

6 | WATER SOURCE AND QUALITY

INTRODUCTION

The two basic objectives of a municipal water supply system are to provide a sufficient quantity of water to meet customer usage demands and to provide high quality water. [Chapter 7](#) discusses the City's ability to supply a sufficient quantity of water and identifies future source requirements. This chapter discusses the City's existing water sources, water rights, water quality regulations, and water quality monitoring results.

EXISTING WATER SOURCES AND TREATMENT

WATER SOURCES

The City is served by multiple groundwater and surface water/spring sources located within and outside its water system service area. They include Clark Springs (including Rock Creek), Kent Springs, East Hill Well(s), Garrison Creek Well, Armstrong Springs Wells, Seven Oaks (Soos Creek) Well, Summit Well, O'Brien Well, 208th Street Well, and 212th Street Wells. The groundwater sources of supply are served by aquifers that underlie the Green and Cedar River basins and fall within and outside the City's water service area and City limits. In 1985, the City contracted with Tacoma Public Utilities (TPU) and became a partner in the Tacoma Regional Water Supply System (RWSS). This project delivers water from the Green River watershed to the City's Water Service Area. At this time, these sources are responsible for meeting all of the City's existing and projected water supply demand.

Kent Source Aquifers – Overview

The main aquifer within the Green River Valley is the recent alluvial aquifer (Qal) that occurs within the Pacific/Algona/Auburn areas, and in the Renton area. The Qal aquifers generally occur at depths of less than 100 feet, are unconfined, and are in hydraulic continuity with multiple surface water systems (White, Green, and Cedar Rivers). Aquifer recharge is from direct infiltration through the land surface, and lateral groundwater inflow from deeper aquifers in the adjacent uplands. Natural aquifer discharge is to the above-mentioned rivers. The Qal aquifer within the Renton area (6 miles north of the City) is very productive, with well yields that typically exceed 1,000 gallons per minute (gpm). The Qal aquifer within the Algona/Pacific/Auburn area (6 miles south of the City) is moderately productive, with well yields on the order of 500 gpm. Water resources in these aquifers are used by several jurisdictions, including the Cities of Pacific, Auburn, Renton, and Algona.

The Qvr aquifer occurs within the Auburn area at depths of 30 to 40 feet below ground surface to as much as 250 feet below ground surface. The aquifer is very productive given its high permeability and abundant recharge, both from the surface and the surrounding uplands. The aquifer discharges naturally to the Green River. The characteristics of the Qvr aquifer (extent, thickness, transmissivity, etc.) are well-defined from previous studies by the City of Auburn. No significant aquifers have been identified within the Green River Valley in the Kent area. The Qvr aquifer also occurs within the southeast portion of the Covington Uplands. The aquifer serves as a source of supply to the major spring sources that serve the City (Kent, Clark, and Armstrong

Springs). The aquifer is shallow and unconfined; recharge is relatively high due to the coarse-grained nature of the surficial soils and underlying geology, and the abundant precipitation that falls on the area. Natural aquifer discharge is to tributaries such as Jenkins Creek and Rock Creek, which discharge to Soos Creek and the Cedar River, respectively.

The Qva aquifer occurs primarily on the western portion of the Covington Uplands. Low-permeability glacial till overlies the aquifer and limits the amount of direct recharge from precipitation (Bauer and Mastin, 1997). Well yields are moderate to low, but the aquifer serves many domestic wells and is the source of supply for most of the wells serving Lake Meridian Water District. Natural discharge from the Qva aquifer occurs to the headwaters of Big Soos Creek.

The Qc₂ aquifer occurs throughout much of the Covington Uplands. In many areas it can be difficult to distinguish the Qc₂ aquifer stratigraphically from the overlying Qva aquifer. Glacial till overlies large portions of the aquifer, limiting the amount of natural recharge from direct precipitation. The Qc₂ aquifer serves as a major source of supply in the east Covington Uplands near Lake Sawyer, and appears to be in hydraulic communication with the north/northeastern end of the lake. Natural discharge from the aquifer occurs primarily to the lower reaches of Soos Creek.

The Qc₃ and Qc₄ aquifers occur within the Kent area near the valley wall and within other localized areas of the Covington Uplands (e.g., at the City's Seven Oaks Well). The aquifers are relatively productive near the City, with well yields that can exceed 1,000 gpm. These deep aquifers are confined beneath the Covington Uplands and receive their recharge as regional-scale downward leakage through the confining aquitard layers. Natural discharge from aquifers that outcrop in the major river valley walls is in the form of springs and seeps that feed the surface rivers. The deeper aquifers (at or below sea level) may discharge naturally to deep valley-filling sediments or through upward leakage across confining aquitard layers in the valley margins. Rates of leakage are usually low, giving rise to good degrees of confinement, as evidenced by artesian water levels in some of the wells located at lower elevations.

There is a general absence of deep well information within the Covington Uplands that might be expected to reveal lateral extensions of these aquifers to the east. Deeper exploratory wells (greater than 500 feet deep) that have been drilled at Kent Springs, and within the Lake Meridian Water District and Covington Water District areas, typically penetrate a thick sequence of fine-grained deposits (clays and silts) with a consistent absence of appreciable water-yielding horizons at depth. Bedrock occurs at shallower depths in the north and east parts of the Covington Uplands, limiting the potential lateral extent of any unidentified deep Qc₃ or Qc₄ aquifers.

Kent Source Aquifers – Reliability

As noted above, five aquifer systems exist in the Covington Uplands area, all of which are presumed to be part of a larger, hydrostratigraphic unit. The City's largest groundwater sources, including Kent, Clark, and Armstrong Springs, are located in the shallower aquifer system (i.e., Qvr aquifer) situated within the Covington Uplands, which flows or discharges to both the Green and Cedar Rivers. Upstream of Clark Springs, the groundwater flows east to west; however, at Clark Springs the flow pattern splits, with groundwater discharge going to both the Green and Cedar Rivers.

The groundwater split that feeds Clark Springs has been determined by King County, the City, and Ecology to discharge to Rock Creek, which is tributary to the Cedar River. The groundwater flowing towards the Green River flows past the City's Kent Springs and Armstrong Springs wells. This same water flows toward Lake Sawyer, which discharges into Covington Creek, which in turn discharges into Soos Creek, which is tributary to the Green River. Kent Springs also has been determined to flow at times into Jenkins Creek, which also flows into Covington Creek and the Green River.

With the exception of one seasonal water right (irrigation of River Bend Golf Course), all of the City's water rights authorize continuous, annual withdrawals of its authorized quantities.

Clark Springs

The Clark Springs Water Supply System is located off of Kent-Kangley Road in a protected, partially fenced, greater than 320-acre section of the Rock Creek watershed (RM 1.8). This property, which is geographically separate from the City of Kent proper, was annexed to the City in 1958 for municipal water supply purposes. The balance of the area falling outside of the City's annexed property is bounded and regulated by the City of Maple Valley on the west, and unincorporated King County to the north, south, and east. Substantial development activity with related increases in impervious surface area and installation of over 300 exempt wells have been allowed to occur within the Rock Creek watershed over the past 30 years. Nevertheless, that portion of the watershed falling within the City's property remains largely in pristine condition.

The Clark Springs Water System is used on a continuous basis throughout the year and is comprised of three separate, but conjunctively managed sources: Clark Springs Trench; Rock Creek Surface Water Diversion; and Clark Springs Wells. Each of these sources draw upon the same shallow aquifer source (Qvr) and are in hydraulic continuity with each other.

The City's Clark Springs Trench is located near Kent-Kangley Road, east of the Maple Valley-Black Diamond Road. Rock Creek flows through the property in a westerly-northwesterly direction and is tributary to the Cedar River. Water is collected in the infiltration gallery, which is constructed of approximately 500 feet of perforated steel pipe placed perpendicular to Rock Creek, across a narrow valley of glacial till, and extending under the streambed.

The collection system and the transmission line were constructed in 1957. Water collected by the gallery system has been determined by the City's hydrogeologic studies to come from the Qvr aquifer, which is the same aquifer source used by the City's Clark Springs Wells and the Kent Springs Water System, as well as the Armstrong Springs Wells at a lower hydraulic gradient.

The design of the Trench infiltration gallery allows the simultaneous withdrawal of water under the Trench water right and the Rock Creek surface water right. This design also allows the City, when appropriate, to limit diversions allowed under its Rock Creek surface water rights (although use of this right is not subject to minimum in-stream flow conditions). In such circumstances, the production of instantaneous and annual quantities authorized under the Rock Creek water right may be voluntarily reduced and shifted to the Trench. This conjunctive management approach assists the City in meeting system demands in a reliable and continuous manner, while protecting in-stream flow conditions in Rock Creek.

Given the close hydraulic connections among the Clark Springs sources, the City has found it most effective from a production and environmental protection standpoint to operate these sources in a conjunctive manner, whereby the instantaneous and annual withdrawals of the system are limited to the cumulative totals allowed under the combined Clark Springs System surface water, springs, and groundwater rights (i.e., 5,400 gpm – Qi, and 8,710 acre-feet per year (afy) – Qa). Current and future operation and management of the Clark Springs Wells, water rights, and overall water supply system facilities are required to occur consistent with the City's Habitat Conservation Plan, Incidental Take Permit, and related Habitat Conservation Plan Implementation Agreement.

Due to the close proximity of the Clark Springs sources to the Landsburg Mine Site (Site), the City has advised Ecology of the City's serious concerns regarding the adequacy of the agency's environmental oversight of the Site, and the risk of a contamination event originating from the Site that results in the temporary or permanent loss of the Clark Springs Water Supply System. To this end, the City has submitted to Ecology comments in opposition to its cleanup action plan for the Site, seeking further investigation/action at the Site and a cleanup action plan more protective of area groundwater, including the Clark Springs source aquifers. The City also has implemented various activities to increase monitoring and sampling at and near Clark Springs.

Kent Springs

The Kent Springs source is located near Black Diamond. The City owns approximately 75 acres at this site. This property has been annexed into the City for municipal purposes. The site is segregated by Cran-Mar Creek, which flows through the property in a westerly direction. Prior to the incorporation of Maple Valley in 1997, and recent annexations by the City of Black Diamond, the Kent Springs Water System property was surrounded by unincorporated King County. Today, Kent Springs is bounded by Maple Valley to the north and east, Black Diamond to the south, and unincorporated King County to the west. Because the City does not regulate land use outside of its Kent Springs Water System property, the City's ability to affect land uses potentially affecting the recharge area for these wells, has been and remains limited.

The Kent Springs Water System is comprised of three wells and a spring fed infiltration gallery. Both sources withdraw supply from the same shallow Qvr aquifer, identified by hydrogeologic studies as the aquifer that also serves the Clark Springs System at a higher hydraulic gradient. Due to their close hydraulic connection, the Kent Springs Wells/spring sources are operated in a conjunctive manner to maximize instantaneous and annual withdrawal capacity.

Armstrong Springs

The Armstrong Springs Wells are located at State Route 516 (Kent-Kangley Road), and east of Wax Road. Both wells withdraw water downstream from the same shallow Qvr aquifer system that serves the Clark and Kent Springs Systems. During its 1998 Phase 1 wellhead protection program study, the City determined that water not captured by the Clark and Kent Springs Systems flows to the Armstrong Springs sources; therefore, the three sources are considered hydraulically connected.

North Kent Wellfield

The water rights originally issued for the 208th Street, 212th Street, and Garrison Creek Wells were changed by the City several years ago to allow for that water to be pumped from any of

those wells (the wells are recognized as all tapping the same body of public groundwater). Consequently, from a practical operational and regulatory standpoint, the well sources operate as a wellfield.

These wells draw water from a confined aquifer that originates beneath the Covington Uplands to the east and extends beneath the Green River Valley to the west.

