

SECTION 1

EXISTING WATER SYSTEM AND POLICIES

Ownership and Management

The City of Battle Ground (City) Water Department is a city-owned water utility in Battle Ground, Washington. The City presently provides water service to approximately 5,300 homes and businesses.

Water System Contact Information:

Mailing Address: City of Battle Ground
109 SW 1st Street, Suite 122
Battle Ground, WA 98604

Phone Numbers: (360) 342-5000 – City Hall
(360) 342-5350 – Public Works Operations Center

FAX Numbers: (360) 342-5359 – Public Works Operations Center
WDOH ID#: 4700 5

The Water Department is managed by the Public Works Department of the City. The Public Works Director is in charge of the department and reports to the City Manager who reports to the City Council. A Public Works Foreman is in charge of operating the water system on a day to day basis. The Public Works Operations Manager and the Assistant City Engineer are also involved in decisions regarding the water system.

The current City's Organizational Table is presented at the end of this section.

System Background

History of Water System Development and Growth

The City was incorporated in 1951. The community stayed relatively small for a long time. In 1990, the population was less than 4,000. Rapid growth due to numerous housing developments, and addition of the Salmon Creek Interceptor for improved sewer capacity, has led to a population of 17,780 in 2011. The City has become an attractive city for commuters from Portland and Vancouver. Growth is expected to continue as the City fills out its Urban Growth Area (UGA) and incorporates more of the surrounding area into the city limits. Over the life of the prior Water System Plan, the number of City water service connections grew from 3,775 (2004 Water Facilities Inventory (WFI)) to 5,923 (2011 WFI). The population is projected to reach over 34,000 by 2031.

The City has relied exclusively on groundwater for its source of water. Wells 1 and 2 were the original wells for the City. As growth occurred Wells 4 and 5 were drilled, and within the

last 10 years Wells 6, 7, 8 and 9 were drilled and put into production. Due to the presence of high levels of iron in the aquifer source, the City does not intend to expand the groundwater source within the UGA. The City may consider replacing Wells 6 and 7 with a new well near Well 9 where iron concentration is limited. In the last 10 years the City's water supply from the wells has been supplemented by water from Clark Public Utilities (CPU) and the Battle Ground School District. The connection to the school well is now disconnected, and the City maintains its current intertie with CPU on NE 199th Street (Eaton Boulevard) at the Maple Grove School.

The City built its first five (5) reservoirs in the same location on Tukes Mountain at the eastern limits of the City's water service area. This location has resulted in high pressures in the majority of the distribution system, requiring most individual services to install private pressure reducing valves. In 2004 the City constructed a new two (2) million gallon (MG) welded steel reservoir west of SW 20th Avenue which has improved system operation with additional storage for times of high water demand.

Geography

The City is in Clark County, which is located in southwestern Washington. Clark County is bounded on the north by the Lewis River, on the east by the western slopes of the Cascade Mountains, and on the south and west by the Columbia River. Bottomland along the Columbia River transitions to plains and terraces. The terrain rises in the northeast to the foothills of the Cascades where elevations climb to 4,000 feet. The county covers approximately 633 square miles with forest covering more than 50 percent of the land areas. Major forested areas are in the north and northeast sections of the county.

Historically, the existing topography was influenced by geologic forces but more recently by surface water erosion. Down faulting has formed the Chelatchie Prairie and the Yacolt basin areas in the northeastern sections of the county. In general, glaciation, with subsequent erosion and deposition, has played a major part in forming the terraced landscape, which occurs in the Fourth Plain area and glacial outwash lowlands along the Columbia River.

Major bodies of water include Vancouver Lake in the southwest corner, Lacamas Lake in the southeast corner, and Lake Merwin and Yale reservoirs on the northern boundary. These latter two (2) bodies of water were created by dam construction for the generation of electrical power. Major rivers include the North Fork and East Fork of the Lewis River, the Washougal River, and the Columbia River. Stream systems include Salmon, Gee, Cedar, Burnt Bridger, Whipple and Lacamas Creeks.

The water utility's existing service area is within the city limits of the City. CPU service area surrounds the City, and also includes customers within the city limits. Features that present significant barriers to the development of the water transmission network include Weaver Creek, and the state highways SR 502 and SR 503.

