Wellhead and Source Water Protection – Part 2: Wellhead Protection Plan Amendment

Prepared for

December 2017

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General Information

UNIQUE WELL NUMBER(S) Primary: 208646, 208645, 208634, 208633, 127264, 127270, 721815; Seasonal: 208629, 208628, 208615, 208616, 208630, 208618, 208643, 233109, 151587

PUBLIC WATER SUPPLY ID # 1020006

SIZE OF POPULATION SERVED 57,186 (2010 Census)

COUNTY Anoka

Documentation List

Step	Date Performed
Scoping Meeting 2 Held (4720.5340, subp. 1)	February 8, 2017
Scoping 2 Decision Notice Received (4720.5340, subp. 2)	April 4, 2017
Remaining Portion of Plan Submitted to Local Units of Government (LUGs) (4720.5350)	October 19, 2017
Review Received From Local Units of Government (4720.5350, subp. 2)	October 20, 2017 to December 18, 2017
Review Comments Considered (4720.5350, subp. 3)	October 20, 2017 to December 20, 2017
Public Hearing Conducted (4720.5350, subp.4)	December 21, 2017
Remaining Portion WHP Plan Submitted (4720.5360, subp. 1)	December 27, 2017
Final WHP Plan Review Received (4720.5360, subp. 4)	

Certification

I hereby certify that this plan, document, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Geologist under the laws of the state of Minnesota.

	December 27, 2017
John C. Greer PG #: 30347	Date

Acronyms

Acronym	Description
DWSMA	Drinking Water Supply Management Area
MGD	Million Gallons per Day
MGY	Million Gallons per Year
MDH	Minnesota Department of Health
MDNR	Minnesota Department of Natural Resources
MGS	Minnesota Geological Survey
MnOPS	Minnesota Office of Pipeline Safety
MPCA	Minnesota Pollution Control Agency
PCSI	Potential Contaminant Source Inventory
WHPA	Wellhead Protection Area
WHPP	Wellhead Protection Plan

Executive Summary

The Wellhead and Source Water Protection Plan (the Plan) for the City of Blaine (the City) addresses the 16 municipal water supply wells operated by the City. The City's original Wellhead Protection Plan was approved by the Minnesota Department of Health in 2007. This Plan amendment was prepared in accordance with the applicable portions of the State of Minnesota Wellhead Protection Rules (Minnesota Rules 4720.5100 through 4720.5590) due to the age of the Plan.

The City is a member of the Anoka County Municipal Wellhead Protection Group (ACMWPG). As such, the City has the opportunity to work with surrounding communities and Anoka County to protect the source water aquifers, when mutually beneficial.

The City's municipal water supply system includes 16 municipal water supply wells: Wells 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, and 17. Wells 3, 4, 6, 11, 12, 13, and 17are primary water supply wells. Wells 1, 2, 5, 7, 8, 9, 10, 14, and 16 are seasonal wells used on an as needed basis to meet peak demands. In total, these wells pump from four different aquifers: the Mt. Simon Sandstone aquifer, the Tunnel City Group-Wonewoc Sandstone aquifer, the Jordan Sandstone aquifer, and an unconsolidated, Quaternary-age sand and gravel aquifer. In accordance with Minnesota Rules 4720.5550, Blaine Wells 2, 5, 8, 9, 10, 13, and 14 are classified as not vulnerable to contamination from the surface while wells 3, 4, 6, 7, 11, 12, 16, and 17 are classified as vulnerable to contamination.

This Plan amendment consists of two parts. In Part 1 of the Plan amendment, wellhead protection areas (WHPAs) for the City's water supply wells were delineated as were the associated drinking water supply management areas (DWSMAs). Six DWSMAs were delineated for Blaine. These DWSMAs encompass Wellhead Protection Areas (WHPAs) for the following Blaine water supply wells:

- Northwest - Wells 5, 7, 9, 12, 13, and 17
- West – Wells 1 and 2
- Well 8 – Well 8
- Southwest – Wells 3, 4, 10, and 16
- East – Wells 6 and 11
- Well 14 – Well 14.

As shown on Figure 1, only the West and Well 8 DWSMAs are contained entirely within the Blaine city limits. The Northwest DWSMA extends into Ham Lake to the north. The Southwest DWSMA extends into both Spring Lake Park and Mounds View to the south. The East DWSMA extends into Lino Lakes to the east and Circle Pines to the south. The Well 14 DWSMA extends into Lexington to the north. The East DWSMA overlaps the Circle Pines and Lino Lakes DWSMAs.

The vulnerability of the uppermost source water aquifer in the DWSMA is classified based on the geologic conditions in and around the City's DWSMAs. The aquifer vulnerability within each of the DWSMAs was classified as follows:

- Northwest DWSMA – vulnerability classified as Moderate in 100% of the area
- West – vulnerability classified as Low in 100% of the area
- Well 8 - vulnerability classified as Low in 100% of the area
- Southwest – vulnerability classified as Moderate in 98% of the area and as Low in 2% of the area
- East - vulnerability classified as Moderate in 100% of the area
- Well 14 - vulnerability classified as Low in 100% of the area

This document comprises Part 2 of the Plan amendment and includes the following information:

- A review of data elements identified by the Minnesota Department of Health as applicable to the DWSMAs.
- Results of an inventory of potential contaminant sources within the DWSMAs.
- A review of changes, issues, problems, and opportunities related to the public water supply and the identified potential contaminant sources.
- A discussion of potential contaminant source management strategies and the goals, objectives, and action plans associated with these management strategies.
- A review of the Wellhead and Source Water Protection evaluation program and Blaine's alternative water supply contingency strategy.

The types of potential contaminant sources that must be inventoried depends on the aquifer vulnerability classification within the DWSMAs. Potential contaminant sources identified in the DWSMAs include non-municipal wells, chemical storage sites, properties that may contain or may have contained Class V wells, other properties where contaminant releases may have occurred, and storage tanks.

The goals and objectives of this WHPP will focus on reducing the potential contaminant pathways to the source water aquifers that may be provided by private wells, and educating property owners and water supply users and working with the neighboring jurisdictions, to the extent practicable, to ensure proper management of the portions of the DWSMAs with the neighboring jurisdictions.

The following goals have been identified for implementation of this WHPP:

- The City will work to maintain or improve the current level of water quality so that the municipal water supply will continue to meet or exceed all applicable state and federal water quality standards.
- Work with other cities in the ACMWPG to protect the source water aquifers.
- The City will provide information and promote activities that protect the source water aquifers that provide water to the municipal system. This will include increasing public awareness of the Wellhead and Source Water Protection Program and groundwater-related issues, and management of the identified potential contaminant sources within the DWSMAs.
- The City will continue to collect data to support future wellhead and source water protection efforts.

Actions identified to accomplish these goals include the following:

- Wells
    - Promoting proper management of existing active wells in the DWSMAs
    - Encouraging the proper sealing of all unused wells within the DWSMAs
    - Identification of new high capacity wells in or near the DWSMAs
- Potential contaminant source properties
    - Notifying owners of potential Class V well properties of requirements related to Class V wells
    - Encouraging proper handling of chemicals/wastes
    - Encouraging proper operation and maintenance of storage tanks
    - Tracking the status of identified brownfields sites and other properties where contaminant releases may have occurred in the DWSMAs
    - Periodically obtaining updated information on potential contaminant sources in the DWSMAs from the regulating agencies to maintain an up-to-date potential contaminant source database for the DWSMAs and allow timely recognition of potential issues that could affect the Blaine municipal water supply or DWSMAs.
- Public education
    - Distribution of the Blaine Annual Water Quality Report for the water supply system,
    - Posting Wellhead Protection Program information on the City of Blaine website https://www.blainemn.gov/ and provide a link to the ACMWPG's *Know the Flow* website (http://www.knowtheflow.us/) on the City's website,
    - Inclusion of wellhead and source water protection in the City's planning process,
- Continued data collection
    - Recording static and pumping water levels in the Blaine municipal wells,
    - Monitoring water levels in the City's observation well network,
    - Collection of additional local geologic and hydrogeologic data as it becomes available from public sources or from City-sponsored projects.

1.0 Introduction

1.1 Background

The City of Blaine (City) currently operates 16 municipal water supply wells: Wells 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, and 17. Wells 3, 4, 6, 11, 12, 13, and 17are primary water supply wells. Wells 1, 2, 5, 7, 8, 9, 10, 14, and 16 are seasonal wells used on an as needed basis to meet peak demands. In total, these wells pump from four different aquifers: the Mt. Simon Sandstone aquifer, the Tunnel City Group-Wonewoc Sandstone aquifer, the Jordan Sandstone aquifer, and an unconsolidated, Quaternary-age sand and gravel aquifer. Minnesota unique well number along with well construction, status, aquifer, and well vulnerability classification for each of Blaine's municipal water supply wells is presented in Table 1. Well locations and Drinking Water Supply Management Area (DWSMA) locations are shown on Figure 1. Minnesota Department of Health (MDH) well records for all the Blaine municipal wells are presented in Appendix A.

The previous Blaine Wellhead Protection Plan (WHPP) Parts 1 and 2 were prepared in 2001 and 2007, respectively. The MDH issued final approval of the previous Part 2 WHPP in 2007. In accordance with the Minnesota Wellhead Protection Rules (Minnesota Rules 4720.5100 through 4720.5590), amendment of the City's WHPP was initiated based on the age of the Plan. The Part 1 WHPP amendment (Barr, 2016a) was approved by the Minnesota Department of Health (MDH) in November 2016 (MDH, 2016). A public information meeting on the Part 1 WHPP amendment was held on January 4, 2017.

In the Part 1 WHPP amendment, six separate DWSMAs were delineated for Blaine that encompassed the wellhead protection areas (WHPAs) delineated for the Blaine water supply wells. In addition to the delineation of the WHPAs and the DWSMAs, Part 1 of the WHPP amendment includes an assessment of the vulnerability to contamination of the Blaine municipal wells and the source water aquifers in the associated DWSMAs. In accordance with Minnesota Rules 4720.5550, Wells 1, 2, 5, 8, 9, 10 , 13, and 14 are classified as not vulnerable to contamination from the surface and Wells 3, 4, 6, 7, 11, 12, 16, and 17 are classified as vulnerable to contamination (see Table 1 and Appendix B). In the Part 1 amendment report, the vulnerability to contamination of the uppermost source water aquifers within the DWSMAs was identified as ranging from Low to Moderate (Barr, 2016a). Figure 1 shows the aquifer vulnerability zones in the Blaine DWSMAs. The Blaine Part 1 WHPP amendment is presented in Appendix B.

1.2 Description of the Public Water Supply System

The City is located in Anoka County. Blaine currently has seven primary water supply wells and nine seasonal-use wells in the municipal water supply and distribution system for Public Water Supply #1020006. Locations of the wells are shown on Figure 1 and general construction details for the Blaine municipal wells are summarized in Table 1. Copies of the MDH well records for the Blaine municipal wells are presented in Appendix A.

The 2010 census indicated that Blaine had a population of 57,186. In 2015 the Metropolitan Council estimated the City's population at 63,180. The Metropolitan Council presents population projections in the Thrive 2040 MSP Plan. The Metropolitan Council projects that the City's population will reach 66,300 in 2020 and 76,700 in 2030.

The projected 2030 average day and maximum day (the largest daily water use in a given year) water demands shown in the City's Water Supply Plan (Barr, 2016b) are approximately 5,200 gallons per minute (gpm) [7.49 million gallons per day (MGD)] and 11,150 gpm (16.05 MGD), respectively. Current daily water demand (based on the period 2010-2015) averages approximately 6.9 MGD. Maximum day demand ranged from 11.2 MGD to 18.9 MGD in the period 2010-2015 (e.g., Barr, 2016b). The current permitted capacity of the system is 20,775 gpm (approximately 29.9 MGD).

The City currently operates three water treatment plants with a total capacity of approximately 13.7 MGD (Barr, 2016b). Treatment performed in these plants includes removal of iron and manganese and addition of chlorine and fluoride. In addition, Water Treatment Plant No. 1, which treats water from Wells 3, 4, and 16, removes 1,2-dichloroethane via air stripping.

Blaine currently has five water storage facilities consisting of four elevated towers and one ground reservoir. These facilities have a combined storage capacity of 10 million gallons. Construction of additional water storage facilities is not currently planned (e.g., Barr, 2016b).

At the time this Plan amendment was prepared, the City was preparing to bring Wells 18, 19, 20, and 21 into service. During the life of this Plan, the City may construct one additional water supply well. The aquifer from which the additional well would pump will be determined at the time the well is designed and permitted.

As discussed by Barr (2016a), pumping information from the City for the period 2011 through 2015 and City water use projections were used to develop pumping rate projections for use in delineating the WHPAs. Annual volume of water pumped by each of the City's municipal water supply wells during the period 2011 through 2015 is shown in Table 2.

1.3 DWSMAs

The DWSMAs delineated in the Part 1 WHPP amendment encompass the 10-year groundwater time of travel WHPAs around the City's wells. As shown on Figure 1, six Drinking Water Supply Management Areas (DWSMAs) have been delineated for Blaine (Barr, 2016a). These DWSMAs encompass Wellhead Protection Areas (WHPAs) for the following Blaine water supply wells:

- Northwest - Wells 5, 7, 9, 12, 13, and 17
- West – Wells 1 and 2
- Well 8 – Well 8
- Southwest – Wells 3, 4, 10, and 16
- East – Wells 6 and 11
- Well 14 – Well 14.

