Executive Summary

ES-1 Introduction

This update of the City’s 2009 Water System Plan was undertaken primarily to incorporate the planned implementation of Dissolved Air Flotation (DAF) at the Whatcom Falls Water Treatment Plant. This update includes analysis related to this key treatment issue that arose since completion of the 2009 Water System Plan, as well as analysis related to recent modifications to the distribution system related to distribution system water quality. Much of the content of the 2009 Water System Plan remains valid – other than where it is revised herein – and continues to document the City’s overall plan for its water system. This document is hereby referred to herein as the Water System Plan Update (WSP Update) and is intended to complement and supplement the 2009 Water System Plan to form the City’s overall water system planning approach for the 6-year and 20-year planning horizons – beginning in 2013.

ES-2 Water Use

The WSP Update includes water use data from 2008, 2009, 2010, 2011, and partial data from 2012. The 2009 Water System Plan included historical water use data only through 2007. The additional years of historical water use data, combined with the data presented in the 2009 Water System Plan as well as water use data from the 1990s enables identification of changing trends in water use. The most notable trend in historical water use downward with respect to maximum day demand (MDD) and flat to slightly declining for average day demand (ADD) – despite the fact that population and water service connections have increased. Historical water use is presented in Figure E-1.

Future water use was estimated by escalating the 2012 ADD equivalent to an annual population growth rate of 1.3 percent. This 1.3 percent annual growth rate is just over half as much as the 2.5 percent annual growth...
rate that was used in the 2009 Water System Plan for estimating future water use, and reflects an updated measure and understanding of local growth trends. Estimated future water use is presented in Table E-1. It is important to estimate future water use as accurately as possible to assess the need for infrastructure improvements. Updated historical and estimated future water use is substantially less than the same from the 2009 Water System Plan. These updates resulted in the deferral distribution system pumping and storage improvements.

**TABLE E-1**
*Estimated Future ADD, MDD, ERUs, and WTP Production*

<table>
<thead>
<tr>
<th>Year</th>
<th>ADD (mgd)</th>
<th>MDD (mgd)</th>
<th>Equivalent Residential Units (ERUs)</th>
<th>WTP Production (mgd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>9.4</td>
<td>14.0</td>
<td>47,236</td>
<td>14.6</td>
</tr>
<tr>
<td>2018</td>
<td>10.2</td>
<td>16.7</td>
<td>51,042</td>
<td>17.3</td>
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<tr>
<td>2022</td>
<td>10.8</td>
<td>17.5</td>
<td>53,749</td>
<td>18.2</td>
</tr>
<tr>
<td>2032</td>
<td>12.2</td>
<td>20.0</td>
<td>61,159</td>
<td>20.8</td>
</tr>
</tbody>
</table>

**ES-3 Distribution System Analysis**

The major elements that comprise the City’s distribution system are storage reservoirs, pump stations, and distribution system pipelines. The City’s water storage and pump station facilities were evaluated based on updated actual water use and updated estimates of future water use, which resulted in deferral of improvement needs presented in the 2009 Water System Plan.

The bulk of the City’s distribution system storage is contained within its lowest pressure zone – the 276 North Pressure Zone. Water flows into this zone by gravity from the Whatcom Falls Water Treatment Plant. Relatively small storage reservoirs serve higher-elevation pressure zones. Pump stations lift water to these higher-elevation pressure zones. Because most all of the City’s pump stations have capacities greater than peak hour demand within the pressure zones they supply, storage from the lower 276 North Pressure Zone can be counted on to serve these upper-elevation pressure zones.

The updated pump station and storage evaluation completed as part of this WSP Update resulted in the improvements presented in Table E-2. However, none of these improvements are planned within the 6-year planning horizon.

**TABLE E-2**
*Summary of Planned Pumping and Storage Improvements*

<table>
<thead>
<tr>
<th>Improvement</th>
<th>ID Number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pumping</strong></td>
<td></td>
</tr>
<tr>
<td>Kearney Road Pump Station</td>
<td>PS-1</td>
</tr>
<tr>
<td>Balsam Lane Pump Station Capacity Expansion</td>
<td>PS-2</td>
</tr>
<tr>
<td>40th Street Pump Station</td>
<td>PS-3</td>
</tr>
<tr>
<td>980 Pump Station</td>
<td>PS-4</td>
</tr>
<tr>
<td>King Mountain Pump Station</td>
<td>PS-5</td>
</tr>
<tr>
<td><strong>Storage</strong></td>
<td></td>
</tr>
<tr>
<td>Samish Hill Reservoir</td>
<td>ST-1</td>
</tr>
<tr>
<td>King Mountain Reservoir</td>
<td>ST-2</td>
</tr>
</tbody>
</table>
ES-4  Treatment Analysis

In late July and August of 2009 the filters at the City’s WTP began clogging much earlier in filter runs than typical. Filter runs became substantially shorter than normal, requiring more frequent filter backwashing. The result of shorter filter runs and increased filter backwashing was greatly reduced WTP capacity – to the point the City implemented mandatory water restrictions, for the first time, to reduce customer demand. It should be noted that voluntary water restrictions are implemented each summer as a means of encouraging conservation during this time of typically-high customer water demand. The water restrictions were successful in reducing customer demand to match WTP capacity. Toward the end of August and into September, filter runs gradually began to return to normal and customer demand dropped, as it customarily does at that time of the year.

Filter clogging was attributed to algae in Lake Whatcom. Monitoring revealed higher than typical counts of most algae species. Although the reasons for the intense algae bloom of the summer of 2009 is the subject of varied speculation, historical and on-going algae monitoring shows that summertime algae blooms in Lake Whatcom have been increasing over the past decade. It is speculated that despite efforts to reverse this trend, summertime algae blooms in Lake Whatcom will continue to increase in intensity and duration over the near-term future. Increased Lake Whatcom algae could again result in summertime algae blooms that prevent the WTP from treating sufficient supply to meet customer demand in the future.

In response to the 2009 algae event, the City completed a study that is presented in a report entitled “Filter-Clogging Algae Mitigation Evaluation,” dated June 2012 – hereinafter referred to as the Algae Mitigation Report. The Algae Mitigation Report evaluated treatment, intake, and lake management improvements and included a recommendation for the City to implement Dissolved Air Flotation (DAF) to mitigate adverse algae conditions. As presented in the Algae Mitigation Report, DAF was determined to be the technically superior treatment approach with respect to mitigating the algae problem, as well as being one of the lower cost treatment alternatives. DAF was also determined to be technically superior and far less costly than any of the intake alternatives. Lake Management was determined to be inadequate as a stand-alone mitigation approach because of the many years that will pass before improved water quality with respect to algae will be observed.

In general, the schedule for DAF implementation includes preliminary and detailed design beginning in 2014 – including the DOH-required submittals for the Project Report and the Construction Documents. Construction and commissioning would begin in late 2015 and extend into 2017.

ES-5  Improvement Program

The Improvement Program presented in Table E-3 replaces what was developed for the 2009 Water System Plan. The largest capital improvement over the 6-year planning horizon is the implementation of DAF at the Whatcom Falls Water Treatment Plant.

ES-6  Financial Program

The City recently completed a rate study for its water and sewer utilities, entitled “2012 Water and Sewer Rate Update.” The study presented a 6-year financial plan from 2013 through 2018. Key findings and recommendations resulting from the study include rate increases of 9.0% in 2013, 8.0% per year from 2014 through 2016, 6.0% for 2017 and 2018. The rate study included accounting for capital investment that matches the quantity presented in the Improvement Program in Table E-3. The rate increases planned for implementation by the City are anticipated to be more than adequate to cover utility expenses, including planned capital improvements.
### TABLE E-3

**Improvement Program**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Kearney Road Pump Station</td>
<td>PS-1</td>
<td>--</td>
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<td>--</td>
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<tr>
<td>Balsam Lane Pump Station Capacity Expansion</td>
<td>PS-2</td>
<td>--</td>
<td>--</td>
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<td>Future 980 Pump Station</td>
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<td>--</td>
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<tr>
<td>Samish Hill Reservoir</td>
<td>ST-1</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
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<td>King Mountain Reservoir</td>
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<td>$6,000,000</td>
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<td>T-2</td>
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<td>--</td>
<td>--</td>
<td>--</td>
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<tr>
<td>Disinfection Improvements</td>
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<td>$100,000</td>
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<td>Screening Relocation Improvements</td>
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<td>$950,000</td>
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<td>$11,850,000</td>
<td>$18,700,000</td>
<td>$12,900,000</td>
<td>$18,600,000</td>
</tr>
</tbody>
</table>

¹ Each of the projects designated with an “X” in the timeframe beyond the 6-year planning horizon were not incorporated into the financial program for the water utility. Therefore, estimated costs were not developed for these improvements.