The City works closely with the Washington State Department of Transportation to coordinate the installation of water facilities along new or upgraded highways that have increasingly restricted access.

Inventory of Existing Facilities

Existing City water facilities are illustrated on Plate 1 in Appendix A and on Figure 1-1, Existing Water System Schematic, at the end of this section.

Water Sources

The existing water system is supplied by eight (8) groundwater wells and two (2) active emergency interties with CPU. Table 1-1 summarizes the City’s existing supply sources and their capacities in gallons per minute (gpm). Additional detail on existing sources is provided in Section 3. All of these water sources are equipped with flow meters to measure and record production rate and volume. All water sources except Wells 4 and 5 have remote operation and monitoring capability provided by a Supervisory Control and Data Acquisition (SCADA) system that is managed for the City by CPU.

**Table 1-1
Water Supply Summary**

DOH Source No.	Well No. or Supply Source	Location	Water Right Qi (gpm)	Operating Q (gpm)
SO1	1	W Main Street (SR502) and SW 5th Avenue	350	280
SO2	2			
SO3	4	SW 10th Street dead end east of SR 503	250	150
SO4	5			
SO5	CPU Intertie	NE 199th Street (Eaton Blvd) at Maple Grove School	4-inch - 500 gpm	
SO6	School District Intertie		Abandoned	
SO7	CPU Intertie	NE Grace (142nd) Avenue and NE 10th St	6-inch for emergency use only	
SO8	6	SW 20th Street (112th) at SW 21st Court	350	200
SO9	7	Horsethief Reservoir Site on SW 11th Street	1,375	300
SO10	8			400
SO11	9			350

Water Treatment

All City wells are chlorinated and liquid sodium fluoride is added for dental benefits. Fluoride levels in the water system range from 0.8 to 1.3 mg/l with a goal of 1.0 mg/l. Residual chlorine disinfectant levels in the water system range from 0.4 to 0.8 mg/l. Table 1-2 summarizes water treatment facilities at each of the City's wells.

Chlorination

All of the City water utility's water production facilities include disinfection treatment to provide a residual throughout the distribution system. This treatment is achieved using 12.5 percent liquid sodium hypochlorite.

Iron and Manganese Removal

An iron and manganese removal facility is provided for Wells 7, 8 and 9. The facility uses manganese dioxide ore (AS-721 media) to adsorb dissolved iron and manganese. Chlorine is added prior to the adsorption units to provide continuous regeneration of the manganese dioxide media as well as for disinfection residual maintenance in the distribution system.

**Table 1-2
Groundwater Well Treatment Summary**

DOH Source No.	Well No.	Fluoridation	Chlorination Type	Iron & Manganese Treatment
SO1	1	Liquid	Liquid Hypochlorite	None
SO2	2	Liquid		
SO3	4	Liquid	Liquid Hypochlorite	None
SO4	5	Liquid		
SO8	6	Liquid	Liquid Hypochlorite	Sequestering w/Sodium Silicate
SO9	7	Liquid	Liquid Hypochlorite	Pyrolusite Adsorption
SO10	8	Liquid		
SO11	9	Liquid		

Water Storage Reservoirs

The existing water system contains a total of six (6) water storage reservoirs. Three (3) of these reservoirs are concrete and three (3) are steel. The total volume of the reservoirs is 3.84 MG with an effective volume of 3.54 MG due to dead storage in the Horsethief Reservoir. Five (5) of the reservoirs (three (3) concrete and two (2) steel) are located together on Tuke's Mountain. The sixth, a 2 MG steel reservoir, is located next to Wells 7, 8 and 9 in the Horsethief subdivision in the southwest part of town. Reservoirs on Tuke's Mountain serve the distribution system by gravity from an overflow elevation of 544 feet. The adjacent

Horsethief Pump Station supplies water to the distribution system from the Horsethief Reservoir. Table 1-3 provides a summary of the existing water storage facilities.

