CHAPTER 4

EXISTING WATER SYSTEM COMPONENTS

INTRODUCTION

The District owns and operates a Group A water distribution and storage system. The system consists of 24 pressure zones ranging from a hydraulic grade of 680 feet in the Lake Forest Park area to 292 feet along the shore of Lake Washington.

SOURCE OF SUPPLY

Historically, the District has purchased all of its water from SPU. In 2005, the District and SPU executed a new block wholesale contract with an expiration date of 2062. The new block contract is included in Appendix G. The block contract replaces the District's prior 1982 SPU wholesale supply contract that expired at the end of 2011.

The quantities secured under the new SPU block contract, coupled with ongoing and future conservation programs, are expected to meet the District's system demands over a 20-year planning period, if not longer. However, the contract does not preclude the District from developing additional sources of supply, including its Snohomish River Regional Water Authority water right, if such action is required and/or if such supplemental supplies can be developed on a more cost-effective basis than SPU wholesale supply.

Under normal operating conditions, the District's water supply comes from a number of connections to the SPU Tolt I Pipeline, Tolt II Pipeline, and the Tolt Eastside Supply Line (TESSL). The District has an additional connection to SPU at the Maple Leaf pipeline. The TESSL interties both the Tolt and Cedar River sources along the eastside of Lake Washington. The connections to SPU's pipelines are discussed later in this Chapter and are summarized in Table 4-1.

TOLT RIVER

There are two watersheds in the Tolt River Basin: the North Fork Tolt and the South Fork Tolt. Both are located in northeastern King County. At this time, only the South Fork Tolt Watershed is used for Seattle's municipal water supply. The South Fork Tolt Reservoir provides approximately 18.3 billion gallons of storage. Water from the South Fork Tolt Reservoir flows to the 280 million gallon (MG) Regulating Basin, which is at an elevation of 765 feet. The Tolt has a treatment capacity of 120 mgd and a transmission capacity of 135 mgd.

CEDAR RIVER

The Cedar River Watershed is located in southeast King County. The upper portion of the Watershed contains Chester Morse Lake, which has 15.8 billion gallons of usable storage above the lake's natural gravity outlet. About 12 miles downstream of Chester Morse Lake is the Landsburg Diversion Dam where the water is diverted from the Cedar River. From the Landsburg Diversion Dam, the water is conveyed to the Lake Youngs Reservoir through two large-diameter pipelines. The Lake Youngs Reservoir covers about 700 acres and has a usable storage capacity of approximately 1.5 billion gallons. The total capacity of the reservoir is approximately 4.8 billion gallons.

WATER RIGHTS

SPU Water Rights

SPU holds various water rights for use of water from the Cedar River, South Fork Tolt River, and Seattle Well Fields. Also, SPU has water right applications on file with Ecology for potential future sources of supply, including for the North Fork Tolt River, Snoqualmie Aquifer, and additional yield from the Seattle Well Fields. An evaluation of specific SPU water right claims, permits, and applications as called for in DOH planning guidelines is included as an appendix to their *2013 Water System Plan*. Forecasts indicate that SPU does not need any new water rights within the 20-year planning horizon.

Snohomish River Regional Water Authority

As a member of the Snohomish River Regional Water Authority (RWA), the District has a shared interest in the former Weyerhaeuser water right that was acquired by the RWA in 1996. Pursuant to a change application approved by Ecology (and subsequent judicial review), the water right authorizes a place of use that includes Northshore Utility District, the City of Everett, and Woodinville Water District. The water right change approval also authorizes an instantaneous quantity (Qi) of 36 mgd, an annual quantity (Qa) of 23.7 mgd, and a 50-year development schedule (2053). By RWA agreement, the District has a 28 percent share of the RWA water right. For purposes of future development, this means the District is entitled to 10 mgd (Qi) and approximately 6.6 mgd (Qa).

District Surface Water Application

The District applied for a surface water right for the Snohomish River at French Creek in 1994 with an instantaneous withdrawal rate of 38.7 cubic feet per second and an annual withdrawal rate of 28,005 acre-feet per year. Due to the backlog of water rights applications, a response from Ecology is not expected in the near future. A copy of the application is included in Appendix H.

WATER TREATMENT

Since the District currently relies exclusively on treated water from SPU, the District does not treat water at this time. SPU has two water treatment facilities; one for the Tolt River watershed and one for the Cedar River watershed. The following sections provide a description of each of these facilities.

Tolt Treatment Facility

The Tolt Treatment Facility came online in 2001 and has increased reliability and flexibility of the Tolt system during periods of high turbidity by providing filtration in accordance with the requirements of the Safe Drinking Water Act and Surface Water Treatment Rule. The treatment facility also increases system capacity by allowing SPU to utilize the Tolt River source over a much greater range in raw water quality, thus allowing SPU to utilize a greater storage range. The treatment process includes ozonation, filtration, corrosion control, chlorination and fluoridation for 120 mgd. This source can provide about one-third of the water supply used by SPU and its wholesale customers.

