown-gray, sandy GRAVEL	64	66
Brown to olive-gray, medium to coarse S:G	66	73
Light brown to olive-gray, medium S:G	73	84.5
Light to moderate brown, slightly silty, slightly fine sandy GRAVEL	84.5	89
Gray, damp, very silty, coarse sandy SILT	89	97
Log Prepared by Pacific Groundwater Group		

Work Started 5/20/96 Completed 6/4/96

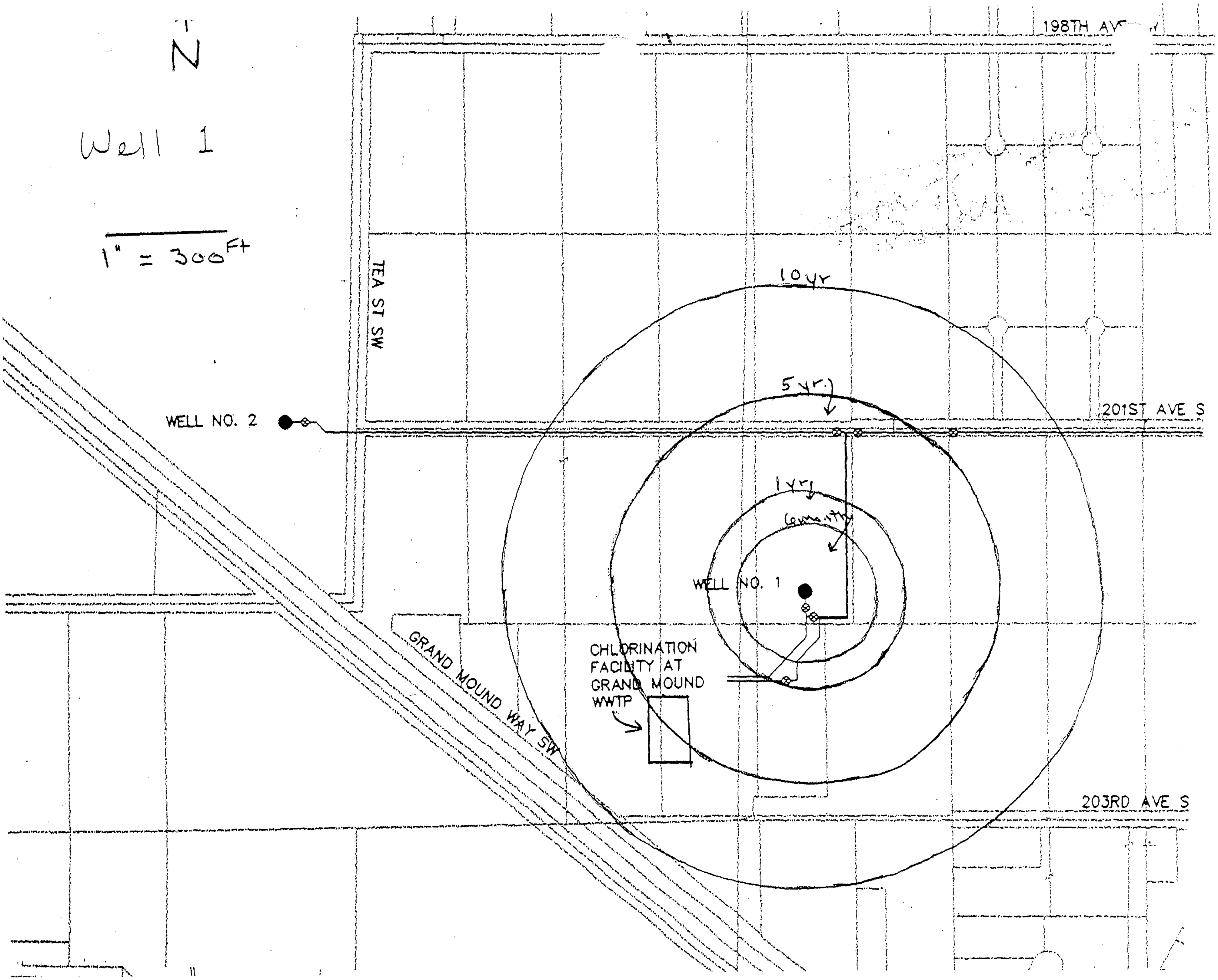
WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Holt Drilling Inc (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address 10621 Todd Rd E
(Signed) Roby Holt (WELL DRILLER) License No. 1099
Contractor's Registration No. HOLTDI*136OG Date 8-14, 1996

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20 (9/93)


N
Well 1
1" = 300 Ft
198TH AVE
TEA ST SW
WELL NO. 2
10 yr
5 yr.
1 yr.
201ST AVE S
WELL NO. 1
CHLORINATION
FACILITY AT
GRAND MOUND
WWTP
GRAND MOUND WAY SW
203RD AVE S

PARCEL # 51303300000

Date Stamp

Reviewed by:

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

PROOF OF APPROPRIATION OF WATER

PERMIT NUMBER	CHANGE APPROVAL NUMBER
G2-22514B	

NAME OF PERMITTEE	CONTACT NAME (IF DIFFERENT)
Thurston County Department of Water & Waste Management/Randy O'Hern	

MAILING ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
921 Lakeridge Drive SW, Room 100	Olympia	WA	98502

PHONE NUMBER	FAX NUMBER
(360) 357-2491	(360) 754-4682

SOURCE(S) OF WATER	NO.	¼	¼	SECTION	TOWNSHIP N.	RANGE, (E/W)M
Wells 1, 2	1 & 2	SW	SE	11	15	3W

LIST ALL PURPOSES WATER IS USED FOR: Municial - Domestic, Commercial, Industrial

DATE WATER WAS COMPLETELY APPLIED TO BENEFICIAL USE	TIME OF YEAR WATER IS USED:	IF SEASONALLY, LIST THE START AND END DATE
January 1, 1999	☒ Continuous/Year round ☐ Seasonal	Start: End:

DESCRIBE HOW CONSTRUCTION AND DEVELOPMENT RELATED PROVISIONS (AS REQUIRED BY PERMIT) HAVE BEEN OR ARE TO BE MET (USE ADDITIONAL SHEET OF PAPER IF NECESSARY)

DESCRIPTION OF SPECIFIC AREA ON WHICH WATER IS BENEFICIALLY USED(USE ADDITIONAL SHEET OF PAPER IF NECESSARY)
The Grand Mound Urban Growth Area as described in the Thurston Comprehensive Plan.

NO.	¼	¼	SECTION	TOWNSHIP N.	RANGE, (E/W)M
1 & 2	SW	SE	11	15	3W

PHYSICAL WITHDRAWAL OR DIVERSION INFORMATION

For Pump Designed Water System Information:

TYPE OF PUMP: ☒ Submersible ☐ Turbine ☐ Centrifical ☐ Other

MAKE	MODEL #	SERIAL #	HORSEPOWER
8" Hitachi	10MQL		30
MOTOR	**BHP**	**SPEED**	**RPM**
Hitachi	30	1770	1770
☒ Water lubricated ☐ Oil Lubricated			
BOOSTER PUMP	**BREAK HORSEPOWER**	**PRESSURE**	**OPEN DISCHARGE**
☐ Yes ☒ No			☐ Yes ☒ No
PUMP DISCHARGE HEAD PRESSURE	**DISCHARGE PIPE DIAMETER**		
psi 70	6 inch DI		

For Ground Water Withdrawal (if more than one, please include attachment)

Ecology Unique Well Identification Number(s) ACK136 (Include a copy of the well log(s))

PUMP SETTING (DEPTH)	STATIC WATER LEVEL	DYNAMIC (PUMPING) LEVEL
57 ft	20 feet below land surface	24 feet below land surface
ACCESS PORT INSTALLED?	**AIRLINE INSTALLED?**	**AIRLINE LENGTH**
☒ Yes	☐ Yes No electronic measure device	Ft

For Non-Pump Designed Water Systems

METHOD OF WATER DIVERSION	DESCRIPTION OF WORKS: SCREEN MESH SIZE	DESCRIPTION OF WORKS: METHOD OF CONTROL
N/A		

Ground Water Contamination
Susceptibility Assessment Survey Form
Version 2.2

IMPORTANT! Please complete one form for each ground water source (well, wellfield, spring) used in your water system. Photocopy as necessary.

PART I: System Information

Well owner/manager : Thurston County-Dept. Water & waste Management

Water system name : Thurston County Grand Mound

County: Thurston

Water system number: 071580 Source number: Well #2

Well depth: 60 (ft.) (*From WFI form*)

Source name: Well #2

WA well identification tag number: A C T - 0 1 6

______ well not tagged

Number of connections: 79 Population served: 1500

Township: 15 N Range: 03W

Section: 11 1/4 1/4 Section: ______

Latitude/longitude (if available): ______ / ______

How was lat./long. determined?

____ global positioning device ____ survey ____ topographic map
____ other: ______

* Please refer to Assistance Packet for details and explanations of all questions in Parts II through V.