² The total project for the GP Hydro Project is preliminarily estimated to be approximately $3,000,000. The amount beyond the initial evaluation is not shown in the table because it is assumed the project will not be completed until beyond the 6-year planning horizon.
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A    Status of 2009 Water System Plan Improvement Program
B    2012 Water and Sewer Rate Study (Executive Summary, only)
C Filter Clogging Algae Mitigation Evaluation (Executive Summary, only)
D SEPA Compliance
E Review Consistency
F Dept. of Commerce – Notice of Intent to Adopt Amendment
G Public Meeting
H City Council Adoption
1. Introduction

The City of Bellingham (City) hereby updates its Water System Plan, which was completed in September 2009. The Washington State Department of Health (DOH) water system identification number for the City’s municipal system is 05600.

This update does not replace the 2009 Water System Plan in its entirety, but instead provides updated analysis related to a key treatment issue that arose since completion of the 2009 Water System Plan, as well as recent modifications to the distribution system related to distribution system water quality. Much of the content of the 2009 Water System Plan remains valid – other than where it is revised herein – and continues to document the City’s overall plan for its water system. This document is hereby referred to herein as the Water System Plan Update (WSP Update) and is intended to complement and supplement the 2009 Water System Plan to form the City’s overall water system planning approach for the 6-year and 20-year planning horizons – beginning in 2013.

In support of the treatment and distribution elements cited above, the City’s historical and estimated future water use have been supplemented with updated information. The resulting improvements from the treatment and distribution analysis comprise a revised Improvement Program, which is presented herein – replacing the one in the 2009 Water System Plan. In support of the new Improvement Program, a summary of the City’s financial strategy is summarized herein.

In summary, this WSP Update is comprised of updates to the following elements of the 2009 Water System Plan:

- **Water Use:** This WSP Update incorporates recent water use information and provides a revised estimate of future water use projections for the overall system and hereby replaces those elements from the 2009 Water System Plan. Other water use elements from the 2009 Water System Plan remain valid.

- **System Analysis:** This WSP Update includes hydraulic analysis of the distribution system (pipelines, pump stations, storage reservoirs) that reflects recent piping modifications within the distribution system. Facility description from the 2009 Water System Plan has not been repeated herein and remains valid. In addition to the analysis of the 2009 Water System Plan, analysis related to water age within the distribution system was completed because of recent related water quality impacts associated with loss of chlorine residual.

- **Treatment Analysis:** This WSP Update includes discussion of the planned dissolved air flotation (DAF) system to address annual summertime Lake Whatcom algae blooms that reduce capacity at the Whatcom Falls Water Treatment Plant (Plant). The City began planning for this improvement after the summer of 2009, during which Plant capacity was reduced to the point customer demand could not be met – resulting in the need for mandatory water restrictions. The DAF improvement was not included in the 2009 Water System Plan because the 2009 Water System Plan had been completed prior to the summertime algae bloom. This planned improvement is the primary stimulus for this WSP Update. This WSP Update also includes evaluation of the need for additional filtration capacity based on updated water use estimates.

- **Improvement Program:** The Improvement Program developed for this WSP Update reflects the updated analyses presented herein. This Improvement Program hereby replaces the 2009 Improvement Program in its entirety.
Financial Program: Simultaneous to the completion of this WSP Update, the City completed a rate study for its water and wastewater utilities. The results of the rate study, entitled “2012 Water and Sewer Rate Update,” which includes increased water rates to cover escalating costs and near-term capital improvements, are briefly summarized herein.

Documentation of requisite compliance with the State Environmental Policy Act (SEPA) is presented in Appendix D. The requisite statement of Local Government Consistency from Whatcom County is included as Appendix E.
2. Water Use

Updated historical and projected City water use is presented in this section. This section includes water use data from 2008, 2009, 2010, 2011, and partial data from 2012. The 2009 Water System Plan included historical water use data only through 2007. The additional years of historical water use data, combined with the data presented in the 2009 Water System Plan as well as water use data from the 1990s enables identification of changing trends in water use. The additional years of historical water use data also support estimating future water use because these same trends can be incorporated into those estimates.

2.1 Historical Water Use

Historical water use is presented in Table 2-1 and Figures 2-1 and 2-2. From this table and these figures, several trends are identifiable, including:

- Steadily increasing service connections since 1990 with a reduced rate of increase in service connections over the past few years.
- Average Day Demand (ADD) for the City’s system has declined overall since 1990 as well as in the past few years.
- Similar to ADD but at a greater rate, Maximum Day Demand (MDD) for the City’s system has declined overall since 1990 as well as in the past few years.
- Per-connection ADD and MDD water use has declined steadily and substantially since 1990.
- The MDD/ADD demand ratio has declined over the years, which reflects the more-rapid decline in MDD than ADD.
- Water treatment plant (WTP) production at the Whatcom Falls WTP has declined over the years in parallel with the decline in MDD. The City generally operates the WTP to match system demand on a daily basis.
- Water use data from 2008 through 2012 – data that was not available for the 2009 Water System Plan – reflects decline in each of the water use metrics presented in Table 2-1. This recent decline has a substantial impact on estimates of future water use.

Overall, it is clear that despite growth in population, which is reflected in the growth in number of service connections, total water use has been declining. There is both a decline in overall system ADD and MDD, but a much greater decline in MDD. The reason for this decline is the marked reduction in the quantity of water used per connection, which generally reflects the ever-increasing awareness of individual customers to conserve and use water wisely. These trends are reflected in many other communities throughout western Washington – particularly as it relates to reductions in MDD, which results primarily from reduced summertime outdoor watering.

The extent to which the further reduction in per-connection water use continues into the future is uncertain. However, the City’s ongoing program to convert two thirds of its customers, which are currently unmetered, to metered customers will likely lead to further per-connection water use reductions and could potentially result in negligible growth in overall system ADD and MDD for several years to come.
### TABLE 2-1