The 208th Street and 212th Street Wells are flowing artesian in nature. They have an artesian shut-in pressure of approximately 15 to 20 pounds per square inch during the off-season. The 208th Street, 212th Street, and Garrison Creek Wells are hydraulically connected, as pumping of one well will result in a drop in static artesian pressure of the others. Also, the water quality (i.e., manganese and iron) conditions are somewhat similar in all wells.

East Hill

The East Hill Wells, both the 104th and 108th Avenue SE sites, are located along the eastern rim of the Kent Valley. The aquifer shows seasonal water level fluctuations, with the lowest static water levels occurring in the summer and fall months. These fluctuations can reduce the production available from the current active well.

Remaining Sites

The remaining City well sites are all within the City limits on the Covington Uplands, east of the Green River Valley. The exception being the River Bend Golf Course irrigation wells, which are drilled in the Green River Valley near the western valley margin.

Additional information on each of the City's existing potable sources is presented in [Chapter 2](#).

ROCK CREEK PROTECTION/CLARK SPRINGS WATER SUPPLY SYSTEM

Rock Creek is considered an important spawning ground for the Cedar River sockeye salmon, a stock that is recognized as depressed (Washington Department of Fish and Wildlife, et al., 1994). The extent of historic use of Rock Creek by Chinook salmon is uncertain, and recent use has been infrequent and unlikely to include any actual spawning. Rock Creek is used by Coho salmon for spawning.

Because of Rock Creek's outstanding natural habitat and its role in supporting the Clark Springs Water System, the City has a substantial and ongoing interest in preserving the health and vitality of the Rock Creek watershed. To that end, in 1997, the City installed a streamflow augmentation system that, depending on the aquifer levels, can supply up to 900 gpm (2.0 cubic feet per second (cfs)) of water to be discharged into Rock Creek (Figure 1-3) during low flow periods when listed salmonid species are spawning.

The flow augmentation system operates by pumping water from the clearwell in the Clark Springs System, from which it is then discharged to Rock Creek after aeration. The water available for flow discharge is subject to hydrologic conditions affecting the infiltration gallery. This system is operated periodically, especially when streamflows fall below 3 cfs during the October, November, and December salmonid spawning periods. Augmentation reduces the instantaneous amount of water available for the municipal water supply by the amount pumped to the stream.

The flow augmentation project described above was just one of the resource protection measures the Public Works Department implemented both prior and subsequent to the City's 2002 Water System Plan Update. Those measures include: 1) promoting responsible resource protection measures by governmental agencies and private parties within the Rock Creek basin; 2) sustained and effective monitoring of flow and aquatic habitat conditions; 3) improving flow and aquatic habitat conditions in Rock Creek; and 4) substantially minimizing/avoiding adverse operational effects upon listed species and aquatic habitat.

The listings of salmon and trout stocks in the Puget Sound Region (1998) under the Endangered Species Act (ESA) resulted in a decision by the Kent City Council on January 8, 2001, to notify the National Marine Fisheries Service (NMFS) and US Fish and Wildlife Service (USFWS) of the City's intent to voluntarily formalize its conservation activities under a Habitat Conservation Plan, and in so doing, obtain an Incidental Take Permit under Section 10(a)(1)(B) of the ESA for the operation of its Clark Springs Water Supply System (CSWSS) located adjacent to Rock Creek.

CLARK SPRINGS HABITAT CONSERVATION PLAN

In 2001, the City undertook efforts to prepare a Habitat Conservation Plan (HCP) in support of the City's application for an Incidental Take Permit (ITP) in conformance with Section 10(a)(2)(A) of the ESA.

The text of the HCP, which required over 6 years of studying and planning to prepare, was completed by the City in December 2010. The HCP was the product of a collaborative effort between the City and the federal fishery Services (Services), including the US Fish and Wildlife Service and the National Marine Fisheries Service, to meet the requirements of the ESA, domestic, industrial, and commercial water supply demands, fire flow requirements, and other related public safety needs of the City.

In more specific terms, the accomplishment of the HCP represents a long-term commitment by the City to protect important fish resources that may be impacted by future operations of the Clark Springs System and to mitigate those potential impacts to the maximum extent practicable.

With the HCP's completion, the City formalized its voluntary efforts to conserve and enhance important fish and wildlife habitat on the site and elsewhere in the Rock Creek basin. The final Environmental Impact Statement (EIS) for the HCP was prepared by the Services in spring of 2011.

On September 6, 2011, NMFS issued an ITP to the City, which shall be in effect until September 25, 2061. The ITP allows the City to operate its existing and proposed water supply operations in a lawful manner without threat of prosecution for incidental take that may occur to species covered by the ITP. An HCP Implementation Agreement was executed by USFWS, NMFS, and the City on September 26, 2011.

Implementing the HCP consistent with the ITP shall ensure that City activities to provide municipal water supply within its service area will include measures that benefit fish resources, in particular ESA-listed species such as bull trout and Chinook salmon, over both the short- and long-term. To this end, The City is currently in the process of designing, permitting, and constructing Habitat Conservation Measures (HCMs) outlined in the HCP.

WATER TREATMENT

All City water sources are chlorinated and fluoridated. In 2015, the Tacoma Green River filtration facility was completed, allowing for less-constrained use of the Tacoma supply. Aeration and sodium hydroxide pH adjustment are used at the Guiberson Reservoir site to treat blended Kent Springs and Tacoma RWSS water. The City also uses pH adjustment at the 212th Street Treatment Plant, Pump Station #5, and the East Hill (104th Avenue SE) Well.

WATER RIGHTS

EXISTING POTABLE WATER RIGHTS AND INTERTIES

The City currently holds 23 water rights that provide its potable and non-potable municipal water supply. In total, the City's water rights authorize a total instantaneous withdrawal rate (Q_i) of 23,458 gpm or 33.8 million gallons per day (MGD), and a total annual withdrawal volume (Q_a) of 19,885.6 afy (17.75 MGD). Within that total number of rights, the City holds one (1) water right claim and twenty-two (22) water right certificates.

In addition, the City has water available from the City of Tacoma RWSS. A summary of the water rights and water sources is presented in [Table 6-1](#), and the principal water right documents are contained in [Appendix H](#).

**Table 6-1
Existing Water Rights and Interties**

Water Right	Priority Date	Document	Use	Source Location	Instantaneous Rate (gpm)		Annual Volume (afy)	
					Additive	Non-additive	Additive	Non-additive
SWC 7232	10/14/1931	Cert	Municipal	Clark Springs	2,244	0	3,600	0
GWC 3107-A	2/18/1957	Cert	Municipal	Clark Springs	2,250	0	1,350	0
GWC 7660-A	2/4/1969	Cert	Municipal	Clark Springs	906	4,494	3,760	4,950
G1-123225CL	5/1/1909	L.F. Claim	Municipal	Kent Springs	4,488	0	965	0
G1-22956C	9/2/1977	Cert	Municipal	Kent Springs	3,690	0	5,904	0
G1-24189C	10/6/1982	Cert	Municipal	Armstrong Springs	1,300	0	0	500
G1-23614C	6/4/1980	Sup. Cert	Municipal	North Kent Wellfield	500	0	0	800
G1-24190C	10/6/1982	Sup. Cert	Municipal	North Kent Wellfield	2,700	0	0	1,400
G1-24404C	8/24/1983	Sup. Cert	Municipal	North Kent Wellfield	1,200	0	0	600
GWC 42-D	9/1/1923	Cert	Municipal	East Hill (104th)	60	0	90	0
GWC 44-A	9/12/1945	Cert	Municipal	East Hill (104th)	90	0	135	0
GWC 2890-A	9/12/1956	Cert	Municipal	East Hill (104th)	120	0	146	0
G1-23285C	1/4/1979	Cert	Municipal	East Hill (104th)	1,900	0	3,040	0
GWC 651-A	3/23/1948	Cert	Municipal	East Hill (108th)	60	0	42	0
GWC 2428-A	2/25/1953	Sup. Cert	Municipal	East Hill (108th)	120	0	78.4	0
GWC 767-A	1/18/1951	Sup. Cert	Municipal	O'Brien	243	0	45	0
G1-24073C	4/26/1982	Cert	Municipal	Soos Creek (Seven Oaks)	900	0	0	864
GWC 1116-A	6/17/1950	Cert	Municipal	Summit	200	0	320	0
GWC 494-A	7/29/1947	Cert	Municipal	Hamilton Road	38	0	30	0
GWC 4534-A	5/4/1962	Cert	Municipal	Hamilton Road	12	0	19.2	0
G1-23713C	10/15/1980	Cert	Municipal	High Meadows	7	0	11	0
GWC 1957-A	3/24/1952	Cert	Dom & Irr	Chappelear	140	0	60	0
G1-25204C	3/25/1988	Cert	Muni Irr	River Bend Golf Course	290	0	290	0
Total City Water Rights					23,458		19,885.6	
Total Tacoma RWSS					8,778		14,159	
Combined Total					32,236		34,044.6	

The City's water rights and water sources will be discussed based on location. All water rights divert or withdraw water from Water Resource Inventory Area (WRIA) 9 – Duwamish-Green, except for those water rights associated with the Clark Springs site, which is located in WRIA 8 – Cedar-Sammamish.

Ecology issued metering order DE 02WRNR-3754 dated April 1, 2002 to the City ([Appendix H](#)). This administrative order requires the City to install and maintain an approved measuring device on all points of diversion or withdrawal under almost all of its water rights. The two water rights that were not explicitly included were GWC 767-A (O'Brien) and GWC 1957-A (Chappelear). The meters need to be read weekly with the data submitted to Ecology on an annual basis (by January 31 of the following year).

Clark Springs

There are three water rights (Surface Water Certificate (SWC) 7232, Ground Water Certificate (GWC) 3107-A, and GWC 7660-A) authorizing one surface water diversion, one infiltration trench, and three wells associated with the Clark Springs site. Combined, these three water rights total 5,400 gpm and 8,710 afy, as limited by the most recently issued water right (GWC 7660-A). This site is the City's only site located in WRIA 8 with Clark Springs draining into Rock Creek, which then drains into the Cedar River.

Contrary to how these water rights have been depicted in the water right record and older water system plans, with the older two water rights being shown as being non-additive on both an instantaneous and annual basis, it is believed that the more accurate and proper way to display these water rights is shown in **Table 6-1**. This interpretation does not change the overall instantaneous rate or annual volume that can be withdrawn or diverted from any particular source at the Clark Springs site, but it more accurately represents the history of the water rights with the most junior water right placing an overall limit on both the instantaneous rate and annual volume that can be withdrawn.

GWC 7660-A contains minimum instream flow limitations for a control point located where Rock Creek crosses the Kent-Kangley Road at the downstream edge of the site. The flow in Rock Creek must be at or above the minimum levels as measured at that location, or else withdrawal of water under this water right must be stopped. The minimum instream flow levels for Rock Creek throughout the year are 15 cfs from January 1 through May 1, then decreasing arithmetically to 2 cfs by July 1, remaining at 2 cfs through October 31st, then 15 cfs from November 1st through December 31st. Diversion and withdrawal under the two older water rights (SWC 7232 and GWC 3107-A) are not subject to these minimum instream flow restrictions.

The City monitors stream conditions for the purposes of protecting fish and related aquatic habitat consistent with the HCP, in order to minimize/avoid potential adverse operational effects. During low flow events or seasonal conditions, the City may meet its current demand requirements by shifting its withdrawal of authorized, and required, quantities to its infiltration trench system.

Current and future operations and management of the Clark Springs site are required to occur consistent with the City's HCP, ITP, and related HCP Implementation Agreement.