Cedar River Treatment Facility

The Cedar River source is treated at two facilities. Water is first treated at the Landsburg Treatment Facility, where chlorine and fluoride are added. Chlorination here serves to control invasive plant species in Lake Youngs and minimize microbacterial growth in the transmission pipeline between Landsburg and Lake Youngs. Water is then treated at the new Cedar Treatment Facility with ozone, UV, chlorination, fluoridation and corrosion control. Completed in 2004, this facility has a capacity of 180 mgd.

SUPPLY PIPELINES

The major supply pipelines for the District are the Tolt I Pipeline, Tolt II Pipeline, and the Tolt Eastside Supply Line (TESSL). The District also has a connection to SPU's Maple Leaf Pipeline, but it is used only in emergency situations. The Tolt Pipelines both vary in size from 54 inches to 60 inches over the course of the alignment and provide a combined maximum capacity of 120 mgd. The TESSL ranges from 48 inches at the north end of the line to 36 inches at the southern end of the line.

MASTER METERS

The District currently has ten master meters located at various points along the Tolt Pipelines and one metered connection to the TESSL. Under typical operating conditions, nine of the eleven connections are used to supply water to the system. Master Meters 6A and 6B do not provide water supply under normal operating conditions, but are set to open automatically under low downstream pressure conditions. In addition, SPU can supply the District from the Cedar River system by backfeeding the District from the Lake

Forest Park Reservoir. This alternate source was recently enhanced by the installation of isolation valves on the Tolt I Pipeline at Master Meters 5A and 5B. This allows the Master Meters 7A, 7B, 6, 5A, and 5B to be fed from the Cedar River system if necessary. Table 4-1 provides a summary of the master meter locations, size, and hydraulic grade.

TABLE 4-1

Existing Master Meter Connections

Master Meter	Source Pipeline	SPU Master Meter	Meter Size (in)	Minimum System Head (ft)[(1),(2)]	Pressure Zones[(2)]
MM1	TESSL	94	10	550	446
MM2	Tolt	81 & 82	6	560	446
MM3	Tolt	83	12	555	529 & 451
MM4A	Tolt	84	6	550	601
MM4B	Tolt	85	6	550	601
MM5A	Tolt	86	10	545	380
MM5B	Tolt	86	10	545	601
MM6A	Tolt	89	6	530	473
MM6B	Tolt	90	6	530	473
MM7A	Tolt	93	10	525	530S
MM7B	Tolt	93	6	525	680 Pumps

(1) Minimum system head is defined in the SPU contract.
(2) Datum is NAVD 88.

Figure 4-1 provides a map of the SPU regional water supply system.

REGIONAL WATER RESOURCES PLANNING

Strong growth in the Puget Sound area along with the ESA listings of Puget Sound Chinook salmon and Bull Trout continue to apply significant pressure on the region's existing water resources. In response, the District has maintained its efforts to identify and implement cost-effective water conservation, water use efficiency, and other appropriate demand management tools and technologies. On the supply side, the District is also continuing to evaluate future source options in the Puget Sound Region. Consistent with these efforts, the District participates in a number of regional water supply planning organizations including RWA, the Central Puget Sound Water Supply Forum, and the SPU Operating Board.

Since the viability of future water supply is dependent on the future actions of governmental agencies, regional water suppliers, and a variety of stakeholders in the regional planning process, the District must keep a variety of options open. The District Board and staff have determined that, at the present time, this strategy best protects and

LAKE FOREST PARK RESERVOIR

SNOHOMISH COUNTY
KING COUNTY

TOLT PIPELINES NO. 1 AND NO. 2

TOLT RIVER MUNICIPAL WATERSHED

MAPLE LEAF RESERVOIR AND PUMP STATION

TOLT TREATMENT FACILITY

TOLT EAST SIDE SUPPLY LINE

PUGET SOUND

LAKE HILL PUMP STATION

WEST SEATTLE RESERVOIR

CEDAR EAST SIDE SUPPLY LINE

HIGHLINE WELL FIELD

MAPLE WOOD PUMP STATION

CONTROL WORKS

LAKE YOUNGS TUNNEL

LAKE YOUNGS

CEDAR TREATMENT FACILITY

CEDAR RIVER

CHESTER MORSE LAKE

LAKE YOUNGS SUPPLY LINES

CEDAR RIVER MUNICIPAL WATERSHED

N

0 2 4 8 Miles

Legend:

- NORTHSHORE UTILITY DISTRICT BOUNDARY
- CEDAR RIVER WATERSHED
- TOLT RIVER WATERSHED
- COUNTY LINE
- SPU PIPELINES
- PS SPU PUMP STATION
- SPU RESERVOIR
- SPU TREATMENT FACILITY
- W SPU WELL FIELD
- M DISTRICT MASTER METERS

NORTHSHORE UTILITY DISTRICT WATER SEWER

WATER SYSTEM PLAN

FIGURE 4-1
SPU REGIONAL SUPPLY SYSTEM

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M:\Nshore\14451 Water System Plan C1317\GIS\BOUNDARIES_FIG4-1.mxd

represents the interests of the District's ratepayers. Irrespective of the various regional planning activities currently underway, the District anticipates that SPU will remain the primary regional water supplier of potable water in the King County area for at least the next 40 years, if not beyond.