PART II: Well Construction and Source Information

1) Date well originally constructed: 11 / 25 / 97 month/day/year

last reconstruction: __ / __ / __ month/day/year

______ information unavailable

PART III: Hydrogeologic Information

1) Depth to top of open interval: [check one]

___ (less than) 20 ft ___ 20-50 ft X 50-100 ft ___ 100-200 ft ___ (greater than) 200 ft

___ information unavailable

2) Depth to ground water (static water level):

___ (less than) 20 ft X 20-50 ft ___ 50-100 ft ___ (greater than) 100 ft

___ flowing well/spring (artesian)

How was water level determined?

___ well log X other: "As-built" by Pacific Groundwater Group.

___ depth to ground water unknown

3) If source is a flowing well or spring, what is the confining pressure:

________ psi (pounds per square inch)
or
________ feet above wellhead

N/A

4) If source is a flowing well or spring, is there a surface impoundment, reservoir, or catchment associated with this source: ___ YES ___ NO

5) Wellhead elevation (height above mean sea level): 160 (ft)

How was elevation determined? ___ topographic map X Drilling/Well Log "As-built" ___ altimeter

___ other: ______________________

___ information unavailable

6) Confining layers: (This can be completed only for those sources with a drilling log, well log or geologic report describing subsurface conditions. Please refer to assistance package for example.)

___ evidence of a confining layer in well log

X no evidence of a confining layer in well log

If there is evidence of a confining layer, is the depth to ground water more than 20 feet above the **bottom of the lowest confining layer?** ___ YES ___ NO

N/A

___ information unavailable

PART IV: Mapping Your Ground Water Resource

1) Annual volume of water pumped: 5,447,300 (gallons)

How was this determined?

X meter

__ estimated: X pumping rate (525 gpm)

__ pump capacity (__________)

__ other: __________

2) "Calculated Fixed Radius" estimate of ground water movement: (see Instruction Packet)

6 month ground water travel time : 170 (ft)

1 year ground water travel time : 240 (ft)

5 year ground water travel time: 480 (ft)

10 year ground water travel time: 750 (ft)

Information available on length of screened/open interval?

X YES __ NO

Length of screened/open interval: 17 (ft)

3) Is there a river, lake, pond, stream, or other obvious surface water body within the 6 month time of travel boundary? __ YES X NO (mark and identify on map).

4) Is there a stormwater and/or wastewater facility, treatment lagoon, or holding pond located within the 6 month time of travel boundary? __ YES X NO (mark and identify on map).

Comments: __________

2) Source specific water quality records:

Please indicate the occurrence of any test results since 1986 that meet the following conditions: (Unless listed on assessment, MCLs are listed in assistance package.)

A. Nitrate: (Nitrate MCL = 10 mg/l)	YES
Results greater than MCL	
(less than) 2 mg/liter nitrate	
2-5 mg/liter nitrate	X
(greater than) 5 mg/liter nitrate	
Nitrate sampling records unavailable	

B. VOCs: (VOC detection level 0.5 ug/l or 0.0005 mg/l.)	YES
Results greater than MCL or SAL	
VOCs detected at least once	
VOC test performed but never detected	X
VOC sampling records unavailable	

C. EDB/DBCP: (EDB MCL = 0.05 ug/l or 0.00005 mg/l. DBCP MCL = 0.2 ug/l or 0.0002 mg/l.)	YES
EDB/DBCP detected below MCL at least once	
EDB/DBCP detected above MCL at least once	
EDB/DBCP never detected	
EDB/DBCP tests required but not yet completed	
EDB/DBCP tests not required	X

D. Other SOCs (pesticides and other synthetic organic chemicals):	YES
Other SOCs detected	
Other SOC tests performed but none detected *	
Other SOC tests not performed	X

*If any SOCs in addition to EDB/DBCP were detected, please identify and date. If other SOC tests were performed, but no SOCs detected, list test methods here: ____________________

____

____

____

3) Is the source located in an aquifer with a high horizontal flow rate? (These can include sources located on flood plains of large rivers, artesian wells with high water pressure, and/or shallow flowing wells and springs.)

___ YES X NO

4) Are there other high capacity wells (agricultural, municipal and/or industrial) located within the CFRs?

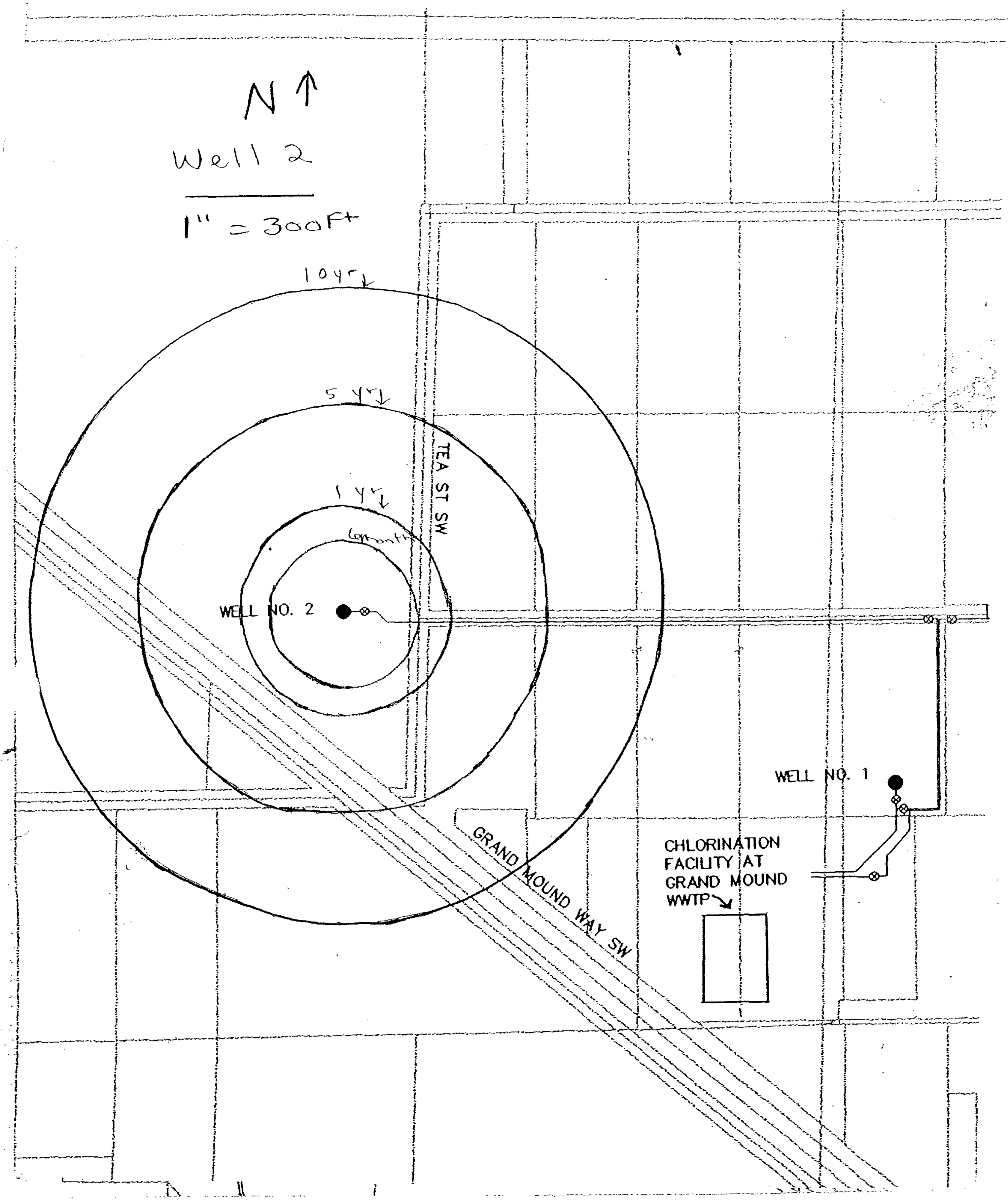
a) Presence of ground water extraction wells removing more than approximately 500 gal/min within...

	YES	NO	unknown
6 month travel time		X	
6 month-1 year travel time		X	
1-5 year travel time		X	
5-10 year travel time			X

b) Presence of ground water recharge wells (dry wells) or heavy irrigation within...

