
Marysville Water Comprehensive Plan Technical Memorandum



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Subject: Wellhead Protection Plan Update
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Project No.: 61281

This technical memorandum presents the City's Wellhead Protection Plan Update for the Edward Spring and well sources.

1. Purpose of Wellhead Protection Plan Update

All Group A Public Water Systems with ground water production sources are required to develop and implement a Wellhead Protection Program in accordance with Washington Administrative Code (WAC) 246-290-135(3). The purpose of a Wellhead Protection Plan (WHPP) is to document and summarize the Wellhead Protection Program and to create a plan for appropriate improvements to wellhead protection. Each Group A public water system must submit a complete and appropriate WHPP to the Washington Department of Health (DOH) as a required component of a Water Comprehensive Plan or Small Water System Management Program.

The goal of a Wellhead Protection Program is to maintain existing source water quality by protecting existing ground water supplies from potential sources of contamination. The primary objectives of a WHPP are to:

- delineate a wellhead protection area around each ground water supply,
- identify and prioritize potential sources of ground water contamination,
- maintain an up-to-date contaminant inventory,
- notify facility owner/operators, regulatory agencies, and spill response organizations about the WHPP, and
- outline emergency spill response and contingency plans.

This Wellhead Protection Plan Update (WHPP Update) has been developed to document and summarize how the City of Marysville's (City's) 2002 WHPP has worked to achieve these goals and objectives during the period between 2002 and 2007, describe planned efforts to continue protecting the City's well sources, and recommend management projects to improve wellhead protection.

2. Update Approach

This WHPP Update was prepared as part of the City's Water Comprehensive Plan, due to be completed in 2009. This update was developed by reviewing available data and information from the City, discussions with City staff, and a windshield survey conducted to verify land use near sources (except Highway No. 9 Well). No additional data were collected in conjunction with this update. Finally, wellhead delineation data developed in the 2002 WHPP did not need to be updated as part of this effort, as the City's pumping regime has not significantly changed.

The City's WHPP and the WHPP Update cover the following sources of supply:

- Edward Springs,
- Edward Springs Well No. 1,
- Edward Springs Well No. 2,
- Edward Springs Well No. 3,
- Lake Goodwin Well No. 2,
- Sunnyside Well No. 2, and
- Highway No. 9 Well.

3. Background Information

Seven of the City's nine drinking water sources are included in the City's WHPP. Of these seven sources, only Edward Springs and associated wells provide a significant portion of the City's drinking water supply. Lake Goodwin Well No. 2 currently serves approximately 25 homes located close to the well. Sunnyside Well No. 2 and Highway No. 9 Well are currently emergency standby sources. Operational information and annual water right limitations for all seven sources are summarized in Table 1.

The 2002 WHPP includes detailed reports on well completion, well configurations, well logs, and Water Well Reports for all of the sources included in the WHPP.

Table 1 Operational Summary for City Wells and Springs

Source Name	Operational Status	Reliable Capacity (MGD)	Annual Water Right – Q _a (MGD)	Current Treatment Operations	Additional Information
Edward Springs	Production	2.5	2.0	Chlorine or UV	This source consists of approximately 25 shallow collectors. This unfiltered source is classified as GUI.
Edward Springs Well No. 1	Production	(1)	(1)	Chlorine or UV	Well No. 1 & No. 2 are secondary calls for the reservoir.
Edward Springs Well No. 2	Production	(1)	(1)	Chlorine or UV	Well No. 1 & No. 2 are secondary calls for the reservoir.
Edward Springs Well No. 3	Production	(1)	(1)	Chlorine or UV	Typically used when Stillaguamish source is off-line.
Lake Goodwin Well No. 2	Limited Production	0.5	0.785	Chlorine	Well screen clogs at higher flow rates. Serves only 25 homes.
Sunnyside Well No. 2	Emergency Standby	0 (Backup Only)	1.05	Chlorine	Source has limited capability – has been pumped dry in the past.
Highway No. 9 Well	Emergency Standby	0 (Backup Only)	1.43	None	Has elevated iron and manganese concentrations. Pumping well has impacted nearby wells.

(1) The Edward Springs Well capacities are included in the Edward Springs total.

Edward Springs and Associated Wells

The Edward Springs source was developed as a Work Projects Administration project in the 1930's with an initial capacity of 1.4 MGD. Improvements to the collection system have increased the capacity to 2.5 MGD. Water is collected from springs by approximately 25 shallow collectors. Water flows by gravity from the collectors to a screen house.