**Table 1-3
Water Storage Reservoir Summary**

Reservoir Name	Year Built	Height (ft)	Dia. (ft)	Total Volume (MG)	Effective Volume (MG)	Overflow Elevation (ft)
Tukes Mtn #1	1954	35	35	0.25	0.25	544
Tukes Mtn #2	1970s	50	25	0.18	0.18	544
Tukes Mtn #3	1980s	45	25	0.17	0.17	544
Tukes Mtn #4	1980s	40	25	0.15	0.15	544
Tukes Mtn #5	1999	38	68	1.03	1.03	544
Horsethief #6	2004	31	110	2.06	1.76	296
Totals:				3.84	3.54	

Pump Stations

The City’s water system has two (2) booster pump stations, one (1) at the Horsethief Reservoir and one (1) on Tukes Mountain.

The Horsethief Station pumps water through four (4) booster pumps from the Horsethief Reservoir up to the Tukes Mountain reservoirs. The pump station’s two (2) 50 horsepower (hp), 500 gpm pumps have variable frequency drives to match pump output with demand. The Horsethief Pump Station was designed such that 2,000 gpm could be provided with any one (1) pump out of service.

The Tuke’s Mountain Pump Station, at the intersection of NE 14th Street and NE 15th Avenues, has four (4) pumps. This station provides added pressure to serve homes that are too high to receive adequate service pressure by gravity from the Tuke’s Mountain reservoirs. Table 1-4 lists the capacities of each booster pump. All pumps are end suction centrifugal pumps.

**Table 1-4
Pump Station Summary**

Location	Horsepower (hp)	Elevation (ft)	Capacity (gpm)	Total Dynamic Head (TDH, ft)
Horsethief 1	50	269	500	270
Horsethief 2	50	269	500	270
Horsethief 3	100	269	1,000	270
Horsethief 4	100	269	1,000	270
Tukes 1	5	380	30	240
Tukes 2	30	380	300	240
Tukes 3	40	380	1,000	100
Tukes 4	40	380	1,000	100

Transmission and Distribution Mains

The City’s water system includes approximately 75 miles of transmission and distribution mains. Table 1-5 provides a summary of water mains by pipe diameter. All new water mains are ductile iron or PVC. The existing water system includes some steel mains in the central core of the City and a minimal amount of asbestos cement (AC) pipe. All steel pipe was installed before 1970 and is 6-inch diameter or smaller. AC pipe was installed in the 1970s.

Because of high static pressures in the system from the reservoirs on Tukes Mountain, most water services have individual pressure reducing valves. These are installed on the customer side of the meter and are customer maintained. See Section 3 for an evaluation of the existing water distribution facilities.

**Table 1-5
Water Main Summary**

Diameter (inches)	Length (miles)
4-inch or less	1.6
6	17.9
8	43.6
10	0.3
12	8.8
16	2.7
TOTAL	74.9

Related Plans

Coordinated Water System Plans

Clark County's *Coordinated Water System Plan Update (2012)* (CWSP). The most recent update was provided to update the 1999 plan, and to reflect new changes in service boundaries and service agreements, as required by the RCW. The 1999 update of the CWSP was developed to reflect the changes in zoning that resulted from implementation of growth management planning in Clark County. The 1999 plan completely replaced the 1991 and 1983 plans, which provided historical background and conceptual discussion of regional water supply system options.

Comprehensive Land Use Plans

Clark County's *20-Year Comprehensive Growth Management Plan*, adopted in 2007 and amended in 2008, 2009 and 2010. Among the measures to manage growth and development throughout the county, the plan identifies land uses and development densities appropriate for various areas of the county. It establishes UGAs and sets forth policies aimed at encouraging compact orderly development within these urban boundaries, and it defines level of service standards for public facilities.

Previous Battle Ground Water System Plans

Battle Ground Water System Plan (1994 and 2004) and *Water System Plan Update (1998)*. These plans serve as reference for this plan as well as documenting the history of the water system.