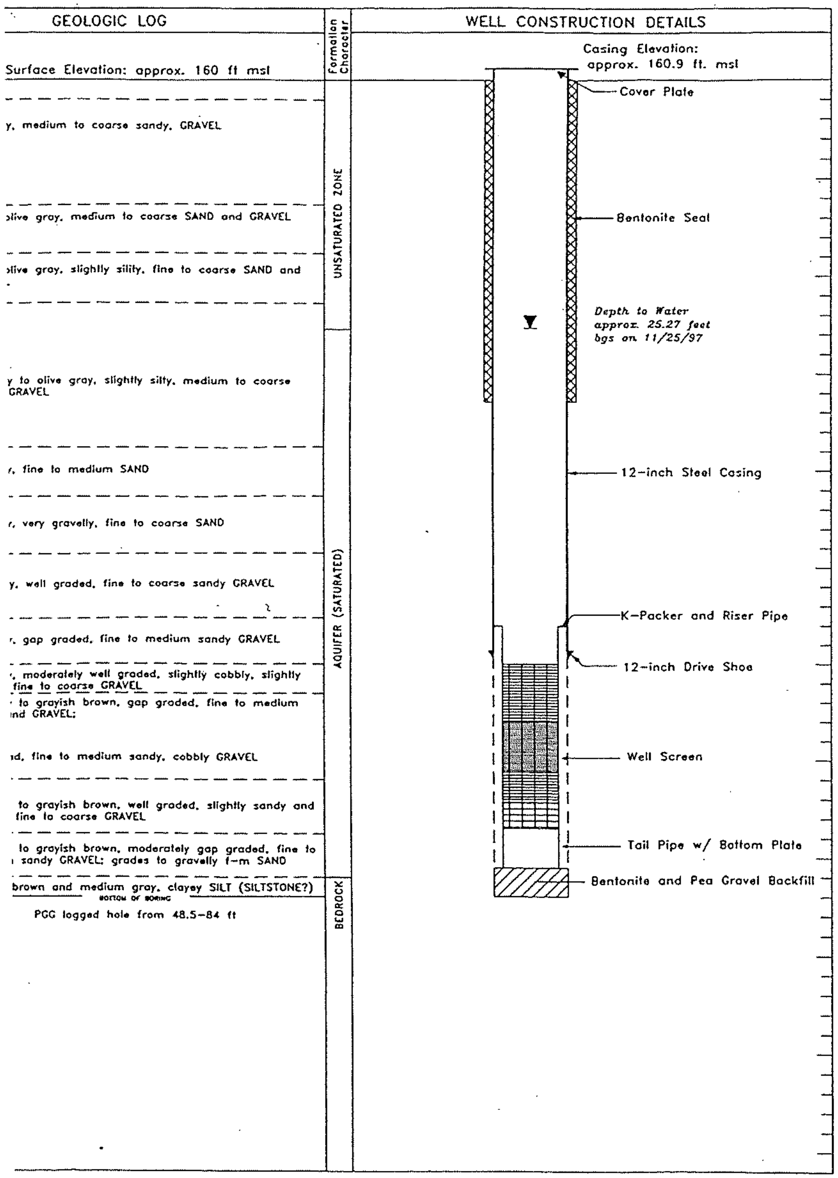
	YES	NO	unknown
1 year travel time		X	
1-5 year travel time		X	
5-10 year travel time		X	

Please identify or describe additional hydrologic or geographic conditions that you believe may affect the shape of the zone of contribution for this source. Where possible, reference them to locations on the map produced in Part IV.



N
Well 2
1" = 300ft
10yr
5yr
1yr
6month
TEA ST SW
WELL NO. 2
WELL NO. 1
GRAND MOUND WAY SW
CHLORINATION FACILITY AT GRAND MOUND WWTP

Geologic Log and Well Construction Details



E: TC / GM Groundwater Devel.
CATION NUMBER: TW-2
¼ SW¼ Sec. 11 T.15N, R.3W
IRM: Pacific Groundwater Group
VE: Jim Mathieu

WATER LEVEL ELEVATION: 134.73 feet msl (approx.)
WATER LEVEL DATE: 11/25/97
START CARD NO.: W072099
UNIQUE WELL ID NO.: ACT016
DRILLING METHOD: Cable Tool
FIRM: Holt Testing, Inc.

Well Screen As-Built

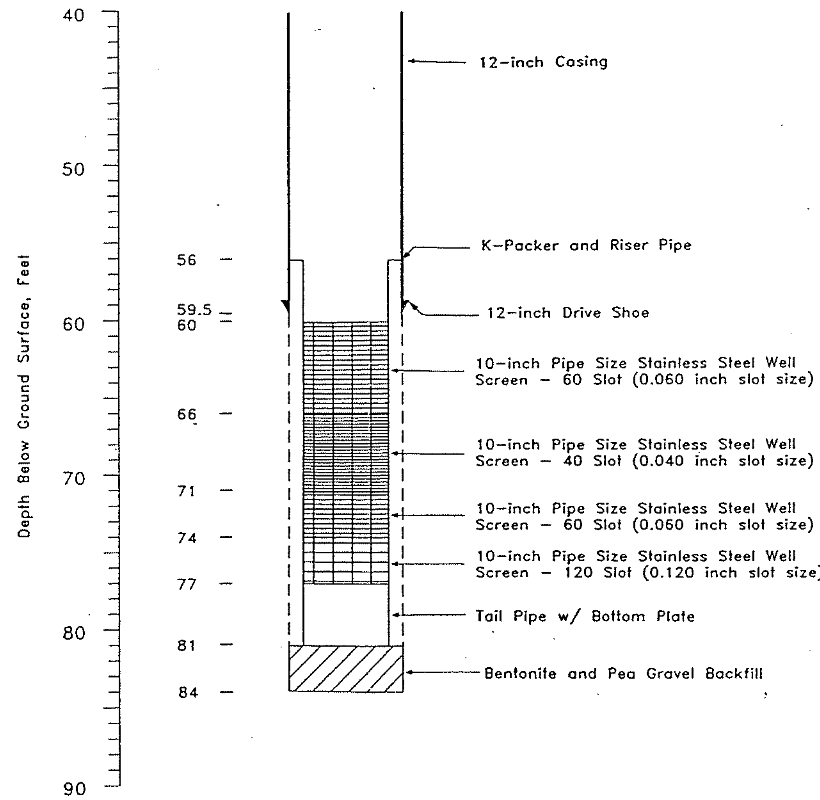


FIGURE 2
GEOLOGIC LOG AND WELL DESIGN FOR WELL TW-2

Thurston County / Grand Mound Groundwater Development Program

Pacific Groundwater Group

RECEIVED
DEPT. OF ECOLOGY/SWRO

'02 JAN 25 A10:55

PARCEL # 51303300000

Date Stamp

Reviewed by:

ECOLOGY

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

PROOF OF APPROPRIATION OF WATER

PERMIT NUMBER	CHANGE APPROVAL NUMBER
G2-22514B	

NAME OF PERMITTEE / CONTACT NAME (IF DIFFERENT)
Thurston County Department of Water & Waste Management/Randy O'Hern

MAILING ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
921 Lakeridge Drive SW, Room 100,	Olympia	WA	98502

PHONE NUMBER	FAX NUMBER
(360 357-2491	(360 754-4682

SOURCE(S) OF WATER	NO.	¼	¼	SECTION	TOWNSHIP N.	RANGE, (E/W)M
Wells 1, 2	1 & 2	SW	SE	11	15	3W

LIST ALL PURPOSES WATER IS USED FOR:
Municial - Domestic, Commercial, Industrial

DATE WATER WAS COMPLETELY APPLIED TO BENEFICIAL USE	TIME OF YEAR WATER IS USED:	IF SEASONALLY, LIST THE START AND END DATE
January 1, 1999	☒ Continuous/Year round ☐ Seasonal	Start: End:

DESCRIBE HOW CONSTRUCTION AND DEVELOPMENT RELATED PROVISIONS (AS REQUIRED BY PERMIT) HAVE BEEN OR ARE TO BE MET (USE ADDITIONAL SHEET OF PAPER IF NECESSARY)

DESCRIPTION OF SPECIFIC AREA ON WHICH WATER IS BENEFICIALLY USED(USE ADDITIONAL SHEET OF PAPER IF NECESSARY)
The Grand Mound Urban Growth Area as described in the Thurston Comprehensive Plan.