In addition to the spring, there are three drilled wells in the Edward Springs watershed. Wells No. 1 and No. 2 were installed prior to 1960. Well No. 3 is located near the Edward Springs Reservoir and was installed in 1987. All wells flow to the screen house and are then pumped to the Edward Springs Treatment Facility located adjacent to the Edward Springs Reservoir.

Washington State DOH classified the spring collection system as groundwater under the influence of surface water (GUI) source in March 2000. This classification has made the source subject to all rules and requirements of the Surface Water Treatment Rule (SWTR). Edward Springs has a controlled access watershed and water with consistently low turbidity. The City operates the Edward Springs source under the filtration avoidance clause of the SWTR through development of a Watershed Management Plan and other improvements which include fencing

and signage at the watershed perimeter and disinfection and CT compliance improvements. In preparation for upcoming regulations, the City of Marysville designed and built an ultra-violet (UV) light disinfection system for the Edward Springs source in 2011.

The City recently re-drilled Edward Springs Well No. 1, in 2007. Additionally, the City plans to rehabilitate Well No. 3 in the near future.

A significant driver for the City's Wellhead Protection Program activities is the unfiltered status of the Edward Springs supply. Because of this, the City is required to submit an annual report summarizing the effectiveness of their source water protection program, compliance with 11 criteria to remain unfiltered (per WAC 246-290-690), and significant changes in the system's ability to comply with the criteria to remain unfiltered.

Lake Goodwin Well

The Lake Goodwin Well was originally constructed in 1970. The well is located approximately two miles west of Edward Springs and had the capability to pump directly into the Edward Springs Reservoir through a twelve-inch supply main. The well was intended to provide an additional 500 GPM backup to Edward Springs. However, pumping at that flow created clogging of the well screen by small silt particles. Therefore, the maximum operating capacity of the Lake Goodwin Well is limited to 350 GPM.

Water from this source is currently isolated from the Edward Springs Reservoir by a closed valve. The well serves the 25 homes along the supply line. The Lake Goodwin Well is also the source for the 327 pressure zone, which will be put into service in 2008.

Sunnyside Wells

Sunnyside Well No. 1 was constructed in 1956. Sunnyside Well No. 2 was constructed in 1965 to operate in conjunction with Well No. 1. In 1977, and again in 1980, Well No. 1 was pumped dry during a summer drought. As a result, Well No. 1 was taken off-line soon after and is no longer in service. Sunnyside Well No. 2 experienced similar problems and is now maintained only as an emergency source in the event the Everett-Marysville pipeline is off-line. The source is exercised on a quarterly basis and tested annually enabling the City to use it as necessary. The well was chlorinated when operated as a primary source; however all disinfection equipment was removed when the well was reclassified for emergency use only.

Highway 9 Well

Located west of State Route 9 at 64th Street NE, (SR 528) the Highway 9 Well was constructed in 1981 to serve the 510 pressure zone. The Highway 9 Well has had serious iron and manganese problems since it was first brought on-line. Customer complaints of reddish water and stained laundry prompted the City to treat the well output with a sequestering agent to prevent the iron and manganese from precipitating. The sequestering process was effective only for a short period and as the water was stored in the reservoir iron precipitate formed and settled.

Compounding the iron and manganese problem was the influence of the Highway 9 Well on private wells in the area. It became evident that the aquifer had limited capacity when the water level and level of area wells dropped after a period of operation. Operating the Highway 9 Well caused water levels to drop enough that the private wells were nearly dry. The City was forced to respond by providing water service to those property owners free of charge.

In 1984 the Highway 9 Well was taken off-line due to these issues. The well is only used to augment supply during emergency periods. The well is exercised on a quarterly basis to remain operable. The well was chlorinated when operated as a primary source; however all disinfection equipment was removed when the well was reclassified for emergency use only.

4. Relevant Source Water Programs and Planning Efforts

There are a number of Federal, State, and local laws, regulations, and programs that relate to general source water protection. The 2002 WHPP outlined each of these programs and how they impact the City's Edward Spring and well sources. Many of the programs involve collection of water quality data, land use data, or otherwise provide information that can support the City's wellhead protection efforts. Application of these programs and efforts has not changed significantly with regard to the City's groundwater sources, except for adoption of the Critical Aquifer Recharge Areas regulations.