Clark Public Utilities Water System Plan

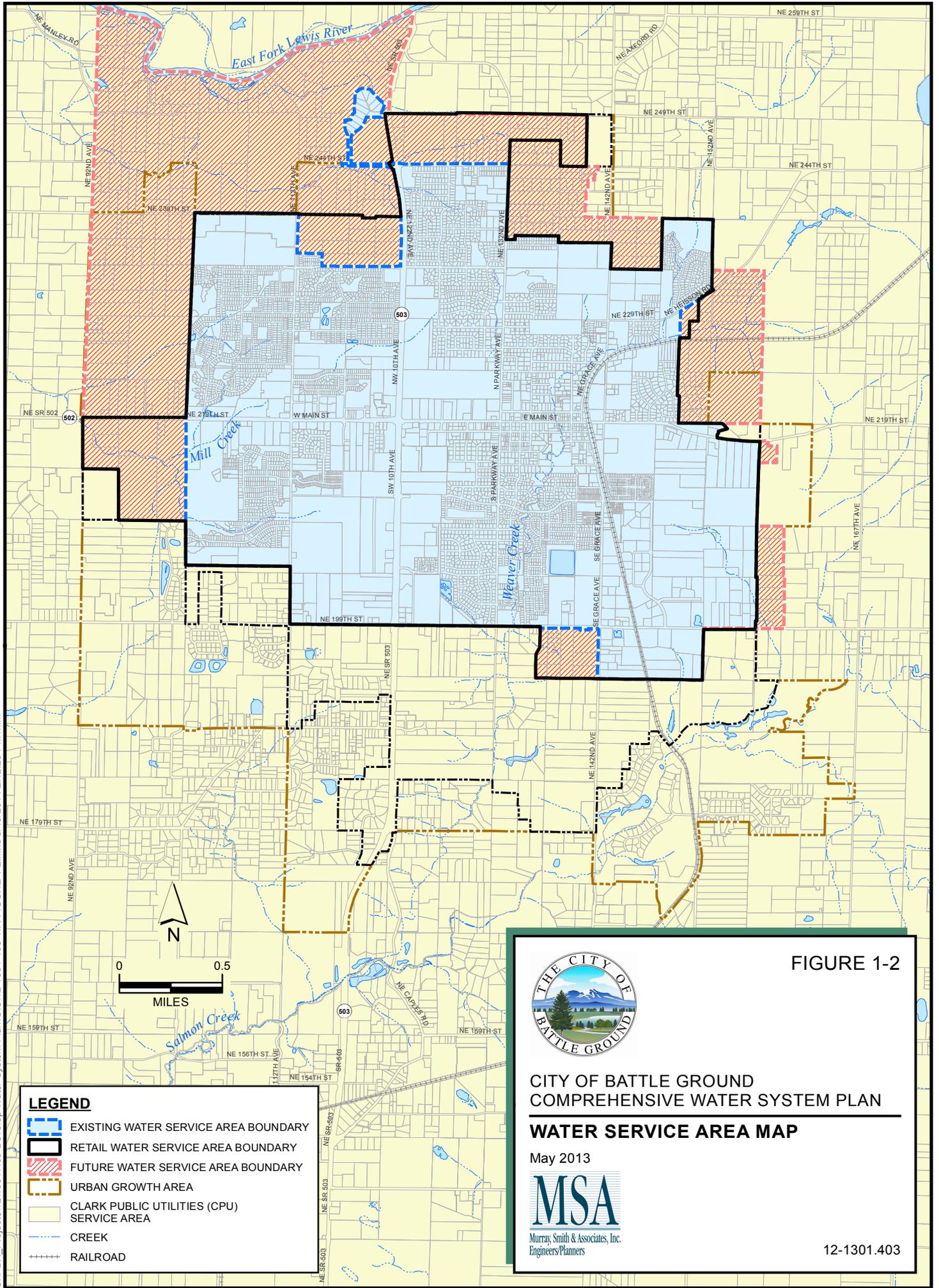
Clark Public Utilities Water System Plan (2004 and 2011). This plan is a comprehensive document detailing the operation, maintenance and future plans for CPU. Since CPU has interties with the City and has adjacent service area there is information that relates to the planning work for the City's water facilities.

Battle Ground Wellhead Protection Plan

Battle Ground Wellhead Protection Plan (2000, updated 2012). This plan documents the geology of the groundwater around the City and lists potential contaminants of the City's wells as well as determining the vulnerability of each well. The plan lays out a direction for the City to protect both the quantity and quality of their groundwater source. The Wellhead Protection Plan is included as Section 5 of this Water System Plan.