Surface Water Certificate SWC 7232

SWC 7232, with a priority date of October 14, 1931, authorizes the diversion of a total of 5 cfs (4,488 gpm) for year round domestic supply from Rock Creek in the S ½ Section 26, Township 22 North, Range 6 East W.M., in WRIA 8. No annual volume limitation was specified, which was common practice at the time. The original certificate was issued to the City of Kent in July 1958. No changes have been made to this certificate since it was issued.

Pursuant to beneficial use of the water consistent with RCW 90.03.015, SWC 7232 qualifies as for municipal water supply purposes.

Ground Water Certificate GWC 3107-A

GWC 3107-A, with a priority date of February 18, 1957, authorizes the withdrawal of a total of 2,250 gpm and 1,350 afy for year round municipal supply from an infiltration trench located in

the S ½ Section 26, Township 22 North, Range 6 East W.M., in WRIA 8. The original certificate was issued to the City of Kent in July 1958. No changes have been made to this certificate since it was issued.

Ground Water Certificate GWC 7660-A

GWC 7660-A, with a priority date of February 4, 1969, authorizes the withdrawal of a total of 5,400 gpm and 8,710 afy under all of the City's Clark Springs site water rights, for year round municipal supply. This water right specifically authorizes withdrawal of water from three wells located in the S ½ Section 26, Township 22 North, Range 6 East W.M., in WRIA 8. This water right was granted subject to minimum instream flows for Rock Creek as measured at a point on the downstream side of the site. The original certificate was issued to the City of Kent in March 1972. No changes have been made to this certificate since it was issued.

Kent Springs

There are two water rights (Ground Water Claim G1-123225CL and certificate G1-22956C) authorizing diversion from the springs (infiltration gallery/trench) under the claim and three active wells under the certificate associated with the Kent Springs site. Combined, these water rights total 8,178 gpm and 6,869 afy. As will be discussed later, a Showing of Compliance with RCW 90.44.100(3) form was filed recently with Ecology to get Kent Springs Well #3 (completed in April 2001 with Unique Well ID AEC886) authorized under the water right certificate.

Ground Water Claim G1-123225CL

This ground water claim was filed on a long-form. G1-123225CL, with a claimed first date of use of May 1, 1909, claims a withdrawal of 10 cfs (4,448 gpm) and 965 afy for year round municipal supply from a spring located in the SE ¼ SW ¼ and SW ¼ SE ¼ Section 33, Township 22 North, Range 6 East W.M., in WRIA 9. The claim was filed by the City of Kent in June 1974. No changes have been made to this claim since it was filed.

Ground Water Certificate G1-22956C

G1-22956C, with a priority date of September 2, 1977, authorizes the withdrawal of a total of 3,690 gpm and 5,904 afy for year round municipal supply from two wells located in the SE ¼ SW ¼ Section 33, Township 22 North, Range 6 East W.M., in WRIA 9. The original certificate was issued to the City of Kent in February 1979. No changes have been made to this claim since it was filed.

Armstrong Springs

There is one ground water certificate (G1-24189C) and two active wells associated with the Armstrong Springs site. The water right is for 1,300 gpm and 500 afy with the annual volume being non-additive to other City water rights. The well names have changed over time and what was originally referred to as Wells #A-4 and #A-5, are now referred to as Armstrong Wells #1 and #2, respectively. These two wells at this site have been recognized as a wellfield by DOH.

Ground Water Certificate G1-24189C

G1-24189C, with a priority date of October 6, 1982, authorizes the withdrawal of 1,300 gpm and 500 afy (non-additive) for year round municipal supply from two wells located in the E ½ NE ¼ Section 36, Township 22 North, Range 5 East W.M., in WRIA 9. The original certificate was issued to the City of Kent in January 1986. No changes have been made to this certificate since it was issued.

North Kent Wellfield (208th Street, 212th Street, and Garrison Creek)

There are three water right certificates (G1-23614C, G1-24190C, and G1-24404C) and six wells associated with this area that make beneficial use of these water rights. Originally, each well location in this area was covered by a single water right. In 2003, Ecology approved changes to each water right such that now each well location is included as an authorized point of withdrawal under each water right. During the 2003 changes, all three water rights were authorized to use the 208th Street Well, 212th Street Wells #1 and #2, and the Garrison Creek Well #1. These changes provide the City with flexibility when it comes to operating these wells. Combined, these water rights total 4,400 gpm and 2,800 afy with the annual volume being non-additive to other City water rights.

There is currently 1 well (active) at the 208th Street location, 3 wells (all active) at the 212th Street location, and 2 wells (1 active and 1 inactive) at the Garrison Creek location. As will be discussed later, Showing of Compliance with RCW 90.44.100(3) forms were filed recently with Ecology to get 212th Street Well #3 (completed in May 2001 with Unique Well ID AFR915) and Garrison Creek Well #2 (completed in February 2004 with Unique Well ID AFT320) authorized under all three water rights.

The Garrison Creek Well #1 was damaged in the 2001 Nisqually Earthquake, an attempt was made to redevelop the well in 2003, but that effort failed. The failure of Garrison Creek Well #1 is what drove construction of Garrison Creek Well #2.

Ground Water Certificate G1-23614C

G1-23614C, with a priority date of June 4, 1980, authorizes the withdrawal of 500 gpm and 800 afy (non-additive) for year round municipal supply from four wells located in the NE ¼ SE ¼ and SE ¼ NW ¼ Section 7 and the SE ¼ SW ¼ Section 6, Township 22 North, Range 5 East W.M., in WRIA 9. A superseding certificate was issued to the City of Kent in September 2013, subsequent to Ecology's approval of a water right change application. The original certificate had been issued to the City of Kent in May 1983 for municipal supply from Garrison Creek Well #1.

Ground Water Certificate G1-24190C

G1-24190C, with a priority date of October 6, 1982, authorizes the withdrawal of 2,700 gpm and 1,400 afy (non-additive) for year round municipal supply from four wells located in the NE ¼ SE ¼ and SE ¼ NW ¼ Section 7 and the SE ¼ SW ¼ Section 6, Township 22 North, Range 5 East W.M., in WRIA 9. A superseding certificate was issued to the City of Kent in September 2013, subsequent to Ecology's approval of a water right change application. The original certificate had been issued to the City of Kent in April 1993 for municipal supply from 212th Street Wells #1 and #2.

Ground Water Certificate G1-24404C

G1-24404C, with a priority date of August 24, 1983, authorizes the withdrawal of 1,200 gpm and 600 afy (non-additive) for year round municipal supply from four wells located in the NE ¼ SE ¼ and SE ¼ NW ¼ Section 7 and the SE ¼ SW ¼ Section 6, Township 22 North, Range 5 East W.M., in WRIA 9. A superseding certificate was issued to the City of Kent in September 2013, subsequent to Ecology's approval of a water right change application. The original certificate had been issued to the City of Kent in April 1993 for municipal supply from the 208th Street Well.

East Hill (104th Avenue SE)

The East Hill (104th Avenue SE) site consists of four ground water certificates (GWC 42-D, GWC 44-A, GWC 2890-A, and G1-23285C). The combined total authorized by these water rights is 2,170 gpm and 3,411 afy.

The City acquired the water system and East Hill (104th Avenue SE) wells water rights from the original owner in 1978 during annexation of the area into the City. When acquired, the East Hill (104th Avenue SE) water rights were used to supply a water system that was serving more than 15 residential connections. Subsequent to their acquisition, these water rights have been beneficially used for City water supply, consistently documented in the City's water system plans, and expressly denoted in the City's water rights portfolio and listing of the City's water rights. Based on the definitions in the municipal water law (RCW 90.03.015), these water rights qualify as being for municipal water supply purposes.

There are currently 5 wells (1 active, 1 unequipped, and 3 inactive) at the East Hill (104th Avenue SE) site. The active well is the East Hill Well #1 (originally authorized as a point of withdrawal under G1-23285C). The unequipped well is East Hill Well #2 (Unique Well ID AFT321) that was completed in June 2004, but has yet to be equipped and connected to the City's distribution system. The three inactive wells were the original points of withdrawal under GWC 42-D, GWC 44-A, and GWC 2890-A. As will be discussed later, Showing of Compliance with RCW 90.44.100(3) forms were filed recently to get the wells added to GWC 42-D, GWC 44-A, and G1-23285C.

The specifics of each water right will be discussed in this section.

Ground Water Certificate 42-D

GWC 42-D, with a priority date of September 1, 1923, authorizes the withdrawal of 60 gpm and 90 afy for year round domestic supply and watering livestock for community from a well located in Tract 20 of R.O. Smith Orchard Tracts, in Section 20, Township 22 North, Range 5 East W.M., in WRIA 9. The original certificate was issued to the East Hill Community Well Company in March 1946. No changes have been made to this certificate since it was issued.

Ground Water Certificate 44-A

GWC 44-A, with a priority date of September 12, 1945, authorizes the withdrawal of 90 gpm and 135 afy for year round municipal supply from a well located in Tract 20 Smith's Orchard Tracts, Section 20, Township 22 North, Range 5 East W.M., in WRIA 9. The original certificate was issued to the East Hill Community Well Company in April 1947. No changes have been made to this certificate since it was issued.

Ground Water Certificate 2890-A

GWC 2890-A, with a priority date of September 12, 1956, authorizes the withdrawal of 120 gpm and 146 afy for year round community domestic supply from a well located in Lot 1 of R.J. Bower's Addition to King County of Section 20, Township 22 North, Range 5 East W.M., in WRIA 9. The original certificate was issued to the East Hill Community Well Company in August 1957. No changes have been made to this certificate since it was issued.

There is currently no active well at the location specified, and the City has been making beneficial use of this water right from the East Hill Well #1 located in Tract 20 of R.O. Smith Orchard Tracts, in Section 20, Township 22 North, Range 5 East W.M., through a *de facto* change.

Ground Water Certificate G1-23285C

G1-23285C, with a priority date of January 4, 1979, authorizes the withdrawal of 1,900 gpm and 3,040 afy for year round municipal supply from a well located in Block 20 R.O. Smith Orchard Tracts of Section 20, Township 22 North, Range 5 East W.M., in WRIA 9. This well is referred to as the East Hill Well #1. The original certificate was issued to the City of Kent in February 1982. No changes have been made to this certificate since it was issued.

East Hill (108th Avenue SE)

The East Hill (108th Avenue SE) site consists of two ground water certificates (GWC 651-A, and GWC 2428-A). The combined total authorized by these two water right certificates is 180 gpm and 120.4 afy.

There were historically 3 wells at the East Hills (108th Avenue SE) site (1 active and 2 inactive). As will be discussed later, a water right change will be filed on GWC 651-A to include the active well as an authorized point of withdrawal.

The City acquired the water system and East Hill (108th Avenue SE) site water rights from the original owner in 1964 during annexation of the area into the City. When acquired, the East Hill water rights were used to supply a water system that was serving more than 15 residential connections. Subsequent to their acquisition, these water rights have been beneficially used for City water supply, consistently documented in the City's water system plans, and expressly denoted the City's water rights portfolio and listing of the City's water rights. Based on the definitions in the municipal water law (RCW 90.03.015), these water rights qualify as being for municipal water supply purposes.

The well is currently operable, is run monthly to exercise the equipment, and serves as a back-up/standby water source that is not physically connected to the City's water distribution system. In the event of a large-scale natural disaster that compromises the City's water system, the well motor and pump can be operated with an on-site generator and can be used to pump water such that customers could travel to the site to receive potable water.

The specifics of each water right will be discussed in this section.

Ground Water Certificate 651-A

GWC 651-A, with a priority date of March 23, 1948, authorizes the withdrawal of 60 gpm and 42 afy for year round community water supply from a well located in the NE ¼ NW ¼ Section

29, Township 22 North, Range 5 East W.M., in WRIA 9. The original certificate was issued to the East Hill Water Co., Inc. in June 1951. No changes have been made to this certificated right since it was issued.