The Northwest DWSMA is found in Township 31N, Range 23W, Sections 4, 5, 6, 7, and 8 and Township 32N, Range 23W, Sections 18, 31, 32, and 33. The West DWSMA lies in Township 31N, Range 23W, Sections 18 and 19. The Well 8 DWSMA lies in Township 31N, Range 23W, Sections 17 and 20. The Southwest DWSMA is found in Township 30N, Range 23W, Sections 5 and 6; Township 30N, Range 24W, Sections 1 and 2; and Township 31N, Range 23W, Sections 20, 28, 29, 30, 31, 32, and 33. The East DWSMA lies in Township 31N, Range 22W, Sections 18 and 19 and Township 31N, Range 23W, Sections 13, 24, and 25. The Well 14 DWSMA lies in Township 31N, Range 23W, Sections 35 and 26.

As shown on Figure 1, only the West and Well 8 DWSMAs are contained entirely within the Blaine city limits. The Northwest DWSMA extends into Ham Lake to the north. The Southwest DWSMA extends into both Spring Lake Park and Mounds View to the south. The East DWSMA extends into Lino Lakes to the east and Circle Pines to the south. The Well 14 DWSMA extends into Lexington to the north. The East DWSMA overlaps the Circle Pines and Lino Lakes DWSMAs. The Well 14 DWSMA overlaps the Mounds View DWSMA. The Southwest DWSMA overlaps the Spring Lake Park East DWSMA. The West DWSMA overlaps the Coon Rapids NE DWSMA.

In the Part 1 amendment report, the aquifer vulnerability within each of the DWSMAs was classified as follows:

- Northwest DWSMA – vulnerability classified as Moderate in 100% of the area
- West – vulnerability classified as Low in 100% of the area
- Well 8 - vulnerability classified as Low in 100% of the area
- Southwest – vulnerability classified as Moderate in 98% of the area and as Low in 2% of the area
- East - vulnerability classified as Moderate in 100% of the area
- Well 14 - vulnerability classified as Low in 100% of the area

The distribution of aquifer vulnerability classifications is shown on Figure 1.

2.0 Identification and Assessment of Data Elements

The Minnesota Wellhead Protection Rules specify data elements that must be addressed in wellhead protection plans. For the WHPP amendment, MDH staff met with City staff on two occasions to discuss the data elements that are specified in the Minnesota Rules 4720.5400. Results of these scoping meetings were transmitted to the City via two Scoping Decisions dated March 17, 2015 (MDH, 2015) and April 4, 2017 (MDH, 2017).

The first Scoping Meeting was held on February 24, 2015. At this meeting, the data elements related to delineation of the WHPAs and DWSMAs and assessment of well and aquifer vulnerability were discussed. The second Scoping Meeting was held on February 8, 2017. At this meeting, the data elements required to support development of Part 2 of the WHPP amendment (this document) which identifies potential contaminant sources within the DWSMAs and identifies management strategies to help safeguard the municipal water supply from identified potential contaminants were discussed. An assessment of these data elements, as required by the Minnesota Wellhead Protection Rules, is presented in Appendix C.

3.0 Inventory of Potential Contaminant Sources

In Part 1 of this WHPP amendment, WHPAs for the Blaine water supply wells and the associated DWSMAs were delineated. The DWSMAs encompass the 10-year groundwater time of travel WHPAs around the City's wells (Barr, 2016a). As discussed above in Section 1.3, six DWSMAs were delineated for the City's wells.

As shown in Appendix C, the current land use (i.e., year 2010 data from the Metropolitan Council) numerous land uses are found within the DWSMAs. Land uses in the DWSMAs that cover one percent or more of the area in the DWSMAs include Residential of various types, Undeveloped land, Airport, Major Highways, Park/Recreational/Preserve, Retail and Other Commercial, Institutional, Industrial and Utility, Golf Course, and Open Water.

Per the April 4, 2017 Scoping 2 Decision Notice, the City performed a Potential Contaminant Source Inventory (PCSI) within the DWSMAs.

3.1 Inventory Process

At Scoping Meeting No. 2, the types of potential contaminant sources that must be inventoried in the Blaine DWSMAs Area were identified. As discussed in Appendix C, sources of data accessed for the potential contaminant source inventory include Minnesota Department of Health (MDH), Minnesota Department of Natural Resources (MDNR), Minnesota Department of Public Safety (DPS), Minnesota Geological Survey (MGS), Minnesota Office of Pipeline Safety (MnOPS), Minnesota Pollution Control Agency (MPCA), Metropolitan Council, Minnesota Geospatial Information Office (MGIO), National Pipeline Mapping System, U.S. Department of Transportation (USDOT), and U.S. Environmental Protection Agency (USEPA) databases.

Aquifer vulnerability in the Blaine DWSMAs varies from Low to Moderate (Figure 1). Approximately 98 percent of the area in the Southwest DWSMA has an aquifer vulnerability classification of Moderate. The aquifer vulnerability is classified as Low in 100 percent of the West, Well 8, and Well 14 DWSMAs. The aquifer vulnerability is classified as Moderate in 100 percent of the Northwest and East DWSMAs.

The potential contaminant source types that must be inventoried vary based on the aquifer vulnerability classification. In areas where the aquifer vulnerability is classified as Moderate the types of potential contaminant point sources inventoried include above-ground and underground storage tanks, leaking underground storage tank (LUST) locations, potential Class V well locations (Class V wells are wells or other structures that facilitate injection of wastes into the subsurface), pipeline facilities, chemical storage locations, spills/potential contamination sites, and wells. In areas where the aquifer vulnerability is classified as Low the types of potential contaminant point sources inventoried include potential Class V well locations and wells.

The first step in the inventory was to determine if there were any potential contaminant sources in the Inner Wellhead Management Zone (IWMZ) or the Emergency Response Zone (ERZ) around each of the Blaine wells. The IWMZ is defined as the area within a 200 foot radius of each municipal well. The most

recent IWMZ inventory for each of the Blaine municipal wells is presented in Appendix C. The ERZ is defined as the area within which the travel time of groundwater to a municipal well is one year or less. The inventory was then expanded out to the boundaries of the DWSMAs.

3.2 Inventory Results

A more detailed discussion of the potential contaminant sources within the DWSMAs is presented in Appendix C. The inventory results are summarized in Table 3.

MDH policy requires that at least 25 locations of each type of potential contaminant source identified during the PCSI for an initial WHPP be verified during preparation of the plan. The policy also requires that if there are fewer than 25 of a particular potential contaminant source type that all locations of that type be verified. For WHPP amendments, MDH policy modifies this requirement by applying the "25 rule" only to those portions of the new DWSMA that are outside the limits of the original DWSMA. In addition, MDH requires that potential contaminant source locations identified within the original DWSMA limits during preparation of the original plan be verified prior to submittal of the Part 2 WHPP amendment to MDH for approval.

In keeping with MDH policy, all identified potential contaminant source locations within the limits of the old Blaine DWSMAs were verified during preparation of this Plan amendment. Furthermore, all potential contaminant source locations identified in the areas between the boundaries of the old and new Blaine DWSMAs were also verified. As part of location verification locations identified during the PCSI that mapped incorrectly were corrected to the extent possible based on available data. Verification procedures used included matching mapped locations with addresses on MDH Well Records or State/County-issued permits or in County/State/Federal databases, published business addresses, property parcel addresses, local knowledge of City staff, or information from City files (note that not all verification procedures were used for each type of potential contaminant source). Verified locations are identified in the tables in Appendix C. New information developed on contaminant sources in the future will be verified as they are discovered as part of the WHPP implementation.

As shown in Table 3, potential contaminant sources were assigned a priority based on the relative risk they pose to the public water supply. The evaluation of risk related to a potential contaminant source type is based on the locations of potential contaminant sources of that type and the aquifer vulnerability classification. Higher priority was assigned to those potential contaminant sources that would pose the highest risk to the municipal water supply should a contaminant release occur.

4.0 Impact of Changes to the Public Water Supply Wells

In accordance with the requirements of Minnesota Rules 4720.5220, anticipated changes in the physical environment, land use, surface water, and groundwater in the DWSMAs within the next ten years and the impact of these changes on the source water aquifers are discussed in this section.

4.1 Potential Changes Identified

4.1.1 Physical Environment

Currently, significant or large-scale changes in the physical environment that might affect the DWSMAs, are not anticipated in the next ten years. Any changes are expected to be the result of development/redevelopment of properties or localized infrastructure changes. Such changes are not anticipated to result in land uses different than found elsewhere in the DWSMAs and would not be expected to significantly affect the source water aquifers. Any minor changes to the physical environment will likely not affect the management strategies for the Blaine DWSMAs presented in this WHPP amendment.

At the time this Plan was being prepared, the City was in the process of developing a new well field in the northeastern portion of Blaine (the Northeast Well Field) to meet projected future demand. The City was also preparing for a new water treatment plant to service the new well field. The City does not anticipate the addition of any wells beyond those in the Northeast Well Field during the life of this Plan. It is anticipated that one additional DWSMA will need to be delineated after the four wells in the Northeast Wellfield are put into service. This will be done when the City is directed to do so by the MDH and with the assistance of the Wellhead Protection Consultant.

Only the West and Well 8 DWSMAs are contained entirely within the Blaine city limits. The Northwest DWSMA extends into Ham Lake to the north. The Southwest DWSMA extends into both Spring Lake Park and Mounds View to the south. The East DWSMA extends into Lino Lakes to the east and Circle Pines to the south. The Well 14 DWSMA extends into Lexington to the north. Locations of the Blaine DWSMAs are shown on Figure 1.

4.1.2 Land Use

As indicated in the Metropolitan Council's System Statement for Blaine (Metropolitan Council, 2015), The City's general geographic planning designation is Suburban Edge. Current land uses in the Blaine DWSMAs include Residential of various types, undeveloped land, Airport, Major Highways, Park/Recreational/Preserve, Retail and Other Commercial, Institutional, Industrial and Utility, Golf Course, and Open Water. Projected future land uses within the City are anticipated to include many of the land uses currently present within the DWSMAs.

A land use map for the year 2010 and a projected year 2030 land use map are shown on Figures 2 and 3, respectively. Projected land use in Blaine in 2030 is expected to be consistent with the City's current

growth planning. Comparison of the year 2010 land use with the projected future land use indicates that, in general, the currently undeveloped properties within the Blaine DWSMAs will be developed.

All land uses anticipated during the next ten years within the DWSMAs are currently present in the areas covered by this WHPP. As a result, adjustments in the land use within the DWSMAs such as those projected for the year 2030 will be adequately addressed by the management strategies put forth in this WHPP.

4.1.3 Surface Water

There are surface water bodies and wetlands within the Blaine DWSMAs. The City's Local Surface Water Management Plan (Bonestroo, 2008) along with City ordinances and zoning address these surface water bodies and wetlands. Blaine's management of surface water bodies and wetlands is not expected to adversely affect the management strategies for the DWSMAs. Rather, the City's management of surface water bodies and wetlands is consistent with the objectives of this Plan.

The City is not aware of any plans to alter the course or location of any surface water bodies currently present within the DWSMAs in the next ten years.

4.1.4 Groundwater

As the population of Blaine grows, water demand in the City will grow. As discussed above, the City does not anticipate installing any new municipal wells beyond those in the Northeast Well Field that had not yet been brought online at the time this Plan was prepared. There are four wells in the Northeast Well Field. Two of the wells in the Northeast Well Field are completed in the confined Quaternary sand and gravel aquifer and two of the wells are completed in the Tunnel City-Wonewoc aquifer.

City staff inspect the municipal wells regularly. The MDH inspects all wells annually. This annual inspection includes sampling of all wells to ensure they comply with applicable regulatory standards. In addition, Blaine uses a SCADA system to measure the volume of water pumped from a well, the instantaneous pumping rate for each well, and the water level (static or pumping) in each well. At the time this Plan amendment was prepared, the City was in the process of upgrading the SCADA system.

Groundwater level data for the confined Quaternary sand and gravel aquifer has been collected from an MDNR observation well (Observation Well 02034, Unique No. 782120) since December 2010. This observation well is located approximately 0.9 miles northeast of Blaine Well 10. Water level data from the well indicates that potentiometric levels in the sand and gravel aquifer fluctuate seasonally but the data do not indicate any long term, downward trend over the monitoring period.

Since 2014, the City has installed a network of 10 observation wells throughout the City. These wells are distributed between the water table aquifer, the confined sand and gravel aquifer, and the Tunnel City-Wonewoc (Barr, 2014; 2016c). Recently, the City began routine measurement of groundwater levels in these observation wells.

The City supports water conservation. The City's water conservation program includes year-round odd-even day sprinkling restrictions (see Part II, Chapter 86, Section 86-7 of the City Code). In addition, during the period May 15 through September 15 no sprinkling is allowed between 10 a.m. and 6 p.m. The sprinkling restrictions do not apply to private wells used for lawn watering, hand watering of gardens and trees with a watering can or hose, watering of new landscaping or sod for a period of 30 days after installation, and watering of city-owned athletic fields. During declared water emergencies, the City Manager has the authority to implement additional water emergency responses.