Existing and Retail Service Area

Figure 1-2 shows the City's existing, retail and future water service areas, city limits, UGA and CPU service area. The City's Water System services residential, commercial, industrial, and institutional customers within the city limits and less than 10 residences outside the city



LEGEND

- EXISTING WATER SERVICE AREA BOUNDARY
- RETAIL WATER SERVICE AREA BOUNDARY
- FUTURE WATER SERVICE AREA BOUNDARY
- URBAN GROWTH AREA
- CLARK PUBLIC UTILITIES (CPU) SERVICE AREA
- CREEK
- RAILROAD

FIGURE 1-2



CITY OF BATTLE GROUND
COMPREHENSIVE WATER SYSTEM PLAN
WATER SERVICE AREA MAP

May 2013



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 Engineers/Planners

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limits. Some residents within the City's limits are served by CPU. The City's retail service area includes all area within the city limits that is not currently served by CPU.

Future Service Area

The City will continue to see extensions of distribution mains to ultimately serve any part of the City's UGA which is not served by CPU. CPU currently serves water to a large portion of customers inside the City's UGA. CPU will continue to serve those areas it already serves as agreed to under the terms of a service area interlocal agreement between the City and CPU. Expansion of the UGA is limited owing principally to controls on development imposed by Clark County's Comprehensive Plan and implementing land use regulations, consistent with the Growth Management Act (GMA). Currently CPU serves 97 connections within the City's service area and 725 connections outside City service area boundaries that are inside the City UGA.

Service Area Agreements

The City, CPU, and the other water purveyors within Clark County have recently updated the CWSP. As documented in the CWSP, all areas of the county fall within the designated service area of an existing water purveyor. The City and CPU have decided that CPU will continue to serve any of its existing service area that is annexed by the City. Consistent with the City's retail water service area, any area annexed that is not currently served by CPU will be served by the City.

Water Utility Service Area Policies

Wholesale Water and Wheeling of Water

The water utility will consider requests for wholesale water sales arrangements only with other major water purveyors. It would consider a request for wheeling water through the distribution system. Important considerations include monitoring and control, hydraulic evaluation of the potential impacts, water quality, and water rights changes.

Direct Connection

The water utility requires direct service from its main water system.

Design and Performance Standards

The City has prepared a comprehensive set of engineering and construction standards for all new utility projects. Water system standards are summarized in Section 7 of this plan.

Oversizing Policy

The water utility will provide financial assistance for oversizing of water facilities when the needs of the system exceed the development's requirements.

System Extension

All extensions to the water utility's system must meet its adopted engineering standards. Where desirable to meet long term system needs, the water utility will pay for oversizing facilities as appropriate.

Conditions of Service

Purveyor Responsibilities

The water utility is responsible for providing water that meets quality and quantity standards of the State of Washington and the utility's design standards. The water utility will attempt to minimize service interruptions during maintenance, repair, and construction activities.

Customer Responsibilities

The customer is responsible for payment of all charges incurred from their water service and for responding to the water utility's requests for water conservation during emergencies.

Connection Fees

The water utility will assess new or upgrading water customers' system development charges and fees. See the Financial Plan section of this report for additional detail.

Meter and Materials Requirements

The water utility will provide and install all water meters.

Consent

The customer must consent to access by the utility for inspection, maintenance, and repair of water facilities. All new facilities must be located within either the public right-of-way or within a dedicated utility easement.

Cross Connection

The water utility has a cross connection control program. When cross connections are identified or assemblies and/or plumbing are found defective, the utility will provide assistance to correct the problem, but will ultimately terminate service if left uncorrected. The customer is responsible for the purchase, installation, maintenance, and annual testing of cross connection control assemblies that meet the utility's standards.

Service Connection Responsibility

Service taps on new mains will be completed by the project proponent provided the water utility has been notified and a water utility inspector is onsite. A party acceptable to the water utility shall make all service taps on existing mains. All connections to existing water facilities require 48-hour notification.

Developer Extension Requirements

All developer extensions must meet the water utility's engineering and construction standards including design by a professional engineer. Financing of extensions is the developer's responsibility with the possible addition of utility oversizing by the water utility. Developer extensions involving booster pumps stations, reservoirs, new sources, or other facilities besides distribution mains must complete the Washington State Department of Health (DOH) project approval and review process, after approval by the City and before construction can begin.