There is currently no active well at the location specified and the City has been making beneficial use of this water right from the East Hill Well #1 located in Section 20, Township 22 North, Range 5 East W.M., and from the 108th Avenue Well located in Section 29, Township 22 North, Range 5 East W.M. through a *de facto* change.

Ground Water Certificate 2428-A

GWC 2428-A, with a priority date of February 25, 1953, authorizes the withdrawal of 120 gpm and 78.4 afy for year round municipal supply from the 108th Avenue Well located in the NW ¼ NW ¼ NE ¼ Section 29, Township 22 North, Range 5 East W.M., in WRIA 9. A superseding certificate was issued to the City of Kent in July 2015 after the City requested that Ecology conform the water right to recognize it as being for municipal water supply purposes. The original certificate had been issued to the East Hill Water Co., Inc. in December 1955 for domestic supply for community.

Ground Water Claim G1-123227CL

In addition to the ground water certificates, there is a ground water claim in the City's name for this site as well. That claim is G1-123227CL. The claimed rate is 150 gpm and the claimed annual volume is 241 afy. The date of first use is identified as October 1964. Since October 1964 is after Chapter 90.44 RCW was established, it is assumed that this claim does not represent a vested right. For this reason, it is not included in the City's water rights total.

O'Brien

There is one ground water certificate (GWC 767-A) for the O'Brien site, which has two (1 active and 1 inactive) wells. As will be discussed later, a Showing of Compliance with RCW 90.44.100(3) form was filed recently with Ecology to get the O'Brien Well #2 (Unique Well ID AEJ475) completed in September 1999, authorized under the water right.

Ground Water Certificate 767-A

GWC 767-A, with a priority date of January 18, 1951, authorizes the withdrawal of 243 gpm and 45 afy for year round municipal supply from one well located within Tract 27 of Shinn's Cloverdale Addition to Kent Section 7, Township 22 North, Range 5 East W.M., in WRIA 9. A superseding certificate was issued to the City in July 2015 after the City requested that Ecology conform the water right to recognize it as being for municipal water supply purposes. The original certificate had been issued to the O'Brien Water Users Association, Inc. in September 1951 for domestic supply of community.

Ground Water Claim G1-123226CL

In addition to the ground water certificate, there is a ground water claim in the City's name for this site. That claim is G1-123226CL. The claimed rate is 60 gpm and the claimed annual volume is 96.5 afy. The date of first use is identified as February 1959. Since February 1959 is after Chapter 90.44 RCW was established, it is assumed that this claim does not represent a vested right. For this reason, it is not included in the City's water rights total.

Soos Creek (Seven Oaks)

There is one ground water certificate (G1-24703C) and one active well associated with the Soos Creek (Seven Oaks) site.

Ground Water Certificate G1-24073C

G1-24073C, with a priority date of April 26, 1982, authorizes the withdrawal of 900 gpm and 864 afy (non-additive) for year round municipal supply from one well located within SW ¼ NW ¼ Section 28, Township 22 North, Range 5 East W.M., in WRIA 9. The original certificate was issued to the City of Kent in November 1984. No changes have been made to this certificate since it was issued.

Summit

There is one ground water certificate (GWC 1116-A) and one active well associated with the Summit site. The active well has been redeveloped to correct a sanding issue. The well is currently operable, is run monthly to exercise the equipment, and serves as a back-up/standby water source that is not physically connected to the City's water distribution system. In the event of a large-scale natural disaster that compromises the City's water system, the well motor and pump can be operated with an on-site generator and can be used to pump water such that customers could come to the site to receive potable water.

Ground Water Certificate 1116-A

GWC 1116-A, with a priority date of June 17, 1950, authorizes the withdrawal of 200 gpm and 320 afy for year round municipal supply from one well located within Lot 11, Block 4 of City View Addition to Kent, Section 19, Township 22 North, Range 5 East W.M., in WRIA 9. The original certificate was issued to the City of Kent in July 1952. No changes have been made to this certificate since it was issued.

Hamilton Road

There are two ground water certificates (GWC 494-A and GWC 4534-A) and two wells associated with the Hamilton Road site. Combined, these two water rights total 50 gpm and 49.2 afy. The City acquired the water system and water rights from the original owner in 1967 during annexation of the area into the City. When acquired, the water rights were used to supply a water system that was serving more than 15 residential connections. Subsequent to their acquisition, these water rights have been consistently documented in the City's water system plans, denoted within the City's water rights portfolio. Based on the definitions in the municipal water law (RCW 90.03.015), these water rights qualify as being for municipal water supply purposes.

These water rights are being retained and managed by the City to meet future municipal demand.

Ground Water Certificate GWC 494-A

GWC 494-A, with a priority date of July 29, 1947, authorizes the withdrawal of 38 gpm and 30 afy for year round domestic supply for community from one well located within the NW ¼ SE ¼ Section 18, Township 22 North, Range 5 East W.M., in WRIA 9. The original certificate

was issued to the Hamilton Road Community Water Company in November 1950. No changes have been made to this certificate since it was issued.

Ground Water Certificate GWC 4534-A

GWC 4534-A, with a priority date of May 4, 1962, authorizes the withdrawal of 12 gpm and 19.2 afy for year round community domestic supply from one well located within the N ½ NE ¼ NW ¼ SE ¼ Section 18, Township 22 North, Range 5 East W.M., in WRIA 9. The original certificate was issued to the Hamilton Road Community Water Company in June 1963. No changes have been made to this certificate since it was issued.

High Meadows

There is currently one ground water certificate (G1-23713C) and one well associated with the High Meadows site. This water right is being retained and managed by the City to meet future municipal demand.

Ground Water Certificate G1-23713C

G1-23713C, with a priority date of October 15, 1980, authorizes the withdrawal of 7 gpm and 11 afy for year round municipal supply from one well located within the NE ¼ SW ¼ NW ¼ Section 17, Township 22 North, Range 5 East W.M., in WRIA 9. The original certificate was issued to the City of Kent in November 1984. No changes have been made to this certificate since it was issued.

Chappelear

There is one ground water certificate (GWC 1957-A) and one well at the Chappelear site. This water right is maintained as a standby water supply source for the City. This water right is being retained by the City to meet future municipal demand.

Ground Water Certificate GWC 1957-A

GWC 1957-A, with a priority date of March 24, 1952, authorizes the withdrawal of 140 gpm and 60 afy for year round domestic supply and irrigation of 30 acres from one well located in the NE ¼ SW ¼ Section 4, Township 21 North, Range 5 East W.M., in WRIA 9. The original certificate was issued to Harry M. Chappelear in August 1954. No changes have been made to this certificate since it was issued.

Tacoma Regional Water Supply System

The City is authorized to take up to 12.64 million gallons per day (MGD) (equal to 8,778 gpm and 14,159 afy) from Tacoma's RWSS as a partner. The water right utilized by the City of Tacoma for this water supply is surface water permit S1-00726P. S1-00726P is classified as an interruptible water right as it contains a provision requiring that diversion can only occur when minimum instream flows are met in the Green River at USGS gage 12106700. The minimum instream flows for normal and critical years are outlined in the permit as well as in WAC 173-509-030.

Over the past several years, the City has evaluated how Tacoma RWSS water could be used to provide source water for a proposed aquifer storage and recovery well at Lakehaven's

Optimization of Aquifer Storage for Increased Supply (OASIS) project. Water stored during the winter would be used to meet summer peaking and emergency standby/reliability standard requirements.

PENDING POTABLE WATER RIGHT APPLICATIONS

The City has two water right applications for additional municipal potable water supply pending before Ecology.

Potable Applications

Ground Water Application G1-27619A

G1-27619A, with a priority date of May 22, 1995, requests the withdrawal of 1,200 gpm and 500 afy for year round municipal supply from two wells located within the E ½ SW ¼ Section 4, Township 21 North, Range 5 East W.M., in WRIA 9. This application remains pending in Ecology's water right application processing queue.

Ground Water Application G1-27620A

G1-27620A, with a priority date of May 22, 1995, requests the withdrawal of 7,000 gpm and 6,496 afy for year round municipal supply from three wells located within the SE ¼ SE ¼ Section 7 and SW ¼ SW ¼ Section 8, Township 21 North, Range 5 East W.M., in WRIA 9. This application proposed to take water from wells in close proximity to the Green River during high flows for placement in storage and later use during high demand periods. This application remains pending in Ecology's water right application processing queue.

NON-POTABLE WATER RIGHTS HELD BY THE CITY

The City holds one ground water certificate (G1-25204C) that is for purposes other than potable water supply. This water right is mentioned here due to its ownership by the City but is not included in any of the calculations when comparing the City's water supply available to meet existing or future potable municipal demands.

River Bend Golf Course

The River Bend Golf Course is owned and operated by the City and the City has one water right and two wells (1 active and 1 inactive) at this location. Since this water right was issued to the City and is for a governmental or governmental proprietary purpose (irrigation of a golf course), under RCW 90.03.015(4)(b), the water right is considered to be for municipal water supply purposes. This water right is used exclusively for irrigation of the golf course and is not physically connected to the City's potable water distribution system.

As will be discussed later, a Showing of Compliance with RCW 90.44.100(3) form was filed recently with Ecology to get the River Bend Golf Course Well #2 (completed in August 2016 with Unique Well ID APP320) authorized under the water right.

Ground Water Certificate G1-25204C

G1-25204C, with a priority date of March 25, 1988, authorizes the withdrawal of 290 gpm and 290 afy for seasonal irrigation of 145 acres of the River Bend Golf Course from one well located

within the NE ¼ SE ¼ Section 22, Township 22 North, Range 4 East W.M., in WRIA 9. The original certificate was issued to the City of Kent Parks and Recreation Department in May 1990. No changes have been made to this certificate since it was issued.

NON-POTABLE AND NON-CONSUMPTIVE WATER RIGHT APPLICATIONS HELD BY THE CITY

The City has submitted three ground water applications (G1-27608A, G1-27778A, and G1-27914A) for non-consumptive streamflow augmentation of Mill Creek. These water right applications are included in this water system plan for completeness but are not included in any of the calculations when looking at the City's water supply available to meet existing or future potable municipal demands.

Mill Creek Streamflow Augmentation

The goal of the proposed Mill Creek Streamflow Augmentation Project is to increase critically low summer base flows in Mill Creek by pumping shallow ground water and then aerating it prior to discharge into the stream. Mill Creek is one of the City's major streams and experiences extremely low base flows (approximately 0.5 to 2.0 cfs) during the summer months. Primary benefits desired are to improved salmonid habitat by enhancing water quality and increasing available habitat by roughly doubling summertime streamflows.

Ground Water Application G1-27608A

G1-27608A, with a priority date of April 25, 1995, requests the withdrawal of 200 gpm and 100 afy for streamflow augmentation of Mill Creek during the low-flow season from one well located within the NW ¼ Section 19, Township 22 North, Range 5 East W.M., in WRIA 9. This application remains pending in Ecology's water right application processing queue.

Ground Water Application G1-27778A

G1-27778A, with a priority date of November 7, 1996, requests the withdrawal of 750 gpm and 400 afy for streamflow augmentation of Mill Creek during the low-flow season from four wells located within the S ½ Section 11, Township 22 North, Range 4 East W.M., in WRIA 9. This application remains pending in Ecology's water right application processing queue.

Ground Water Application G1-27914A

G1-27914A, with a priority date of May 1, 1998, requests the withdrawal of 100 gpm and 80 afy for streamflow augmentation of Mill Creek during the low-flow season from one well located within the SE ¼ SW ¼ Section 1, Township 22 North, Range 4 East W.M., in WRIA 9. This application remains pending in Ecology's water right application processing queue.