**Historical Water Use**

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<tr>
<th>Year</th>
<th>Service Connections</th>
<th>Total System Demand</th>
<th>Per-Connection Demand</th>
<th>Demand Ratio</th>
<th>WTP Production</th>
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<td></td>
<td>ADD (mgd)</td>
<td>MDD (mgd)</td>
<td>ADD (gpcpd)</td>
<td>MDD (gpcpd)</td>
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<td>1990</td>
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<td>598</td>
<td>1,032</td>
</tr>
<tr>
<td>1993</td>
<td>18,447</td>
<td>10.2</td>
<td>18.4</td>
<td>552</td>
<td>995</td>
</tr>
<tr>
<td>1994</td>
<td>18,810</td>
<td>11.0</td>
<td>23.2</td>
<td>584</td>
<td>1,235</td>
</tr>
<tr>
<td>1995</td>
<td>19,394</td>
<td>10.6</td>
<td>25.3</td>
<td>544</td>
<td>1,302</td>
</tr>
<tr>
<td>1996</td>
<td>19,736</td>
<td>9.7</td>
<td>19.5</td>
<td>494</td>
<td>989</td>
</tr>
<tr>
<td>1997</td>
<td>20,416</td>
<td>9.5</td>
<td>19.2</td>
<td>465</td>
<td>942</td>
</tr>
<tr>
<td>1998</td>
<td>20,611</td>
<td>9.9</td>
<td>18.1</td>
<td>479</td>
<td>877</td>
</tr>
<tr>
<td>1999</td>
<td>20,996</td>
<td>9.2</td>
<td>16.0</td>
<td>440</td>
<td>763</td>
</tr>
<tr>
<td>2000</td>
<td>21,493</td>
<td>9.5</td>
<td>15.8</td>
<td>441</td>
<td>737</td>
</tr>
<tr>
<td>2001</td>
<td>22,076</td>
<td>9.5</td>
<td>15.3</td>
<td>429</td>
<td>694</td>
</tr>
<tr>
<td>2002</td>
<td>22,352</td>
<td>10.4</td>
<td>17.9</td>
<td>464</td>
<td>801</td>
</tr>
<tr>
<td>2003</td>
<td>23,240</td>
<td>10.6</td>
<td>19.5</td>
<td>457</td>
<td>840</td>
</tr>
<tr>
<td>2004</td>
<td>23,464</td>
<td>10.8</td>
<td>20.7</td>
<td>460</td>
<td>882</td>
</tr>
<tr>
<td>2005</td>
<td>23,905</td>
<td>10.6</td>
<td>17.8</td>
<td>443</td>
<td>743</td>
</tr>
<tr>
<td>2006</td>
<td>24,210</td>
<td>10.9</td>
<td>19.4</td>
<td>448</td>
<td>800</td>
</tr>
<tr>
<td>2007</td>
<td>24,573</td>
<td>10.3</td>
<td>18.3</td>
<td>420</td>
<td>746</td>
</tr>
<tr>
<td>2008</td>
<td>24,759</td>
<td>10.1</td>
<td>17.4</td>
<td>410</td>
<td>702</td>
</tr>
<tr>
<td>2009</td>
<td>24,880</td>
<td>10.1</td>
<td>18.0</td>
<td>408</td>
<td>723</td>
</tr>
<tr>
<td>2010</td>
<td>24,978</td>
<td>9.6</td>
<td>15.7</td>
<td>384</td>
<td>627</td>
</tr>
<tr>
<td>2011</td>
<td>25,011</td>
<td>9.5</td>
<td>13.5</td>
<td>380</td>
<td>541</td>
</tr>
<tr>
<td>2012</td>
<td>--</td>
<td>9.4</td>
<td>13.9</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

1. Abbreviations: mgd = million gallons per day; gpcpd = gallons per connection per day
2. WTP Production = Total System MDD plus 4% to account for uses at the Whatcom Falls WTP, including filter backwashing, filter-to-waste, and other minor uses prior to delivery to customers.
3. The 2012 MDD was a recorded value on August 3, 2012.
4. The number of service connections for 2012 was assumed to be unchanged from the end of 2011 (25,011) - reflecting slowing growth and poor economic conditions. The actual number at the end of 2012 was not available at the time this data was assembled.
5. The estimated 2012 ADD was estimated to be 99.3% of the 2011 ADD based on a comparison of the first 7 months of available water use data from 2012 and the same data from 2011.
FIGURE 2-1
Historical Water Use and Service Connections

FIGURE 2-2
Historical Per-Connection Water Use and Demand Ratio
2.2 Estimated Future Water Use

Projected water use is presented in Table 2-2 – extending from the current year, 2012, through the 20-year planning horizon. Because the 2012 calendar year was not complete at the time this WSP Update was prepared, an entire year of actual ADD for 2012 was not available; however, it was estimated to be slightly less than the ADD for 2011 – by 0.7 percent. This estimate was developed after a review of master meter data at the water treatment plant for the first 8 months of 2012 showed that water use for this 8-month period was 99.3% of water use for the same period in 2011.

<table>
<thead>
<tr>
<th>Year</th>
<th>ADD (mgd)</th>
<th>MDD (mgd)</th>
<th>Equivalent Residential Units (ERUs)</th>
<th>WTP Production (mgd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>9.4</td>
<td>14.0</td>
<td>47,236</td>
<td>14.6</td>
</tr>
<tr>
<td>2018</td>
<td>10.2</td>
<td>16.7</td>
<td>51,042</td>
<td>17.3</td>
</tr>
<tr>
<td>2022</td>
<td>10.8</td>
<td>17.5</td>
<td>53,749</td>
<td>18.2</td>
</tr>
<tr>
<td>2032</td>
<td>12.2</td>
<td>20.0</td>
<td>61,159</td>
<td>20.8</td>
</tr>
</tbody>
</table>

1. The estimated 2012 ADD was estimated to be equal to the 2011 ADD multiplied by 1.2% based on a comparison of date from the first 7 months of 2011 and 2012.
2. The 2012 MDD was a recorded value on August 16, 2012, as presented in Table 2-1.
3. The 2018 and 2032 MDDs were estimated using the average of the MDD/ADD demand ratios for 2007 through 2012 (using estimated 2012 ADD) multiplied by the corresponding 2018 and 2032 ADDs.
4. Future ERUs were estimated using the 199 gpd/ERU value from the 2009 Water System Plan.
5. WTP Production = Total System MDD plus 4% to account for WTP uses.
6. 2018 and 2032 estimates of ADD and ERUs are based on an annual population growth rate of 1.5%.

Actual MDD data for 2012 was available at the time this WSP Update was prepared, as presented in Table 2-1. However, future MDD was not estimated based on this 2012 MDD value. MDD is more affected by seasonal weather conditions and therefore subject to greater year-to-year variability than ADD. Future MDD was estimated by applying an average of the MDD/ADD demand ratio from the last few years (2007 through 2012) to the estimated future ADD values for 2018 and 2032. This approach reduces the impact of the very low MDD values from 2010, 2011, and 2012 which resulted from unseasonably cool summers. At the same time, however, this approach provides an accounting of the longer-term and recent decline of the City’s MDD. It appears that the trend toward reduced MDD can be attributed, in part, to unseasonably cool summers during the 2010 to 2012 period as well as longer-term changes in customer water use.

Future water use (6-year, 10-year, and 20-year projections) was estimated by escalating the 2012 ADD equivalent to an annual population growth rate of 1.3 percent. This population growth rate estimate represents the annualized increase associated with the latest growth rate estimates adopted by the City for utility planning as well as the City’s overall Comprehensive Plan. This 1.3 percent annual growth rate is just over half as much as the 2.5 percent annual growth rate that was used in the 2009 Water System Plan for estimating future water use, and reflects an updated
measure and understanding of local growth trends. The estimated future water use presented in Table 2-2 is approximately 60 percent of what was estimated in the 2009 Water System Plan. This much-lower estimate of future water use results, in part from a lower ADD baseline starting point, but more-significantly from the lower annual growth rate.

It is important to estimate future water use as accurately as possible to assess the adequacy of water rights as well as the need for infrastructure improvements. Although not specifically addressed in this WSP Update, the City has adequate municipal water rights to meet its current and projected ADD and MDD. With respect to infrastructure need, however, an accurate estimate of future MDD is of primary importance because MDD is used as the key criterion to establish the capacity of supply and treatment improvements.
3. Distribution System Analysis

Analysis of the City’s distribution system capacity, incorporating distribution system improvements since 2009 and updated water use, is presented in this section. The major elements that comprise the City’s distribution system are storage reservoirs, pump stations, and distribution system pipelines. The City’s water storage and pump station facilities were evaluated based on the updated actual water use and updated estimates of future water use, which resulted in changes from the improvement needs presented in the 2009 Water System Plan.

The analysis presented herein is for capacity purposes, only, and does not address condition-related facility issues. The City is initiating an Asset Management Program that will continue through 2013 to identify condition-related facility improvement needs for its drinking water and wastewater facilities. Upon its completion, the results of that program will be incorporated into the City’s Water Plan.