In the next ten years it is possible that new business or industrial developments in or near the Blaine DWSMAs may seek to construct privately-owned high capacity wells completed in one of the City's source water aquifers. Such wells could potentially affect the DWSMA boundaries, depending on their location and pumping rate. At the time this Plan was prepared, the City was not aware of any proposed developments with plans for privately-owned high capacity wells within or near the DWSMAs.

Available information from the MDNR's Minnesota Permitting and Reporting System (MPARS) database indicates that there are 58 high capacity wells within a zone that includes the Blaine DWSMAs and extends one mile beyond the DWSMA boundaries (this number does not include the 16 Blaine municipal supply wells). High capacity wells are defined as wells that pump more than 1,000,000 gallons per year or more than 10,000 gallons per day. Owners of these wells are required to obtain a groundwater appropriation permit from the MDNR. High capacity wells outside of the DWSMAs were identified because changes in operation of these wells could, potentially, affect the DWSMA boundaries. Of these 58 non-Blaine wells, 26 are used for some type of irrigation, 17 are used for municipal water supply, eight are used for private water supply, two are used for commercial/institutional water supply, and one is used for water level maintenance. The high capacity wells in the DWSMAs and within one mile of the boundaries of the DWSMAs are shown on Figure 4 and summarized in Table 4. Additional information on these wells can be found in Appendix C.

Beyond the future operation of the Blaine municipal wells in the Northeast Well Field, no significant changes regarding groundwater use within or near the DWSMAs are anticipated to occur within the next ten years.

4.2 Impact of Changes

4.2.1 Water Use

The City's Water Supply Plan (Barr, 2016b) projects the daily average water demand in 2030 will be approximately 7.5 MGD or approximately 5,200 gpm and 2030 maximum day water demand will be approximately 16.1 MGD or approximately 11,150 gpm. Current daily water demand (based on the period 2010-2015) averages approximately 6.9 MGD. Maximum day demand (the largest daily water use in a given year) ranged from approximately 11.2 MGD to approximately 18.9 MGD in the period 2010-2015 (e.g., Barr, 2016b).

The 2030 maximum day water demand (the largest daily water use in a given year) predicted in the City's Water Supply Plan (Barr, 2016b) is approximately 11,150 gpm or 16.1 MGD. For the period 2010-

2015, the City's maximum day water demand ranged from approximately 11.2 to 18.9 MGD. During this same period, the City's average day water demand ranged from approximately 6.4 to 7.7 MGD. The City's water distribution system is currently supplied with water from 16 wells with a total permitted operating capacity of 20,775 gpm (29.9 MGD).

Once the wells in the Northeast Well Field become operational the City does not anticipate the addition of any additional wells to meet future water demand during the life of this Plan. It is anticipated that one additional DWSMA will need to be delineated after the four wells in the Northeast Wellfield are put into service. This will be done when the City is directed to do so by the MDH and with the assistance of the Wellhead Protection Consultant.

The placement of an additional high capacity well in or near the DWSMAs or significant changes in current groundwater appropriations by existing wells could have an impact on the source water aquifers and local water supplies. Such changes could also affect the WHPAs and DWSMAs identified for the existing City of Blaine wells or change the static water levels in the wells. The City will work with the MDH Source Water Protection Unit and the MDNR to identify proposed high capacity wells in the vicinity of the Blaine DWSMAs and provide interaction, to the extent practicable, with the proposed well owner to minimize potential problems.

To conserve valuable water resources and to mitigate, to the extent possible, drought impacts, the City limits use of water from the municipal water supply system for lawn and garden sprinkling and irrigation year-round to an odd-even schedule corresponding to property address. In addition, during the period May 15 through September 15 no sprinkling is allowed between 10 a.m. and 6 p.m.

4.2.2 Influence of Existing Water and Land Government Programs and Regulations

As noted above, to conserve valuable water resources and address drought impacts, the City has controls on outdoor water usage. The City also provides water conservation information on their website and has a tiered billing structure for water use. These programs are designed to assist residents and businesses with water conservation strategies through incentives and educational information.

Blaine's stormwater management program is described in the City's Local Surface Water Management Plan (Bonestroo, 2008). In addition, the MDH has prepared a guidance document that addresses siting of stormwater infiltration basins within DWSMAs. The City believes that their existing plan and MDH guidance are sufficient to address stormwater within the city limits.

County and city ordinances, the MDNR Division of Waters' appropriations permitting program, the MPCA's storage tank permitting program and hazardous waste generator permitting program, the State of Minnesota Well Management and Drinking Water Supply Programs, State subsurface sewage treatment system (SSTS) rules, State rules regarding chemical handling and storage, and the U.S. EPA's rules regarding Class V wells will be relied upon for assistance in regulating the installation of new wells, the operation of wells, water appropriation permitting, the proper sealing of unused wells, proper operation and maintenance of SSTS, proper maintenance and operation of storage tanks, proper storage of

chemicals, proper handling of hazardous wastes, and addressing Class V wells. In addition, Blaine is aware of and supports the low interest loan program offered by Anoka County Community Development and the Minnesota Department of Agriculture's Best Management Practices Program that can be used for maintenance and sealing of wells. Blaine believes that the current level of regulations and oversight by various governmental entities are adequate to address these issues.

Land use control and land disturbing activities outside of the City of Blaine will be governed by the local unit of government with jurisdiction in a particular area. This WHPP has been developed to protect the interests of the City of Blaine and, to the extent practicable, to have no adverse effect on the plans and strategies developed for adjacent areas.

The City of Blaine will continue to rely on Federal, State, County, and local agencies and regulations and programs to handle issues outside of the City's boundaries regarding water conservation, water appropriations, and well drilling. City staff will look to the MDH for continued regulation of the installation of wells and proper sealing and abandonment of old wells. In addition, The City recognizes that the MDNR plays a role in the approval of applications for construction of new high capacity wells as well as administering water appropriations.

The programs identified above have proven to be effective. City staff will cooperate with the identified agencies, to the extent practicable, as issues arise in the future.

4.2.3 Administrative, Technical, and Financial Considerations

The City expects to have adequate resources available over a multi-year period to manage their source water aquifers within their DWSMAs. Funds to support ongoing wellhead and source water protection efforts will come from the City's water utilities budget. Wellhead and source water protection activities will be evaluated periodically per MDH requirements and any changes in the focus of the tasks will also be evaluated to determine if additional funding will be necessary to accommodate the changes. When appropriate and to assist in funding of activities, the City may apply for grants from the MDH Source Water Protection Grant Program to fund implementation of management activities described later in this Plan.

For this WHPP to be effective, the City will need to keep the public aware of the issues affecting the public water supply through public educational programs. Therefore, the wellhead and source water protection actions described later in this Plan will include public education. Routine administrative duties will be directed or performed by the Wellhead Protection Manager. Specific tasks and strategies will be performed by the Wellhead Protection Manager or delegated by the Manager to City staff or outside resources.

The operation of the wells in the Northeast Well Field will, when directed by the MDH, require the delineation of an additional DWSMA. If new high capacity wells are installed in or near the DWSMAs in the City's source water aquifers or appropriations are increased for existing wells, it is possible that the changes may affect the size and shape of Blaine's WHPAs and DWSMAs. The City intends to amend and

update its Wellhead Protection Plan, as required by the Wellhead Protection Rules, at least every 10 years or as specified by the MDH.

5.0 Issues, Problems, and Opportunities

In accordance with Minnesota Rules chapter 4720.5230, this section discusses issues, problems, and opportunities related to land use, comments from local units of government and the general public, the data elements and local, state, and federal programs and regulations.

5.1 Land Use Issues, Problems, and Opportunities

5.1.1 Source Water Aquifers

As shown on Figure 1, the aquifer vulnerability classification in the Blaine DWSMAs ranges from Low to Moderate. Approximately 98% of the area in the Southwest DWSMA has an aquifer vulnerability classification of Moderate. The aquifer vulnerability is classified as Low in 100% of the West, Well 8, and Well 14 DWSMAs. The aquifer vulnerability is classified as moderate in 100% of the Northwest and East DWSMAs.

The City currently has 16 water supply wells (Table 1). Seven of the wells (Wells 3, 4, 6, 11, 12, 13, and 17) are primary water supply wells and the other wells are used seasonally during periods of high demand.

Once the wells in the Northeast Well Field become operational the City anticipates that the MDH will require one additional DWSMA be delineated. In addition, the addition of other high capacity wells within or near the DWSMAs (either municipal wells or private wells) could produce changes in the groundwater flow system (e.g., flow direction or static water level) which could result in changes to the shape and extent of the WHPAs and DWSMAs delineated for this WHPP. The City will work with the Wellhead Protection Consultant and MDH to amend this WHPP as necessary when additional high capacity wells are installed within or near the DWSMAs.

As discussed elsewhere in this Plan amendment, potential sources of contamination that could affect the source water aquifer were identified during the PCSI. These potential contaminant sources include wells, storage tanks, chemical storage locations, and potential contaminant source properties (brownfield sites, properties associated with hazardous wastes, and a State Superfund site) that did not fall into one of the other potential contaminant source categories (see Appendix C). Table 3 indicates there are seven chemical storage sites located within IWMZs around City water supply wells. All of these storage sites are associated with City water treatment chemicals (i.e., stored at a water treatment plant or in a well house). As such, the City maintains control over these sites and manages them appropriately. Table 3 also indicates there are two closed LUST sites in IWMZs. It should be noted that the Minnesota County Well Index (CWI) includes a record for a non-sealed well that was the pilot hole for Well 12. The pilot hole was over drilled when Well 12 was installed so the "well" is no longer present. A small number of the identified potential contaminant source locations fall in the Emergency Response Zones (ERZs) around the municipal wells (Table 3).

The entities in the various potential contaminant source categories are regulated and tracked by County or State programs. The lack of City jurisdiction over the potential contaminant source entities poses a potential problem for protection of the source water aquifers. However, the jurisdictional issues also provide the City of Blaine with an opportunity to develop working relationships with County and State agencies that regulate and track the potential contaminant source entities. Therefore, the City will work with the appropriate County and State programs, to the extent practicable, to address the potential contaminant sources within the DWSMAs.

Blaine is a member of the Anoka County Municipal Wellhead Protection Group (ACMWPG). As such, the City has the opportunity to work with surrounding communities and Anoka County to protect the source water aquifers, when mutually beneficial. Anoka County regulates some of the potential contaminant sources identified in the City's DWSMAs. Anoka County also provides household hazardous waste management services to residents to help prevent residential pollution of source water aquifers.

Blaine has plans in place that include policies for managing growth of the City, the allowable land uses, water supplies, and wells (e.g., Bonestroo, 2009). Policies identified in these plans will protect the City's source water aquifers.

5.1.2 Groundwater Quality

Blaine has always placed a high priority on the safety of the municipal water supply system. In order to safeguard the municipal water supply system, Blaine strictly limits access to their wells and associated infrastructure to Blaine staff.

Groundwater pumped from the source water aquifers by the Blaine wells is currently free of pathogens and disease-causing organisms. In addition, no contaminants have been reported in water samples from the Blaine wells at concentrations that exceed applicable Federal and state health-related standards and the water Blaine supplies to its customers currently meets or exceeds the water quality requirements of the Federal Safe Drinking Water Act as documented in the City's Annual Drinking Water Quality Reports. The 2016 Drinking Water Report is presented in Appendix D and can also be accessed via the City's website at https://www.blainemn.gov/259/Drinking-Water-Reports along with reports from previous years.

As discussed in Appendix C, potential contaminant sources identified in the Blaine DWSMAs include chemical storage sites, potential Class V well locations, storage tanks, wells, and potential contaminant source properties that did not fall into one of the other potential contaminant source categories. Table 3 provides a summary of the numbers of these potential contaminant sources identified in the DWSMAs during development of this Plan amendment. Development of this Plan amendment provides Blaine with an opportunity to prepare and implement a program to track potential contaminant source locations within the DWSMAs and educate the public regarding source water protection.

5.1.3 DWSMAs

Current land uses within the DWSMAs include Residential of various types, undeveloped land, Airport, Major Highways, Park/Recreational/Preserve, Retail and Other Commercial, Institutional, Industrial and

Utility, Golf Course, and Open Water. As indicated in Table 1, Blaine Wells 3, 4, 6, 7, 11, 12, 16, and 17 have been classified as vulnerable to contamination. The vulnerability to contamination of the portion of the source water aquifers encompassed by the DWSMAs has been classified as ranging from Low to Moderate. Current and future land uses could potentially affect the management strategies for Blaine's DWSMAs.

As noted above, the City is a member of the ACMWPG. The ACMWPG is an advisory group that includes Blaine along with neighboring public water suppliers. The members work together to address and collaborate on common elements of wellhead protection plans.

No other issues, problems, or opportunities, beyond those discussed herein, have been identified regarding land uses in the DWSMAs.

Information gathered for this WHPP amendment provides the City with the basis for tracking potential contaminant sources within the DWSMAs. Thus, the City has an opportunity to catalog and track potential contaminant sources and stay informed of land use changes or potential future threats to the source water aquifers.