NO.	¼	¼	SECTION	TOWNSHIP N.	RANGE, (E/W)M
1 & 2	SW	SE	11	15	3W

PHYSICAL WITHDRAWAL OR DIVERSION INFORMATION

For Pump Designed Water System Information:

TYPE OF PUMP: ☒ Submersible ☐ Turbine ☐ Centrifical ☐ Other ____

MAKE	MODEL #	SERIAL #	HORSEPOWER
8" Hitachi	10MQL		30
MOTOR	**BHP**	**SPEED**	**RPM**
Hitachi	30	1770	1770
☒ Water lubricated	☐ Oil Lubricated		
BOOSTER PUMP	**BREAK HORSEPOWER**	**PRESSURE**	**OPEN DISCHARGE**
☐ Yes ☒ No			☐ Yes ☒ No
PUMP DISCHARGE HEAD PRESSURE	**DISCHARGE PIPE DIAMETER**		
psi 70	6 inch DI		

For Ground Water Withdrawal (if more than one, please include attachment)

Ecology Unique Well Identification Number(s) ACK136 [Include a copy of the well log(s)]

PUMP SETTING (DEPTH)	STATIC WATER LEVEL	DYNAMIC (PUMPING) LEVEL
57 ft	20 feet below land surface	24 feet below land surface
ACCESS PORT INSTALLED?	**AIRLINE INSTALLED?**	**AIRLINE LENGTH**
☒ Yes	☐ Yes No electronic measure devide	

For Non-Pump Designed Water Systems

METHOD OF WATER DIVERSION	DESCRIPTION OF WORKS: SCREEN MESH SIZE	METHOD OF CONTROL
N/A		

THURSTON COUNTY
WASHINGTON
SINCE 1852

Appendix O

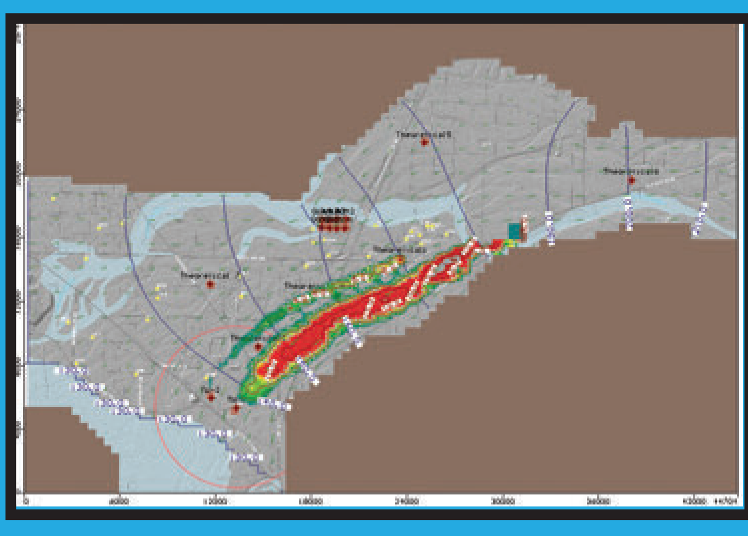
Grand Mound Model Report and Grand Mound Feasibility Report for Future Wells 3 and 4

Scatter Creek Ground Water Numerical Model: Grand Mound Municipal Well Field, Thurston County

Prepared by N. Romero, Hydrogeologist, LHG and LG
B. Zulewski, RS, Geologist

Water Resources and Environmental Health Program, TC

December 29, 2010



FINAL PROVISIONAL REPORT

FOREWORD ON GROUND WATER MODEL EFFORT 2010

The purpose of this preliminary ground water model is to help provide insight to the hydrogeologist for new well placements at the Grand Mound Municipal Well Field. It was not intended to establish land use practices hydraulically up-gradient of the well field such as septic field impacts, at this point in time. Although some scenarios were simulated using septic there were very few hours spent on the contaminant engines and land use analysis due to a low budget.

The model is only an initial exercise in understanding aquifer behavior and aquifer characteristics. This is only a draft report for agency commentary. Most of the hydrogeologist's time was spent constructing the *physical model* using observed hydraulic heads. Because the numerical model was prepared in under *200 hours* it was not used to numerically model transient conditions or specific land use scenarios such as lot acreage for septic fields, agricultural or fish farming.

We hope to obtain another grant to complete the numerical model and contaminant fate and transport simulations. Nonetheless, despite its *early* construction phase, this ground water model was a very valuable learning exercise towards establishing the physical hydraulic properties of the Scatter Creek Aquifer as a whole. These properties in turn do lead to *potential rapid contaminant movement* and issues of susceptibility of drinking and ecosystem waters to contaminant loads. At the same time, the rapid discharge of the aquifer to the Chehalis River Basin may yield equilibrium conditions which do not exceed health standards due to dilution effects for some areas/land use scenarios. Assessing these equilibrium and transient conditions is the next phase of the modeling effort which we hope will be funded.

Sincerely,

Nadine Romero
Thurston County Hydrogeologist, LHG and LG
State of Washington 1453

Nadine L Romero

MEMORANDUM

DRAFT REPORT

TO: Roger Giebelhaus, Engineering, PW
Scott Lindblom, Engineering, PW

FROM: Nadine Romero, Hydrogeologist, LHG, LG,
Water Resources Program, Resource Stewardship

Brad Zulewski, RS., Geologist,
Solid and Hazard Waste Section, Environmental Health

DATE: December 29, 2010

SUBJECT: Hydrogeologic and Ground Water Monitoring Report
Grand Mound Municipal Well Field

We have completed our preliminary hydrogeologic analysis of the Grand Mound Municipal Well field relocation project. This analysis includes preliminary findings on the Scatter Creek Aquifer hydrogeology and the results of a preliminary ground water modeling effort. We are pleased to provide you with this summary and the results of our contaminant ground water modeling.

PROJECT OVERVIEW

This project was officially started on March 5, 2010 and we were able to stay 'on track' with our initial project scope as well as complete a preliminary 3-D numerical ground water model for the study area. The project scope was to perform a hydrogeologic analysis of the Scatter Creek Aquifer (SCA) including the construction of new geologic cross-sections, analyzing recently collected ground water (nitrate, fecal coliform and other water quality parameters) collected by Thurston County Environmental Health from a 40-domestic well network.

At the mid-point of the project, we held a preliminary findings meeting on June 2, 2010 to go over the results of our research and analysis. After this meeting, we then proceeded into building the actual *conceptual* and *numerical* ground water model in August and September of 2010.

PURPOSE OF THE NUMERICAL GROUND WATER MODEL

The central purpose of constructing both the *conceptual* and *numerical* ground water model is to provide a tool to the hydrogeologist to analyze physical and chemical aquifer steady-state conditions (and transient). In creating an analytical tool to simulate observed and future aquifer conditions, the hydrogeologist can provide more insight into protecting the well field and adding new wells.

Ground water modeling is an important step in any well field analysis because it mimics the ground water system in three-dimensions and incorporates complex interactions into a comprehensive hydrogeologic settting.

Previous to this numerical model exercise, we performed a preliminary analysis of nitrate loads and constructed a very basic *analytical* model to show the rate of contaminant movement using estimated ground water velocities found in the literature (Sinclair and others, 1992). The findings from this current numerical exercise is significant because one can portray potential contaminant plumes and ground water flow directions (predicted ground water elevations) along with velocity vectors at current and future equilibrium conditions. The findings in this numerical model are also important because we can also see ‘data gaps’ in the ground water monitoring program and areas of unknown contamination hydraulically up-gradient in the flow field of the municipal wells.

Furthermore, the *numerical* modeling process allows us to learn about aquifer response and contaminant behavior in county ground water systems. Land use decisions and policy development in *critical areas* are increasingly reliant on well-developed models because landscape is increasingly more complex.

This numerical ground water model was constructed in approximately 200 hours. This small budget allowed us to simulate only a few land use scenarios and run a few septic calculations. We hope to find additional grant dollars to run other steady-state and transient conditions and explore contaminant engines. This ground water modeling report is in draft form and is intended to provide only a brief narrative of findings.

WORK COMPLETED

To complete this hydrogeologic analysis the following work items were done:

- Queried ground water data from the Environment Health database in March of 2010. This ground water monitoring data was collected from September 2008 thru March of 2010

- Prepared ground water flow maps for the most recent ground water sampling events

- Constructed ground water elevation and well locate tables
- Prepared nitrate concentration maps
- Researched and analyzed 1000 well logs and water rights from the WA Department of Ecology and WA Department of Health database
- Prepared two new geologic cross-sections using the latest well log information
- Calculated hydraulic gradients and ground water flow velocities and directions at high ground water (March) and low ground water (September) conditions
- Reviewed the 1997 Hydrogeologic Report prepared by Pacific Ground Water Group for Municipal Wells TW-1 and TW-2
- Downloaded and analyzed the USGS well data
- Prepared nitrate concentration graphs for the Grand Mound Municipal Well Field and fecal coliform 'presence-absense' tables.
- Conducted field visits on April 15 and September 2, 2010
- Prepared a mid-project presentation of results and findings for Public Works and Environmental Health on June 2, 2010
- Downloaded and analyzed USGS Seepage Study results from September of 2007 for the Chehalis and Scatter Creek River Systems
- Analyzed real-time gaging station data and December 2007 flood flows on the USGS Prather Bridge station
- Constructed a preliminary three-dimensional steady-state ground water numerical model which calibrated to field measured hydraulic heads (roughly completed in 200 hours) and water quality conditions in the Scatter Creek aquifer
- Prepared calibration tables of hydraulic head and residuals
- Prepared this summary report of findings
- Prepared preliminary recommendations for the municipal well field
- Conducted contaminant fate and transport simulations using MT3D.
- Performed housing 'counts' on the east side of Interstate I-5 and acreage size tabulations
- Investigated water rights for the part of the Scatter Creek Sub-Basin.

CONCEPTUAL MODEL

A conceptual model of the SCA was prepared using recent measurements and water quality data collected in the last 3 years (September of 2008 thru March of 2010). A presentation of a preliminary conceptual model was made to Public Works and Environmental Health in June of 2010 before proceeding into the construction of the numerical model. The conceptual model included an *elevational* model of land surface topography, bedrock geology, aquifer thickness and hydraulic heads and gradient, including well elevations and depths.