The City’s distribution system pipelines were not evaluated with respect to capacity as part of this WSP Update because the City’s actual water use has declined what was documented in the 2009 Water System Plan, updated estimates of future water use are much lower than in the 2009 Water System Plan, and because there have been no changes to fire flow requirements. As a result, the distribution system pipeline analysis presented in the 2009 Water System Plan remains valid, even though somewhat conservative. No system improvements or modifications are warranted or planned because of distribution system pipeline capacity deficiencies.

In addition to the storage and pumping evaluation presented herein, a distribution system water age evaluation was undertaken because of recent concerns relating to maintaining a chlorine residual within the distribution system at the Marietta Reservoir and Kearney Road Reservoir. The purpose of the water age evaluation was to develop a relative comparison of reservoir residence time for existing and potential alternative configurations. The objective of reducing water age is to facilitate maintaining a detectable chlorine residual within the distribution system, which is required.

The analysis presented herein is based on updated water use, as presented in Section 2, which includes substantial reductions in average and peak water use in recent years and more modest projections of growth in water use than what were presented in the 2009 Water System Plan. The analyses were based on current water use as well as projected water use for the 6-, 10-, and 20-year planning horizons. Distribution of water use throughout the water system remains the same as developed for the 2009 Water System Plan.

The City’s latest service area map, pressure zone map, and hydraulic profile are presented at the end of this WSP Update as Figures 3-1, 3-2, and 3-3, respectively. These figures reflect recent changes in the City’s service area via annexation and distribution system modifications in the vicinity of the Kearney Road Reservoir and James Street Pump Station.
3.1 Pressure Zone Demands

The system-wide existing and projected water use is summarized in Section 2 and was used for analyzing the overall system. However, water use for individual pressure zones is also necessary to analyze pumping, storage, and pipeline facilities. A summary of the current pressure zone average day demands (ADDs), as developed from existing customer billing records and meter locations, is presented in Table 3-1. Also presented in Table 3-1 is estimated future ADD on a per-zone basis based on a distribution of growth anticipated by the City. The combined estimated growth in water use for the City is the same as that presented in Table 2-2.

TABLE 3-1

<table>
<thead>
<tr>
<th>Pressure Zone</th>
<th>2012</th>
<th>2018</th>
<th>2022</th>
<th>2032</th>
</tr>
</thead>
<tbody>
<tr>
<td>276 North¹</td>
<td>2,917</td>
<td>3,152</td>
<td>3,172</td>
<td>3,427</td>
</tr>
<tr>
<td>350 Cordata²</td>
<td>804</td>
<td>869</td>
<td>1,107</td>
<td>1,410</td>
</tr>
<tr>
<td>457 South³</td>
<td>1,335</td>
<td>1,443</td>
<td>1,442</td>
<td>1,550</td>
</tr>
<tr>
<td>460 King Mountain</td>
<td>9</td>
<td>10</td>
<td>41</td>
<td>73</td>
</tr>
<tr>
<td>519 Dakin &amp; Consolidation⁴</td>
<td>826</td>
<td>893</td>
<td>905</td>
<td>934</td>
</tr>
<tr>
<td>780 Birch Street</td>
<td>10</td>
<td>11</td>
<td>16</td>
<td>28</td>
</tr>
<tr>
<td>541 College Way</td>
<td>52</td>
<td>56</td>
<td>56</td>
<td>56</td>
</tr>
<tr>
<td>696 Padden Yew</td>
<td>282</td>
<td>305</td>
<td>336</td>
<td>389</td>
</tr>
<tr>
<td>730 Alabama Hill</td>
<td>221</td>
<td>239</td>
<td>276</td>
<td>330</td>
</tr>
<tr>
<td>830 Reveille⁵</td>
<td>17</td>
<td>19</td>
<td>63</td>
<td>108</td>
</tr>
<tr>
<td>873 Governor Road⁵</td>
<td>53</td>
<td>57</td>
<td>106</td>
<td>179</td>
</tr>
<tr>
<td>Total</td>
<td>6,527</td>
<td>7,053</td>
<td>7,507</td>
<td>8,486</td>
</tr>
<tr>
<td>Total (mgd)</td>
<td>9.4</td>
<td>10.2</td>
<td>10.8</td>
<td>12.2</td>
</tr>
</tbody>
</table>

¹ Includes demands for Montgomery Road Water Association, Water District #2, and LWW&SD.
² Includes demands for Deer Creek Association.
³ Includes demands for California Street Water Association.
⁴ Includes demands for the 660 Huntington Pressure Zone, LWW&SD, Water District #7, and Glen Cove Cooperative.
⁵ The 830 Reveille Pressure Zone and the 873 Governor Road Pressure will be combined to 870 Samish Hill Pressure Zone within the 20-year planning horizon.

3.2 Pump Stations

Description of the City’s pump stations is presented in the 2009 Water System Plan. The only changes to the City’s pump stations since 2009, include: (1) the addition of the Samish Crest Pump Station, which provides domestic service for 20 new houses adjacent to the existing Parkhurst Reservoir; and (2) the re-connection of the James Street Pump Station suction from the 276 North
Pressure Zone to the 519 Dakin & Consolidation Pressure Zone. The Samish Crest Pump Station does not provide fire flow to the 20 houses; but instead, fire flow protection is provided from a private fire system supplied from a fire department connection just down-slope from these 20 homes – within the 873 Governor Road Pressure Zone.

Capacity analyses of the City’s major pump stations were based on the updated water use information summarized in Section 2 are presented in the subsections below, after a discussion of evaluation methodology. Pumping deficiencies identified are summarized in Section 3.6.1 and planned improvements for mitigating these deficiencies are presented in Section 3.7.1.

3.2.1 Capacity Evaluation Methodology

The pump station capacity evaluation accounts, where applicable, for pumped zones that are supplied from the zone into which the pump station being evaluated supplies. In other words, a pump station at a lower elevation within the overall water system must not only have the capacity to supply water to the pressure zone it directly discharges to, but also to all of the pumped zones above, that draw water from pressure zone being directly supplied. Pump stations are required, at a minimum, to meet the maximum day demand (MDD) of the pressure zone they supply, in addition to the demands of pressure zones above – as discussed above. The difference in demand from the pressure zone between the peak hour demand (PHD) and MDD is supplied from the storage that establishes the hydraulic grade line of the pressure zone and provides directly, stored supply. Pressure zones that are directly served by storage are referred to as “open” zones while pressure zones that do not have storage within the zone are referred to as “closed” zones.

Pump stations that supply open zones are evaluated with respect to their “firm” capacity, as opposed to their total capacity. Total capacity refers to the capacity of a pump station with all pumps operating. Firm capacity refers to the capacity of a pump station with the largest pump out of service. This capacity evaluation approach is described in the Washington State Department of Health Design Manual.

Pump stations supplying closed zones must have the capacity to supply peak hour demand (PHD) – not just maximum day demand (MDD). As stated above, the difference between PHD and MDD is typically provided by distribution system storage, which is not available in closed zones. In addition to PHD, pump stations supplying closed zones must meet fire flow demand requirements within each pressure zone. Pump stations serving closed zones are required to be equipped with a backup power supply, which is the case for the City’s pump stations serving these zones.

Where two pump stations supply a particular zone, they were evaluated with respect to their combined capacity as though they are a single, combined pump station. This is a valid evaluation approach in recognition that each pump station does not need to completely redundant to each other – each having the capacity to meet the demand needs of the pressure zones they supply. In fact, because they are physically remote from each other, two separate facilities already have a slight inherent increase in redundancy and reliability than a single, larger-capacity facility. Since the two facilities are evaluated with respect to their capacity as a single, combined pumping facility, their combined firm capacity (capacity with the largest pump out of service) is defined by removing only the largest of the pumps from the two facilities (one pump total) from service.
A summary of key evaluation elements of the pump stations evaluated are presented in Table 3-2. For those locations where two pump stations directly supply a pressure zone, both pump stations are listed together in the first column of Table 3-2. This applies to the Dakin & Consolidation Pump Station and the Woburn Pump Station, which both pump to the 519 Dakin & Consolidation Pressure Zone. This also applies to the Consolidation Pump Station and the 38th Street Pump Station, which both pump to the 696 Padden Yew Pressure Zone.