The presence of privately owned wells within the DWSMAs provides potential pathways for contaminants to reach the source water aquifers if they are not properly constructed, maintained, or, if unused, properly sealed. Locations of wells identified within the DWSMAs during the PCSI are shown in Appendix C.

5.2 Issues, Problems, and Opportunities Disclosed at Public Meetings and in Written Comments

At the beginning of this wellhead protection planning process, the City of Blaine sent a notification to surrounding local units of government of its intention to initiate work on an amendment to its wellhead and source water protection plan. After approval by the MDH in November 2016 (MDH, 2016), Blaine sent information on the WHPAs, DWSMAs, and aquifer and well vulnerability to the local units of government whose jurisdictions overlay some portion of the Blaine DWSMAs.

The City of Blaine held a public information meeting on January 4, 2017 to receive comments from the general public regarding Part 1 of the WHPP. The local units of government whose jurisdictions overlay the DWSMAs were notified of the public information meeting. No comments on the Part 1 Wellhead Protection Plan were received from the local units of government or the general public at the Public Information Meeting.

As required by the Wellhead Protection Rules, the City provided local units of government whose jurisdictions overlap the DWSMAs a copy of the draft Part 2 Wellhead Protection Plan amendment. Written comments received from local units of government are presented in Appendix E. None of the comments necessitated any changes to this Plan.

The City of Blaine held a Public Hearing on the WHPP amendment on December 21, 2017. The local units of government whose jurisdictions overlap the DWSMAs were notified of the Public Hearing date, time,

and location. No comments were received from the local units of government or the general public at the Public Hearing.

5.3 Issues, Problems, and Opportunities Related to the Data Elements

Beginning with the delineation of WHPAs and DWSMAs (i.e., Part 1 of the WHPP) and continuing in this document, the required data elements have been addressed. As discussed in Appendix C, available local and regional information was used in compiling and assessing the data elements. Blaine intends to continue collecting data from the municipal wells as well as other applicable information from public data sources, as it becomes available, during the life of this Plan. At a minimum, this Plan will be revised/updated in ten years, as required by the Wellhead Protection Rules, or as directed by the MDH. Each time this Plan is revised/updated the most recent and accurate data available will be used.

5.4 Issues, Problems, and Opportunities Related to Local, State, and Federal Programs and Regulations

The State of Minnesota and local units of government currently enforce land use ordinances, zoning laws, sewer ordinances, well permitting regulations, and groundwater appropriation permit regulations. Blaine will work to promote the use of best management practices, (e.g., via the ACMWPG) for potential contaminant source properties within the DWSMAs. It is anticipated that local issues will be adequately addressed through these existing processes and adoption of best management practices.

6.0 Wellhead Protection Goals

In accordance with Minnesota Rules chapter 4720.5240, this section discusses the goals for present and future water use and land use to provide a framework for WHPP objectives and related actions.

Goals presented in this section were selected based on the information gathered and compiled from the data elements, delineations of the WHPAs and DWSMAs, results of the vulnerability assessments, results of the PCSI, expected future land and water uses, identified issues, problems, and opportunities, and evaluation of this information.

Through the years, the City has met water demands with a sufficient and safe water supply. Blaine intends to continue providing a safe water supply to its residents and businesses and other customers into the future by implementing this WHPP. Implementation of this WHPP will help ensure that the City will meet this goal.

As shown in Table 1, Blaine Wells 3, 4, 6, 7, 11, 12, 16, and 17 are classified as being vulnerable to contamination. As shown on Figure 1, the aquifer vulnerability is classified as Low in 100% of the West, Well 8, and Well 14 DWSMAs. The aquifer vulnerability is classified as moderate in 100% of the Northwest and East DWSMAs. The goals and objectives of this WHPP will focus on reducing the potential contaminant pathways to the source water aquifers that may be provided by private wells, and educating property owners and water supply users and working with the neighboring jurisdictions, to the extent practicable, to ensure proper management of the portions of the DWSMAs with the neighboring jurisdictions.

Blaine has identified the following goals for implementation of this WHPP:

- The City will work to maintain or improve the current level of water quality so that the municipal water supply will continue to meet or exceed all applicable state and federal water quality standards.
- Work with other cities in the ACMWPG to protect the source water aquifers.
- The City will provide information and promote activities that protect the source water aquifers that provide water to the municipal system. This will include increasing public awareness of the Wellhead and Source Water Protection Program and groundwater-related issues, and management of the identified potential contaminant sources within the DWSMAs.
- The City will continue to collect data to support future wellhead and source water protection efforts.

7.0 Objectives and Plans of Action

In accordance with Minnesota Rules chapter 4720.5250, this section discusses the objectives and plans of action to goals for Blaine's Wellhead and Source Water Protection Program.

7.1 Establishing Priorities

Within the DWSMAs, the vulnerability to contamination of the source water aquifer from which the City of Blaine wells draw their water ranges from Low to Moderate (Barr, 2016). The April 4, 2017 Scoping 2 Decision Notice from the MDH required Blaine to evaluate the following types of potential contaminant sources in the PCSI:

- In areas where the aquifer vulnerability is classified as Moderate
    - Above-ground and underground storage tanks
    - Leaking underground storage tank (LUST) locations
    - Potential Class V well locations
    - Pipeline facilities
    - Chemical storage locations
    - Spills/potential contamination sites
    - Wells
- In areas where the aquifer vulnerability is classified as Low
    - Potential Class V well locations
    - Wells

The number of each type of potential contaminant source in the DWSMAs is shown in Table 3.

The City of Blaine has identified the objectives and corresponding actions described in the following sections for accomplishing the wellhead and source water protection goals discussed above in Section 6. These goals for the City of Blaine's Wellhead and Source Water Protection Program will be achieved through the following existing and planned programs:

- Wells
    - Promoting proper management of existing active wells in the DWSMAs
    - Encouraging the proper sealing of all unused wells within the DWSMAs
    - Identification of new high capacity wells in or near the DWSMAs
- Potential contaminant source properties
    - Notifying owners of potential Class V well properties of requirements related to Class V wells
    - Encouraging proper handling of chemicals/wastes
    - Encouraging proper operation and maintenance of storage tanks
    - Tracking the status of identified brownfields sites and other properties where contaminant releases may have occurred in the DWSMAs

    - Periodically obtaining updated information on potential contaminant sources in the DWSMAs from the regulating agencies to maintain an up-to-date potential contaminant source database for the DWSMAs and allow timely recognition of potential issues that could affect the Blaine municipal water supply or DWSMAs.
- Public education
    - Distribution of the Blaine Annual Water Quality Report for the water supply system,
    - Posting Wellhead Protection Program information on the City of Blaine website https://www.blainemn.gov/ and provide a link to the ACMWPG's *Know the Flow* website (http://www.knowtheflow.us/) on the City's website,
    - Inclusion of wellhead and source water protection in the City's planning process,
- Continued data collection
    - Recording static and pumping water levels in the Blaine municipal wells,
    - Monitoring water levels in the City's observation well network,
    - Collection of additional local geologic and hydrogeologic data as it becomes available from public sources or from City-sponsored projects.

7.2 Well Management

The well management objectives outlined in this section consist of promoting the proper sealing of any unused, unmaintained, damaged, or abandoned wells and promoting proper management of active wells within the DWSMAs.

7.2.1 Distribution of Well Operation and Maintenance Information

The MDH has developed a handbook of information on proper well construction, operation, and maintenance titled "Well Owner's Handbook – A Consumer's Guide to Water Wells in Minnesota". This handbook is available on the MDH website. Blaine will attempt to provide the handbook information to all owners of active wells within the DWSMAs. To accomplish this, a link to the MDH website page where the handbook can be found will be added to the City's website and the City will attempt to notify well owners within the DWSMAs via mail that the information is available through the City's website. Blaine staff will track the number of well owners to whom they provide information regarding the Well Owner's Handbook.

7.2.1.1 Source of Action

Blaine staff will obtain the website information for the handbook from the MDH. City staff will then mail the website information to appropriate addresses within the DWSMAs, include a link to the MDH website on the City's website and in the City's *Blaine City Connect* newsletter, and have a copy of the handbook available in a publicly accessible location in the Blaine City offices.

7.2.1.2 Cooperators

None.

7.2.1.3 Time Frame

Distribution of the information to owners of will be done within one year after approval of this WHPP.

7.2.1.4 Estimated Cost

Approximately $500 - $1,000. Costs will include City staff time, mailer printing and postage costs, and handbook printing costs.

7.2.1.5 Goals Achieved

Through the MDH handbook, well owners will be educated concerning the proper operation and maintenance of wells. Proper operation and maintenance of wells will reduce the potential risk of these wells becoming pathways for contaminants to travel from the ground surface to the source water aquifer.

Success criterion: Notification of well owners in the DWSMAs by mail that information on the proper operation and maintenance of private wells is available through the City's website will be completed within one year of MDH approval of the WHPP and tracking of the number of well owners to whom the notification is sent.

7.2.2 Promote the Proper Sealing of Unused, Unmaintained, Damaged, or Abandoned Wells within the DWSMAs

City staff will promote the proper sealing of unused, privately owned wells within the DWSMAs. As indicated in Table 3, the highest priority will be placed on those wells that are completed in the source water aquifers from which the Blaine municipal wells pump and areas under current and near term development.

Proper sealing of unused wells can be promoted by periodically mailing a reminder to owners of wells that unused wells should be properly sealed and/or by posting a reminder on the City's website, in the *Blaine City Connect* newsletter, and working with the ACMWPG to post reminders on the *Know the Flow* website. The reminder will include a notification of the low interest loan program available through Anoka County for the sealing of unused wells and a link to the section of the *Know the Flow* website that has information related to sealing of unused wells. Proper sealing of unused wells at properties on which new developments are built or as properties are redeveloped can be promoted as part of the City's development approval process.

7.2.2.1 Source of Action

City staff

7.2.2.2 Cooperators

ACMWPG

7.2.2.3 Time Frame

The first reminders to owners of wells identified as high priority will all occur within two years of approval of this Plan.

7.2.2.4 Estimated Cost

Approximately $1,000-$2,000 for each well sealing reminder mailing event. City staff time and costs for preparing and mailing reminders to well owners and for preparing reminders to be included in the City's newsletter, on the City's website, or on the *Know the Flow* website.

7.2.2.5 Goals Achieved

As this action is implemented, the City's goal of eliminating potential pathways for contaminants to travel from the ground surface to the source water aquifer will be realized.

Success criterion: The first reminder distributed to well owners in the DWSMAs within two years of MDH approval of the WHPP and subsequent reminders distributed every three years thereafter for the life of the Plan and tracking of the number of reminders distributed.

7.2.3 Identify New High-Capacity Wells within or Near the DWSMAs

With assistance from the MDH and MDNR and, possibly, the Wellhead Protection Consultant, City staff will identify new high-capacity wells that are proposed for construction in or near Blaine's DWSMAs, and/or major changes to groundwater appropriations for existing high-capacity wells, to determine whether the pumping of said wells will affect the groundwater flow direction, static water level, or groundwater availability within the DWSMAs or alter the current boundaries of the DWSMA delineations or other portions of the City's WHPP.

7.2.3.1 Source of Action

City staff will request, or direct the Wellhead Protection Consultant to request, that the MDH and Regional MDNR office provide information on any newly proposed/constructed high capacity wells within or near the DWSMAs or any changes to existing appropriations permits for existing, nearby high capacity wells. City staff will also request assistance from the Wellhead Protection Consultant and the MDH to evaluate whether proposed pumping (or changes to pumping) will change the boundaries of the DWSMAs delineated for Blaine's wells.

7.2.3.2 Cooperators

City staff, MDH, MDNR, and the Wellhead Protection Consultant

7.2.3.3 Time Frame

Request information from the MDH and MDNR every two years; evaluation of potential changes to the DWSMA boundaries as needed

7.2.3.4 Estimated Cost

Approximately $3,000-$10,000 for each event of identifying new wells or changes to existing appropriations permits and evaluating how the changes may affect the DWSMA boundaries. City staff time and, potentially, Wellhead Protection Consultant time.

7.2.3.5 Goals Achieved

As this action is implemented, the City's WHPA/DWSMA delineations will remain current. New well owners will also be identified and educational materials identified/developed as part of other well management strategies can be provided to these new well owners.

Success criterion: Biannual determination of whether there are new high capacity wells in or near the DWSMAs and if there have been any major changes in permitted appropriations for existing high capacity wells in or near the DWSMAs.

7.3 Potential Contaminant Source Properties

The management objectives outlined in this section consist of promoting proper operation of storage tanks, maintaining an up-to-date database of storage tank properties in the portions of the DWSMAs where aquifer vulnerability is classified as Moderate, promoting proper handling of chemicals and wastes, reduction of waste streams at potential contaminant source properties within the DWSMAs, and maintaining the Inner Wellhead Management Zone (IWMZ) around each well so that potential contaminants are prevented from entering the IWMZs.

7.3.1 Notification of Owners of Potential Class V Well Properties

During the PCSI, 24 separate property parcels where Class V wells may be or may have been located were identified within the DWSMAs. The City will provide a fact sheet on Class V wells and reporting requirements to owners of properties where Class V wells may be or may have been located. The fact sheet will describe what a Class V well is and the impacts such wells can have on groundwater quality.