SPU SUPPLY CONTRACT

The District and SPU signed a Fixed Block Water Supply Agreement on January 6, 2005, that expires on January 1, 2062. Under the terms of the contract, SPU will provide the District with an average of 8.55 mgd of treated water supply. Between June 1 and September 30 (peak season), the District is contractually limited to a withdrawal rate of 14.96 mgd during the peak month.

SNOHOMISH RIVER REGIONAL WATER AUTHORITY

The Snohomish River Regional Water Authority (RWA) is a joint administrative entity composed of the Northshore Utility District, the City of Everett, and the Woodinville Water District. The RWA was formed by an interlocal agreement in the fall of 1996. The agreement provides that the RWA will work to promote regional cooperation in the planning and development of new water sources.

The RWA acquired the Weyerhaeuser Timber Company (WEYCO) Surface Water Right S1-10617C in November 1996. This certificated water right authorizes an instantaneous withdrawal of 36 mgd/56 cfs from the Snohomish River for manufacturing purposes. The RWA interlocal agreement allocates to the District approximately 10 mgd instantaneous flow and 6.6mgd average annual flow.

On December 23, 1996, the RWA submitted to Ecology a Plan of Use and application to change the place and purpose of use of the Weyerhaeuser water right to "municipal purposes" and the "Area served by the RWA." In 2001, the change application was approved by Ecology in a Report of Examination (ROE) that described the project's environmental affects, associated mitigation measures, and a 50-year development schedule. In 2002, the RWA was granted a water right which consists of an instantaneous quantity (Qi) of 36 mgd and an annual quantity (Qa) of 23.7 mgd.

The application for change was appealed by the Tulalip Tribes to the Pollution Control Hearings Board (PCHB) in 2001, shortly after the change application was approved by the Department of Ecology. In April 2002, the PCHB upheld Ecology's approval of the RWA change but reduced the annual quantity cited in the ROE from 24.3 mgd to 23.7 mgd. The Tulalip Tribes (Tribes) appealed the PCHB decision in 2002 to the Thurston County Superior Court. The court affirmed the PCHB decision in full, and no further appeal was made by the Tribes.

Although the RWA source has now been approved, it remains the District's intent to continue to be active in regional water resource planning processes and to coordinate as appropriate the future development of RWA supply source(s) with SPU, other regional purveyors, and the Washington State Department of Health CWSP rules, guidelines, and process.

GROUNDWATER DEVELOPMENT

The District has investigated the development of groundwater resources within the District boundary. One test well has been drilled at the Westhill Standpipe site and can produce approximately 75 gpm of potable quality water. The District intends to maintain this well in its current condition as an emergency source. It is not anticipated that groundwater presents a viable supply option capable of meeting the District's future potable water supply needs.

RECLAIMED WATER

As a consequence of the substantial and evolving regulatory limitations affecting the development of new water supply sources and Puget Sound's surging population growth, the viability of reclaimed water as a cost-effective alternative source to meet non-potable water needs has received increasing study and attention in the utility community. In particular, the development of reclaimed water has become a policy and operational priority of King County Department of Natural Resources (KCDNR).

The Brightwater Treatment Plant can currently produce about 7 mgd of reclaimed water and eventually up to 21 mgd in the future. King County markets the use of its reclaimed water to regional utilities as a source substitute to non-potable supply customers/demands and as a means to facilitate (fish) flow augmentation and salmon recovery goals in the region. In 2013, the Brightwater treatment plant began distributing reclaimed water to their first major customer, the Willows Run Golf Course in Redmond.

In 2005, the District analyzed the viability of taking water from the main distribution pipe that runs near the east side of the District's boundary. The District analyzed its customer's demands for reclaimed water, the associated costs to introduce and distribute the reclaimed water, and its current water supply contract and costs. Based on the District's new block contract with SPU and its other supply options, the District determined that at this time, King County reclaimed water does not appear to represent a cost-effective supply alternative for the District's needs and customers. A detailed analysis is presented in Chapter 9.

EXISTING WATER SYSTEM FACILITIES

The District's water system facilities are discussed in the following sections with respect to storage, transmission and distribution, and telemetry and control. The focus of these

sections is to provide an overview of the District's water system identifying equipment and infrastructure.