PERMIT EXEMPT WELLS

In 2016, the Washington State Supreme Court issued its decision in the case of Whatcom County v. Western Washington Growth Management Hearings Board, 186 Wn.2d 648 (2016) (often referred to as the "Hirst" decision). In the Hirst case, the court determined that counties and cities could not issue building permits reliant on permit exempt wells in 15 Puget Sound basins if beneficial use of the proposed well could impact senior minimum flows and/or closed surface

waters – irrespective of whether an adopted instream flow rule allows such use. The City is located within WRIA 8 (Cedar – Sammamish) and WRIA 9 (Duwamish-Green), both of which are affected basins.

As a consequence of the Hirst decision, local governments, including the City, were compelled to advise building permit applicants that the use of an exempt well to serve as a domestic water source may be subject to seasonal variations, curtailment, or other restrictions by Ecology, other agencies, or a court of law.

In 2018, the Washington State Legislature passed ESSB 6091, which allows permit exempt wells constructed in Hirst affected basins prior to the Act’s effective date (January 19, 2018) to serve as proof of adequate domestic supply for a building permit. Such prior-Act wells constructed in these basins, including WRIA 15, in compliance with Chapter 18.04 RCW, are not subject to the new restrictions, limitations, and fees imposed by the Act. This is regardless of whether the well was put to beneficial use prior to January 19, 2018. Projects using permit exempt wells for non-domestic purposes are also not affected by the Act.

Under the new law, those applicants within WRIAs 8 and 9 without constructed wells, and submitting building permits reliant on use of a permit exempt well (RCW 90.44.050) after January 19, 2018, are subject to its terms and limitations. Such applicants shall be limited to a maximum annual average withdrawal of 950 gallons per day (gpd) per connection. This amount may be reduced to 350 gpd for indoor use only during drought conditions. The quantitative and other limitations associated with ESSB 6091 shall remain in effect until a watershed restoration and enhancement plan is approved by Ecology and implementing rules are adopted.

In order to secure building permits, applicants located within the City’s corporate boundaries shall be required to pay the City a fee of \$500, \$350 of which is to be transmitted to Ecology. The City is required to record relevant water use restrictions with the property title.

Ecology is recommending that local jurisdictions located within Hirst affected basins adopt the following recording language:

“Domestic water use at this property is subject to a water use limitation of a maximum annual average withdrawal of 950 gallons per day, per connection, subject to the 5,000 gallon per day limit provided in RCW 90.44.050.”

WATER SUPPLY EVALUATION

An evaluation of the City’s combined existing potable water rights (excluding the Riverbend Golf Course Municipal Irrigation Water Right G1-25204C) and Tacoma RWSS contract was performed to determine the sufficiency of the water rights to meet both existing and future water demands. **Table 6-2** compares the combined maximum instantaneous water right/contract rates of the sources with the maximum day demand of the system, and the combined maximum annual water right/contract volume of the sources with the average day demand of the system. As shown in the table, the City has sufficient water rights (both instantaneous and annual amounts) to meet the demands of its existing customers.

Table 6-2
Existing Water Rights Evaluation

Description	Instantaneous Rights / Maximum Day Demand	Annual Rights / Average Day Demand	
	(gpm)	(afy)	(gpm)
Potable Water Rights	31,946	33,755	20,926
Existing (2016) Water Demand	11,629	8,627	5,348
Surplus (or Deficient) Rights	20,317	25,128	15,578

Table 6-3 summarizes the results of the future water rights evaluation, which compares the water rights and contracts of the existing sources with the system’s future 10-year, 20-year, and 50-year demand projections. The analyses considered future demand projections with and without water use reductions from the City’s planned water use efficiency efforts, as shown in the table. The results of the future water rights evaluation indicate the City has sufficient water rights to meet the demands through the year 2066.

**Table 6-3
Future Water Rights Evaluation**

Description	Instantaneous Rights / Maximum Day Demand	Annual Rights / Average Day Demand	
	(gpm)	(acre-feet)	(gpm)
Year 2026 (+10 years) Without Conservation			
Potable Water Rights	31,946	33,755	20,926
Projected Water Demand	12,375	9,180	5,691
Surplus (or Deficient) Rights	19,571	24,574	15,235
Year 2036 (+20 years) Without Conservation			
Potable Water Rights	31,946	33,755	20,926
Projected Water Demand	13,208	9,798	6,074
Surplus (or Deficient) Rights	18,738	23,957	14,852
Year 2066 (+50 years) Without Conservation			
Potable Water Rights	31,946	33,755	20,926
Projected Water Demand	16,841	12,494	7,745
Surplus (or Deficient) Rights	15,105	21,261	13,181
Year 2026 (+10 years) With Conservation			
Potable Water Rights	31,946	33,755	20,926
Projected Water Demand	11,899	8,827	5,473
Surplus (or Deficient) Rights	20,047	24,927	15,454
Year 2036 (+20 years) With Conservation			
Potable Water Rights	31,946	33,755	20,926
Projected Water Demand	12,716	9,433	5,848
Surplus (or Deficient) Rights	19,230	24,322	15,078
Year 2066 (+50 years) With Conservation			
Potable Water Rights	31,946	33,755	20,926
Projected Water Demand	16,289	12,084	7,491
Surplus (or Deficient) Rights	15,657	21,671	13,435

RECENT WATER RIGHT ACTIONS

Through the water system planning process, it was discovered that newer wells drilled at existing sites had not been added to the appropriate water rights as points of withdrawal. To rectify this problem, the City has submitted Showing of Compliance with RCW 90.44.100(3) forms for the wells and water rights located at the sites identified in the following sections.

Kent Springs

Water right G1-22956C authorizes withdrawal from two wells (Kent Springs Wells #1 and #2). The public notice identified the wells as being located in the SE ¼ SW ¼ Section 33, Township

22 North, Range 6 East W.M. There has been one additional well drilled at this site that is not currently referenced in the water right record as an authorized point of withdrawal. This well is referred to as Kent Springs Well #3 (Well ID Tag AEC866) and was completed in April 2001. The following action was taken to get Kent Springs Well #3 authorized as a point of withdrawal under this water right:

- Submitted a Showing of Compliance with RCW 90.44.100(3) form to identify Kent Springs Well #3 (Well ID Tag AEC866) as an additional point of withdrawal under G1-22956C.

North Kent Wellfield (208th, 212th, and Garrison Creek)

Water rights G1-23614C, G1-24190C, and G1-24404C all went through a water right change application process in 2003 to have the authorized points of withdrawal include wells located at the 208th Street (208th Street Well), 212th Street (212th Street Wells #1 and #2), and Garrison Creek Well sites (Garrison Creek Well #1). The public notice identified the wells as being located in the SE ¼ SW ¼ Section 6 (208th), SE ¼ NW ¼ Section 7 (212th), and NE ¼ SE ¼ Section 7 (Garrison Creek), all in Township 22 North, Range 5 East W.M. There have been two additional wells drilled at these sites that are not currently referenced on the water rights as authorized points of withdrawal. These wells include the 212th Street Well #3 (Well ID Tag AFR915) completed in May 2001 and Garrison Creek Well #2 (Well ID Tag AFT320) completed in February 2004. The following actions were taken to get these two wells included as authorized points of withdrawal under these three water rights:

- Submitted Showing of Compliance with RCW 90.44.100(3) forms to identify the 212th Street Well #3 and Garrison Creek Well #2 as additional points of withdrawal under G1-23614C.
- Submitted Showing of Compliance with RCW 90.44.100(3) forms to identify the 212th Street Well #3 and Garrison Creek Well #2 as additional points of withdrawal under G1-24190C.
- Submitted Showing of Compliance with RCW 90.44.100(3) forms to identify the 212th Street Well #3 and Garrison Creek Well #2 as additional points of withdrawal under G1-24404C.

East Hill (104th Avenue SE)

Currently, there are five wells (3 inactive, 1 active, and 1 unequipped) at the East Hill (104th Avenue SE) site. Four water rights are associated with the site. The site is bisected by an administrative boundary, which complicates things slightly from a water right perspective. The public notice legal description for the wells under three of the water rights (GWC 42-D, GWC 44-A, and G1-23285C) is Block 20 R.O. Smith Orchard Tracts of Section 20, Township 22 North, Range 5 East W.M. The active well and unequipped well are both located within the published well legal description of GWC 42-D, GWC 44-A, and G1-23285C. The active well (East Hill Well #1) is only currently authorized under one water right (G1-23285C). The unequipped well is referred to as East Hill Well #2 (Well ID Tag AFT321) completed in June 2004, is not currently associated with any water right. The following actions were taken to get both wells included as authorized points of withdrawal under these four East Hill (104th Avenue SE) water rights:

- Submitted Showing of Compliance with RCW 90.44.100(3) forms to identify East Hill Well #1 as a replacement point of withdrawal under GWC 42-D and GWC 44-A.
- Submitted Showing of Compliance with RCW 90.44.100(3) forms to identify the East Hill Well #2 (Unique Well ID AFT321) as an additional point of withdrawal under GWC 42-D, GWC 44-A, and G1-23285C.

O'Brien

Water right GWC 767-A authorizes withdrawal from the original O'Brien Well (O'Brien Well #1). The public notice identified the well as being located in Tract 27 of Shinn's Cloverdale Addition to Kent, Washington, Section 7, Township 22 North, Range 5 East W.M. There has been one additional well drilled at this site that is not currently referenced on the water right as an authorized point of withdrawal. This well is referred to as O'Brien Well #2 (Well ID Tag AEJ475) and was completed in September 1999. The following action was taken to get O'Brien Well #2 authorized as a point of withdrawal under this water right:

- Submitted a Showing of Compliance with RCW 90.44.100(3) form to identify O'Brien Well #2 (Well ID Tag AEJ475) as an additional point of withdrawal under GWC 767-A.

River Bend Golf Course

Water right G1-25204C authorizes withdrawal from the original River Bend Golf Course Well. The original River Bend Golf Course Well experienced decreased production and could not be rehabilitated. The public notice identified the well as being located in the NE ¼ SE ¼ Section 22, Township 22 North, Range 4 East W.M. There has been one additional well drilled at this site that is not currently referenced on the water right as an authorized point of withdrawal. This well is referred to as River Bend Golf Course Well #2 (Well ID Tag APP320) and was completed in August 2016. The following action was taken to get the River Bend Golf Course Well #2 authorized as a point of withdrawal under this water right:

- Submitted a Showing of Compliance with RCW 90.44.100(3) form to identify River Bend Golf Course Well #2 (Well ID Tag APP320) as an additional point of withdrawal under G1-25204C.

LONG-TERM WATER SUPPLY PLANNING

Although the City has sufficient water rights to supply the water system through 2066 and beyond, some facility improvements are necessary to fully utilize the City's existing water rights.

The existing sources of supply for the City's water system are a mixture of City owned and operated spring and ground water sources in both WRIA 8 and WRIA 9 authorized under City-held water rights, combined with receipt of treated water from the City of Tacoma's regional water supply system. As the City moves forward, its intention is to rehabilitate and upgrade its facilities to allow for full utilization of its City-owned sources up to the water right limits, as opposed to pursuit of new water rights.

FEASIBILITY OF OBTAINING NEW WATER RIGHTS

When considering supply redundancy, one option to investigate is the ability to obtain new water rights for municipal purposes. The City's current water sources and municipal boundary fall within both WRIA 8 – Cedar-Sammamish (Clark Springs site) and WRIA 9 – Green-Duwamish (majority of the City). Both WRIsAs have administrative rules that establish the requirements that must be met before there can be an issuance of new water rights.