7.3.1.1 Source of Action

City staff, perhaps with the assistance of the MDH, U.S. EPA, and/or Wellhead Protection Consultant, will obtain or prepare a fact sheet that includes information on what constitutes a Class V well and what Federal requirements are associated with Class V wells. City staff will mail the fact sheet to targeted property owners in the DWSMAs and, if necessary, work with staff of the cities of Ham Lake and Spring Lake Park to distribute the information to property owners in those cities.

7.3.1.2 Cooperators

Potentially staff from Ham Lake, Spring Lake Park, MDH, U.S. EPA, and the Wellhead Protection Consultant

7.3.1.3 Time Frame

Distribution of the fact sheet on Class V wells will occur within two years of approval of this Plan.

7.3.1.4 Estimated Cost

Approximately $1,000 to $2,000. Estimated costs include Blaine staff time, printing and postage costs and, potentially, Wellhead Protection Consultant costs.

7.3.1.5 Goals Achieved

Property owners will become aware of their responsibilities related to Class V wells. Compliance with the applicable regulations regarding Class V wells by the property owners will reduce the potential for groundwater contamination and impact to the source water aquifers.

Success criterion: Distribution of fact sheet completed according to the schedule outlined in section 7.3.1.3 and tracking of the number of fact sheets distributed.

7.3.2 Information for Registered Storage Tank Owners

With the assistance of the MPCA, and possibly the Wellhead Protection Consultant, the City will prepare an information packet for owners of properties within the Moderate vulnerability portions of the DWSMAs that have registered storage tanks. Information packets will not be sent to owners of properties for which available information indicates that the storage tanks have been removed. This information packet will likely include information on the City's Wellhead and Source Water Protection Program (the Program) and MPCA publications on proper operation and maintenance of storage tanks. Copies of the information packet materials will be retained by the City.

7.3.2.1 Source of Action

City staff, possibly with the assistance of the Wellhead Protection Consultant, will obtain from the MPCA publications on proper storage tank operation and maintenance for the information packet. City staff, possibly with the assistance of the Wellhead Protection Consultant, will also prepare general information regarding the Program for inclusion in the information packet.

7.3.2.2 Cooperators

City staff, the MPCA and, possibly, the Wellhead Protection Consultant

7.3.2.3 Time Frame

The information packet will be sent to owners of active tanks on properties where aquifer vulnerability is classified as Moderate within two years of approval of this Plan. Updates to targeted registered storage tank owners will be provided periodically thereafter.

7.3.2.4 Estimated Cost

Approximately $1,000-$3,000 each time information packets are distributed to owners of registered tanks. Estimated costs include City staff time, MPCA staff time, information packet production and postage costs, and Wellhead Protection Consultant costs (as necessary).

7.3.2.5 Goals Achieved

Targeted property owners will be educated concerning the Wellhead and Source Water Protection program and on the issues associated with storage tanks and the requirements necessary to maintain a safe and secure system. Property owners will be encouraged to use best management practices regarding their storage tanks, and report any releases of contaminants to the City in addition to any other actions required by applicable regulations. The property owners will also be educated about groundwater

protection principles, and steps that everyone can take to protect the City's municipal water supply. This information packet provides the City the opportunity to heighten the awareness of wellhead and source water protection with these property owners.

Success criterion: Distribution of information packets completed according to the schedule outlined in section 7.3.2.3 and tracking of the number of information packets distributed.

7.3.3 Tracking of Registered Storage Tanks

Biannually, the City will request, or direct the Wellhead Protection Consultant to request, from the MPCA information on the status of registered storage tanks in the portions of the Blaine DWSMAs in which the aquifer vulnerability is classified as Moderate. This information will allow the City of Blaine to update the PCSI database and maintain current information regarding these potential contaminant sources in the DWSMAs. This activity should also identify new registered storage tanks in the DWSMAs.

7.3.3.1 Source of Action

City staff, or the Wellhead Protection Consultant on behalf of the City, will contact MPCA staff to obtain the information on the status of registered storage tanks.

7.3.3.2 Cooperators

City staff, possibly the Wellhead Protection Consultant, and the MPCA.

7.3.3.3 Time Frame

This information will be requested from the MPCA every two years starting two years after approval of this Plan.

7.3.3.4 Estimated Cost

Approximately $500-$1,500for each review and update. Estimated costs include City staff time and Wellhead Protection Consultant time (as necessary).

7.3.3.5 Goals Achieved

By tracking the status of registered storage tanks within the target areas, the City will remain aware of the current status of these potential contaminant sources. This will allow the City to identify potential impacts to the municipal water supply and give the City time to determine the best response to any potential impacts before the municipal water supply is compromised.

Success criterion: Submittal of an annual request to the MPCA for information regarding the status of registered storage tanks in the portions of the DWSMAs where aquifer vulnerability is classified as Moderate and completion of any updates to the PCSI database necessitated by the new information.

7.3.4 Information for Chemical Storage Properties

Through direct mail contact, the City will encourage the owners of the potential contaminant source properties associated with chemical storage within the Moderate vulnerability portions of the DWSMAs to

participate in self-audits of their chemical storage and waste generation and handling. The direct mail contact from the City will also encourage these businesses to request a site visit from the Minnesota Technical Assistance Program (MnTAP). MnTAP helps Minnesota businesses implement industry-tailored solutions that maximize resource efficiency, prevent pollution, and reduce costs to improve public health and the environment.

MnTAP helps Minnesota businesses protect the environment and stay competitive by providing practical alternatives to prevent pollution of land, air, and water. By reducing waste and increasing efficiency, businesses can save on disposal and raw material costs, decrease the regulatory compliance burden, and make working conditions healthier and safer for their employees.

7.3.4.1 Source of Action

City staff, perhaps with the assistance of the Wellhead Protection Consultant, will prepare and distribute the direct mail notice.

7.3.4.2 Cooperators

Wellhead Protection Consultant, potentially

7.3.4.3 Time Frame

Distribution of the direct mail notice will occur within one year of approval of this Plan. Biannually thereafter the direct mail notice will be sent to owners of any newly identified properties within the Moderate vulnerability portions of the DWSMAs that are associated with chemical storage.

7.3.4.4 Estimated Cost

Costs for the preparation of the direct mail notice will include City staff time, printing, postage costs, and, potentially, Wellhead Protection Consultant costs and are estimated to be $800 to $1,800.

7.3.4.5 Goals Achieved

Business owners will become aware of issues related to their chemical storage or waste generation and handling and learn of available assistance for identifying ways to minimize and properly dispose their waste.

Success criterion: Contact of property owners according to the schedule outlined in section

7.3.5 Sites Where Contaminant Releases May Have Occurred

During the PCSI, locations of brownfields redevelopment sites and other sites where contaminant releases may have occurred were identified in the zones in the DWSMAs where aquifer vulnerability is classified as Moderate. City staff will biannually request from the MPCA, Anoka County, and the MPCA updates on the current status of these properties, including information on any groundwater contamination associated with these sites. Updated information will be reviewed to determine if any additional actions related to protection of the City's water supply are warranted.

7.3.5.1 Source of Action

City staff

7.3.5.2 Cooperators

Anoka County, MPCA

7.3.5.3 Time Frame

Requests for updated data will be made biannually starting two years after approval of this Plan amendment.

7.3.5.4 Estimated Cost

Approximately $500 to $1,000 for each data update. Estimated costs include City staff time.

7.3.5.5 Goals Achieved

The City will maintain current information on the status of the dump, spill, and brownfields sites and any groundwater contamination associated with these sites.

Success criterion: Data update requests according to the schedule outlined in section 7.3.6.3.

7.4 Inner Wellhead Management Zone Management

The Inner Wellhead Management Zone (IWMZ) is defined in the Minnesota Rules as that area within a 200-foot radius of a public water supply well. The City will monitor setbacks in the IWMZs, possibly with the assistance of the MDH, to ensure that the IWMZ around each Blaine municipal well remains free of potential contaminant sources. City staff will document each IWMZ inspection and any actions taken to remove potential contaminant sources from an IWMZ.

7.4.1 Source of Action

City staff

7.4.2 Cooperators

City staff and, possibly, the MDH

7.4.3 Time Frame

The monitoring of setbacks within the IWMZs will be done biannually after approval of this Plan.

7.4.4 Estimated Cost

Costs for monitoring the IWMZ setbacks include City staff time estimated as $1,600 for each evaluation of the IWMZs.

7.4.5 Goals Achieved

By monitoring the IWMZ setbacks, Blaine will be able to keep the IWMZ around each well free of potential contaminant sources and ensure that any new regulated activities will meet required setbacks.

Success criterion: Completion of IWMZ potential contaminant source inventories and keeping the IWMZs free of potential contaminant sources.

7.5 Transportation Corridors, Pipelines, and Emergency Response

Establish communication and create awareness among Blaine city staff about transportation corridor and pipeline issues that may affect the public water supply and the procedures in place to address spills and prevent released contaminants from entering the municipal water supply. Transportation corridors include County and State highways. The Wellhead Protection Manager will work with the City's Emergency Manager to ensure that emergency procedures that will protect the municipal water supply are part of the City's emergency response program.

The Wellhead Protection Manager will also provide copies of the WHPP to the Minnesota Pollution Control Agency (MPCA), Minnesota Office of Pipeline Safety (MnOPS), and owners of pipelines that cross the DWSMAs.

7.5.1 Source of Action

City staff

7.5.2 Cooperators

None

7.5.3 Time Frame

The Wellhead Protection Manager will meet with the Emergency Manager within two years of approval of this Plan. Transmittal of the WHPP to the MPCA, MnOPS, and pipeline owners will occur within one year after approval of this plan.

7.5.4 Estimated Cost

Costs for this action will include City staff time and production costs for WHPP copies. Estimated cost is $2,000 to $2,500.

7.5.5 Goals Achieved

The City's emergency responders will work with and assist County and State first responders in the handling of spills in transportation corridors or from pipelines to ensure, to the extent possible, released contaminants are prevented from entering the environment and impacting the municipal water supply.

State agencies and pipeline owners will be educated regarding the boundaries of the Blaine DWSMAs and the management actions that are planned.

Success criterion: Emergency responder and pipeline owner awareness of the City's DWSMAs.

7.6 General Public Education

Public education concerning the DWSMAs associated with the City's municipal wells will include: inclusion of Wellhead and Source Water Protection Program information in the City's *Blaine City Connection* newsletter, distribution of the Blaine Annual Water Quality Reports to residents of Blaine, providing information on the City of Blaine website (https://www.blainemn.gov/) and the *Know the Flow* website (http://www.knowtheflow.us/), and inclusion of wellhead and source water protection into the City's planning process. The *Know the Flow* website is a cooperative water resources management website established by the ACMWPG.

7.6.1 Wellhead Protection Information

The City will develop information regarding the Wellhead and Source Water Protection Program for inclusion in the City's *Blaine City Connection* newsletter. The newsletter is available to all City residents.

7.6.1.1 Source of Action

City staff will prepare information on wellhead protection for the City's newsletter one to two times per year. If necessary, the Wellhead Protection Consultant will be contacted for assistance in preparing this information for the newsletter. The newsletter is distributed to Blaine residents and businesses six times per year and is available on the City's website.

7.6.1.2 Cooperators

City staff and, if necessary, the Wellhead Protection Consultant

7.6.1.3 Time Frame

One to two times per year upon approval of this WHPP

7.6.1.4 Estimated Cost

Approximately $500 - $2,500 each time information is prepared for the newsletter. Costs will include City staff time for preparing the information, and costs for Wellhead Protection Consultant assistance (as needed).

7.6.1.5 Goals Achieved

The information in the newsletter will be intended to educate owners of property within the DWSMAs, and the general public, about the City's Wellhead and Source Water Protection Program, groundwater protection principles, and steps that everyone can take to protect the City's municipal water supply.

Success criterion: At least annual distribution of information related to groundwater and wellhead protection via the City's newsletter.

7.6.2 Drinking Water Quality Report

The City will continue to annually prepare and distribute the Annual Water Quality Report to all Blaine residents. The report provides residents with information regarding the City's municipal water supply and its water quality.

7.6.2.1 Source of Action

City staff

7.6.2.2 Cooperators

None

7.6.2.3 Time Frame

Annually as required by Federal regulations

7.6.2.4 Estimated Cost

Costs include City staff time for preparation of the report and posting it on the City's website. Estimated annual cost for preparation of the report is $1,000 to $1,500.

7.6.2.5 Goals Achieved

The residents of Blaine will become more aware of the Federal water quality requirements for public water supplies. Residents will also become more aware of the overall water quality of Blaine's municipal water supply.

Success criterion: Annual publication/distribution of the Annual Water Quality Report.

7.6.3 City of Blaine and *Know the Flow* Websites

The City will post information on the Wellhead and Source Water Protection Program on the City's website (https://www.blainemn.gov/) and on the *Know the Flow* website (http://www.knowtheflow.us/). If necessary, the Wellhead Protection Consultant will be asked to assist with the preparation of information to be posted on the websites.

7.6.3.1 Source of Action

City staff

7.6.3.2 Cooperators

City staff, ACMWPG, and Wellhead Protection Consultant (as needed)

7.6.3.3 Time Frame

To begin within 180 days of approval of this WHPP. Information on the websites will be updated periodically thereafter.

7.6.3.4 Estimated Cost

Approximately $500-$2,500. City staff time and, potentially, Wellhead Protection Consultant costs.