STORAGE FACILITIES

The District currently operates eight storage facilities with a combined total of 29 million gallons (MG). A discussion of each storage facility is provided in the following sections. All elevations provided are in the North American Vertical Datum (NAVD) 1988. A map showing the location of the various water system facilities within the District is provided as Figure 1-2.

Inglemoor Tank Farm

The majority of the District's storage, 13.7 MG, is located at the Inglemoor Tank Farm. The Tank Farm consists of three ground-level reservoirs at an overflow elevation of 537 feet and a standpipe with an overflow elevation of 601 feet. The 3.0 MG reservoir was constructed in 1961, the 3.5 MG reservoir was constructed in 1980, and the 4.2 MG reservoir was constructed in 1983. The 3.0 MG standpipe was constructed in 1967. The three reservoirs are solely used to fill the standpipe via the Inglemoor Booster Station. The booster station has four centrifugal pumps and a new turbine pump that replaced two old 40-hp pumps. The turbine pump is powered by gravity flow from Master Meter 5B to the 537 reservoirs and pumps water up the standpipe from the lower reservoirs to help turnover and save on electricity costs. The standpipe then provides gravity supply to the 601 Zone and many of the lower zones through pressure-reducing valves (PRVs).

Under normal operating conditions, the ground-level reservoirs are supplied by gravity through a 24-inch direct transmission line from Master Meter 5B. When the hydraulic grade of the Tolt Pipeline is high enough, the Inglemoor Standpipe and 601 Zone can be supplied by gravity from Master Meter 5B. Generally, however, the standpipe is filled by boosting the water from the reservoirs. In the event that the Tolt Pipeline is out of service, the Tank Farm can also be supplied via the Norway Hill Booster Station.

The ground elevation at the Inglemoor Tank Farm is approximately 501 feet. The lowest usable level in the standpipe while maintaining 30 psi throughout the 601 Zone is 67 feet. All storage is usable in the ground-level reservoirs.

Kingsgate Standpipe

The Kingsgate storage facility is a 3 MG welded steel standpipe constructed in 1982. The standpipe has an overflow elevation of 446 feet. The standpipe provides gravity supply primarily to the 446, 380 South, and 366 Zones. The standpipe is typically supplied by Master Meters 1, 2 and 3.

The elevation of the base of the Kingsgate Standpipe is approximately 352 feet. The elevation of the highest service connection is approximately 344 feet; therefore, the lowest usable level in the standpipe is 61 feet while maintaining 30 psi.

Norway Hill Reservoir

The Norway Hill storage facility is a 5 MG welded steel reservoir constructed in 1991. The reservoir was constructed on property owned by the City of Bothell and 1.0 MG of the reservoir is dedicated for the City's use. The reservoir has an overflow elevation of 451 feet. The reservoir provides gravity supply primarily to the 451 and 366 Zones. The reservoir is typically supplied by Master Meter 3.

The elevation of the base of the Norway Hill Reservoir is approximately 422 feet. The elevation of the highest service connection is approximately 344 feet; therefore, the entire volume of the reservoir can be considered usable storage.

Lake Forest Park Reservoir

The Lake Forest Park storage facility is a 4.4 MG pre-stressed, post-tension concrete reservoir constructed in 1987. The reservoir has an overflow elevation of 530 feet. The reservoir provides gravity supply to the 530, 473, and 435 Zones and storage to the 640 Zone through the Lake Forest Park Booster Station. The reservoir is typically supplied by Master Meter 7.

The entire volume of the reservoir can be considered usable storage since there are no gravity customers high enough to create dead storage.

Westhill Standpipe

The Westhill storage facility is a 3 MG welded steel standpipe constructed in 1978. The standpipe has an overflow elevation of 380 feet. The standpipe provides gravity supply primarily to the 380 Zone. The standpipe is supplied by Master Meter 5A.

The elevation of the base of the Westhill Standpipe is approximately 259 feet. The elevation of the highest service connection is approximately 275 feet; therefore, the lowest usable level in the standpipe is 85 feet while maintaining 30 psi.

Table 4-2 provides a summary of the construction year, type of construction, dimensions, and critical elevations of each of the District's reservoirs and standpipes.

TABLE 4-2

Existing Storage Facilities

Storage Facility	Year	Type	Capacity (MG)	Diam. (ft)	Unit Vol. (gal/ft)	Base Elev. (ft)[(1)]	Overflow Elevation (ft)[(1)]
Lake Forest Park Res.	1987	Post-Tensioned Conc.	4.4	160	150,400	501	530
Inglemoor Res. 1	1961	Welded Steel	3.0	115	77,700	501	537
Inglemoor Res. 2	1980	Welded Steel	3.5	124	90,300	501	537
Inglemoor Res. 3	1983	Welded Steel	4.2	135	107,100	501	537
Inglemoor Standpipe	1967	Welded Steel	3.0	70	28,800	501	601
Westhill Standpipe	1978	Welded Steel	3.2	67	26,400	265	329
Kingsgate Standpipe	1982	Welded Steel	2.9	73	31,300	355	449
Norway Hill Reservoir	1991	Welded Steel	4.9	169	167,800	422	451
Total			**29.1**				

(1) Datum is NAVD 1988.