The Green River and Cedar Rivers are subject to minimum instream flow rules and/or agreements that effectively preclude all new surface water withdrawals beyond those occurring during high flow winter months. Since the City of Tacoma secured a flow-restricted, seasonal water right on the Green River for its Second Supply/P-5 project in the 1980's, no further surface water applications have been approved by Ecology due to ongoing concerns relating to flow levels, cumulative impacts, and tribal treaty rights. Moreover, because streams tributary to the Green and Cedar Rivers have been closed by administrative rule to further appropriation, Ecology has not seriously entertained the issuance of new primary rights for these surface waters for several years. Due to the foregoing factors, and the advent of the Endangered Species Act, development of new additive surface water rights is not considered a viable supply alternative.

Application for Emergency Source Water Right

As a result of the contamination risk posed by the Landsburg Mine Site to its Clark Springs Water Supply System (CSWSS) and Rock Creek, the City intends to undertake the studies and analysis necessary to submit an emergency source water right application to Ecology. The City's goal in this regard is to secure an emergency supply source in close proximity to the existing CSWSS with the capacity to replace as much of the CSWSS supply as possible. The emergency source application process, which will be undertaken consistent with the permit requirements cited in Ecology Water Resources Program Policy POL-1045, will include a request for a pre-application meeting with Ecology, a request for a preliminary permit approval to undertake appropriate source testing, and consultations with the Muckleshoot Indian Tribe.

FEASIBILITY OF TRANSFERRING EXISTING WATER RIGHTS

Changing attributes of existing City-owned water rights is dependent on passing the statutory tests outlined in Chapters 90.03 and 90.44 RCW and as clarified in case law.

North Kent Wellfield Expansion to Include O'Brien Site

Water right changes include a variety of options, including changes in place of use, purpose of use, and to the point of diversion or withdrawal of water, as well as the addition of points of diversion or withdrawals to allow groundwater production in a wellfield configuration. As noted earlier, the City has secured approval to operate its 208th Street, 212th Street, and Garrison Creek Wells in a wellfield configuration under its water rights to restore the production capacity affected by the Nisqually Earthquake. Due to the close physical proximity and hydrogeologic relationship of this wellfield to the O'Brien site (Cert. No. 767-A), the City intends to submit water right change applications to include the O'Brien site Well #2 as an additional point of withdrawal to the existing North Kent Wellfield water rights (G1-23614C, G1-24190C, and G1-24404C) and to include the North Kent Wellfield wells as additional points of withdrawal under GWC 767-A.

DRINKING WATER REGULATIONS

OVERVIEW

The quality of drinking water in the United States is regulated by the Environmental Protection Agency (EPA). Under provisions of the Safe Drinking Water Act (SDWA), the EPA is allowed to delegate primary enforcement responsibility for water quality control to each state. In the State of Washington, DOH is the agency responsible for implementing and enforcing the drinking water regulations. For the State of Washington to maintain primacy (delegated authority to implement requirements) under the SDWA, the state must adopt drinking water regulations that are at least as stringent as the federal regulations. In meeting these requirements, the State, in cooperation with the EPA, has published drinking water regulations that are contained in Chapter 246-290 WAC.

EXISTING REGULATIONS

The Federal SDWA was enacted in 1974, as a result of public concern about water quality. The SDWA sets standards for the quality of drinking water and requires water treatment, if these standards are not met. The SDWA also sets water testing schedules and methods that water systems must follow. In 1986, the SDWA was amended as a result of additional public concern and frequent contamination of groundwater from industrial solvents and pesticides. The 1986 Amendments require water systems to monitor and treat for a continuously increasing number of water contaminants identified in the new federal regulations. The EPA regulated approximately 20 contaminants between 1974 and 1986. The 1986 Amendments identified 83 contaminants that EPA was required to regulate by 1989. Implementation of the new regulations has been marginally successful due to the complexity of the regulations and the associated high costs. To rectify the slow implementation of the new regulations, the SDWA was amended again and re-authorized in August of 1996.

In response to the 1986 SDWA Amendments, EPA established six rules, known as the Phase I Rule, Phase II and IIB Rules, Phase V Rule, Surface Water Treatment Rule, Total Coliform Rule, and Lead and Copper Rule. The EPA regulates most chemical contaminants through the Phase I, II, IIB, and V Rules. The City's active sources are affected by many of these rules.

The EPA set two limits for each contaminant that is regulated under the rules. The first limit is a health goal, referred to as the Maximum Contaminant Level Goal (MCLG). The MCLG is zero for many contaminants, especially known cancer-causing agents (carcinogens). The second limit is a legal limit, referred to as the Maximum Contaminant Level (MCL). The MCLs are equal to or higher than the MCLGs; however, most MCLs and MCLGs are the same, except for contaminants that are regulated as carcinogens. The health goals (MCLGs) for carcinogens are typically zero, because they cause cancer and it is assumed that any amount of exposure may pose some risk of cancer. A summary of each rule follows.

To fully understand the discussion that follows, a brief definition of several key terms is provided below.

- Organic Chemicals – Animal or plant produced substances containing carbon and other elements such as hydrogen and oxygen.

- Synthetic Organic Chemicals (SOCs) – Man-made organic substances, including herbicides, pesticides, and various industrial chemicals and solvents.
- Volatile Organic Chemicals (VOCs) – Chemicals, as liquids, that evaporate easily into the air.
- Inorganic Chemicals (IOCs) – Chemicals of mineral origin that are naturally occurring elements. These include metals such as lead and cadmium.

Phase I Rule

The Phase I Rule, which was the EPA’s first response to the 1986 Amendments, provided limits for eight VOCs that may be present in drinking water. VOCs are used by industries in the manufacturing of rubber, pesticides, deodorants, solvents, plastics, and other chemicals. VOCs are found in everyday items such as gasoline, paints, thinners, lighter fluid, mothballs, and glue, and are typically encountered at dry cleaners, automotive service stations, and elsewhere in industrial processes. The City currently complies with all contaminant monitoring requirements under this rule.

Phase II and IIb Rules

The Phase II and IIb Rules updates and creates limits for 38 contaminants (organics and inorganics). Some of the contaminants are frequently applied agricultural chemicals (nitrate), while others are more obscure industrial chemicals. The City currently complies with all contaminant monitoring requirements under this rule.

Phase V Rule

The Phase V Rule sets standards for 23 additional contaminants, of which 18 are organic chemicals (mostly pesticides and herbicides) and 5 are IOCs (such as cyanide). The City currently complies with all contaminant monitoring requirements under this rule.

Surface Water Treatment Rule

Surface water sources, such as rivers, lakes, and reservoirs (which are open to the atmosphere and subject to surface runoff), and GWI sources are governed by the Surface Water Treatment Rule. The SWTR seeks to prevent waterborne diseases caused by the microbes *Cryptosporidium*, *Legionella*, and *Giardia lamblia*, which are present in most surface waters. The rule requires disinfection of all surface water and GWI sources. All surface water and GWI sources must also be filtered, unless a filtration waiver is granted. A filtration waiver may be granted to systems with pristine sources that continuously meet stringent source water quality and protection requirements. The City’s water supply is classified as groundwater at all sources except for the Tacoma Regional Water Supply. Tacoma Public Utilities is responsible for monitoring and satisfying the water quality requirements for the Tacoma Second Supply Pipeline Source.

Interim Enhanced Surface Water Treatment Rule

The Interim Enhanced Surface Water Treatment Rule (IESWTR) became effective concurrent with the Stage 1 Disinfectants/Disinfection Byproducts Rule. The rule primarily applies to public water systems that serve 10,000 or more people and use surface water or GWI sources. The rule also requires primacy agencies (i.e., DOH in Washington State) to conduct sanitary surveys of all

surface water and GWI systems, regardless of size. The rule is the first to directly regulate the protozoan *Cryptosporidium* and has set the MCLG for *Cryptosporidium* at zero. The City's water supply is classified as groundwater at all sources except for the Tacoma Regional Water Supply. Tacoma Public Utilities is responsible for monitoring and satisfying the water quality requirements for the Tacoma Second Supply Pipeline Source.

Long Term 1 Enhanced Surface Water Treatment Rule

The Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) addresses water systems using surface water or GWI sources serving fewer than 10,000 people. The rule extends protections against *Cryptosporidium* for smaller water systems. The City's water supply is classified as groundwater at all sources except for the Tacoma Regional Water Supply. Tacoma Public Utilities is responsible for monitoring and satisfying the water quality requirements for the Tacoma Second Supply Pipeline Source.

Revised Total Coliform Rule

The Revised Total Coliform Rule sets an MCL for *Escherichia Coli* (*E. coli*) and specifies the frequency and timing of coliform testing based on population served, public water system type, and source water type. When total coliform is detected, it is a treatment technique trigger. The water system must conduct an assessment of their water system facilities and operations and fix any sanitary defects. For confirmed *E. coli* incidents, known as an *E. coli* MCL violation, the water system must perform a Level 2 assessment and provide public notice within 24 hours. If a positive sample is collected on a consecutive system, the City will also need to collect source samples.

Coliform is a group of bacteria, some of which live in the digestive tract of humans and many animals, and are excreted in large numbers with feces. Coliform can be found in sewage, soils, surface waters, and vegetation. The presence of any coliform in drinking water indicates a potential health risk and potential waterborne disease outbreak, which may include gastroenteric infections, dysentery, hepatitis, typhoid fever, cholera, and other infectious diseases. *E. coli* is a member of the coliform group which is almost exclusively of fecal origin, and their presence can lead to increased health risks.

A copy of the City's Water Quality Monitoring Plan, including the coliform monitoring program and *E. coli* response plan, is contained in [Appendix I](#).

Lead and Copper Rule

The Lead and Copper Rule identifies action levels for both lead and copper. An action level is different than an MCL. An MCL is a legal limit for a contaminant, and an action level is a trigger for additional prevention or removal steps. The action level for lead is greater than 0.015 milligrams per liter (mg/L). The action level for copper is greater than 1.3 mg/L. If the 90th percentile concentration of either lead or copper from the group of samples exceeds these action levels, a corrosion control study must be undertaken to evaluate strategies and make recommendations for reducing the lead or copper concentration below the action levels. The rule requires systems that exceed the lead level to educate the affected public about reducing its lead intake. Systems that continue to exceed the lead action level after implementing corrosion control and source water treatment may be required to replace piping in the system that contains lead sources. Corrosion control is typically accomplished by increasing the pH of the water to

make it less corrosive, which reduces its ability to break down water pipes and absorb lead or copper.

Lead is a common metal found throughout the environment in lead-based paint, air, soil, household dust, food, certain types of pottery, porcelain, pewter, brass, and water. Lead can pose a significant health risk if too much of it enters the body. Lead builds up in the body over many years and can cause damage to the brain, red blood cells, and kidneys. The greatest risk is to young children and pregnant women. Lead can slow normal mental and physical development of growing bodies.

Copper is a common, natural, and useful metal found in our environment. It is also a trace element needed in most human diets. The primary impact of elevated copper levels in water systems is stained plumbing fixtures. At certain levels (well above the action levels), copper may cause nausea, vomiting, and diarrhea. It can also lead to serious health problems in people with Wilson's disease. Long-term exposure to elevated levels of copper in drinking water could also increase the risk of liver and kidney damage. The City currently complies with all contaminant monitoring and treatment requirements under this rule.

Radionuclides Rule

The EPA established interim drinking water regulations for radionuclides in 1976 under the SDWA. MCLs were established for alpha, beta, and photon emitters, and radium 226/228. Radionuclides are elements that undergo a process of natural decay and emit radiation in the form of alpha or beta particles and gamma photons. The radiation can cause various kinds of cancers, depending on the type of radionuclide exposure from drinking water. The regulations address both man-made and naturally occurring radionuclides in drinking water.