7.6.3.5 Goals Achieved

The residents of Blaine will become more aware of wellhead and source water protection issues and the actions Blaine is taking to protect the municipal water supply. Education of the residents should lead to a better awareness of pollution prevention among the City's population.

Success criterion: Posting of Wellhead and Source Water Protection Program information on the City and *Know the Flow* websites according to the schedule identified in section 7.6.3.3.

7.7 Inclusion of Wellhead and Source Water Protection in the Planning Process within the DWSMAs

Copies of this WHPP amendment will be supplied to the City's Planning and Development Department so that they are aware of the Wellhead Protection Program. The Wellhead Protection Manager will work with the Planning and Development Department to determine the best way to ensure that the City's planning process is consistent with the goals and objectives of this WHPP. Options that may be discussed could include developing checklists related to wellhead protection for use in the planning review process, development of guidelines (based on MDH guidance) regarding when to allow storm water control facilities in the DWSMAs, adjustments to zoning, amendments to the City Code, communication with other members of the ACMWPG regarding their efforts in this area, and available resources from Metropolitan Council.

7.7.1 Source of Action

City staff

7.7.2 Cooperators

ACMWPG, Metropolitan Council

7.7.3 Time Frame

The Wellhead Protection Manager and those responsible for City planning and economic development will determine, within two years of approval of this WHPP, how best to incorporate wellhead and source water protection into the City's development, zoning, and planning processes.

7.7.4 Estimated Cost

Approximately $3,000-$5,000. Costs to complete this task will include staff time to develop a process for including wellhead protection in the planning process and to review proposals that could affect the municipal wells and associated DWSMAs.

Success criterion: Implementation of a method for incorporating wellhead and source water protection into the City's development, zoning, and planning processes.

7.7.5 Goals Achieved

Wellhead and source water protection will be incorporated into future planning efforts. Potential pollution risks to the source water aquifers will be reduced.

7.8 Data Collection

Blaine will continue to collect and maintain local geologic and hydrogeologic data as it becomes available in order to improve and augment current information and to provide additional data for future revisions of this WHPP. The City will also continue to collect information on potential contaminant sources within the DWSMAs.

7.8.1 Monitoring Static and Pumping Levels in Municipal Wells

The City will continue to routinely measure the static and pumping water levels in the municipal wells. These water levels will be recorded by the SCADA system and can be summarized in the reports obtained from the SCADA system.

7.8.1.1 Source of Action

City staff

7.8.1.2 Cooperators

None.

7.8.1.3 Time Frame

Ongoing

7.8.1.4 Estimated Cost

Approximately $2,000-$4,000 annually

7.8.1.5 Goals Achieved

Routine collection of groundwater levels in the municipal wells will provide data for the evaluation of groundwater elevation trends over time.

Success criterion: Compilation of a long term groundwater elevation dataset that can be used to evaluate groundwater elevation trends in the source water aquifers.

7.8.2 Water Level Monitoring in City Observation Wells

The City maintains a network of ten observation wells. Water levels are currently measured manually in these wells on a monthly basis. The City will continue to monitor the water levels in the observation wells. In addition, the City will evaluate installation of transducers with onboard dataloggers (e.g., Level Troll 500s manufactured by In-Situ, Inc. or similar instruments from other manufacturers) to automate measuring and recorded water levels in the observation wells. If the City determines that installation of transducers in the wells is appropriate then a schedule for acquisition and deployment of the instruments

will be developed and implemented. City staff may request assistance from the Wellhead Protection Consultant in evaluating groundwater level data.

7.8.2.1 Source of Action

City staff

7.8.2.2 Cooperators

Wellhead Protection Consultant (as needed)

7.8.2.3 Time Frame

Water level measurement will continue on at least a quarterly basis. Within five years the City will assess whether to install transducers in the observation wells.

7.8.2.4 Estimated Cost

Current annual cost of staff time for manual water level measurements is estimated to be approximately $500. The cost for a new transducer is estimated to be approximately $1,500 to $2,000 per well.

7.8.2.5 Goals Achieved

Routine collection of groundwater levels in the observation wells will provide data for the evaluation of groundwater elevation trends over time in the source water aquifers.

Success criterion: Continued measurement of groundwater levels in the observation well network.

7.8.3 Other Geologic and Hydrogeologic Data Collection

The City will attempt to collect local geologic and hydrogeologic data for the Blaine area as it becomes available from other public sources or through City-sponsored projects. The City will also support, whenever possible, future data collection efforts by other governmental entities (e.g., MGS, MDH, MDA, MDNR, MPCA, Coon Creek Watershed District, Rice Creek Watershed District, and Anoka County).

7.8.3.1 Source of Action

City staff

7.8.3.2 Cooperators

State and Anoka County agencies conducting geologic and hydrogeologic studies, well drilling companies, Wellhead Protection Consultant, and others.

7.8.3.3 Time Frame

Ongoing beginning with approval of this WHPP.

7.8.3.4 Estimated Cost

Approximately $1,000 to $1,500 for compiling data from other public sources.

7.8.3.5 Goals Achieved

More accurate hydrogeologic data will be available for use in siting future wells and for future revisions of the delineated WHPAs and the DWSMAs for existing and proposed municipal wells. Updated and more accurate vulnerability assessments may be possible as a result of new information.

Success criterion: Compilation of a geologic/hydrogeologic dataset that can be used in the future.

7.8.4 Updating of the Groundwater Model Used in the WHPA Delineations

Any new local geologic and hydrogeologic data for the Blaine area will be periodically reviewed to determine if the groundwater model used in the WHPA delineations will need to be updated. In addition, pumping from high capacity wells often changes over time. Changes in pumping from high capacity wells in or near the Blaine DWSMAs could affect the DWSMA boundaries. Therefore, the City will work with the Wellhead Protection Consultant to review available information and determine if the groundwater flow model should be updated so that future WHPA/DWSMA delineations will be consistent with available information.

7.8.4.1 Source of Action

City staff

7.8.4.2 Cooperators

Wellhead Protection Consultant

7.8.4.3 Time Frame

Five to seven years after approval of this Plan

7.8.4.4 Estimated Cost

Approximately $1,000 to $5,000 depending upon the magnitude of the revisions needed to make the groundwater flow model consistent with the most current available information.

7.8.4.5 Goals Achieved

The groundwater flow model used in the WHPA delineations will be consistent with available information. Since the groundwater flow model used to delineate the WHPAs will be consistent with current information updating of the WHPAs in the future can be done more efficiently.

Success criterion: An updated groundwater flow model that can be used for future updates to Part 1 of the City's WHPP.

7.8.5 Potential Contaminant Source Database

The City will periodically update the information on potential contaminant sources within the DWSMAs collected during the development of this WHPP, with the assistance of the Wellhead Protection consultant – if needed. The City will add information to the potential contaminant source database as additional potential contaminant source sites are identified or as sites are closed through working with the MPCA,

the MDH, the MDNR, the U.S. EPA, and Anoka County. New information for the PCSI database will be obtained by contacting appropriate MPCA, MDH, MDNR, U.S. EPA, and County programs on a bi-annual basis regarding any new information on potential contaminant sources that may be available.

7.8.5.1 Source of Action

City staff.

7.8.5.2 Cooperators

MPCA, MDH, MDNR, U.S. EPA, Anoka County staff, and the Wellhead Protection Consultant, if needed.

7.8.5.3 Time Frame

Every two years beginning after approval of this WHPP.

7.8.5.4 Estimated Cost

Approximately $500-$2,500 every two years. City staff time and, if needed, Wellhead Protection Consultant costs. Actual costs will depend upon the amount of new potential contaminant source location information that must be added to the potential contaminant source database and in any year could be higher than the estimated range shown.

7.8.5.5 Goals Achieved

This database will be a useful tool to track, catalog, and document the status of potential contaminant sources within the DWSMAs.

Success criterion: Maintaining an up to date potential contaminant source database.

7.8.6 Potential Contaminant Source Verification

Potential contaminant sources were identified within the DWSMAs during the PCSI. As part of the development of this WHPP, all locations of identified potential contaminant sources were verified by the Wellhead Protection Consultant to the extent possible based on the available data. Any new potential contaminant source locations identified during the implementation of this WHPP will be verified by the City with the assistance of the Wellhead Protection Consultant, if needed.

7.8.6.1 Source of Action

City staff.

7.8.6.2 Cooperators

City staff and the Wellhead Protection Consultant, if needed.

7.8.6.3 Time Frame

Every two years after approval of this WHPP if new potential contaminant sources in the DWSMAs are identified.

7.8.6.4 Estimated Cost

Approximately $1,000-$3,500. City staff time and Wellhead Protection Consultant, if needed. Actual costs will depend upon the number of new potential contaminant source locations that must be verified and in any update could be higher than the estimated range shown.

7.8.6.5 Goals Achieved

Verification of newly identified potential contaminant source locations within the DWSMAs will allow the City to remain in compliance with the requirements of the State of Minnesota's Wellhead and Source Water Protection Program. Verification of the newly identified locations will also ensure that the City uses the most accurate data on type and location of potential contaminant sources as implementation of this WHPP proceeds.

Success criterion: All potential contaminant source locations in the database are verified to the extent possible.

7.8.7 Tritium Sampling

Tritium (^{3}H), a radioactive isotope of hydrogen, whose atmospheric concentrations rose in the 1950s and early 1960s due to atmospheric hydrogen bomb testing, has been used extensively to date groundwater. Tritium activities peaked during atmospheric hydrogen bomb testing of the 1950s and 1960s, and values of ^{3}H in precipitation reached a maximum of approximately 10,000 TU (tritium units) in 1963 (Mazor, 2004). Natural production of ^{3}H in the upper atmosphere introduces approximately 5 TU to precipitation each year (Mazor, 2004). The presence of tritium at concentrations above 1 tritium unit in a groundwater sample indicates the presence of a significant fraction of post-1954 (i.e., recently infiltrated) water in the sample. Sampling of City wells for tritium at regular intervals will allow for tracking of tritium concentrations over time. If a tritium concentration in a groundwater sample from a well is significantly higher than the concentration in a previous sample from the same well it could be an indication that there is a pathway such as an unused, unsealed well in the vicinity that allows water to move from the surface to the source water aquifer faster than before the pathway became available. The City will ask the MDH to sample Wells 2, 3, 5, 9, 11, 13, 14, 16, and 17 in year seven or eight of this WHPP. Thereafter, the City will then ask the MDH to sample the municipal wells for tritium at least every 10 years. Since the MDH already has a program to sample municipal wells for tritium the City would rely on the MDH to collect the samples and have them analyzed for tritium.

7.8.7.1 Source of Action

City staff

7.8.7.2 Cooperators

MDH

7.8.7.3 Time Frame

In year seven or eight of this WHPP and then at least every 10 years thereafter.

7.8.7.4 Estimated Cost

At the time this plan was prepared, cities were not charged by the MDH for tritium sampling and analysis.

7.8.7.5 Goals Achieved

Obtaining data to evaluate if pathways that allow for relatively rapid movement of water from the surface to the source water aquifers are present.

Success criterion: Collection of groundwater samples from the selected City wells and analysis of these samples for tritium on the schedule outlined in section 7.8.7.3.

7.8.8 Evaluation of Well 6 Casing

There is uncertainty regarding the condition of the casing in Well 6 and whether the casing is fully grouted. Therefore, the City will hire a well contractor to evaluate the condition of the casing and whether it is fully grouted during the next scheduled maintenance of the well.

7.8.8.1 Source of Action

City staff

7.8.8.2 Cooperators

Well contractor

7.8.8.3 Time Frame

Next scheduled maintenance of Well 6

7.8.8.4 Estimated Cost

Approximately $10,000 to $15,000. The actual cost will depend on the level of effort required to determine if the casing is fully grouted.

7.8.8.5 Goals Achieved

Determining if the Well 6 casing is providing a pathway that allows for relatively rapid movement of water from the surface to the source water aquifers.

Success criterion: Evaluation of the Well 6 casing on the schedule outlined in section 7.8.8.3.

8.0 Evaluation Program

Per Minnesota Rule 4720.5270, the progress in implementing a WHPP must be evaluated routinely to determine the effectiveness of the WHPP in terms of accomplishment of goals. Monitoring and evaluation measures to ensure effectiveness of the management strategies are detailed below.

Evaluation activities discussed in this WHPP amendment include the following:

- Track the implementation of the objectives, activities, and tasks discussed above in Section 7.0.
- Determine the effectiveness of specific management strategies for the protection of the Blaine municipal water supply.
- Identify possible changes to the management strategies to improve overall effectiveness.
- Determine the adequacy of financial resources and staff availability to perform and implement the management strategies planned each year.
- Update the WHPP if new wells are added to the municipal water supply system.

The City of Blaine will continue to cooperate with the MDH in the monitoring of the City's municipal water supply to determine if the management strategies presented in this WHPP are having a positive effect on water quality and to identify any water quality problems that may arise and need to be addressed.