TRANSMISSION AND DISTRIBUTION FACILITIES

Transmission and distribution facilities allow the water supply to reach the District's customers. These facilities include transmission and distribution mains, booster stations, and pressure-reducing stations that allow water to flow between pressure zones from one hydraulic grade to another.

Water Mains

Transmission mains are generally classified as water pipes larger than 12 inches in diameter. Transmission mains may or may not provide water service to customers and are primarily used to convey water from one area of the system to another. Distribution mains are generally classified as water pipes with diameters of 12 inches and smaller and maintain adequate pressures for serving the District's customers. Pipe materials within the District currently include the following:

- Asbestos-cement pipe (AC)
- Cast iron pipe (CI)
- Polyvinyl chloride pipe (PVC Class 200, PVC-DR18)
- Ductile iron pipe (DI)
- Concrete cylinder pipe (CCP)
- Poly pipe (Poly)
- Permastran
- High Density Polyethylene Pipe (HDPE)

Table 4-3 provides a list of pipe diameters, pipe materials and the total length of each within the water system as of December 31, 2013.

TABLE 4-3

Pipe Lengths by Diameter and Type (1)

Diam. (inches)	Ductile Iron	Cast Iron	Steel	CCP	PVC 900	PVC Other	AC	Poly	Permastan	HDPE	Total
1	0	0	0	0	0	3,321	0	593	0	0	3,914
1.5	0	0	0	0	0	548	0	0	0	0	548
2	123	0	0	0	382	22,629	0	2,036	0	200	25,370
3	0	0	0	0	510	12,304	0	0	0	0	12,814
4	58,044	25,370	0	0	62	241	15	0	0	0	83,732
6	7,055	122,949	0	0	2,296	14,318	696	0	397	195	147,906
8	657,596	63,395	0	0	42,122	63,789	41,762	0	8,160	0	876,824
10	21,744	9,803	0	0	1,507	4,948	10,084	0	3,317	0	51,403
12	165,382	7,518	8	4	6,031	12,966	6,600	0	2,546	0	201,055
14	6,614	424	0	0	0	0	490	0	0	0	7,528
16	34,150	0	0	0	0	0	0	0	0	880	35,030
18	20,082	0	0	2	0	0	0	0	0	0	20,084
20	1,009	0	0	0	0	0	0	0	0	0	1,009
24	596	0	0	9,332	0	0	0	0	0	0	9,928
30	146	0	0	0	0	0	0	0	0	0	146
Total	**972,541**	**229,459**	**8**	**9,338**	**52,910**	**135,064**	**59,647**	**2,629**	**14,420**	**1,275**	**1,477,291**

(1) Water main inventory provided by District, updated 12/31/2013.

Deactivated Water Mains

Beginning in the early 1980s, the District began a water main replacement program. Since that time, the District has replaced 97 miles of water main, most of which was deactivated in place. These pipes range in size from 2 inches to 12 inches and consist of AC, PVC, steel, permastran, cast iron, and ductile iron.