In 2007, Snohomish County adopted Chapter 30.62C Critical Aquifer Recharge Areas as part of the county's planning regulations. The purpose of this regulation is to "safeguard the public health, safety, and welfare and to protect groundwater resources." The regulation establishes sole source aquifers, Group A wellhead protection areas and areas sensitive to groundwater contamination as potential Critical Aquifer Recharge Areas (CARAs). In this regulation, Snohomish County establishes a process for designating an area as a CARA and establishes standards and requirements for the protection of these areas. This added regulation will serve to bolster protection of the City's groundwater sources by prohibiting, conditioning, or otherwise regulating certain activities and uses within the wellhead protection areas.

5. Hydrogeological Characterization

The 2002 WHPP contains a comprehensive hydrogeological characterization, which develops the basis for delineation of wellhead protection areas around each City well and spring. The 2002 hydrogeological characterization include descriptions of

- Regional stratigraphy,
- Regional aquifer properties,
- Stratigraphy and aquifer properties near City wells and springs,
- Stratigraphic characterization of City wells and springs, and
- Nearby water wells.

This information is considered to be up-to-date and does not need to be revisited for the WHPP Update.

6. Delineation of Wellhead Protection Areas

The 2002 WHPP establishes the delineation of wellhead protection areas. These wellhead protection area delineations were developed in accordance with Washington Administrative Code (WAC) 246-290-135(2)(b), WAC 246-209-135(3)(c)(ii), DOH's WHPP Guidance Document, and discussions with the DOH regional engineer. The wellhead protection areas for Lake

Goodwin Well No. 2, Sunnyside Well No. 2, and Highway No. 9 Well were determined using the Calculated Fixed Radius Method for Time of Travel Zones. The Multiple Well Capture Zone Module of the semi-analytical WHPA model was used to delineate time of travel for the Edward Springs and Well sources per DOH WHPP guidelines. This approach, which is considered to provide more accurate information, was selected for the Edward Springs and Well sources because of the high susceptibility rank assigned to these sources by DOH.

The current wellhead protection area around each City well consists of five zones:

- Sanitary control area. Potential contaminant sources should be excluded from this zone to prevent surface contamination from cascading down the well casing.
- Six-month time of travel zone.
- One-year time of travel zone. Within this zone, potential sources of bacteria and viruses should be managed to prevent microbial contamination of the well.
- Five-year time of travel zone. Within this zone, potential sources of chemical contamination should be managed to protect future water supplies.
- Ten-year time of travel zone. Within this zone, known and high-risk sources of chemical contamination should be managed to protect future water supplies.

This information is considered to be up-to-date and does not need to be revisited for this WHPP Update. However, it is important to note that the City plans to increase use of the Lake Goodwin Well significantly beginning in 2008. This could require the City to re-delineate the associated wellhead protection area for the next WHPP Update.

7. Land Use and Non-Point Pollution

Section 5 of the 2002 WHPP details current and future land use for each of the wells and Edward Springs. Table 2 summarizes the land uses associated with each of the City's groundwater and springs sources, as discussed in the 2002 WHPP and verified by a windshield survey of areas near all wells except Highway No. 9. Additionally, the table presents non-point sources of pollution typically associated with these land uses. Each of the wellhead protection areas is surrounded primarily with rural residential land use, except for the Sunnyside Well, which appears to be primarily surrounded by single family residential land use. City staff indicate that land use has not changed significantly in these areas since 2002. Because land use has not been altered, the same potential sources of non-point pollution are still likely to be present and have been identified in Table 2.

Table 2 Summary of Land Use and Potential Non-Point Sources of Pollution for Wellhead Protection Areas

Source Name	Land Use Zoning in Area	Potential Non-Point Sources (identified in 2002 Wellhead Protection Plan)
Edward Springs and Edward Springs Wells 1, 2, and 3	Rural Residential (R-5)	<ul style="list-style-type: none"> • On-site septic systems • Small animal feeding operations • Pesticide and fertilizer application • Release/Improper disposal of household products • Illegal dumping • Accidental spills along State Highway 531 • Abandoned wells
Lake Goodwin Well No. 2	Rural Residential , Rural Business, and Forestry and Forestry/Recreation	<ul style="list-style-type: none"> • On-site septic systems • Pesticide and fertilizer application • Release/Improper disposal of household products • Accidental spills along State Highway 531 • Abandoned wells
Sunnyside Well No. 2	Rural Residential, Medium & Single Family Residential, Rural Use, Agricultural, Neighborhood Business, and Business Park	<ul style="list-style-type: none"> • On-site septic systems, • Pesticide and fertilizer application • Release/Improper disposal of household products • Urban stormwater runoff • Abandoned wells
Highway No. 9 Well	Rural Residential, Medium & High Density Single Family Residential	<ul style="list-style-type: none"> • On-site septic systems, • Pesticide and fertilizer application • Release/Improper disposal of household products • Accidental spills along State Highway 9 and State Highway 528 • Abandoned wells

8. Contaminant Inventory

The purpose of this section is to provide an inventory of known and potential contaminant sources within the City’s delineated wellhead protection areas. Wellhead protection areas have been determined for each City well and spring as discussed in Section 4. The City is required to update this inventory every two years.