The Blaine Wellhead Protection Manager will strive to provide a report to the City Council every two years that summarizes the progress in implementing the management strategies and objectives in this WHPP. The report will be completed using the MDH Wellhead Protection Program Evaluation form (Appendix F). The City will retain a copy of the report in its Wellhead Protection file and send a copy of the report to the MDH Source Water Protection Unit in St. Paul. The intent of the bi-annual reports is to compile a comprehensive review of the implementation of the source management strategies for use when the City updates or revises this WHPP. As specified by the Wellhead Protection Rules, this WHPP will be updated a minimum of every 10 years, or more often as required due to changes to the municipal water supply system.

9.0 Alternative Water Supply Contingency Strategy

The purpose of a contingency plan is to establish, provide, and keep updated certain emergency response procedures and information for the public water supply, which may become vital in the event of a partial or total loss of public water supply services as a result of natural disaster, chemical contamination, civil disorder, or human-caused disruptions.

The City's procedures for responding to water emergencies and the City's water conservation plan are presented in the City's 2007 Water Emergency and Conservation Plan (Bluestone, 2007). As required, the Water Emergency and Conservation Plan was submitted to the MDNR Division of Waters – Appropriation Permit Program and the Metropolitan Council for review and approval. The MDNR approval letter for the Water Emergency and Conservation Plan is dated May 23, 2007. The City Council adopted the Water Emergency and Conservation Plan on August 16, 2007and the MDNR recorded the Water Emergency and Conservation Plan Certificate of Adoption as being completed on August 23, 2007. A copy of the Water Emergency and Conservation Plan, the MDNR approval letter, and the Certificate of Adoption are presented in Appendix G. A copy of the Water Emergency and Conservation Plan can also be obtained from the City upon request.

At the time this Plan amendment was prepared the City was awaiting final approval from the MDNR of the new Water Supply Plan to address water emergencies and water conservation that had been submitted to the Department. Once the new Water Supply Plan is approved by the MDNR and adopted by the City it will replace the 2007 Emergency and Conservation Plan. The City will provide documentation of MDNR

10.0 References

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Metropolitan Council, 2015. 2015 System Statement – City of Blaine, System Statement issue date September 17, 2015.

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Minnesota Department of Health (MDH), 2016. Letter from Amal M. Djerrari of the MDH to Mike Ulrich of the City of Blaine approving the Part 1 Wellhead Protection Plan Amendment, dated November 18, 2016.

Minnesota Department of Health (MDH), 2017. Scoping 2 Decision Notice and Meeting Summary – City of Blaine – PWSID 1020006, Letter from John Freitag of the MDH to Mike Ulrich of the City of Blaine, April 4, 2017.

Tables

Table 1

Municipal Well Construction Summary
City of Blaine WHPP Amendment

Local Well ID	Unique Number	Use/ Status[1]	Casing Diameter (in.)	Casing Depth (ft.)	Well Depth (ft.)	Year Constructed	Aquifer	Well Vulnerability
1	208629	S	12	244	675	1959	CTCW-CMTS	Not Vulnerable
2	208628	S	12	229	665	1960	CTCW-CMTS	Not Vulnerable
3	208646	P	20	221	681	1960	CJDN-CMTS	Vulnerable
4	208645	P	20	227	520	1964	CJDN-CWON	Vulnerable
5	208615	S	20	234	686	1966	CTCW-CMTS	Not Vulnerable
6	208634	P	24 x 16	300	741	1968	CTCW	Vulnerable
7	208616	S	24 x 16	287	487	1969	CTCW	Vulnerable
8	208630	S	24 x 16	242	500	1971	CTCW	Not Vulnerable
9	208618	S	24 x 16 x 12	370	480	1972	CTCW	Not Vulnerable
10	208643	S	24 x 16	257	480	1971	CTCW	Not Vulnerable
11	208633	P	24 x 16	290	735	1974	CTCW-CMTS	Vulnerable
12	127264	P	24 x 20	188	228	1976	QBAA[2]	Vulnerable
13	127270	P	30 x 24 x 16	355	685	1977	CTCW-CMTS	Not Vulnerable
14	233109	S	30 x 24 x 16	461	736	1978	CWON-CMTS	Not Vulnerable
16	151587	S	30 x 24 x 18	298	505	1986	CTCW	Vulnerable
17	721815	P	24 x 18	203	244	2005	QBAA[2]	Vulnerable

[1] P = Primary, S = Seasonal

[2] Well is screened rather than open borehole

Aquifer Codes:

CTCW = Tunnel City Group-Wonewoc Sandstone
CTCG-CMTS = Tunnel City Group to Mt. Simon Sandstone
CWON-CMTS = Wonewoc Sandstone to Mt. Simon Sandstone
CJDN-CMTS = Jordan Sandstone to Mt. Simon Sandstone
CJDN-CWON = Jordan Sandstone to Wonewoc Sandstone
QBAA = Quaternary Buried Artesian Aquifer

Table 2

Annual Volume of Water Pumped
City of Blaine WHPP Amendment

		Total Annual Withdrawal (gal/yr)				
Unique Number	Well Name	2011	2012	2013	2014	2015
208629	1	54,870,000	15,810,000	15,392,000	20,368,000	2,037,000
208628	2	59,849,000	25,827,000	30,089,000	24,443,000	7,702,000
208646	3	294,842,000	349,360,000	438,228,000	403,528,000	395,857,000
208645	4	320,565,000	378,353,000	352,926,000	384,549,000	372,172,000
208615	5	68,864,000	42,122,000	56,631,000	26,950,000	7,243,000
208634	6	309,728,000	410,462,000	336,242,000	374,402,000	351,529,000
208616	7	7,771,000	3,623,000	23,516,000	11,721,000	448,000
208630	8	75,307,000	42,721,000	58,323,000	23,127,000	11,692,000
208618	9	32,642,000	26,014,000	26,829,000	15,220,000	3,647,000
208643	10	123,551,000	47,496,000	40,695,000	36,227,000	14,764,000
208633	11	323,577,000	216,655,000	181,739,000	178,339,000	180,989,000
127264	12	183,259,000	311,648,000	261,981,000	263,389,000	258,891,000
127270	13	332,417,000	455,237,000	356,815,000	305,176,000	421,556,000
233109	14	48,996,000	59,426,000	95,483,000	24,180,000	23,482,000
151587	16	39,199,000	43,102,000	32,372,000	3,156,000	3,032,000
721815	17	236,057,000	369,863,000	203,511,000	225,026,000	279,837,000
	Totals	2,511,494,000	2,797,719,000	2,510,772,000	2,319,801,000	2,334,878,000

Source: City water use records, MPARS

Table 3

Summary of Potential Sources of Contaminants and Assigned Management Priority
City of Blaine WHPP Amendment

Potential Contaminant Source Category	Total Number in DWSMAs[1, 3]	Number Within IWMZ (Priority Assigned)	Number Within ERZ and (Priority Assigned)	Number Within Remainder of the DWSMAs (Priority Assigned)
Chemical Storage Sites	27	MVZ – 7[2](Mod.)	MVZ – 4(High)	MVZ – 16(Mod.)
Potential Contaminant Source Locations	15	MVZ – 1[2](Mod.)	MVZ – 3(Mod.)	MVZ – 11(Mod.)
Potential Class V Well Locations	26	MVZ – 0 LVZ – 0	MVZ – 11 (Mod.) LVZ – 0	MVZ – 14 (Mod.) LVZ – 1
Leaking Tank Sites				
Closed	37	MVZ – 2(Low)	MVZ – 6(Low)	MVZ – 29(Low)
Registered Storage Tanks (total # of tanks)				
Status = Active	53	MVZ – 0	MVZ – 10(High)	MVZ – 43(Mod.)
Status = Inactive or Unknown	156	MVZ – 6(Mod.)	MVZ – 16(Mod.)	MVZ – 134(Low)
Wells (status = Active, Inactive, or Unknown) – East DWSMA				
Completed in or penetrating a source water aquifer	1	MVZ – 0 LVZ – 0	MVZ – 0 LVZ – 0	MVZ – 1(High) LVZ – 0
Not completed in or penetrating source water aquifer	104	MVZ – 0 LVZ – 0	MVZ – 0 LVZ – 0	MVZ – 0 LVZ – 104(Mod.)
Wells (status = Active, Inactive, or Unknown) – Northwest DWSMA				
Completed in or penetrating a source water aquifer	184	MVZ – 0 LVZ – 0	MVZ – 2(High) LVZ – 0	MVZ – 181(High) LVZ – 0
Not completed in or penetrating source water aquifer	36	MVZ – 0 LVZ – 0	MVZ – 4(Mod.) LVZ – 0	MVZ – 32(Mod.) LVZ – 0
Wells (status = Active, Inactive, or Unknown) – Southwest DWSMA				
Completed in or penetrating a source water aquifer	0	MVZ – 0 LVZ – 0	MVZ – 0 LVZ – 0	MVZ – 0 LVZ – 0
Not completed in or penetrating source water aquifer	64	MVZ – 0 LVZ – 0	MVZ – 27(Mod.) LVZ – 0	MVZ – 36(Mod.) LVZ – 1(Mod.)

Table 3

Summary of Potential Sources of Contaminants and Assigned Management Priority
City of Blaine WHPP Amendment

Potential Contaminant Source Category	Total Number in DWSMAs[1, 3]	Number Within IWMZ (Priority Assigned)	Number Within ERZ and (Priority Assigned)	Number Within Remainder of the DWSMAs (Priority Assigned)
Wells (status = Active, Inactive, or Unknown) – West DWSMA				
Completed in or penetrating a source water aquifer	0	MVZ – 0 LVZ – 0	MVZ – 0 LVZ – 0	MVZ – 0 LVZ – 0
Not completed in or penetrating source water aquifer	3	MVZ – 0 LVZ – 0	MVZ – 0 LVZ – 0	MVZ – 0 LVZ – 3(Mod.)
Wells (status = Active, Inactive, or Unknown) – Well 8 DWSMA				
Completed in or penetrating a source water aquifer	0	MVZ – 0 LVZ – 0	MVZ – 0 LVZ – 0	MVZ – 0 LVZ – 0
Not completed in or penetrating source water aquifer	9	MVZ – 0 LVZ – 0	MVZ – 0 LVZ – 0	MVZ – 0 LVZ – 9(Mod.)
Wells (status = Active, Inactive, or Unknown) – Well 14 DWSMA				
Completed in or penetrating a source water aquifer	0	MVZ – 0 LVZ – 0	MVZ – 0 LVZ – 0	MVZ – 0 LVZ – 0
Not completed in or penetrating source water aquifer	3	MVZ – 0 LVZ – 0	MVZ – 0 LVZ – 0	MVZ – 0 LVZ – 3(Mod.)

MVZ Moderate aquifer vulnerability zone LVZ Low aquifer vulnerability zone

ERZ Emergency Response Zone: defined as portion of the WHPA within the 1-year groundwater time of travel area.

IWMZ Inner Wellhead Management Zone: defined in MR4720.5100 subpart 19 as the area within 200 feet of a public water supply well.

[1] Total number of each potential contaminant source type identified during the PCSI.

[2] Site(s) are under City control so priority is set as moderate.

[3] Total number of wells does not include the 16 Blaine municipal water supply wells.

Table 4

High Capacity Wells Within One Mile of the DWSMAs
City of Blaine

Map ID	Unique ID	Status	Permittee	Use	Aquifer
1	208629	Active	Blaine, City of	Municipal/Public Water Supply	CTCW-CMTS
2	208628	Active	Blaine, City of	Municipal/Public Water Supply	CTCW-CMTS
3	208646	Active	Blaine, City of	Municipal/Public Water Supply	CJDN-CMTS
4	208645	Active	Blaine, City of	Municipal/Public Water Supply	CJDN-CWON
5	208615	Active	Blaine, City of	Municipal/Public Water Supply	CTCW-CMTS
6	208634	Active	Blaine, City of	Municipal/Public Water Supply	CTCW-CMTS
7	208616	Active	Blaine, City of	Municipal/Public Water Supply	CTCW
8	208630	Active	Blaine, City of	Municipal/Public Water Supply	CTCW
9	208618	Active	Blaine, City of	Municipal/Public Water Supply	CTCW
10	208643	Active	Blaine, City of	Municipal/Public Water Supply	CTCW
11	208633	Active	Blaine, City of	Municipal/Public Water Supply	CTCW-CMTS
12	127264	Active	Blaine, City of	Municipal/Public Water Supply	QBAA
13	127270	Active	Blaine, City of	Municipal/Public Water Supply	CTCW-CMTS
14	233109	Active	Blaine, City of	Municipal/Public Water Supply	CWON-CMTS
16	151587	Active	Blaine, City of	Municipal/Public Water Supply	CTCW
17	721815	Active	Blaine, City of	Municipal/Public Water Supply	QBAA
59	208995	Active	Circle Pines, City of	Municipal/Public Water Supply	QBAA
120	753655	Active	Wildwood Village and Wildwood Village II	Landscaping/Athletic Field Irrigation	QBAA
154	575168	Active	Perfect 10 Car Wash	Commercial/Institutional Water Supply	CJDN
235	209209	Active	Ind School District 12	Landscaping/Athletic Field Irrigation	CJDN
319	615970	Active	CF Majestic Oaks Arcis LLC, c/o Arcis Equity Partners, LLC	Golf Course Irrigation	QBAA
349	790641	Active	CF Majestic Oaks Arcis LLC, c/o Arcis Equity Partners, LLC	Golf Course Irrigation	QBAA
109793	109793	Active	Brookside Mobile Home Prk	Private Water Supply	QBAA