Hydrogeology of the Scatter Creek Aquifer

Two new geologic cross-sections were prepared for the SCA using the latest well log information provided by the WA Department of Ecology. These geologic cross-sections are provided in the appendices.

Only a few wells reach bedrock. However, we were able to confirm that the Eocene-age bedrock consisting of off-shore marine fine-grained sandstones and siltstones (as described by Snavely and others, 1958) were present at a consistent altitude of 80 feet above *msl* (mean sea level) from east to west into the Grand Mound municipal well field. The uplifted areas of the Scatter Creek area are primarily Eocene-age sandstones and volcanics. Outcrops of the Eocene-age rocks were mapped by Snavely and others (1958).

The actual geomorphic valley of the Scatter Creek aquifer above the Eocene-age rocks consists of gravel, cobbles and sand. This unit was formed from glacial outburst floods originating in Yelm. The new WA DNR geologic map for Maytown shows these units as Qgyo3 (the Yelm Lobe of the Vashon glaciation –Tanwax and Ohop Valley Outburst Floods). The Vashon glacier extended to the Tenino Range, however previous glacial maxima was as far south as Chehalis.

Land surface elevations of the Scatter Creek Aquifer range from 280 feet above msl in the east to 160 feet above msl at the municipal well field. The Chehalis River flood plain (in the geomorphic channel) elevation approximately 1000 feet from the municipal well field is around 120 feet above msl. The uplifted hill areas of Scatter Creek range from 300 to 600 feet in the area modeled.

New Hydraulic Head and Gradient Calculations

Hydraulic gradients calculated from prepared ground water elevation maps for the winter and end of summer season ranged from .0027 to .0031 ft/ft. The highest ground water elevations found in the Scatter Creek aquifer were in March of 2010 which ranged from 195.69 ft msl (Bredl) at the east end of model down to 126.42 ft msl (Schneider) at the southwest end. The lowest ground water elevations found were in September of 2008 which ranged from 181.66 ft msl (Bredl) down to 121.68 ft msl (Schneider – Sep 2009 only). The lowest ground water elevations that can be found throughout the ground water study were in domestic well 33ET01 (Cookston) at 104.40 ft msl at the far west end (northwest corner). Please refer to appendices.

Ground water in most of the domestic wells fluctuates approximately 8 to 15 feet yearly. The USGS well located in the northwest corner of the model tends to fluctuate as much as 25 feet yearly.

The ground water flow direction extends from east to west in the Scatter Creek basin and there were no noted changes in the direction during any of the sampling events. Ground water flow maps were prepared for this report as provided in the appendices.

USGS Seepage Study

One of the largest seepage studies performed in Washington State was conducted on the Chehalis River. Discharge measurements were made along an 81.6 mile reach of the river. Ironically, this study was done just prior to the largest recorded flood flow on the Chehalis River in December 1-3, 2007. The reason that the seepage study is important is that it allows calibration of the discharge (Q) in the numerical model.

The Chehalis River basin area is approximately 2800 square miles. At the end of summer, on September 11-13 of 2007 the USGS measured discharge on the river and its many tributaries including Scatter Creek. The significance of this work is that the flow measurements represent the ground water contribution only to the Chehalis River (and not snow or rainfall).

The Chehalis River gains some 76.9 *cfs* from Prather Bridge from the river mile 59.9 gaging station, to the intersection of Independence Road and the Chehalis at river mile 54.2. In this 5.7 mile stretch input from Prairie Creek and other small un-named stream may occur. However, because these were not measured during the 2007 USGS seepage study we are assuming that there was no flowing water in the streams in September that year. After discussing flow conditions on Prairie Creek with our field staff, it was confirmed that flow is virtually non-existent in September. We can also assume that flow is negligible to non-existent in the smaller un-named tributaries.

Scatter Creek, however, had a discharge of 20.7 *cfs* on September 11, 2007 as it entered the Chehalis River. However, it had a loss of minus (-) 2.6 *cfs* between the uplift area in the northwest (at Sargent Road) and James Road. The net gain into the Chehalis was 18.1cfs.

Chehalis River

The flood gage height for December 4, 2007 was 20.2 feet (peak flood stage) at the Prather Bridge, USGS gaging station in Grand Mound. The gage datum elevation is 123.65 ft msl and the peak flood stage elevation was 143.85 feet. During the February 2, 1996 peak flood event the gage height was 19.98 ft and flood stage elevation was 143.63 ft msl. The peak flood discharge was *79,100 cfs* for the December 4, 2007 event and *74,800 cfs* for the February 9, 1996 event.

The flood plain of the Chehalis River ranges from around 120 feet above msl to 116 feet above msl in the model area. Bluffs above the geomorphic flood plain rise have an elevation of around 160 feet above msl.

It was noted by county staff at the Ground Mound Waste Water Treatment facility that during the Chehalis flooding of December 2007 the southwest corner of the plant (pit bottom) was flooded.

This observation matches the flood elevations at the USGS gage of 143.83 feet as the pit bottom elevation in the southwest corner is 142 feet above *msl*. Furthermore, hydraulic head elevations denoted in the geologic cross sections are consistent with the recorded flood elevations (refer to appendices).

As will be discussed later, the ground water numerical model resulted in discharge to the Chehalis River where the actual river exists. Seepage or *daylighting* of the aquifer occurs in the geomorphic valley in the ground water model. Hydraulic head elevations simulated in the Scatter Creek aquifer model were observed to sharply decline into the Chehalis River system to elevations of 120 feet above *msl* or less.

Discharge Measurement on Scatter and Prairie Creek

Thurston County Water Resources has been measuring stream discharge at two stream gages in Grand Mound. One stream gage is on Scatter Creek at James Road and the other is on Prairie Creek and Highway 12. The highest field measured flows are show in the appendices. Prairie Creek typically dries out by early summer.

Nitrate Concentrations in the Scatter Creek Aquifer

Environmental Health (EH) program has been monitoring the water quality of the Scatter Creek aquifer for more than a decade. A new monitoring program began in September of 2008 where approximately 40 domestic wells are sampled *semi-annually*. During the first year wells were sampled quarterly. A copy of the well sampling database was obtained for this project and queried for monitoring results. Utilizing this data, water quality tables and ground water concentration maps were subsequently prepared. See appendix.

Historically, nitrate concentrations have been highest near the central to eastern part of the study area, where large dairy farms formerly operated. Nitrate concentrations at a former dairy site located less than one mile upgradient and northeast from the study area, exceeded 45 mg/l in the mid 1990's.

Nitrate concentrations in downgradient wells have steadily *decreased* following the closure of the dairy areas over the last decade. Nitrate levels in residential wells downgradient from the dairy site have decreased from 8.7 mg/l in 2004 to 4.1 mg/l in 2009 (this represents 112% decrease). Other wells located further down-gradient have experienced nitrate reductions ranging from 24-60% during the 6-year period.

Similarly, the Grand Mound Municipal well field nitrate concentrations have decreased over time. Well field nitrate concentrations for the last decade are provided in tables and maps (appendices). While there have been some intermittent 'increases' or pulses of elevated nitrate, the net impact over time has been a drop of 2 ppm.

Since the mid 1990's, the Scatter Creek Basin has experienced significant residential development. Residential septic systems have now replaced agricultural operations as the major nitrate source in the aquifer.

Other Water Quality Parameters

We downloaded available water quality data from both the DOH SENTRY system and the county water quality database to examine water quality trends. Fecal coliform has been another target analyte in county water quality studies from septic field impacts and agriculture. The 2004 water quality study shows that approximately 30% of the samples taken in the monitoring network had hits of fecal coliform. The recently acquired 2008-2010 fecal coliform samples are present in 8% of the monitoring wells which is a sharp reduction in the number of well contaminated with fecal coliform.

We briefly examined chloride concentrations and found a few anomalies in SENTRY datasets. We have had no time to further explore chloride concentrations as requested by the Planning Department. We hope to acquire 1 or 2 days of funding to go over *chloride* data in the future.

Scatter Creek Aquifer Geochemistry

A previous geochemical assessment was done in January of 2009 on the first round of ground water sampling. Major cation and anion chemistry was done during this sampling to determine the key controls on aquifer geochemistry. A *Piper-Trilinear* diagram and ionic balances were completed for these results (separate report) and show that the SCA is a high Ca-Mg-Bicarbonate controlled water. The SCA geochemistry generally "fits" in the overall Thurston County ionic ranges for natural ground waters, but are slightly *less sodic* and *more calcic*.

GROUND WATER NUMERICAL MODEL

A numerical ground water model was prepared using Visual Modflow 4.2.4 (Visual Modflow 2009.1). A steady-state, *1-layer* model was prepared for the second phase of this investigation to help the hydrogeologist assess overall hydraulic properties of the aquifer using observed hydraulic heads for calibration. In addition, the numerical model also has a *contaminant fate* and *transport* component to understand contaminant movement and nitrate concentrations at the municipal well field.