**TABLE 3-2**

**Major City Pump Stations**

<table>
<thead>
<tr>
<th>Pump Station(s)</th>
<th>Zone Supplied from Pump Station</th>
<th>Higher-Elevation Pressure Zones Served from Supplied Zone</th>
<th>Pumps to a Reservoir?</th>
<th>Demand Capacity Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Otis Street²</td>
<td>457 South</td>
<td>541 College Way, 696 Padden Yew, 873 Governor Road, 830 Reveille, 980 Samish Crest</td>
<td>Yes</td>
<td>MDD</td>
</tr>
<tr>
<td>Dakin &amp; Consolidation PS; Woburn PS²</td>
<td>519 Dakin &amp; Consolidation</td>
<td>696 Padden Yew, 730 Alabama Hill, 780 Birch Street, 660 Huntington, 830 Reveille, 873 Governor Road, 980 Samish Crest</td>
<td>Yes</td>
<td>MDD</td>
</tr>
<tr>
<td>James Street</td>
<td>530 King Mountain</td>
<td>None</td>
<td>No</td>
<td>PHD</td>
</tr>
<tr>
<td>College Way</td>
<td>541 College Way</td>
<td>None</td>
<td>No</td>
<td>PHD+FF</td>
</tr>
<tr>
<td>Short Street</td>
<td>350 Cordata</td>
<td>None</td>
<td>No</td>
<td>PHD+FF</td>
</tr>
<tr>
<td>Consolidation PS; 38th Street PS</td>
<td>696 Padden Yew</td>
<td>873 Governor Road, 830 Reveille</td>
<td>Yes</td>
<td>MDD</td>
</tr>
<tr>
<td>Birch Street</td>
<td>780 Birch Street</td>
<td>None</td>
<td>No</td>
<td>PHD+FF</td>
</tr>
<tr>
<td>Balsam Lane</td>
<td>730 Alabama Hill</td>
<td>None</td>
<td>No</td>
<td>PHD+FF</td>
</tr>
<tr>
<td>Governor Road</td>
<td>873 Governor Road</td>
<td>980</td>
<td>Yes</td>
<td>MDD</td>
</tr>
<tr>
<td>Huntington</td>
<td>660 Huntington</td>
<td>None</td>
<td>No</td>
<td>PHD</td>
</tr>
<tr>
<td>Reveille</td>
<td>830 Reveille</td>
<td>None</td>
<td>No</td>
<td>PHD+FF</td>
</tr>
</tbody>
</table>

¹ The Huntington, Samish Heights, Raymond, and Bonanza pump stations are very small pump stations that do not provide fire flow and serve areas that are not anticipated to grow substantially. All but the Huntington pump station are anticipated to be decommissioned and replaced within the 20-year planning horizon.

² The 696 Padden Yew Pressure Zone and the three higher-elevation pressure zones supplied from the 696 Padden Yew Pressure Zone can be supplied either via the Consolidation Pump Station or the 38th Street Pump Station. As a result, for the purpose of this analysis (and as an element of conservatism) the demand associated with these pressure zones was accounted in the evaluation of both the Otis Street Pump Station and the combined evaluation of the Dakin & Consolidation Pump Station / Woburn Pump Station.
3.2.2 Otis Street

As shown in Table 3-3, the Otis Street pump station has adequate capacity through the 6-year, 10-year, and 20-year planning period to meet the demands of the 457 South Pressure Zone. No capacity improvements to the Otis Street pump station are needed.

<table>
<thead>
<tr>
<th>TABLE 3-3 Otis Street Pump Station Capacity Evaluation (gpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand/Capacity</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>Demand (MDD) Required¹</td>
</tr>
<tr>
<td>Existing Total Capacity</td>
</tr>
<tr>
<td>Existing Firm Capacity</td>
</tr>
<tr>
<td>Excess (Deficient) Capacity</td>
</tr>
</tbody>
</table>

¹ Includes MDDs for 457 South, 541 College Way 696 Padden Yew, 873 Governor Road, and 830 Reveille

3.2.3 Dakin & Consolidation; Woburn Street

The Dakin & Consolidation Pump Station (formerly referred to as the Dakin & Yew Pump Station) is the primary pump station serving the 519 Dakin & Consolidation Pressure Zone (formerly the 519 Dakin & Yew Pressure Zone). The Woburn Street Pump Station serves as a redundant backup pump station. The two smaller, normal-operating pumps at the Woburn Street Pump Station are periodically operated manually to maintain operating condition and aid circulation of the distribution system. The two larger, high-flow pumps are controlled by a low pressure sensor on the discharge of the pumps that could initiate service in the event of a fire flow condition. As a result, the Woburn Street Pump Station typically only operates during such low pressure conditions.

As shown in Table 3-4, the combined capacity of these two pump stations far exceeds the required demands of the 519 Dakin & Consolidation Pressure Zone and each of the pressure zones above that are served directly or indirectly from the 519 Dakin & Consolidation Pressure Zone for each of the planning horizons listed. The 696 Padden Yew, 830 Reveille, and 873 Governor Road Pressure Zones

<table>
<thead>
<tr>
<th>TABLE 3-4 Dakin &amp; Consolidation Pump Station; Woburn Street Pump Station Capacity Evaluation (gpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand/Capacity</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>Demand (MDD) Required¹</td>
</tr>
<tr>
<td>Existing Total Capacity</td>
</tr>
<tr>
<td>Existing Firm Capacity</td>
</tr>
<tr>
<td>Excess (Deficient) Capacity</td>
</tr>
</tbody>
</table>

¹ Includes MDDs for 519 Dakin & Consolidation, 696 Padden Yew, 730 Alabama Hill, 780 Birch Street, 830 Reveille, and 873 Governor Road.
were included in the capacity evaluation presented in Table 3-4, as an element of conservatism, even though the 696 Padden Yew Pressure Zone (and the small zones above it) is also served from the 457 South Pressure Zone via the 38th Street Pump Station. No capacity improvements are planned at either the Dakin & Consolidation Pump Station or the Woburn Street Pump Station.

### 3.2.4 James Street

The James Street Pump Station supplies the 530 King Mountain Pressure Zone from the 519 Dakin & Consolidation Pressure Zone. Supply via the 519 Dakin & Consolidation Pressure Zone instead of the 276 North Pressure Zone is a modification the City completed in 2011, as described previously. The 530 King Mountain Zone is a closed zone; it is not served directly by storage. The James Street Pump Station must meet the peak hour demand (PHD) of the 530 King Mountain Pressure Zone. In addition, because it supplies a closed zone it would typically be required to have fire flow capacity to meet fire demands. However, the James Street Pump Station does not have fire flow capacity. To alleviate this deficiency, in 2011 the City extended the 519 Dakin Yew Pressure Zone to much of the 530 King Mountain Pressure Zone area to provide fire flow. Consequently, the James Street Pump Station is not required to provide fire flow capacity.

As shown in Table 3-5, the James Street Pump Station has adequate capacity to meet the domestic PHD needs of the 530 King Mountain Pressure Zone through the 10-year planning horizon. However, by the 20-year planning horizon, capacity expansion will be necessary.

<table>
<thead>
<tr>
<th>Demand/Capacity</th>
<th>2012</th>
<th>2018</th>
<th>2022</th>
<th>2032</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand (PHD) Required</td>
<td>22</td>
<td>24</td>
<td>101</td>
<td>180</td>
</tr>
<tr>
<td>Existing Total Capacity</td>
<td>240</td>
<td>240</td>
<td>240</td>
<td>240</td>
</tr>
<tr>
<td>Existing Firm Capacity</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>Excess (Deficient) Capacity</td>
<td>98</td>
<td>96</td>
<td>19</td>
<td>(60)</td>
</tr>
</tbody>
</table>

1 Closed zone (not served directly by storage). Fire flow is not required because it is served by a parallel distribution piping system extended from the 519 Dakin & Consolidation Pressure Zone.