Utility Easements

All piping, pumping, source, storage, and other facilities shall be located on public rights-of-way or dedicated utility easements. Utility easements must be a minimum of 15 feet in width and piping shall be installed no closer than five (5) feet from the easements edge.

Complaints

The water utility will evaluate all customer complaints to determine if they indicate a potential problem with the existing water treatment process, system facilities, or operational practices. The utility will be responsive to customer concerns and take appropriate action, as applicable; to address water quality or quantity concerns based on available resources and the significance the problem. Complaints may be made orally or in writing to the utility at any time through the utility contacts listed on water bills. The utility will maintain records of all complaints received and the actions taken to identify the source of the problem and to either resolve the problem or reduce the potential for future impacts.

In order to avoid unnecessary customer concerns, customers shall be informed of planned water service outages at least 24 hours in advance.

**The City of Battle Ground
2012 Organizational Table**

City Council

Mayor	Lisa Walters
Deputy Mayor	Shane Bowman
Council Members	William Ganley, Alex Reinhold, Philip Johnson, Mike Ciraulo, Adrian E. Cortes
City Manager	John M. Williams
City Clerk	Kay Kammer
Executive Assistant	Bonnie Gilberti

Police Department

Police Chief	Bob Richardson
Administrative Assistant	Margie Mendoza
Police Records Supervisor	Gail Truax
Police Records Clerks	Debi Knight-Gallino, Judy Teel
Police Lieutenant	Roy Butler
Police Sergeants	Jason Arrowsmith, Kim Armstrong, Simon Gellar, Aaron Kanooth, Jason Perdue
Police Officers	Philip Anderson, Brian Archer, Chris Crouch, Montie Elford, Michele Fox, Clint Fraser, John Graves, Shaun Holahan, Rick Kelly, Kyle Kinnan, Ed Michael, Brett Neilson, Joshua Phelps, Tim Wilson
Community Service Officer	Brent Gullickson
Community Service Crew Leaders	Gerald McBurney, Bob Powell