The contaminant inventory documented in this section includes active point sources only. Point sources are defined as discernible discrete potential sources of contamination. Potential point sources of contamination have been identified for this WHPP Update using the Washington State Department of Ecology’s Facility/Site Identification Database (FSID). This database lists any operation that is a potential or active source of pollution. This includes gas stations, automotive stores, dry cleaners, gravel pits, waste management sites, and industrial facilities. Only active sites (i.e., those that are operational and/or for which cleanup activities are underway) were included in this contaminant inventory. This inventory includes point sources located within the 10-year (or less) time of travel zone.

Edward Springs Wellhead Protection Area

No potential point sources of contamination were located within the Edward Springs Wellhead Protection area. The majority of this wellhead protection area is owned and controlled by City of Marysville.

Lake Goodwin Well No. 2 Protection Area

One active potential point source of contamination is located within the Lake Goodwin Well No. 2 protection area. This potential point source is:

This potential point source is an active underground storage tank located within the 5-year time of travel zone for Lake Goodwin Well No. 2. The two other potential points sources listed in the 2002 Plan are now classified as "inactive" status.

Sunnyside Well No. 2 Wellhead Protection Area

Four active potential point sources of contamination are located within the Sunnyside Well No. 2 Wellhead protection area. These potential point sources are presented in Table 3.

Table 3 Potential Point Sources of Contamination – Sunnyside Well No. 2

Potential Point Source	Address	Type of Source
Aaron's Auto	7625 44 th Ave NE, Marysville WA	Hazardous Waste Generator
Transportation Coop	8820 42 nd St. NE, Everett WA	Leaking Underground Storage Tank and Underground Storage Tank
Stan's Radiator	9014 42 nd St NE, Everett Wa	State Clean-up Site
Boulevard Grocery	5304 61 st St NE, Marysville WA	Underground Storage Tank

Highway 9 Wellhead Protection Area

The FSID database does not clearly present the wellhead protection area and nearby facilities for this well. However, it appears that there are no active potential point sources within the protection area described in the 2002 WHPP.

8. Notification

According to WAC 246-290-135, the City is required to notify all owners or operators of known or potential groundwater contamination sources. The notification letters are to inform the owner/operators of their location within one of the City's wellhead protection areas.

The last contaminant inventory was conducted in 2002 as part of development of the WHPP. As a result, the City notified identified owners/operators of the presence of wellhead protection areas. No new potential contamination sources have been identified during this update that would require notification.

9. Contingency Planning and Emergency Spill Response Planning

According to WAC 246-290-135, the City is required to include, as part of their wellhead protection efforts, a contingency plan which ensures customers have an adequate supply of potable water in the event that contamination results in the temporary or permanent loss of the primary sources of supply. Additionally, the City is required to document coordination with local emergency incident responders, which is to include notification of wellhead protection area boundaries, contaminant inventory findings, and the contingency plan.

9.1 Contingency Planning

The City has developed a comprehensive Contingency Plan for Water Supply Disruptions During Emergencies (Contingency Plan). A full copy of the Contingency Plan is contained as an appendix to the Water Comprehensive Plan. The Contingency Plan, developed in 2002, supplements the City's Emergency Response Plan, which covers all City services.

In brief, the Contingency Plan addresses the following topics:

- Hazard analysis, covering both natural and human-caused hazards;
- Vulnerability Assessment, addressing the vulnerability of key water system components to the hazards identified;
- Mitigation plan, addressing facility protection and backup systems;
- Preparedness planning, including linkage to the City's Emergency Response Plan; and
- Training of City personnel to respond to emergencies affecting the water system.

The City benefits from the fact that there are several independent sources of supply in different locations. These include surface water, ground water, and purchased water from the City of Everett. Furthermore, the City has backup wells and interties with adjacent systems that can provide water under emergency conditions. These multiple sources offer considerable flexibility and will allow uninterrupted deliveries during most emergency situations. The City also has a Mutual Aid Agreement with neighboring jurisdictions that addresses sharing of personnel and equipment during water and/or wastewater system emergencies. For further details on the Contingency Plan, refer to the Water Comprehensive Plan.