### 3.2.5 Short Street

The Short Street pump station supplies water to the 350 Cordata Pressure Zone from the 276 North Pressure Zone, and is the only means of boosting water to this zone. The 350 Cordata Pressure Zone is a closed zone; it is not served directly by storage. The Short Street Pump Station must meet the peak hour demand (PHD) of the 350 Cordata Pressure Zone. In addition, because it supplies a closed zone, it must also provide fire flow capacity to meet fire demands.

As shown in Table 3-6, the Short Street Pump Station has adequate capacity to meet the domestic PHD needs as well as the fire flow needs of the 350 Cordata Pressure Zone through the 10-year planning horizon. However, by the 20-year planning horizon, some minor capacity expansion is anticipated to be necessary based on growth projections used. This estimated future need will be
### Table 3-6
**Short Street Pump Station Capacity Evaluation (gpm)**

<table>
<thead>
<tr>
<th>Demand/Capacity</th>
<th>2012</th>
<th>2018</th>
<th>2022</th>
<th>2032</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand (PHD) Required</td>
<td>1,978</td>
<td>2,138</td>
<td>2,724</td>
<td>3,470</td>
</tr>
<tr>
<td>Demand (Fire Flow) Required</td>
<td>3,500</td>
<td>3,500</td>
<td>3,500</td>
<td>3,500</td>
</tr>
<tr>
<td>Combined Demand Required</td>
<td>5,478</td>
<td>5,638</td>
<td>6,224</td>
<td>6,970</td>
</tr>
<tr>
<td>Existing Total Capacity</td>
<td>9,250</td>
<td>9,250</td>
<td>9,250</td>
<td>9,250</td>
</tr>
<tr>
<td>Existing Firm Capacity</td>
<td>6,750</td>
<td>6,750</td>
<td>6,750</td>
<td>6,750</td>
</tr>
<tr>
<td>Excess (Deficient) PHD Capacity</td>
<td>1,272</td>
<td>1,112</td>
<td>526</td>
<td>(220)</td>
</tr>
</tbody>
</table>

Re-evaluated in the future based on actual water use information at that time as well as updated growth projections at that time.

It should also be noted that the City recently installed the Kellogg PRV that enables water from the 519 Dakin & Consolidation Pressure Zone to flow into the eastern-most end of the 350 Cordata Pressure Zone. This PRV provides an emergency back-up supply (not full-capacity) in the event there’s a problem with the Short Street Pump Station. This PRV will also allow water into the 350 Cordata Pressure Zone during very high demand within the zone, including a fire flow condition.

### 3.2.6 College Way

The College Way Pump Station supplies water to the 541 College Way Pressure Zone from the 457 South Pressure Zone, and is the only means of boosting water to this zone. The 541 College Way Pressure Zone is a closed zone; it is not served directly by storage. The College Way Pump Station must meet the peak hour demand (PHD) of the 541 College Way Pressure Zone. In addition, because it supplies a closed zone, it must also provide fire flow capacity to meet fire demands. As shown in Table 3-7, the 541 College Way pump station has sufficient capacity through the 6-, 10-, and 20-year planning periods. No improvements are planned over the 20-year planning horizon.

### Table 3-7
**College Way Pump Station Capacity Evaluation (gpm)**

<table>
<thead>
<tr>
<th>Demand/Capacity</th>
<th>2012</th>
<th>2018</th>
<th>2022</th>
<th>2032</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand (PHD) Required</td>
<td>128</td>
<td>138</td>
<td>138</td>
<td>138</td>
</tr>
<tr>
<td>Demand (Fire Flow) Required</td>
<td>2,000</td>
<td>2,000</td>
<td>2,000</td>
<td>2,000</td>
</tr>
<tr>
<td>Combined Demand Required</td>
<td>2,128</td>
<td>2,138</td>
<td>2,138</td>
<td>2,138</td>
</tr>
<tr>
<td>Existing Total Capacity</td>
<td>3,400</td>
<td>3,400</td>
<td>3,400</td>
<td>3,400</td>
</tr>
<tr>
<td>Existing Firm Capacity</td>
<td>2,400</td>
<td>2,400</td>
<td>2,400</td>
<td>2,400</td>
</tr>
<tr>
<td>Excess (Deficient) PHD Capacity</td>
<td>272</td>
<td>262</td>
<td>262</td>
<td>262</td>
</tr>
</tbody>
</table>
3.2.7 Consolidation; 38th Street

The Consolidation and 38th Street pump stations supply water to the 696 Padden Yew Pressure Zone from the 519 Dakin & Consolidation Pressure Zone and the 457 South Pressure Zone, respectively. The 696 Padden Yew Pressure Zone includes storage that directly serves the 696 Padden Yew Pressure Zone; therefore, fire flow capacity is not required from these two pump stations because it is provided from storage. As shown in Table 3-8, the combined capacity of Consolidation Pump Station and the 38th Street Pump Station are adequate to meet the estimated future demands of the 696 Padden Yew Pressure Zone as well as the higher-elevation zones that are supplied from the 696 Padden Yew Pressure Zone.

### TABLE 3-8
**Consolidation Pump Station; 38th Street Pump Station Capacity Evaluation (gpm)**

<table>
<thead>
<tr>
<th>Demand/Capacity</th>
<th>2012</th>
<th>2018</th>
<th>2022</th>
<th>2032</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand (MDD) Required(^1)</td>
<td>562</td>
<td>607</td>
<td>798</td>
<td>1,033</td>
</tr>
<tr>
<td>Existing Total Capacity</td>
<td>1,900</td>
<td>1,900</td>
<td>1,900</td>
<td>1,900</td>
</tr>
<tr>
<td>Existing Firm Capacity</td>
<td>1,400</td>
<td>1,400</td>
<td>1,400</td>
<td>1,400</td>
</tr>
<tr>
<td>Excess (Deficient) Capacity</td>
<td>838</td>
<td>793</td>
<td>602</td>
<td>367</td>
</tr>
</tbody>
</table>

\(^1\) Includes MDDs for 696 Padden Yew, 830 Reveille, 873 Governor Road, and 980 Pressure zones.

3.2.8 Birch Street

The Birch Street Pump Station supplies water to the 780 Birch Street Pressure Zone from the 519 Dakin & Consolidation Pressure Zone, and is the only means of boosting water to this zone. The 780 Birch Street Pressure Zone is a closed zone; it is not served directly by storage. The Birch Street Pump Station must meet the PHD of the 780 Birch Street Pressure Zone. In addition, because it supplies a closed zone, it must also provide fire flow capacity as well to meet fire demands.

As shown in Table 3-9, the 780 Birch Street pump station has sufficient capacity through the 6-, 10-, and 20-year planning periods. No improvements are planned over the 20-year planning horizon. It should also be noted that service from the Birch Street Pump Station and the 780 Birch Street Pressure Zone will be extended in the future to five existing residences currently served by two small booster pumps (Raymond Pump Station and Bonanza Pump Station; refer to Figure 3-3).

### TABLE 3-9
**Birch Street Pump Station Capacity Evaluation (gpm)**

<table>
<thead>
<tr>
<th>Demand/Capacity</th>
<th>2012</th>
<th>2018</th>
<th>2022</th>
<th>2032</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand (PHD) Required</td>
<td>25</td>
<td>27</td>
<td>39</td>
<td>69</td>
</tr>
<tr>
<td>Demand (Fire Flow) Required</td>
<td>750</td>
<td>750</td>
<td>750</td>
<td>750</td>
</tr>
<tr>
<td>Combined Demand Required</td>
<td>775</td>
<td>768</td>
<td>776</td>
<td>796</td>
</tr>
<tr>
<td>Existing Total Capacity</td>
<td>2,340</td>
<td>2,340</td>
<td>2,340</td>
<td>2,340</td>
</tr>
<tr>
<td>Existing Firm Capacity</td>
<td>1,240</td>
<td>1,240</td>
<td>1,240</td>
<td>1,240</td>
</tr>
<tr>
<td>Excess (Deficient) PHD Capacity</td>
<td>465</td>
<td>472</td>
<td>464</td>
<td>444</td>
</tr>
</tbody>
</table>
3.2.9 Balsam Lane

The Balsam Lane pump station supplies water to the 730 Alabama Hill Pressure Zone. It is the only means of boosting water to this zone. The 730 Alabama Hill Pressure Zone is a closed zone; it is not served directly by storage. The Balsam Lane Pump Station must meet the PHD of the 730 Alabama Hill Pressure Zone. In addition, because it supplies a closed zone, it must also provide fire flow capacity as well to meet fire demands.