Table 4

High Capacity Wells Within One Mile of the DWSMAs
City of Blaine

Map ID	Unique ID	Status	Permittee	Use	Aquifer
110471	110471	Active	Lino Lakes, City Of	Municipal/Public Water Supply	CJDN
114392	114392	Active	TPC Twin Cities	Golf Course Irrigation	CTCW
114392	114392	Active	TPC Twin Cities	Sod Farm Irrigation	CTCW
114414	114414	Active	National Sports Center Foundation	Landscaping/Athletic Field Irrigation	CTCW
114414	114414	Active	National Sports Center Foundation	Sod Farm Irrigation	CTCW
133213	133213	Active	Lakes Irrigation, LLC	Sod Farm Irrigation	CTCW-CMTS
138928	138928	Active	Brookside Mobile Home Prk	Private Water Supply	QBAA
168720	168720	Active	Coon Rapids, City Of	Municipal/Public Water Supply	CTCW-CMTS
180920	180920	Active	Spring Lake Park, City Of	Municipal/Public Water Supply	CMTS
202929	202929	Active	Coon Rapids, City Of	Municipal/Public Water Supply	CTCW-CMTS
202930	202930	Active	Coon Rapids, City Of	Municipal/Public Water Supply	CTCW-CMTS
202931	202931	Active	Coon Rapids, City Of	Municipal/Public Water Supply	CTCW
202932	202932	Active	Coon Rapids, City Of	Municipal/Public Water Supply	CTCW-CMTS
202951	202951	Active	Coon Rapids, City Of	Municipal/Public Water Supply	CTCW-CMTS
206637	206637	Active	Spring Lake Park, City Of	Municipal/Public Water Supply	CTCW-CMTS
206638	206638	Active	Spring Lake Park, City Of	Municipal/Public Water Supply	CTCW-CMTS
206719	206719	Active	Mounds View, City Of	Municipal/Public Water Supply	CTCW-CMTS
208566	208566	Active	MN Dept of Corrections - Lino Lakes	Commercial/Institutional Water Supply	CTCW
208594	208594	Active	CF Majestic Oaks Arcis LLC, c/o Arcis Equity Partners, LLC	Agricultural Crop Irrigation	CTCW-CMTS
208594	208594	Active	CF Majestic Oaks Arcis LLC, c/o Arcis Equity Partners, LLC	Golf Course Irrigation	CTCW-CMTS
208611	208611	Active	Anoka-Hennepin ISD 11	Landscaping/Athletic Field Irrigation	CTCW
208636	208636	Active	Circle Pines, City of	Municipal/Public Water Supply	CJDN
208648	208648	Active	Centennial MHP	Private Water Supply	QBAA
208651	208651	Active	Restwood Terrace M H Park	Private Water Supply	QBAA

Table 4

High Capacity Wells Within One Mile of the DWSMAs
City of Blaine

Map ID	Unique ID	Status	Permittee	Use	Aquifer
208992	208992	Active	Restwood Terrace M H Park	Private Water Supply	QBAA
208996	208996	Active	Lexington, City Of	Municipal/Public Water Supply	QBAA
223294	223294	Active	Spring Lake Park, City Of	Municipal/Public Water Supply	CTCW-CMTS
249759	249759	Active	Paul Revere Cooperative	Private Water Supply	QBAA
407899	407899	Active	Centennial MHP	Private Water Supply	QBAA
474384	474384	Active	Coon Rapids, City Of	Municipal/Public Water Supply	QBAA
510541	510541	Active	CF Majestic Oaks Arcis LLC, c/o Arcis Equity Partners, LLC	Agricultural Crop Irrigation	CTCW-CMTS
510541	510541	Active	CF Majestic Oaks Arcis LLC, c/o Arcis Equity Partners, LLC	Golf Course Irrigation	CTCW-CMTS
510541	510541	Active	CF Majestic Oaks Arcis LLC, c/o Arcis Equity Partners, LLC	Golf Course Irrigation	CTCW-CMTS
538124	538124	Active	Medtronic Inc	Basin (Lake) Level Maintenance	OPCJ
538124	538124	Active	Medtronic Inc	Golf Course Irrigation	OPCJ
538124	538124	Active	Medtronic Inc	Landscaping/Athletic Field Irrigation	OPCJ
538605	538605	Active	Silverthorn Estates Townhome Association	Landscaping/Athletic Field Irrigation	OPDC
554238	554238	Active	Majestic Greens, LLC	Private Water Supply	QWTA
562962	562962	Active	Ind School District 12	Landscaping/Athletic Field Irrigation	CTCW
563006	563006	Active	Spring Lake Park, City Of	Municipal/Public Water Supply	CMTS
609817	609817	Active	Bachman's Inc	Landscaping/Athletic Field Irrigation	CTCW
609817	609817	Active	Bachman's Inc	Nursery Irrigation	CTCW
674498	674498	Active	National Sports Center Foundation	Golf Course Irrigation	CTCW
706843	706843	Active	Anoka-Hennepin ISD 11	Landscaping/Athletic Field Irrigation	CTCW
774904	774904	Active	Lexington Estates Townhome Assoc No 4	Landscaping/Athletic Field Irrigation	QBAA
805355	805355	Active	Village at Rice Creek Condominiums Association	Landscaping/Athletic Field Irrigation	Not Available

Table 4

High Capacity Wells Within One Mile of the DWSMAs
City of Blaine

Map ID	Unique ID	Status	Permittee	Use	Aquifer
808973	808973	Active	Village at Rice Creek Condominiums Association	Landscaping/Athletic Field Irrigation	Not Available
NA1	Not Available	Active	Pulte Homes, Inc.	Construction Dewatering	Not Available
NA2	Not Available	Active	Spring Lake Park Leased Housing Associates I, LLLP	Construction Dewatering	Not Available
NA3	Not Available	Active	XPO Logistics Freight, Inc.	Construction Dewatering	Not Available
NA4	Not Available	Active	Defcon Powersports	Construction Dewatering	Not Available

[1] Map ID refers to Figure 4

Aquifer Codes:

CJDN = Jordan Sandstone
CTCW = Tunnel City Group-Wonewoc Sandstone
CMTS = Mt. Simon Sandstone
CWON = Wonewoc Sandstone
OPDC = Prairie du Chien Group
OPCJ = Prairie du Chien Group-Jordan Sandston
QBAA = Quaternary Buried Artesian Aquifer
QWTA = Quaternary Water Table Aquifer

Figures

A - Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones.

AE - The base floodplain where base flood elevations are provided. AE Zones are now used on new format FIRMs instead of A1-A30 Zones.

X - Area of minimal flood hazard, usually depicted on FIRMs as above the 500-year flood level. Zone C may have ponding and local drainage problems that don't warrant a detailed study or designation as base floodplain. Zone X is the area determined to be outside the 500-year flood and protected by levee from 100-year flood.

Municipal Well

Blaine DWSMA

Municipal Boundary

FEMA Flood Zone

A

AE

X

Aquifer Vulnerability

Moderate

Low

2 - Municipal Well Location PCSI ID (PCSI ID refers to Table C-3)

0 2,000 4,000

Feet

MUNICIPAL WELLS, DWSMAs, AND AQUIFER VULNERABILITY
Blaine Part 2 WHPP Amendment
City of Blaine

FIGURE 1

Andover
Ham Lake
Coon Rapids
Blaine
Lino Lakes
Circle Pines
Lexington
Brooklyn Park
Fridley
Spring Lake Park
Mounds View
Shoreview
North Oaks

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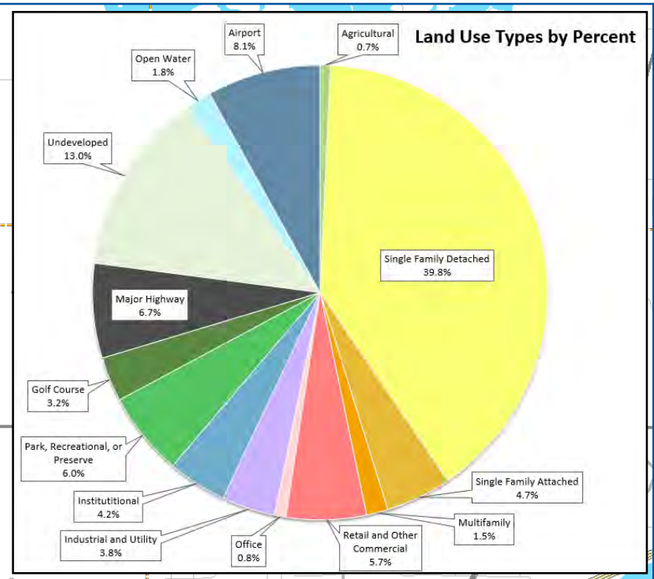


Andover
Ham Lake
Coon Rapids
Blaine
Lino Lakes
Circle Pines
Lexington
Shoreview
Mounds View
Spring Lake Park
Fridley
Brooklyn Park
North Oaks

Municipal Well
Blaine DWSMA
Municipal Boundary
Farmstead
Single Family Detached
Manufactured Housing Park
Single Family Attached
Multifamily
Retail and Other Commercial
Office
Mixed Use Commercial and Other
Industrial and Utility
Institutional
Park, Recreational or Preserve
Golf Course
Major Highway
Airport
Agricultural
Undeveloped
Water

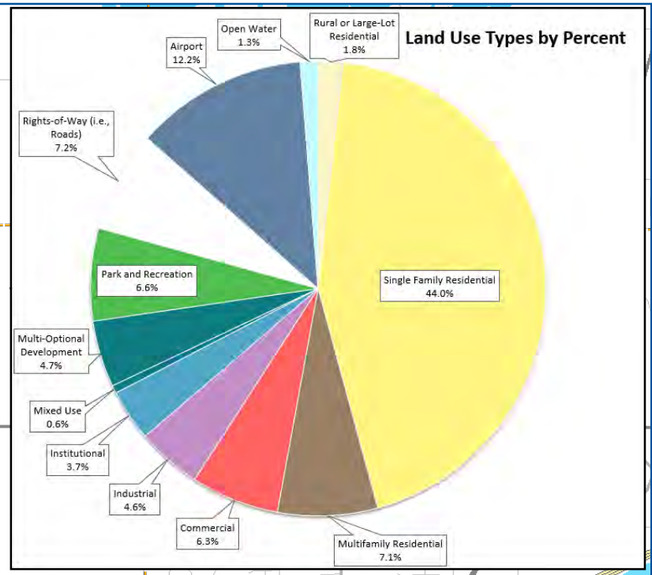
* Land Use Data (Met Council 2010 Generalized Land Use)

2 - Municipal Well Location PCSI ID (PCSI ID refers to Table C-3)

0 2,000 4,000
Feet

CURRENT
LAND USE
Blaine Part 2 WHPP Amendment
City of Blaine

FIGURE 2



Municipal Well
Blaine DWSMA
Municipal Boundary

Planned Future Land Use*

- Rural or Large-Lot Residential
- Single Family Residential
- Multifamily Residential
- Commercial
- Industrial
- Institutional
- Mixed Use
- Multi-Optional Development
- Park and Recreation
- Rights-of-Way (i.e., Roads)
- Airport
- Open Water

* Land Use Data (Met Council 2030 Generalized Interpreted Land Use)

2 - Municipal Well Location PCSI ID (PCSI ID refers to Table C-3)

0 2,000 4,000
Feet

PLANNED FUTURE
LAND USE
Blaine Part 2 WHPP Amendment
City of Blaine

FIGURE 3

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BARR

Andover
Ham Lake
Columbus
Coon Rapids
Blaine
Lino Lakes
Circle Pines
Lexington
Brooklyn Park
Fridley
Spring Lake Park
Mounds View
Shoreview
North Oaks

208594
554238
510541
510541
349
319
120
208611
12
13
17
9
5
7
133213
114392
NA1
208566
562962
202931
474384
706843
202932
168720
202930
202929
8
2
1
114414
674498
202951
10
NA4
16
4
3
154
NA2
609817
180920
223294
206638
206637
563006
538124
805355
808973
206719
774904
538605
11
6
235
59
110471
208636
208996
249759
208648
407899
208651
208992
14
109793
138928

Permitted Water Appropriations (MPARS) Within 1 Mile of DWSMA

- Agricultural Crop Irrigation
- Basin (Lake) Level Maintenance
- Commercial/Institutional Water Supply
- Construction Dewatering
- Golf Course Irrigation
- Landscaping/Athletic Field Irrigation
- Municipal/Public Water Supply
- Nursery Irrigation
- Private Water Supply
- Sod Farm Irrigation
- Blaine DWSMA
- Municipal Boundary

Aquifer Vulnerability

- Moderate
- Low

2 - MPARS Location PCSI ID
(PCSI ID refers to Table C-8)

N

0 2,000 4,000
Feet

HIGH CAPACITY WELLS WITHIN ONE MILE OF THE DWSMAs
Blaine Part 2 WHPP Amendment
City of Blaine

FIGURE 4

BARR

Barr Footer: ArcGIS 10.4.1, 2017-08-21 15:06 File: I:\Projects\23\02\1038\Maps\Reports\WHPP\Fig04 High Capacity Wells within 1 Mile of the DWSMA.mxd User: jil2