The contaminant fate and transport part of the model is still under development and was only recently started after the preliminary physical geologic model was constructed. Very few land use scenarios were simulated. Advection, dispersion and contaminant fate properties were not explored or researched under this budget. Modeling was *non-reactive transport* and only a steady state condition of 1800 days was simulated for a few land use scenarios.

The model was able to predict observed hydraulic heads in the Scatter Creek Aquifer as shown in the Appendix fairly closely. During the model construction process one of the central goals is to match theoretical to *observed* hydraulic heads under an array of hydrogeologic assumptions.

The model dimensions are tabled below.

Model Extent:	
X1, Y1 (origin):	0, 0
X2, Y2:	44,704 *ft*, 29744 *ft*
Grid:	90 columns x 60 rows
Cell Size:	500 ft x 500 ft
Model Area:	40 *sq* miles
Other:	Sy = .20
	n_e=.20
	N_{tot} = .25
	Z_{min}=0
	Z_{max}=1000 ft
	$P_{tot2008}$=46.44 in
	RCH=23 in
	$dh/dl_{mar2009}$=.0029
	$dh/dl_{sep2008}$=.0031
	$T_{TW\text{-}1pumping}$ = 525,000 gpd/ft
	$b_{TW\text{-}1}$ = 53 ft

FINDINGS

Hydraulic Conductivity

Calibration - One of the key findings in the modeling effort is that the ground water numerical model had to be 'opened up' to larger hydraulic conductivity values (larger than we had originally anticipated) in order for the hydraulic head to match observed water level elevations.

This simulation process was surprising in that most county ground water systems hydraulic conductivites (K) are typically 150 to 350 feet per day. While we know that a glacial outburst flood formed the SCA, there have been few comprehensive studies evaluating overall hydraulic properties of the aquifer. Sinclair and others (1992) had done one of the first comprehensive inventories of wells and nitrate concentrations in Scatter Creek and estimated hydraulic conductivities to be on the order of K=750 feet per day.

The numerical ground water model, however, shows that it must have a much larger K than Sinclair predicted on the order of 1000 feet per day for overall hydraulic conditions. Therefore, what the numerical model is showing is that the Scatter Creek Aquifer does indeed behave like a true outburst flood deposit which is now designated as the Qgyo3 deposit (as newly mapped by WA DNR Geology Division, Maytown). This geologic unit may have profound implications in the 'inter-connectedness' of aquifers locally including the Salmon Creek Basin and Scott Lake systems.

Pumping Well Calibration Changes: Pumping wells also helped calibrate model heads particularly in problem node areas (where residuals = +8.0 ft).   After a field visit to the Scatter Creek Wildlife Area (northern area of model) we found aqua culture facility on 183rd and looked up water rights. We found large ground water pumpages and inserted 25% of these water rights into pumping wells in model. The effect was to bring down hydraulic heads close to observed. Refer to appendices. We also assumed from WA Ecology domestic wells on file that ground water was extracted at a rate of 500 gpd per home. We placed several theoretical wells into model with minus *300 gpm* pumping rates for housing areas on the east side of 1-5 and some on west side for industry.   Refer to appendices.

Ground Water Flow Vectors and Isotropic Properties

The next important area of findings in the numerical model is that the Scatter Creek Aquifer has sharp directional ground water vectors which streamline ground water flow into narrow constrictions or pathways of high flow.

While one can observe 'ancestral channels' and ancestral stream geomorphology in LiDAR maps and can conclude that these may be highly transmissive channels, we did not load this variable 'channel' hydraulic conductivity into the numerical model, at this point. As we have no lithologic information about the channels, and there was also no budget to procure more information on these features. The numerical model was constructed using only isotropic conditions across the layer—anisotropic conditions were not detailed.

Shape of Contaminant Plumes and Dispersion

The effect of the vectors as discussed above is that they keep ground water contamination in narrow dispersive fields due to high ground water velocities.   Furthermore, even with high pumping wells the contaminant plumes are not dispersed very widely.   Although in one of the modeling scenarios it is possible to see the effects capturing a *nearby* plume of contamination.

We have not evaluated these nitrate 'plumes' very closely and have not figured out how to overlay plumes on top of each other. Again, we did not have a complete budget to do this work. What we can say about the very few land use scenarios that we simulated is that plumes can not only travel *quickly* they can also be *eliminated quickly*, too, relative to most aquifers in the county. We modeled only steady-state at 1800 days. It may be that at 3600 days that the plume will continue to dilute and that the 1800 days scenario is indeed long-term equilibrium over the course of 10 or 20 years and never affect the well field beyond water quality standards.

A question was posed about the 'fecal coliform' dispersion and whether this is similar to nitrate. We could not find any definitive pattern in the fecal coliform. One would expect that it would follow nitrate patterns. Because it does not appear to do so, we expect that other biogeochemical processes are at work and control coliform behavior such as microbes and total organic carbon. Fecal coliform do not appear to behave like non-reactive 'particles'. Nitrate on the other hand is fairly non-reactive (outside of oxidation/reduction mechanisms).

Cumulative Contaminant Impacts

The largest looming question in the contaminant modeling process is delineating the cumulative effects of 'constant concentrations', previous *point sources, background* conditions coming into the model *and historical background,* as well as future 'constant concentrations'. The contaminant fate and transport modeling effort needs to assess what happens between .33 acres lots versus the larger 1-acre ones. This evaluation was not done.

The existing municipal well field consisting of TW-1 and TW-2 shows both constant and decreasing concentrations of nitrate over the last decade. We briefly explored the reasons for these trends in the contaminant modeling process. We believe that large scale agricultural operations can quickly spike well field concentrations within 5 years in the Scatter Creek aquifer. It may be possible for nitrate concentrations to climb to greater than 3 mg/l within 10 years. However, we have not modeled the 3600 day scenario in steady state conditions to determine what predicted concentrations would be and whether dilution would over-ride ultimate impacts at the well heads 5 miles from a dairy point source.

RECENT STUDIES COMPARISON

In the last decade the USGS has completed several interesting studies characterizing nitrate in shallow aquifers. Hinkle and others (2008) completed an analysis of septic tank effluent effects in the Deschutes Aquifer near La Pine, Oregon. Unlike the SCA this aquifer does not have a hydraulic conductivity as high as SCA. La Pine shallow aquifers exceed drinking water standards of 10 mg/l because ground water moves very slowly and there is low recharge. Age-dating of ground water found that residents were drinking 30 to 50 year old ground water.

The preliminary SCA ground water numerical model shows that at the well field ground water is perhaps as old as 1 to 7 years. The La Pine Aquifer is currently contaminated near or at the water table and is moving downward. The SCA does not have data to show what is going on at depth, however, we suspect that contamination has moved downward as well.

What makes the SCA at risk is also the occurrence and *potential rapid transport* of personal care products, pharmaceuticals and viruses. At the same time the high ground water fluxes will help dilute concentration *build up* of these products, however build up can occur due to high contaminant loads from agriculture as seen in the historical ground water results.

RECOMMENDATIONS

Recommendation 1: Placement of Additional Wells

We recommend that future wells be placed in areas of *least* nitrate contamination. The numerical model shows that these areas may not have been 'hydraulically down-gradient' of past large agricultural industries (dairy and aquaculture) and current high density housing on septic. The high nitrate concentrations (historical and existing) show that past agricultural operations and homes on septic may have contributed to the high contaminant loads which are now being reduced as observed in recent ground water sampling events.

<u>Based on our findings this means that optimum locations for new municipal wells would be outside of the 1 miles radius of the existing well field (TW-1 and TW-2) towards the northwest</u>. This area currently has the least impacts by nitrate with concentrations of 2 to 3 mg/l.

We understand that Public Works' key concern is to find the best well locations in terms of water quality and future municipal well safety. At this point, we would not recommend placement of future municipal wells southeast of the current well field unless there is solid and comprehensive water quality data to support otherwise. Based on our recent meetings with Public Works we understand the southeast area was recommended by previous consultants. We would need to examine the hydrogeology rationale and logic behind this recommendation further to help Public Works better assess this possibility. Our preliminary numerical model findings, however, do not support this area due to future up-gradient septic housing development.

See Recommendation 3 for vertical well placement recommendations.

Recommendation 2: Conduct Additional Ground Water Sampling in Data Gaps Identified in Numerical Ground Water Modeling

The numerical ground water modeling exercise shows that there are clearly data gaps in the water quality assessment program (we want to clarify that the current water quality assessment program wasn't designed to protect the well field, but simply identify water quality trends in previously identified areas of concern). In order to protect the well field from future impacts due to new higher density development (or future industrial or agricultural complexes) along the Highway 99 growth corridor, then domestic well samplings should be conducted in this area, particularly directly down-gradient of the high density home subdivisions.