As shown in Table 3-10, the Balsam Lane pump station has adequate capacity to meet PHD requirements of the 730 Alabama Hill Pressure Zone. However, it does not currently have adequate capacity to meet the combined PHD and fire flow requirement. This deficiency will increase as growth continues in the 730 Alabama Hill Pressure Zone.

<table>
<thead>
<tr>
<th>TABLE 3-10</th>
<th>Balsam Lane Pump Station Capacity Evaluation (gpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand/Capacity</td>
<td>2012</td>
</tr>
<tr>
<td>Demand (PHD) Required</td>
<td>544</td>
</tr>
<tr>
<td>Demand (Fire Flow) Required</td>
<td>1,500</td>
</tr>
<tr>
<td>Combined Demand Required</td>
<td>2,044</td>
</tr>
<tr>
<td>Existing Total Capacity</td>
<td>2,200</td>
</tr>
<tr>
<td>Existing Firm Capacity</td>
<td>1,600</td>
</tr>
<tr>
<td>Excess (Deficient) PHD Capacity</td>
<td>(444)</td>
</tr>
</tbody>
</table>

3.2.10 Governor Road

The Governor Road pump station supplies water to the 873 Governor Road Pressure Zone, which is supplied directly by storage from the Parkhurst Reservoir. The recently completed Samish Crest Pump Station is also served from the 873 Governor Road Pressure Zone, and it supplies the new 980 Pressure Zone. The Samish Crest Pump Station is considered to be a “temporary” pump station to serve approximately 20 additional houses that are at too high an elevation to be supplied from the 873 Governor Road Pressure Zone.

As shown in Table 3-11, the Governor Road Pump Station has adequate capacity to meet the MDD capacity need of the Governor Road Pressure Zone through the 10-year planning horizon. Beyond that, additional capacity will be necessary. However, long-term utility planning for this area by the City includes eventual replacement of the Governor Road Pump Station, the Parkhurst Reservoir, and the new Samish Crest Pump station with newer, larger-capacity facilities that will meet the needs of the broader area and enable combination of the 830 Reveille Pressure Zone and 873 Governor Road Pressure Zone.

When future development proceeds at the higher elevations just to the north of the 873 Governor Road Pressure Zone, it will serve as a catalyst to combine the 873 Governor Road Pressure Zone and the 830 Reveille Pressure Zone into a single, new 870 Samish Hill Pressure Zone. This new 870
### TABLE 3-11
**Governor Road Pump Station Capacity Evaluation (gpm)**

<table>
<thead>
<tr>
<th>Demand/Capacity</th>
<th>2012</th>
<th>2018</th>
<th>2022</th>
<th>2032</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand (MDD) Required(^1)</td>
<td>87</td>
<td>94</td>
<td>152</td>
<td>472</td>
</tr>
<tr>
<td>Existing Total Capacity</td>
<td>1,460</td>
<td>1,460</td>
<td>1,460</td>
<td>1,460</td>
</tr>
<tr>
<td>Existing Firm Capacity</td>
<td>360</td>
<td>360</td>
<td>360</td>
<td>360</td>
</tr>
<tr>
<td>Excess (Deficient) Capacity</td>
<td>273</td>
<td>266</td>
<td>208</td>
<td>(112)(^2)</td>
</tr>
</tbody>
</table>

\(^1\) Includes MDDs for 873 Governor Road and 980 Pressure zones.

\(^2\) The Governor Road Pump Station is expected to be abandoned and replaced by the new 40th Street Pump Station and 870 Samish Hill Reservoir before there is a capacity deficiency at the Governor Road Pump Station.

Samish Hill Pressure Zone will be served by a new reservoir, the 870 Samish Hill Reservoir, and will be supplied from a new pump station (40th Street Pump Station) to be located at the site of the existing 40th Street Reservoir. Development at even higher elevations, including the homes served from the existing, temporary Samish Crest Pump Station, will be combined into a new, expanded 980 Pressure Zone. This new 980 Pressure Zone will be a closed zone and will be supplied from a new pump station (Future 980 Pump Station) located at the site of the new 870 Samish Hill Reservoir.

No specific development proposals or plans for the area exist at this time. However, development in this area is expected to prompt the need for the 870 Samish Hill Reservoir, the 40th Street Pump Station, and the Future 980 Pump Station sometime between the 6- and 20-year planning horizons.

#### 3.2.11 Reveille

The Reveille Pump Station supplies water to the 830 Reveille Pressure Zone from the 696 Padden Yew Pressure Zone and is the only means of boosting water to this zone. The 830 Reveille Zone is a closed zone; it is not served directly by storage. The Reveille Pump Station must meet the PHD of the 830 Reveille Pressure Zone. In addition, because it supplies a closed zone, it must also provide fire flow capacity as well to meet fire demands.

As shown in Table 3-12, the Reveille Pump Station has adequate capacity meet PHD requirements through the 6-year planning horizon. However, sometime after that (depending on actual growth and development within the 830 Reveille Zone), additional pumping capacity will be necessary. Unless the 870 Samish Hill Reservoir and associated facilities are in place (refer to discussion above for the Governor Road Pump Station), the City will expand the capacity of the pump station by replacing the smaller (100-gpm) of the two existing pumps with a larger pump to meet projected PHD. The City does not intend to modify the pump station to provide fire flow because fire flow capacity is forthcoming once the 870 Samish Hill Reservoir is completed and placed into service.
### Table 3-12

**Reveille Pump Station Capacity Evaluation (gpm)**

<table>
<thead>
<tr>
<th>Demand/Capacity</th>
<th>2012</th>
<th>2018</th>
<th>2022</th>
<th>2032</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand (PHD) Required</td>
<td>43</td>
<td>46</td>
<td>109</td>
<td>267</td>
</tr>
<tr>
<td>Demand (Fire Flow) Required</td>
<td>750</td>
<td>750</td>
<td>750</td>
<td>750</td>
</tr>
<tr>
<td>Combined Demand Required</td>
<td>793</td>
<td>796</td>
<td>859</td>
<td>1,017</td>
</tr>
<tr>
<td>Existing Total Capacity</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>Existing Firm Capacity</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Excess (Deficient) PHD Capacity</td>
<td>(693)</td>
<td>(696)</td>
<td>(759)</td>
<td>(917)</td>
</tr>
</tbody>
</table>

### 3.3 Storage

Description of the City’s distribution system reservoirs is presented in the 2009 Water System Plan. There have been no storage volume additions or subtractions since the 2009 Water System Plan. As is required, the City’s overall water system was evaluated with respect to required storage volume, and individual pressure zones served directly (or indirectly as in closed zones) from storage were also evaluated with respect to required storage volume. Many of the City’s pressure zones are not served directly from storage, which is acceptable if the pump station supplying these zones is designed and operated appropriately to meet PHD plus fire flow. Some of these zones are planned to be served directly from new storage in the future, but the timing for these improvements is dependent on the pace of growth within these closed zones. Per-zone storage evaluations were not undertaken for closed zones because in most cases they will continue to remain as closed zones. In cases where closed zones could be modified to be served directly from storage, the precise volume of storage needed will be assessed when development is imminent.