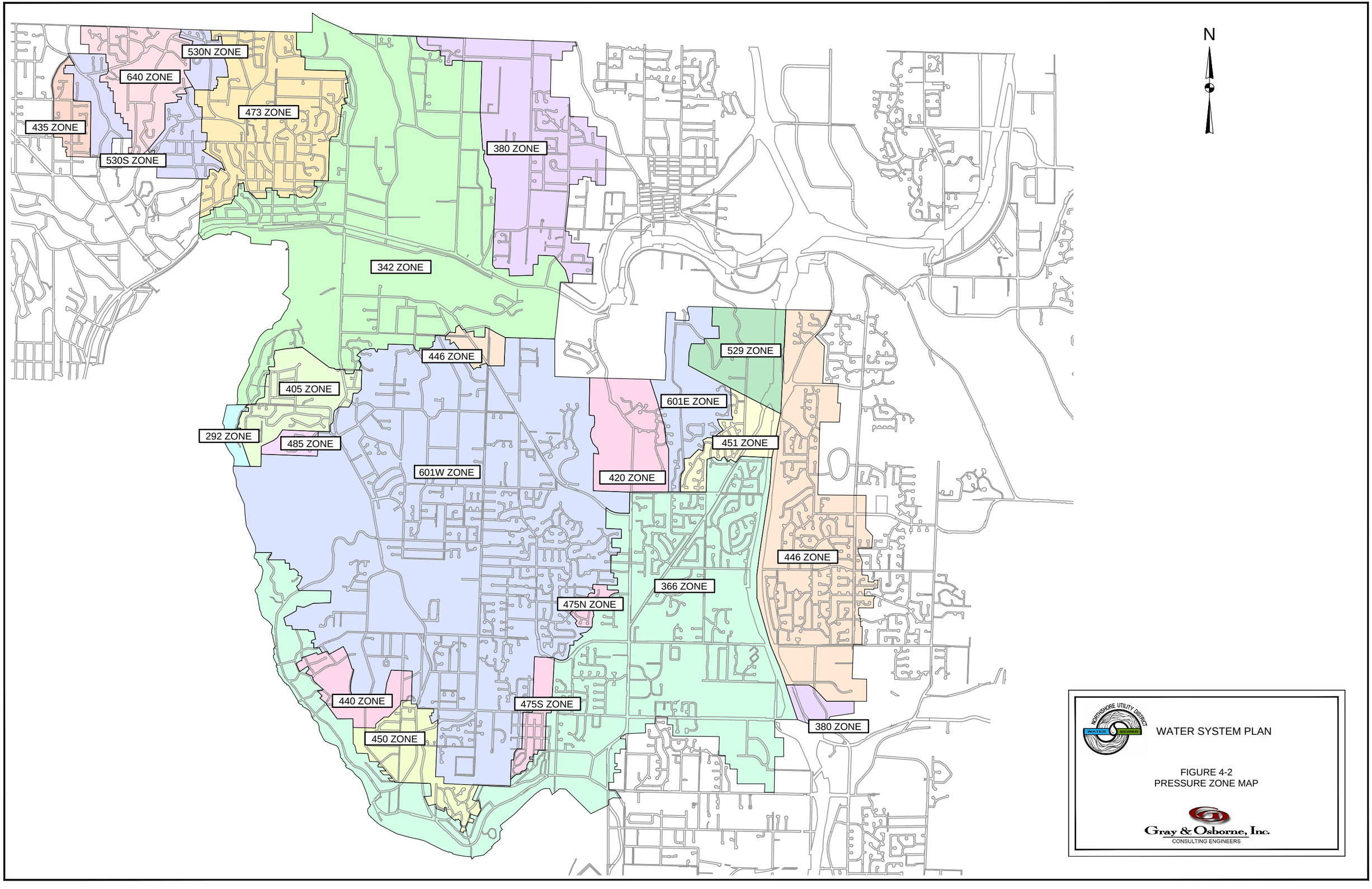
The City of Kirkland has purchased some of the deactivated pipe from the District for use as fiber optic conduit. The District has also offered to sell deactivated piping to Brightwater for their rehabilitation and use as a water transmission main to provide backup well water supply to Lake Forest Park Water District. The District plans to develop a strategy for marketing the deactivated water mains to other users including telephone, fiber optic, DSL, and cable service providers.

Pressure Zones

Due to the topography of the District, the water system operates on 24 pressure zones. With the exception of the 640 Zone, which is supplied by the Lake Forest Park Booster Station, the hydraulic grades of the main pressure zones are set by the water levels in the various reservoirs. Smaller pressure zones are served through pressure-reducing valves from the higher zones. Pressures in many areas of the District exceed 80 psi; therefore, services in these areas have individual PRVs to reduce the pressure before entering the home. The locations of the various pressure zones are shown in Figure 4-2. A system schematic showing the transmission and distribution facilities and storage facilities is included as Figure 4-3.

Pressure-Reducing Valve Stations

In order to operate 24 pressure zones, the District maintains numerous pressure-reducing valve stations as shown in Table 4-4. In most cases, there are two PRVs at each station. The smaller valve operates to provide the average daily demand to the zone that it serves. The larger valve, which is generally set 5 psi lower than the small valve, is primarily used for fire protection or large demands.



NORTHSHORE UTILITY DISTRICT
WATER SEWER

WATER SYSTEM PLAN

FIGURE 4-2
PRESSURE ZONE MAP

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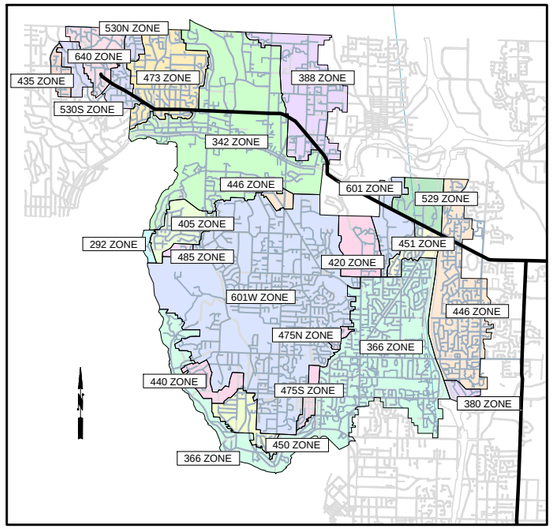