Recommendation 3: Vertical Well Placement--Conduct Additional Ground Water Studies in the Deeper Aquifer to Further Define Ground Water Quality Conditions

We recommend that new ground water monitoring wells be completed at depths of 90 to 100 feet below ground surface in the highest areas of ground water contamination (hydraulically up-gradient of the existing well field) and several hundred feet hydraulically down-gradient of the high density development as noted in Recommendation 2.

We also recommend additional ground water monitoring wells in the area of the future well field development (in the *shallow*, *intermediate* and *deep* aquifer).

Recommendation 4: Complete Contaminant Fate and Transport Modeling

We recommend that additional monies be sequestered for continued contaminant modeling. We recommend modeling out to 3600 days (10-years and the 20-year scenario) in *steady state* to see impacts on the Grand Mound Municipal Well Field. If we cannot secure the Centennial Grant for this effort then I would recommend finding other small grants to complete this important exercise.

Recommendation 5: Secure Previous Ground Water Assessment Reports for the Grand Mound Well Field

We did not have time to secure previous additional reports as our time was spent procuring current datasets and building the conceptual ground water model. The 1996 Pacific Groundwater Group Report is an important report to find (Update: This report was scanned and provided to us on December . We leave this recommendation in place because it is an important caveat and provides background context for our study).

Recommendation 6: Continue to Work with Strategic Planning Group to Model Future Land Use Scenarios (General Recommendation).

The planning department of the county has done a lot of research on the Grand Mound area. They will find the results of this modeling effort very insightful, and most importantly very useful in terms of planning future land use scenarios and visualization. They can set up additional land use scenarios for us to simulate and model.

Recommendation 7: Work with Emergency Services to Add River Modules To Numerical Model (General Recommendation and not intended for Public Works to Pursue)

Emergency services may find that this numerical ground water model can be developed into predicted flood elevations. We have procured MIKE11 software that can be inserted in numerical model. A preliminary exercise involving 100 hours, if funded can provide us more detail on flooding disasters and predicted hydraulic head elevations. The reason why this effort is important is to also protect the well field from both surface and ground water flooding. The current waste water treatment plant and chlorine treatment processing is placed in a former gravel pit. Our geologic cross-sections show the lower altitude and potential problem of 'ground water' backup (elevational rise of ground water during severe flooding) into the treatment area is at risk also.

Recommendation 8: Continue to Analyze the USGS Studies and Results from La Pine Aquifer

We highly recommend continued analysis and updates on what has happened for human behavior and land planning changes in the La Pine Aquifer, Oregon. The USGS conducted a very valuable set of studies for the Deschutes Basin septic impacts. We recommend funding to further research what is already being done out there for insight into what should happen to the SCA.

FINAL CONCLUSIONS

This numerical modeling effort will be extremely valuable to the county as a whole and not only Public Works Department. Several of the recommendations are intended as general commentary to other readers of this report (including the Environmental Health Department, Emergency Management, Planning Department, State Health, the WA Department of Ecology, the USGS and other agencies) . We hope to continue running model simulations as money becomes available.

This draft report will continue to evolve through upcoming presentations and input from county departments and outside agencies. Public Works may want hire us to run simulations at smaller 'scope of work' scales (on the order of 24 to 40 hours) to address specific detail and/or new questions as they come along.

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APPENDICES

Potentiometric Map of Scatter Creek Aquifer – March 2009
Potentiometric Map of Scatter Creek Aquifer – September of 2008
Geologic Cross-Section A-A'
Geologic Cross-Section B-B'
Nitrate Concentration Map – March 2009
Graph of Nitrate Concentrations at Grand Mound Municipal Well Field
Trilinear Diagram of Scatter Creek Aquifer
Simulation Outputs A
Simulation Outputs B
Simulation Outputs C
Table: Well Location Coordinate Table and GW Hydraulic Head Elevations
Table: Summary Nitrate Concentration Table 2008-2010
Table: Comparison Table of Hydraulic Heads (Calibrations) GW Model vs Field Measurements
Table: Well Pumpage Estimates
Table: Housing Counts

ACKNOWLEDGEMENTS

A special thank you to Brad Zulewski for assistance on background research and preparation of data tables, maps and geologic cross-sections. It was 6 months of hard work and lots of learning. We met every Tuesday to go over findings and stay 'on-top' of the project scope. Ground water numerical models take a lot of research work and preparation. This effort could not have been accomplished without solid commitment from staff.

A special thank you to the Sue Davis ground water monitoring group in EH for their sampling and analysis work of the Scatter Creek aquifer system. We are appreciative of their efforts and diligence in collecting quality information and in managing a large database system. This contaminant fate and transport model could not have been completed without their efforts.

A special thanks to Environmental Health (EH) for approving funds to build a long awaited numerical nitrate model for the Scatter Creek Aquifer in a joint project with Public Works Engineering.

A special thanks to Public Works Engineering for hiring us to complete a Phase I analysis of the Grand Mound Municipal Well Field.

THURSTON COUNTY
WASHINGTON
SINCE 1852

COUNTY COMMISSIONERS

Cathy Wolfe
District One
Sandra Romero
District Two
Karen Valenzuela
District Three

RESOURCE STEWARDSHIP DEPARTMENT

Creating Solutions for Our Future

Cliff Moore
Director

MEMORANDUM

TO: Roger Giebelhaus, Engineering, PW
Scott Lindblom, Engineering, PW

FROM: Nadine Romero, Water Resources Program, RS
Hydrogeologist, LHG, LG

DATE: July 26, 2011

SUBJECT: New Well Head Protection Area Delineations
Grand Mound Municipal Wells (Future Wells TW-3 and TW-4)

As discussed with you in our April 19, 2011 meeting, I am providing you with this brief summary on the results of our additional ground water modeling exercise which we conducted in April and May for Public Works. Per our scope of work, we completed additional 2D and 3D ground water modeling for the 2011 Water Comprehensive Plan Rewrite.

WORK COMPLETED

The following work items were completed for this project:

- Conducted additional ground water modeling simulations using the calibrated numerical model constructed in October of 2010 with Visual Modflow 4.2 to delineate the well head protection areas (WHPA's) for well TW-1 and TW-2 for the *1- year* and *3- year* capture zones.

- Downloaded and ran new well head protection software from EPA to create geographic based modeling in 2D for existing and theoretical well head protection area delineations.

- Simulated 'theoretical' future wells (TW-3 and TW-4) to discern potential well head protection areas for emergency or expanded water supplies

- Provided Public Works well head protection area maps showing the new extents of WHPA's and the new geometry/shape for the 2011 Water Comprehensive Plan rewrite.

- Went over preliminary results/finding in a meeting with Public Works on April 19, 2011
- Conducted additional simulations/modeling after the April 19, 2011 meeting.
- Prepared this brief summary report.

FINDINGS

There were a number of new findings in this modeling effort for the well head protection areas in contrast to the older previous 1994 Water Comprehensive Plan.

These new findings are as follows:

- The 1-year and 3-year well head capture zones for municipal wells TW-3 and TW-4 are more extensive than those plotted in 1994 report. Well head protection areas are longer and extend as far as 183rd Avenue on the eastern side of Interstate 5 which is some 3 miles from the well heads.
- Both ground water modeling efforts, one using a calibrated model constructed withVisual Modflow (numerical modeling) and the other using the new WhAEM2000 v 3.2.1 (analytical and geographic based) show 'arched' ground water flow paths which match the direction of ground water flow derived from our latest potentiometric maps. These maps use water level and water quality data from an existing 40 well monitoring network in the Scatter Creek Aquifer sampled by EH. These ground water flow paths follow bedrock and physiographic boundaries which were loaded into both models.
- Ground water velocities (V) are calculated at around 10 feet per day and horizontal hydraulic conductivity (K) was estimated at 1000 feet/day using the calibrated numerical model we created for the Scatter Creek Aquifer. Transmissivity derived from pumping tests conducted on the Grand Mound Wells in the 1990's also support high K values of more than 1200 feet per day.
- Narrow capture zones were defined in the WHPA delineations in both modeling efforts. These narrow zones are only around 200 feet wide on each side of the well head assuming a pumping rate of 500 gpm. While we recommend that future wells are placed at least 1500 feet apart there may be some room for less spacing distance due to the high aquifer transmissitivies and narrow ground water capture in the Scatter Creek Aquifer.

RECOMMENDATIONS

This additional modeling exercise allowed us to further refine the numerical and analytical modeling effort, in tandem, to produce new well head protection areas for the existing and future Grand Mound Well Field.

Based on these simulations we recommend the following:

1. Amend the new 2011 Water Comprehensive Plan to show the latest 1-Year and 3-Year Well Head Protection Areas (WPHA's) as provided in this summary. This means extending the WHPA for TW-1 and TW-2 to 183rd and Highway 12 on the east side of Interstate 5. This region is approximately 3 miles from well TW-1.

2. Continue with the next phase of following up with the Environmental Health Department (EH)- Solid and Hazardous Waste Section to retrieve the latest well head inspection reports for the upcoming 2011 field survey to identify the best areas for future and existing wells "free" from potential spills and human land use activity that would be detrimental to the well field.