The City has also developed a separate plan for responding to droughts. Marysville's City Council adopted the *Drought Response Plan* in 2001. This Plan was developed to conserve available water supply and to protect the integrity of Marysville's water system and minimize the adverse impacts of water supply shortage conditions. The Drought Response Plan, which has been included in an appendix of the Water Comprehensive Plan, includes the following elements:

- Description of possible water supply shortage scenarios,
- Data needed to identify and manage a drought situation,
- Coordination with other purveyors that may be affected, and
- Establishment of four stages of response to water supply shortage conditions, according to severity of the drought.

For each water shortage response stage, the City has clearly defined communications protocols, internal operating adjustments, and supply and demand management strategies to be carried out as a response.

In addition to these planning efforts, the City monitors water levels at each well quarterly to determine the potential for a supply shortage and to check for long-term trends in water levels.

9.2 Emergency Spill Response Planning

The City developed a Water System Emergency Response Plan (ERP) in December 2004. This ERP documents responses to water system emergency scenarios, including specific situations such as microbial contamination, chemical contamination, and hazardous materials spills. For each scenario, the City has established immediate actions, notifications, and follow-up actions. The ERP also specifically describes coordination with other emergency responders. In addition to scenario-specific actions, the City's ERP establishes:

- Chain of command,
- Emergency notification,
- Communication protocols,
- Alternative water sources,
- Procedures for return to normal operations,
- Training and rehearsals, and
- Improvement projects related to emergency response.

The City has notified emergency responders of wellhead protection areas, contaminant inventory findings, susceptibility assessments of sources, and the contingency plan.

10. Wellhead Protection Program Activities (2002 – 2007)

As described earlier, many of the City's Wellhead Protection Program activities are focused on protecting the Edward Springs and Edward Well sources. This is because source water

protection is an important element of meeting criteria for having an unfiltered groundwater under the influence source (Edward Springs), and the rest of the City's wells are emergency sources or are of limited capacity.

As a requirement for using an unfiltered source of supply, the City provides DOH with an annual report which describes each year's watershed management activities, compliance with 11 criteria to remain unfiltered, and planned changes in system design and operation. A copy of the most recent annual report is included as an appendix to the Water Comprehensive Plan.

The City has implemented the following Wellhead Protection Program Activities:

Signage:

The City has posted signage inside the watershed and at boundaries to deter trespassing and contamination of the watershed. These signs include "No Trespassing," "No Dumping," and "Edward Springs Watershed Protected Drinking Water Source."

Watershed Manager:

The City has designated a staff member to be Watershed Manager. This person has the responsibilities of implementing and enforcing the watershed control and wellhead protection programs, assigning individuals to make daily and weekly inspections, reviewing site logs, and responding to phone calls regarding watershed activity. The current Watershed Manager is Terry Hawley.

Inspections and Patrols:

The City has implemented both daily and weekly inspections of the watershed. Each day, a staff member inspects the Edward Springs greenhouse and immediate area, collector roads, and Edward Springs. Weekly inspections include patrols along a foot trail and abandoned road in the vicinity.

Security:

The City has established security monitoring protocols to limit access to the watershed. Additionally, the City provides the police with a copy of the annual source water protection report. The police regularly monitor watershed property. The City has installed security chain link fencing with barbed wire along Lakewood Road and the east property line to further limit access to the watershed perimeter.

Water Quality Monitoring:

The City implemented continuous turbidity monitoring of the Edward Springs collector wells in 2005. Additionally, the City samples for fecal coliforms four days per week. The City also performs source water quality monitoring of multiple parameters, as required by Safe Drinking Water Act requirements, as described in Chapter 7 of the Water Comprehensive Plan.

Education:

The Watershed Manager has educated City staff regarding watershed sensitivity. In turn, City personnel have also worked to educate adjacent property owners regarding watershed protection.

11. Planned Future Wellhead Protection Program Activities

The City plans to implement these future Wellhead Protection Program Activities in the Edward Springs source protection area:

Security:

The City will continue fencing the Edward Springs property to limit access.

Water Quality Monitoring:

The City plans to upgrade telemetry systems for monitoring turbidity, pH, and chlorine residuals. The upgraded system will include two-way radios.

Education:

The City plans to publish an educational brochure in the summer of 2008, describing wellhead protection activities implemented by the City.