Community Development Department

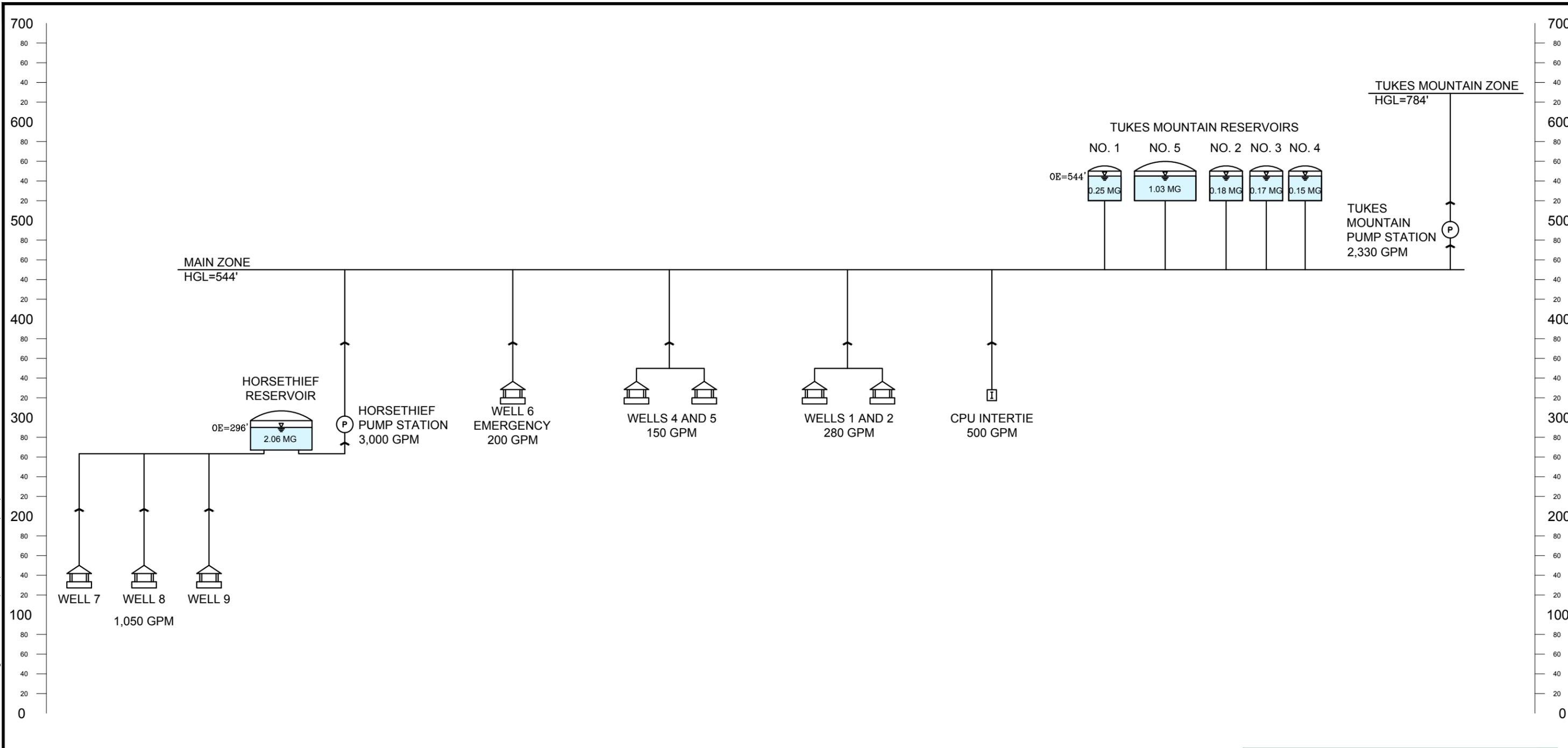
Community Development Director	Robert Maul
Planning Supervisor	Sam Crummett
Building Inspector	Larry LaDuke
Plans Examiner	Mark Miller
Community Development Technician	Dorothy Harrington, Jessica Herceg
Customer Service Clerk	Alisha Smith

Finance Department

Finance and Information Services Director	Cathy Huber Nickerson
Senior Accountant	Brian Wolf
Information Technologies Manager	Dan Oehler
Accounts Payable Clerk	Chris Doerschuk
Payroll/Receivables Clerk	Sue Yeska
Utility Billing Clerk	Joy Lee

Customer Service Clerk	Tonya Brownlie
Fire Department	Fire and EMS – Fire District 27
Municipal Court Department	
Lead Court Clerk	Carol Landwehr
Court Clerks	Michelle Muir & Erin Danielson
Parks and Recreation	
Parks and Recreation	
Director	Debbi Hanson
Customer Service Clerk	vacant
Public Works Department	
Public Works Director/ City	
Engineer	Scott Sawyer
Assistant City Engineer	Mark Herceg
Associate Civil Engineer	Marit Ernst, and Ryan Jeynes
Engineering Technicians	Rick Adams, Joan Hall, Kelly Uhacz, Tommy Renner, Chris Smart
Customer Service Clerk	Darsie Slawson
Public Works Foreman	Cal Newton, Michael Venne
Maintenance Workers	Shawn Scott, Ron Buma, Chuck Kraus, Dave Petty, Don Risto, Wade Kinnan, Nick Grier, Kerry Hymas, Robert Miller, Crystal Springer, Dean Vandermeer, Mike Wilcock.

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	WATER MAIN
	RESERVOIR (CAPACITY INDICATED IN MILLION GALLONS, OVERFLOW ELEVATION IN FEET)
	WELL
	PUMP STATION (CAPACITY IN GALLONS PER MINUTE)
	INTERTIE

ABBREVIATIONS

GPM	GALLONS PER MINUTE
OE	RESERVOIR OVERFLOW ELEVATION
HGL	HYDRAULIC GRADE LINE
CPU	CLARK PUBLIC UTILITIES
PS	PUMP STATION

FIGURE 1-1



CITY OF BATTLE GROUND
COMPREHENSIVE WATER SYSTEM PLAN

WATER SYSTEM SCHEMATIC

MAY 2013



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