3. Continue to sharpen and identify future well field areas for water supply expansion with the county hydrogeologist. The results of this modeling effort show 'narrow' and long well head capture areas which means future wells could expand to the northwest where ground water quality has historically been better (less than 2 mg/l for background conditions). These areas also do not appear to be in the down-gradient ground water flow path of future growth from septic fields/housing developments.

4. Recommended minimum distances between high capacity pumping wells should be at least 1500 feet but further discussions with the engineer and hydrogeologist on this aspect to go over findings may result in less distance.

Please let me know if you have further questions.

Sincerely,
Nadine Romero

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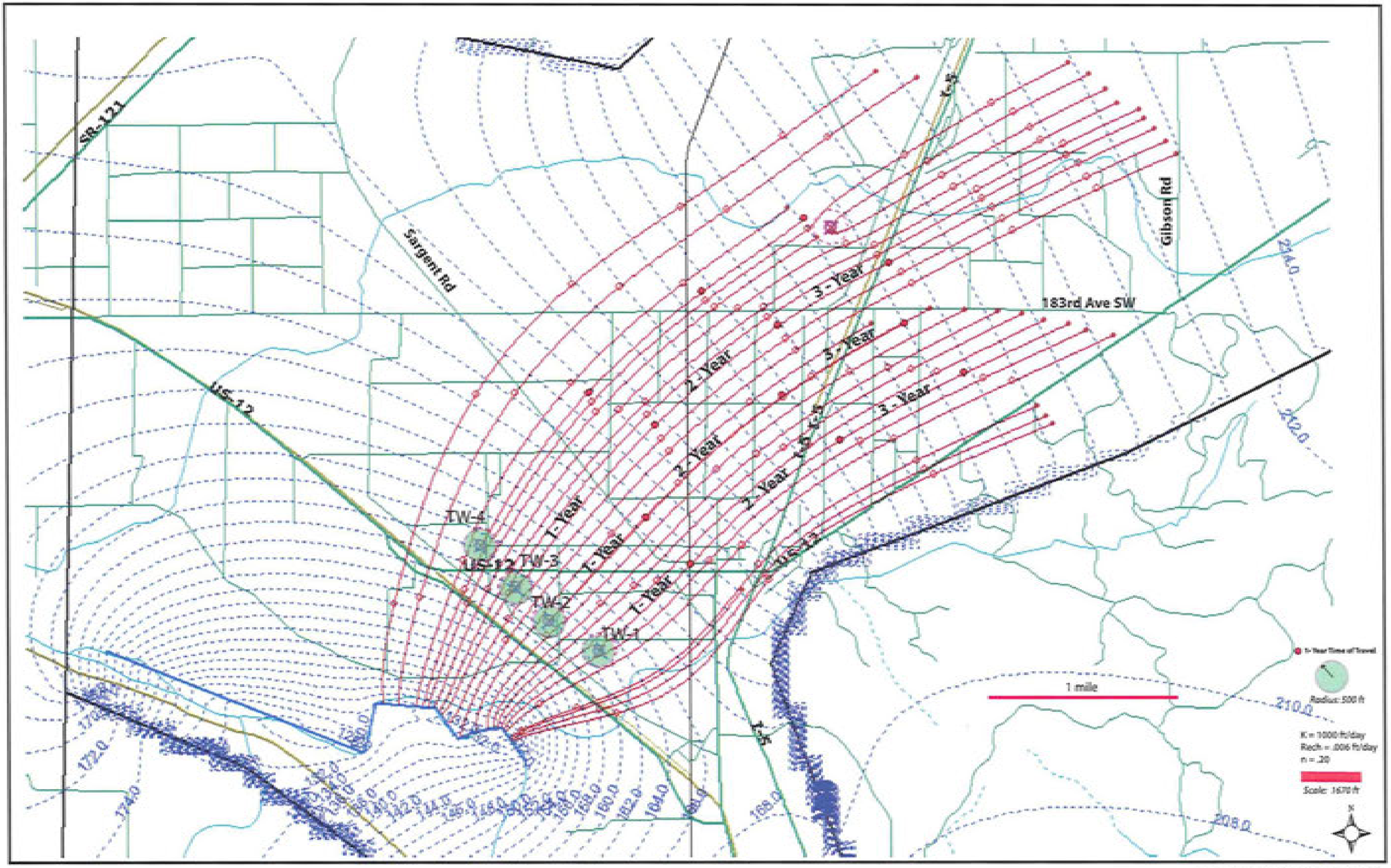
Nadine L Romero
Hydrogeologist
1453
Licensed Geologist

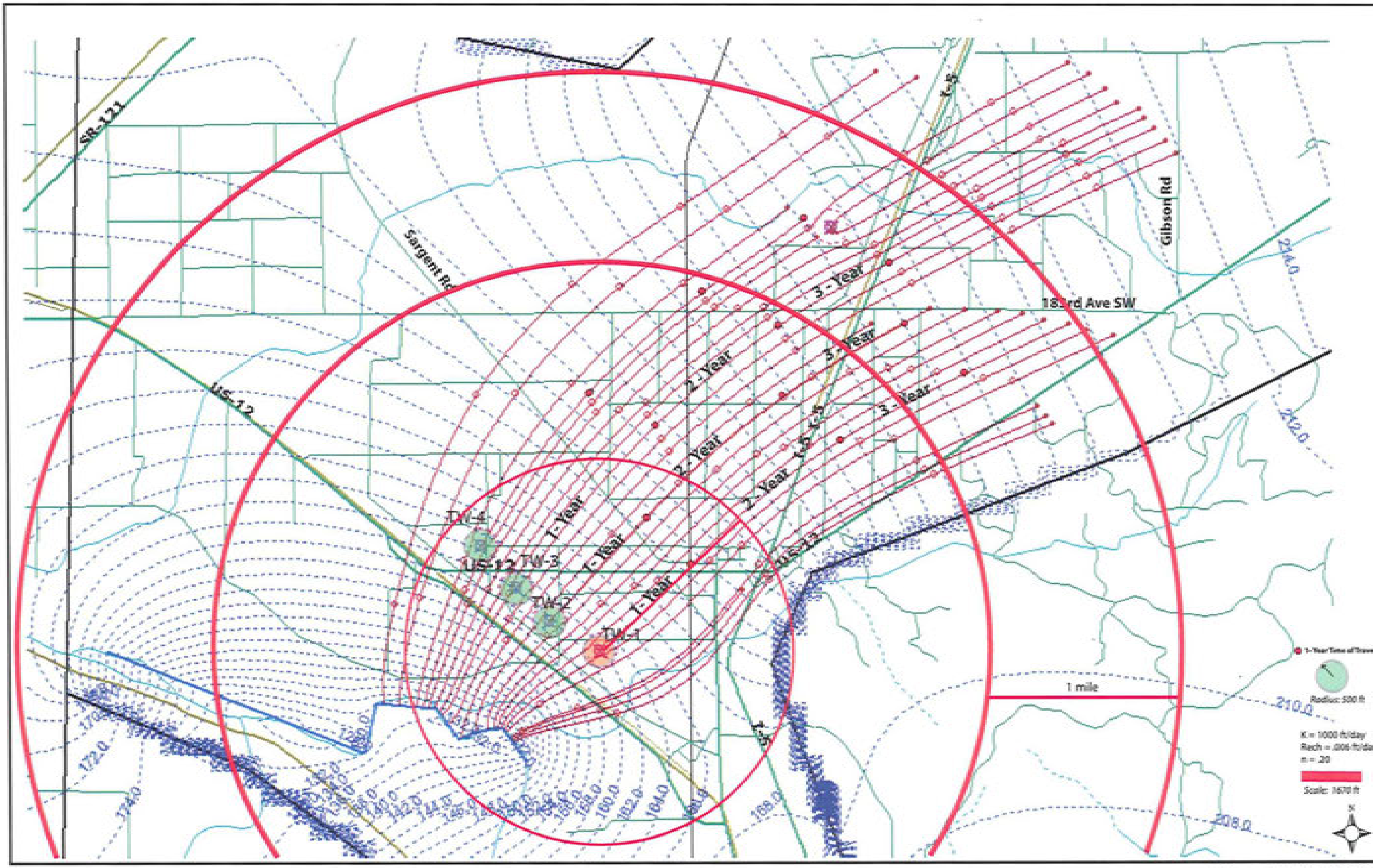
NADINE L. ROMERO

Nadine L Romero



By N. Romero, Hydrogeologist, 5/16/2011

Figure 1: 1-Year and 3-Year Capture Zones: Existing (TW-1 & 2) and Theoreticial Wells (TW-3 & 4)
Grand Mound Well Head Protection Area - Simulation Using *WhAEM2000 V.3.2.1*



By N. Romero, Hydrogeologist, 5/16/2011

Figure 2: 1-Year and 3-Year Capture Zones: Existing (TW-1 & 2) and Theoreticial Wells (TW-3 & 4)
Grand Mound Well Head Protection Area - Simulation Using *WhAEM2000 V.3.2.1*

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