The 1986 Amendments to the SDWA finalized the regulations for radionuclides by eliminating the term "interim." The amendments also directed the EPA to promulgate health-based MCLGs, as well as MCLs. The EPA failed to meet the statutory schedules for promulgating the radionuclide regulations, which resulted in a lawsuit. In 1991, the EPA proposed revisions to the regulations, but a final regulation based on the proposal was never promulgated. The 1996 Amendments to the SDWA directed the EPA to revise a portion of the earlier proposed revisions, adopt a schedule, and review and revise the regulations every 6 years, as appropriate, to maintain or improve public health protection. Subsequent to the 1996 Amendments, a 1996 court order required the EPA to either finalize the 1991 proposal for radionuclides or to ratify the existing standards by November 2000.

The final rule was published in the Federal Register on December 7, 2000, and became effective on December 8, 2003. The rule established an MCLG of zero for the four regulated contaminants and MCLs of 5 picocuries per liter (pCi/L) for combined radium-226 and radium-228, 15 pCi/L for gross alpha (excluding radon and uranium), 4 millirems per year (mrem/year) for beta particle and photon radioactivity, and 30 micrograms per liter ($\mu\text{g/L}$) for uranium. The City currently complies with all contaminant monitoring requirements under this rule.

Wellhead Protection Program

Section 1428 of the 1986 SDWA Amendments mandates that each state develops a wellhead protection program. The Washington State mandate for wellhead protection, and the required elements of a wellhead protection program, is contained in WAC 246-290-135, Source

Protection, which became effective in July of 1994. In Washington State, DOH is the lead agency for the development and administration of the State's wellhead protection program.

A wellhead protection program is a proactive and ongoing effort of a water purveyor to protect the health of its customers by preventing contamination of the groundwater that it supplies for drinking water. All federally defined Group A public water systems that use groundwater as their source are required to develop and implement a wellhead protection program. All required elements of a local wellhead protection program must be documented and included in either the Water System Plan (applicable to the City) or a Small Water System Management Program document (not applicable to the City). A copy of the City's Wellhead Protection Program is contained in [Appendix J](#).

Consumer Confidence Report

The CCR is the centerpiece of the right-to-know provisions of the 1996 Amendments to the SDWA. The annual report must be updated and re-issued to all customers by July 1st of each year thereafter.

The CCR is a report on the quality of water that was delivered to the water users during the previous calendar year. The reports must contain certain specific elements, but may also contain other information that the purveyor deems appropriate for public education. Some, but not all, of the information that is required in the reports includes the source and type of the drinking water, type of treatment, contaminants that have been detected in the water, potential health effects of the contaminants, identification of the likely source of contamination, violations of monitoring and reporting, and variances or exemptions to the drinking water regulations. A copy of the City's most recent CCR is contained in [Appendix K](#).

Stage 1 Disinfectants/Disinfection Byproducts Rule

Disinfection byproducts (DBPs) are formed when free chlorine reacts with organic substances, most of which occur naturally. These organic substances (called precursors) are a complex and variable mixture of compounds. The DBPs themselves may pose health risks. Trihalomethanes (THM) are a category of DBPs that had been regulated previous to this rule. However, systems with groundwater sources that serve a population of less than 10,000 were not previously required to monitor for THM.

The rule applies to the City and most other water systems, including systems serving fewer than 10,000 people that add a chemical disinfectant to the drinking water during any part of the treatment process. The rule reduced the MCL for total THM, which are a composite measure of four individual THM, from the previous interim level of 0.10 mg/L to 0.08 mg/L. The rule established MCLs and requires monitoring of three additional categories of DBPs (0.06 mg/L for five haloacetic acids (HAA5), 0.01 mg/L for bromate, and 1.0 mg/L for chlorite). The rule established maximum residual disinfectant levels for chlorine (4.0 mg/L), chloramines (4.0 mg/L), and chlorine dioxide (0.8 mg/L). The rule also requires systems using surface water or groundwater directly influenced by surface water to implement enhanced coagulation or softening to remove DBP precursors, unless alternative criteria are met. The City currently complies with all contaminant monitoring requirements under this rule.

Unregulated Contaminant Monitoring Regulation

The EPA established the Unregulated Contaminant Monitoring Regulation (UCMR) to generate data on contaminants that are being considered for inclusion in new drinking water standards. The information collected by select public water systems will ensure that future regulations established by the EPA are based on sound science.

Three separate lists of unregulated contaminants are maintained under the UCMR: List 1, List 2, and List 3. Contaminants are organized on the tiered lists based on the availability of standard testing procedures and the known occurrence of each contaminant, with List 1 containing contaminants that have established standard testing procedures and some, but insufficient, information on their occurrence in drinking water. Monitoring for contaminants on the three lists is limited to a maximum of 30 contaminants within a 5-year monitoring cycle, and the EPA is required to publish new contaminant monitoring lists every 5 years. As new lists are published, contaminants will be moved up in the lists if adequate information is found to support additional monitoring. All public water systems serving more than 10,000 people and a randomly selected group of smaller water systems are required to monitor for contaminants. The City currently monitors for some unregulated contaminants.

Arsenic

Arsenic is highly toxic, affects the skin and nervous system, and may cause cancer. The Arsenic Rule sets the MCLG of arsenic at zero and reduces the MCL from the previous standard of 0.05 mg/L to 0.01 mg/L. Arsenic's monitoring requirements will be consistent with the existing requirements for other inorganic contaminants. The City complies with this rule since its surface and groundwater sources have naturally low levels of arsenic that are below the MCL.

Filter Backwash Recycling Rule

Public water systems using surface water or groundwater under the direct influence of surface water that utilize filtration processes and recycling must comply with the Filter Backwash Recycling Rule. The rule aims to reduce risks associated with recycling contaminants removed during filtration.

The rule requires filter backwash water be returned to a location that allows complete treatment. In addition, filtration systems must provide detailed information regarding the treatment and recycling process to the state. The City's water supply is classified as groundwater at all sources except for the Tacoma Regional Water Supply. Tacoma Public Utilities is responsible for monitoring and satisfying the water quality requirements for the Tacoma Second Supply Pipeline Source.

Stage 2 Disinfectants/Disinfection Byproducts Rule

The EPA implemented the Stage 2 Disinfectants/Disinfection Byproducts Rule simultaneously with the Long Term 2 Enhanced Surface Water Treatment Rule.

Similar to the Stage 1 D/DBPR, this rule applies to most water systems that add a disinfectant to the drinking water other than ultraviolet light or those systems that deliver such water. The Stage 2 D/DBPR changes the calculation procedure requirement of the MCLs for two groups of disinfection byproducts, total THM (TTHM) and HAA5. The rule requires each sampling location to determine compliance with MCLs based on their individual annual average DBP

levels (termed the Locational Running Annual Average), rather than utilizing a system-wide annual average. The rule also proposes new MCLGs for chloroform (0.07 mg/L), trichloroacetic acid (0.02 mg/L), and monochloroacetic acid (0.03 mg/L).

Additionally, the rule requires systems to document peak DBP levels and prepare an Initial Distribution System Evaluation (IDSE) to identify Stage 2 D/DBPR compliance monitoring sites. IDSEs require each water system to prepare a separate IDSE plan and report, with the exception of those systems who obtain a 40/30 Certification or a Very Small System Waiver. In order to qualify for the 40/30 Certification, all samples collected during Stage 1 monitoring must have TTHM and HAA5 levels less than or equal to 0.040 mg/L and 0.030 mg/L, respectively. The City currently complies with all contaminant monitoring requirements under this rule and has qualified for 40/30 Certification and does not require IDSE plan.

Long Term 2 Enhanced Surface Water Treatment Rule

Following the publishing of the IESWTR, the EPA introduced the LT1ESWTR to supplement the preceding regulations. The second part of the regulations of the LT1ESWTR are mandated in the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR). The final rule was implemented simultaneously with the Stage 2 D/DBPR described in the previous section. This rule applies to all systems that use surface water or GWI sources.

This rule establishes treatment technique requirements for filtered systems based on their risk level for contamination, calculated from the system's average *Cryptosporidium* concentration. Requirements include up to 2.5-log *Cryptosporidium* treatment, in addition to existing requirements under the IESWTR and LT1ESWTR. Filtered systems that demonstrate low levels of risk will not be required to provide additional treatment. Unfiltered systems under this rule must achieve at least a 2-log inactivation of *Cryptosporidium* if the mean level in the source water remains below 0.01 oocysts/L. If an unfiltered system's mean level of *Cryptosporidium* exceeds 0.01 oocysts/L, the LT2ESWTR requires the system to provide a minimum 3-log inactivation of *Cryptosporidium*. All unfiltered systems are also required to utilize a minimum of two disinfectants in their treatment process.

The LT2ESWTR also addresses systems with unfinished water storage facilities. Under this rule, systems must either cover their storage facilities or achieve inactivation and/or removal of 4-log virus, 3-log *Giardia lamblia*, and 2-log *Cryptosporidium* on a state-approved schedule. Lastly, the rule extends the requirement of the disinfection profiles mandated under the LT1ESWTR to the proposed Stage 2 D/DBPR. The City's water supply is classified as groundwater at all sources except for the Tacoma Regional Water Supply. Tacoma Public Utilities is responsible for monitoring and satisfying the water quality requirements for the Tacoma Second Supply Pipeline Source.

Groundwater Rule

The EPA promulgated the Groundwater Rule (GWR) to reduce the risk of exposure to fecal contamination that may be present in public water systems that use groundwater sources. The GWR also specifies when corrective action (which may include disinfection) is required to protect consumers who receive water from groundwater systems from bacteria and viruses. The GWR applies to public water systems that use groundwater and to any system that mixes surface

and ground waters if the groundwater is added directly to the distribution system and provided to consumers without treatment equivalent to surface water treatment.

The rule targets risks through an approach that relies on the four following major components.

1. Periodic sanitary surveys of groundwater systems that require the evaluation of eight critical elements and the identification of significant deficiencies (such as a well located near a leaking septic system). DOH conducted its most recent sanitary survey of the City's water system on December 8, 2016, under the state's existing sanitary survey program.
2. Source water monitoring to test for the presence of *E. coli*, enterococci, or coliphage in the sample. There are two monitoring provisions.
 - Triggered monitoring for systems that do not already provide treatment that achieves at least 99.99-percent (4-log) inactivation or removal of viruses and that have a total coliform positive routine sample under the Revised Total Coliform Rule sampling in the distribution system.
 - Assessment monitoring is a complement to triggered monitoring. A state has the option to require systems to conduct source water assessment monitoring at any time to help identify high risk systems.
3. Corrective actions required for any system with a significant deficiency or source water fecal contamination. The system must implement one or more of the following corrective action options: correct all significant deficiencies; eliminate the source of contamination; provide an alternate source of water; or provide treatment that reliably achieves 99.99-percent inactivation or removal of viruses.
4. Compliance monitoring to ensure that treatment technology installed to treat drinking water reliably achieves at least 99.99-percent inactivation or removal of viruses.

The City's last sanitary survey was completed in December 2016. The City is currently addressing minor deficiencies identified in this sanitary survey and complies with all other requirements of the rule.

FUTURE REGULATIONS

Drinking water regulations are continuously changing in an effort to provide higher quality and safer drinking water. Modifications to the existing rules described above and implementation of new rules are planned for the near future. A summary of upcoming drinking water regulations that will most likely affect the City is presented in the following sections.