MASTER METER	HGL (ft.)
MASTER METER NO. 1	451
MASTER METER NO. 2	451
MASTER METER NO. 3	451
MASTER METER NO. 4	601
MASTER METER NO. 5A	380
MASTER METER NO. 5B	601
MASTER METER NO. 6	473
MASTER METER NO. 7A	530
MASTER METER NO. 7B	640

RESERVOIR NAME	CAPACITY (MG)	HGL (ft)
INGLEMOOR STANDPIPE	3.0	601
INGLEMOOR NO. 1	3.0	537
INGLEMOOR NO. 2	4.2	537
INGLEMOOR NO. 3	3.5	537
NORWAY HILL	4.9	451
KINGSGATE	2.9	446
WESTHILL	3.2	380
LAKE FOREST PARK	4.4	530

BOOSTER STATION NAME	ZONE FROM	ZONE TO
INGLEMOOR	537	601
NORWAY HILL	451	601
LAKE FOREST PARK	530	640

LEGEND

- RESERVOIR
- MASTER METER
- BOOSTER STATION
- PRV
- SPU TRANSMISSION LINE
- DISTRICT WATER MAIN

NORTHSHORE UTILITY DISTRICT WATER SEWER

WATER SYSTEM PLAN

FIGURE 4-3
WATER SYSTEM SCHEMATIC

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M:\Nshore\14451 Water System Plan C1317\Pressure Zone Figures\3D Pressure Schematic-V4.dwg, 6/8/2015 11:48:32 AM, pmarshall

TABLE 4-4

Pressure Reducing Valve Stations

New Site No.	Old PRV No.	Elevation (ft)	Size (in)	Setting (psi)	HGL[4] (ft)	Size (in)	Setting (psi)	HGL[4] (ft)
1	1A	276	6	49[2]	388.8	2	56[1]	405
2	1B	242	6	60[2]	381	2	69[1]	401.8
3	1	328		89	533			
4	2	354	6	39[2]	443.8	2	44[1]	455.4
6	3A	347	4	74[2]	517.7	1	79[1]	529.3
7	3&4	482		21[2]	530			
8	NA	503		9[2]	524			
9	5	407	6	35[2]	488.2	2	40[1]	499.7
10	6	249	10	76[2]	424.2	4	81[1]	435.7
11	7	222	10	87[2]	422.5	4	92[1]	434
12	10	137	10	67[2]	292.1	4	72[1]	303.6
13	8	227	6	82[2]	416.4	6	87[1]	428
14	9A	197	10	31[2]	268.1	4	44[1]	298.1
15	2A	125	6	72[2]	291.3	2	77[1]	302.9
16	56	110		108[2]	359			
17	59	204	6	37[2]	289.5	2	42[1]	301
18	61	156	6	64[2]	303.8	2	69[1]	315.4
19	11	101	12	72[2]	267.3	4	88[1]	304.3
20	60	146	6	72[2]	312.6	2	77[1]	324.1
22	9	215		69[2]	373.7			
23	57	134	6	81[2]	320.6	2	86[1]	332.2
24	12	173	6	59[2]	309.5	2	64[1]	321.1
25	17	175	6	50[2]	290.3	2	62[1]	318
26	18	176	6	43[2]	275.3	2	48[1]	286.9
27	19	289	6	75[2]	462.3	2	80[1]	473.8
28	20	275	10	39[2]	365.4	4	50[1]	390.8
29	21	255	6	50[2]	370.4	2	56[1]	384.3
30	22	188	6	56[2]	317.4	2	60[1]	326.6
31	49	150	6	65[2]	300.5	2	73[1]	318.9
32	15	215	6	38[2]	302.8	6	43[1]	314.3
33	14	212	6/6	41[2]/48[1]	307/311	2	48[1]	322.9
34	16	354	4/10	41/51[2]	448/471	2	56[1]	483
35	46	493		11[2]	518.3			
36	62	201		95[2]	419			
37	36	195	12	41[2]	290.1	4	50[1]	310.9
39	47	172	6	51[2]	290.1	2	68[1]	329.3
40	48	187	6	50[2]	302.3	2	63[1]	332.3

TABLE 4-4 – (continued)

Pressure Reducing Valve Stations

New Site No.	Old PRV No.	Elevation (ft)	Size (in)	Setting (psi)	HGL[4] (ft)	Size (in)	Setting (psi)	HGL[4] (ft)
41	58	195	6	83[2]	386.7	2	89[1]	400.6
42	37	202	6	101[2]	435.3	2	106[1]	446.9
43	44	460		64[2]	607.2			
44	53	421		10[2]	444			
45	43	334	6	58[2]	468	2	72[1]	500.3
46	38	232		92[2]	443.9			
47	39	189	14	56[2]	317.9	4	61[1]	329.5
49	28	303		56[2]	431.8			
50		355		91[2]	564.3			
51	41B	243	6	53[2]	365.7	2	58[1]	377.3
52	32	212	4	45[2]	316	2	51[1]	329.8
53	31	107	6	93[2]	321.7	2	98[1]	333.3
54	30	292	6	48[2]	403	2	58[1]	426.1
55		31		0[2]				
56	23	311	6	50[2]	426.5	2	55[1]	438.1
57	24	327	6	43[2]	425.9	2	48[1]	437.4
58	34	250	6	29[2]	317	2	41[1]	344.7
60	50	164	6	65[2]	314.5	2	73[1]	332.9
61	25	278	6	55[1]	405.1	2	50[1]	393.5
62	26	317	6	63[2]	462.1	2	69[1]	475.9
63	35	309	6	Shut off				
64	27	359	6	45[2]	463	2	50[1]	474.5
65	41	140	8	75[2]	313.3	6	80[1]	324.8
66	51	154	8	90[1]	362.3	2	92[1]	367
67	52	143	8	94[2]	360.3	2	94[1]	360.3
68	29	257		68	413.4			
	54	N/A	6	Not in use		2	N/A	N/A
	56	N/A	6	Intertie		2	N/A	N/A

(1) District provided pressure setting as of May 2014.
(2) Recorded Field data.
(3) Adjusted from District records to correspond to field data. Change in pressure from small PRV to large PRV corresponds to District records.
(4) Datum is NAVD 1988.

Booster Stations

The District operates three booster stations, located at the Lake Forest Park Reservoir, the Norway Hill Reservoir, and the Inglemoor Tank Farm. The Lake Forest Park Booster

Station supplies water to the 640 Zone. The Norway Hill Booster Station provides redundant supply to the 601 Zone from the Norway Hill Reservoir. The Inglemoor Booster Station pumps water from the Inglemoor Reservoirs to the Inglemoor Standpipe. Table 4-5 summarizes the District's booster stations.

TABLE 4-5

Booster Stations

Booster Station	Design Flow (gpm)	Design Head (ft)	Auxiliary Power Generator Type	Discharge Zone	Control
Inglemoor Booster Station					
Pump 3	2,000	100	Portable	601W	Inglemoor Standpipe
Pump 4	2,000	100	On-Site w/ATS, Portable(1)(2)	601W	
Pump 5	2,500	100	On-Site w/ATS, Portable(1)(2)	601W	
Pump 6	2,500	100	Portable	601W	
Turbine Pump	3,200	60	N/A	601W	
Norway Hill Booster Station					
Pump 1	1,000	90	No (1)	601E	Inglemoor Standpipe
Pump 2	1,000	90	No (1)	601E	
Lake Forest Park Booster Station					
Pump 1	550	140	On-Site w/ATS	640	640 Zone pressure
Pump 2	550	140	On-Site w/ATS	640	
Pump 3	1,500	140	On-Site w/ATS	640	

(1) The District has a portable generator that can be used at this site.
(2) Includes an automatic transfer switch and onsite generator.

Interties

As discussed in Chapter 3, the District has a number of interties with adjacent purveyors. Table 4-6 provides a list of the District's interties.

TABLE 4-6

Northshore Utility District Interties

Purveyor	Purveyor Receiving Supply	NUD Zone	Other Purveyor Zone	Meter Size	Facilities	Type of Intertie	Telemetry
LFPWD	LFPWD	530	250	4"	Valve/PRV	Emergency	No
LFPWD	NUD	530	250	4"	Valve/Pump	Emergency	No
AWWD	NUD	342	520	8"	Valve/PRV	Emergency	No
WWD	WWD	TESSL	510	10"	PRV	Emergency	No
Kirkland	Kirkland	380	395	None	Valve	Emergency	No
Kirkland	Kirkland	446	395	None	Valve	Emergency	No
Kirkland	Kirkland	366	450	None	Valve	Emergency	No
Bothell	Bothell	366	284	2" & 8"	PRV	Emergency	On/Off only
Bothell	Bothell	446	284	6"	PRV	Continuous use	Flow Meter
Bothell	Bothell	380	336	None	Valves	Emergency	No

TELEMETRY AND CONTROL

The District's telemetry system monitors the flow through their Master Meters from the SPU connections, the storage facilities, and the booster stations. The system allows the District to control the operation of these facilities from the office in order to allow the District to operate the system in the most efficient manner.

SCADA System

The District has a Supervisory Control and Data Acquisition (SCADA) system with master control located at the District Office. The system uses Intouch's Wonderware software to provide a graphical user interface on a series of screens that allow the operator to view and control a variety of parameters at ten water system remote terminal units. In addition, the system monitors pump status, run time and alarm conditions at eleven sewer lift stations and four grinder pump stations.

All reservoirs have pressure transducers that measure reservoir levels and transmit this information to the SCADA system. The Inglemoor Standpipe calls the pumps in the Inglemoor Booster Station and Norway Hill Booster Station based on the level in the standpipe.