Radon

In July of 1991, the EPA proposed a regulation for radon, as well as three other radionuclides. The 1996 SDWA Amendments required the EPA to withdraw the 1991 proposal due to several concerns that were raised during the comment period. A new proposed regulation was published in the Federal Register on November 2, 1999. Comments on the proposed rule were due to the EPA by February 4, 2000. Final federal requirements for addressing radon were delayed until 2008 but have not yet been published. The rule proposes a 300 pCi/L MCL for community water systems that use groundwater or an alternative, less stringent MCL of 4,000 pCi/L for water systems where their state implements an EPA-approved program to reduce radon risks in

household indoor air and tap water. It is not currently known when or what a radon regulation may require as adopted by the EPA or what the implementation schedule for the rule will be. Because the final radon rule requirements are uncertain, the impact of this rule on the City is unknown at this time.

Unregulated Contaminant Monitoring Regulation Revisions

In accordance with the original UCMR and the SDWA, once every 5 years the EPA will issue a new list of no more than 30 unregulated contaminants to be monitored by public water systems. The fourth UCMR was proposed on December 11, 2015, and includes a list of 30 chemicals that will be monitored during the 2017 through 2021 monitoring cycle, and approves several new testing methods to conduct the monitoring. For this upcoming cycle, all systems serving more than 10,000 people and a larger representative sample of smaller water systems will be required to monitor for contaminants. The rule also requires additional water system data to be reported with the monitoring results, establishes a procedure for determining minimum reporting levels, and proposes several revisions to the implementation of the monitoring program.

SOURCE WATER QUALITY

This section presents the current water quality standards for groundwater sources and the results of the City's recent source water quality monitoring efforts. A discussion of the water quality requirements and monitoring results for the City's distribution system is presented in the section that follows.

DRINKING WATER STANDARDS

Drinking water quality is regulated at the federal level by the EPA and at the State level by DOH. Drinking water standards have been established to maintain high-quality drinking water by limiting the levels of specific contaminants (i.e., regulated contaminants) that can adversely affect public health and are known or likely to occur in public water systems. Non-regulated contaminants do not have established water quality standards and are generally monitored at the discretion of the water purveyor and in the interest of customers.

The regulated contaminants are grouped into two categories of standards – primary and secondary. Primary standards are drinking water standards for contaminants that could affect health. Water purveyors are required by law to monitor and comply with these standards and notify the public if water quality does not meet any one of the standards. Secondary standards are drinking water standards for contaminants that have aesthetic effects, such as unpleasant taste, odor, or color (staining). The national secondary standards are unenforceable federal guidelines or goals where federal law does not require water systems to comply with them. However, states may adopt their own enforceable regulations governing these contaminants. The State of Washington has adopted regulations that require compliance with some of the secondary standards. Water purveyors are not required to notify the public if their water quality does not meet the secondary standards.

SOURCE MONITORING REQUIREMENTS AND WAIVERS

The City is required to perform water quality monitoring at each of its active sources for inorganic chemical and physical substances, organic chemicals, and radionuclides. The

monitoring requirements that the City must comply with are specified in WAC 246-290-300. A description of the source water quality monitoring requirements and procedures for each group of substances is contained in the City's Water Quality Monitoring Plan, which is included as [Appendix I](#).

DOH has developed the Susceptibility Assessment Survey Form for water purveyors to complete for use in determining a drinking water source's potential for contamination. The results of the susceptibility assessment may provide monitoring waivers that allow reduced source water quality monitoring. Based on the results of the susceptibility assessment survey for each source, DOH assigned high susceptibility ratings to Clark Springs and the North Kent Wellfield, a moderate susceptibility rating to Kent Springs and Armstrong Wells #1 and #2, and a low susceptibility rating to East Hill Well #1, Seven Oaks Well, Obrien Well, and Garrison Creek Well #2.

SOURCE MONITORING RESULTS

The City's sources maintain a high level of water quality and have met or exceeded all drinking water standards within the last 6 years, with the exception of 4 discrete detections of coliform in November 2016, September 2016, October 2014, and June 2012. Repeat coliform samples were not positive; therefore, these samples can be disregarded as outliers. Kent Springs and Clark Springs were last monitored for IOCs and VOCs in July of 2016. These sources have waivers for IOCs, VOCS, pesticides, soil fumigants, and radionuclides which are valid through December of 2019, and a waiver for herbicides valid through December of 2022. Both spring sources are also sampled annually for nitrates.

Similar to the City's spring sources, the East Hill Well #1, Seven Oaks Well, N Kent Wellfield, O'Brien Well, Garrison Well #1, and Armstrong Wells #1 and #2 sources are tested annually for nitrates, have waivers for IOCs, VOCs, pesticides, soil fumigants, and radionuclides valid through December of 2019, and a waiver for herbicides through December 2022. Additionally, the Seven Oaks Well, N Kent Wellfield, O'Brien Well, and Garrison Creek Well #2 are required to sample for manganese once every 3 years, with the next round of samples being due during the summer of 2019.

The results of inorganic chemical (including nitrate) and VOC monitoring for the City's sources indicate that all primary and secondary standards were met.

Due to the close proximity of the Clark Springs site to the Landsburg Mine site, the City has advised Ecology of the City's concerns about a contamination event originating from the site that results in the temporary or permanent loss of the City's Clark Springs source. In recent years, the City has submitted to Ecology comments in opposition to Ecology's cleanup action plan for the site, seeking further investigative/action at the site and seeking a cleanup action plan more protective of area groundwater including the Clark Springs source aquifers. The City has implemented various activities to increase monitoring and sampling at and near Clark Springs.

GROUNDWATER PROTECTION/RELIABILITY STUDIES

The geology and hydrogeology of southwestern King County, encompassing the City's area, has been summarized in a series of reports, including Luzier (1969) and Woodward, et al. (1995), the *South King County Ground Water Management Plan* (1989), and local area Wellhead Protection Plans (Covington Water District, 1995; Lake Meridian Water District, 1996; and the City of

Kent, 1996). In November 1997, the City authorized Hart Crowser to conduct a Phase 1 wellfield evaluation of its Clark Springs and Kent Springs groundwater systems. This study, which was completed in June 1998, included evaluating the maximum well field yield using the MODFLOW groundwater flow model developed for the Kent Wellhead Protection Study.

In September of 2006, the City retained Robinson, Noble & Saltbush to conduct a reliability study of its in-town water sources, with a project goal of determining the 98-percent reliable firm yield for these sources. The end result of the study should provide the City with the firm yield for each of these wells and well sites, such that the City knows how much water is available to be developed through existing wells and potential future wells at each of its existing well sites.

In January 2008, the City retained Aspect Consulting to undertake a Phase 2 comprehensive wellhead protection study addressing all wells and source aquifers not addressed in the 2008 Phase 1 wellhead protection study. The first task of this study, which was completed in May 2008, involved compiling the delineated wellhead protection areas (WHPA) for each of the City's nine groundwater supply sources. Additional tasks included:

- Preparing an inventory of potential sources of groundwater contamination for the each of the nine groundwater supply sources;
- Ranking each of the contaminant sources identified within each WHPA with respect to its potential risk for contamination of the City's well source;
- Refining the management strategies identified in the existing WHPP, and development of new management strategies as appropriate; and
- Updating the existing Monitoring Plan, Contingency Plan, and Spill Response Plan to address all groundwater supply sources.

Although there are no new potential sources of contamination outlined in the Aspect Consulting study, there are many new confirmed and suspected sites that were not listed in the Hart Crowser study (1996). All of these locations were notified in 2009, and again in 2018, about the wellhead protection area.

As a general operational matter, the City monitors groundwater levels in its well sources to monitor the sources, and as required by Ecology and related water right authorizations.

DISTRIBUTION SYSTEM WATER QUALITY

MONITORING REQUIREMENTS AND RESULTS

The City is required to perform water quality monitoring within the distribution system for coliform bacteria, disinfectant (chlorine) residual concentration, DBPs, lead and copper, and asbestos in accordance with Chapter 246-290 WAC. A description of the distribution system water quality monitoring requirements and procedures are contained in the City's Water Quality Monitoring Plan that is included in [Appendix I](#).

The City has been in compliance with all monitoring requirements for the past several years, except for some coliform violations that are described in the following section. A summary of the results of the distribution system water quality monitoring within the City's system is also presented.

Coliform Monitoring

From 2012 to 2018, coliform monitoring met regulations since samples did not test positive in more than 5 percent of the routine samples taken each month. Positive samples were found in September and November of 2016, October of 2014, and June of 2012. All follow-up repeat samples were negative. The positive samples were likely due to error. Based on the City's current population, a minimum of 80 coliform samples per month from different locations throughout the system are required to be collected. A description of coliform monitoring protocol and sample locations is described in the City's Coliform Monitoring Program, which is included in [Appendix I](#).

Disinfectant Residual Concentration Monitoring

Disinfection requirements applicable to the City are contained in WAC 246-290-310, which states that a disinfectant residual concentration of 0.2 mg/L shall be detectable in all active parts of the distribution system and that the maximum residual disinfectant level shall be 4.0 mg/L for chlorine and chloramines. Handheld chlorine residuals must be recorded each time a coliform sample is collected; therefore, the City collects a minimum of 80 samples each month in addition to its online chlorine analyzers. At least 95 percent of the monthly samples must have detectable levels. In addition, disinfectant residuals within the distribution system shall be reported for every calendar day and cannot be undetectable. The City's chlorination targets are to maintain a 0.5 mg/L residual at the furthest reaches of the distribution system; therefore, water is dosed at the entry point to meet that target. The City typically doses within the range of 0.8 and 1.0 mg/L; however, water coming from Tacoma enters the distribution system with a 1.2 to 1.6 mg/L concentration. In 2018 and January through March 18, 2019, free chlorine readings ranged between 0.30 and 1.93 mg/L and averaged 0.84 mg/L throughout the distribution system. The results of residual disinfectant concentration tests indicate that the City is in compliance with the regulations.

Disinfectants/Disinfection Byproducts Monitoring

THM and HAA5 are DBPs that are formed when free chlorine reacts with organic substances (i.e., precursors), most of which occur naturally. Formation of THM and HAA5 are dependent on such factors as amount and type of chlorine used, water temperature, concentration of precursors, pH, and chlorine contact time. THM have been found to cause cancer in laboratory animals and are suspected to be human carcinogens. In response to the Stage 1 and Stage 2 D/DBPR, the City expanded its distribution system monitoring to include THM and HAA5. The City is required to collect four THM and four HAA5 samples on a quarterly basis. All recent samples show concentrations below both substances MCLs. Therefore, the City is in compliance with this regulation. A copy of the City's Stage 2 D/DBP Monitoring Plan is provided in [Appendix I](#). The City was granted 40/30 Certification based on historical water quality data, and was therefore not required to perform an IDSE.

Lead and Copper Monitoring

The Lead and Copper Rule identifies the action level for lead as being greater than 0.015 mg/L, and the action level for copper as being greater than 1.3 mg/L. The City is required to collect 30 samples every 3 years. The latest tests occurred in September of 2018, which yielded a range of 0.001 to 0.0012 mg/L for lead and a range of 0.02 to 0.29 mg/L for copper. These results have

all been satisfactory, since the 90th percentile concentration of either lead or copper from each group of samples has not exceeded the action levels.

Asbestos

Asbestos monitoring is required if the sources are vulnerable to asbestos contamination or if the distribution system contains more than 10 percent of asbestos cement (AC) pipe. The City has a 9-year waiver with DOH for asbestos monitoring that will expire in December 2019. The last time an asbestos sample was taken was in December 1998. This sample yielded a concentration of 0.196 million fibers per liter, whereas the current MCL for asbestos is 7 million fibers per liter and greater than 10 microns in length. Should the City ever recommence asbestos monitoring, it must be accomplished during the first 3-year compliance period of each 9-year compliance cycle. The water sample must be taken at a tap that is served by an asbestos cement pipe under conditions where asbestos contamination is most likely to occur.