The updated storage evaluation, based on the updated demands presented in Table 3-1 herein, is presented in Tables 3-13 through 3-18. It should be noted that surplus storage available in the City’s 276 North Pressure Zone is accounted in higher-elevation pressure zones, as described in the subsections below, which is appropriate given the generous capacity of the pump stations lifting water to these upper pressure zones. This apportionment of the City’s storage resources is critical to avoid over-counting the need for additional storage at higher elevations.

The methodology for determining the required storage volume for each pressure zone is presented in the 2009 Water System Plan. Note that fire suppression volume is based on the fire flow requirements for each pressure zone, as presented in the 2009 Water System Plan, multiplied by two hours.

Storage deficiencies identified in the subsections below are summarized in Section 3.6.2. Planned improvements for mitigating these deficiencies are presented in Section 3.7.2.
3.3.1 System-Wide

A summary of the storage evaluation for the overall system is presented in Table 3-13. As shown in Table 3-13, there is adequate total storage within the existing overall system through the 10-year planning horizon. After that, additional storage is projected to be required. These projected storage needs will be met with storage implemented in response to development pressure. This additional future storage will be added to the existing system where it is needed, within pressure zones that need additional storage, not within pressure zones that already have excess storage. The general location and capacity of future storage is identified in the per-zone storage evaluation sections below.

<table>
<thead>
<tr>
<th>Storage Component</th>
<th>2012</th>
<th>2018</th>
<th>2022</th>
<th>2032</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational</td>
<td>1.65</td>
<td>1.65</td>
<td>1.65</td>
<td>1.65</td>
</tr>
<tr>
<td>Equalization</td>
<td>1.28</td>
<td>1.39</td>
<td>1.48</td>
<td>1.67</td>
</tr>
<tr>
<td>Standby</td>
<td>18.80</td>
<td>20.31</td>
<td>21.63</td>
<td>24.44</td>
</tr>
<tr>
<td>Fire Suppression</td>
<td>0.42</td>
<td>0.42</td>
<td>0.42</td>
<td>0.42</td>
</tr>
<tr>
<td>Total Required</td>
<td>21.73</td>
<td>23.35</td>
<td>24.75</td>
<td>27.76</td>
</tr>
<tr>
<td>Available¹</td>
<td>23.19</td>
<td>25.69</td>
<td>25.69</td>
<td>25.69</td>
</tr>
<tr>
<td>Surplus (Deficit)</td>
<td>1.46</td>
<td>2.34</td>
<td>1.08</td>
<td>(2.07)</td>
</tr>
</tbody>
</table>

¹ Available storage includes the 1.18 MG of dead storage at Marietta Reservoir. It also includes the subtraction of 5 million gallons of volume dedicated to chlorine contact storage at Whatcom Falls II in 2012 and 2.5 million gallons of chlorine contact storage in future years. The future reduction in chlorine contact storage results from reduced requirements associated with the implementation of the planned Dissolved Air Flotation project (refer to Section 4.1 for further discussion).

3.3.2 276 North

A summary of the storage evaluation for the 276 North Pressure Zone is presented in Table 3-14. As shown in Table 3-14, there is surplus storage in the 276 North Pressure Zone through the 20-year planning horizon. However, it must be noted that most of this surplus storage is available for use by higher-elevation pressure zones that are served directly from the 276 North Pressure Zone. This is true as long as the pump stations supplying these higher-elevation pressure zones have adequate capacity to provide the required PHD for these zones, which is the case for both zones. The two higher-elevation pressure zones that depend on this surplus storage are the 519 Dakin & Consolidation Pressure Zone and the 457 South Pressure Zone. The surplus storage in the 276 North Pressure Zone is adequate to meet the storage needs of these two other zones through the 10-year planning horizon. However, surplus storage from the 276 North Pressure Zone is also available to the higher-elevation pressure zones that are served by these two pressure zones. The availability of surplus storage from the 276 North Pressure Zone has been accounted for in the storage evaluations presented herein of each of the pressure zones that have storage reservoirs. These pressure zones include: 457 South, 519 Dakin & Consolidation, 696 Padden Yew, and 873 Governor Road.
3.3.3 457 South

A summary of the storage evaluation for the 457 South Pressure Zone is presented in Table 3-15. As shown in Table 3-15, there is insufficient storage in the 457 South Pressure Zone. However, as stated above, there is surplus storage in the 276 North Pressure Zone, which supplies the 457 South Pressure Zone via the Otis Street Pump Station. The Otis Street Pump Station has adequate pumping capacity to meet the PHD requirements of the 457 Pressure Zone, which enables accounting surplus storage from the supplying 276 North Pressure Zone to the 457 South Pressure Zone.

### TABLE 3-15
**457 South Pressure Zone Storage Evaluation (million gallons)**

<table>
<thead>
<tr>
<th>Storage Component</th>
<th>2012</th>
<th>2018</th>
<th>2022</th>
<th>2032</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational</td>
<td>0.75</td>
<td>0.75</td>
<td>0.75</td>
<td>0.75</td>
</tr>
<tr>
<td>Equalization</td>
<td>0.27</td>
<td>0.30</td>
<td>0.29</td>
<td>0.32</td>
</tr>
<tr>
<td>Standby</td>
<td>4.00</td>
<td>4.32</td>
<td>4.32</td>
<td>4.63</td>
</tr>
<tr>
<td>Fire Suppression</td>
<td>0.30</td>
<td>0.30</td>
<td>0.30</td>
<td>0.30</td>
</tr>
<tr>
<td>Total Required</td>
<td>5.02</td>
<td>5.36</td>
<td>5.45</td>
<td>5.69</td>
</tr>
<tr>
<td>Available</td>
<td>1.70</td>
<td>1.70</td>
<td>1.70</td>
<td>1.70</td>
</tr>
<tr>
<td>Surplus (Deficit)</td>
<td>(3.32)</td>
<td>(3.66)</td>
<td>(3.75)</td>
<td>(3.99)</td>
</tr>
<tr>
<td>Transfer from 276 North</td>
<td>3.32</td>
<td>3.66</td>
<td>3.75</td>
<td>3.99</td>
</tr>
<tr>
<td>Resulting Surplus (Deficit)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Remaining in 276 North</td>
<td>4.22</td>
<td>5.45</td>
<td>4.58</td>
<td>2.41</td>
</tr>
</tbody>
</table>

1 Includes the demands of the 541 College Way Pressure Zone, which is a closed zone served directly from the 457 South Pressure Zone.
3.3.4 519 Dakin & Consolidation

A summary of the storage evaluation for the 519 Dakin & Consolidation Pressure Zone (formerly the 519 Dakin & Yew Pressure Zone) is presented in Table 3-16. As shown in Table 3-16, there is insufficient storage in the 519 Dakin & Consolidation Pressure Zone. However, as stated above, there is surplus storage in the 276 North Pressure Zone, which directly supplies the 519 Dakin & Consolidation Pressure Zone via the Dakin & Consolidation Pump Station and the Woburn Street Pump Station. These two pump stations have adequate pumping capacity to meet the PHD requirements of the Dakin & Consolidation Pressure Zone, which enables accounting surplus storage from the supplying 276 North Pressure Zone to the 519 Dakin & Consolidation Pressure Zone.

<table>
<thead>
<tr>
<th>Storage Component</th>
<th>2012</th>
<th>2018</th>
<th>2022</th>
<th>2032</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational</td>
<td>0.39</td>
<td>0.39</td>
<td>0.39</td>
<td>0.39</td>
</tr>
<tr>
<td>Equalization</td>
<td>0.21</td>
<td>0.22</td>
<td>0.23</td>
<td>0.25</td>
</tr>
<tr>
<td>Standby</td>
<td>3.07</td>
<td>3.32</td>
<td>3.50</td>
<td>3.93</td>
</tr>
<tr>
<td>Fire Suppression</td>
<td>0.42</td>
<td>0.42</td>
<td>0.42</td>
<td>0.42</td>
</tr>
<tr>
<td>Total Required</td>
<td>3.67</td>
<td>3.94</td>
<td>4.13</td>
<td>4.58</td>
</tr>
<tr>
<td>Existing Storage</td>
<td>1.50</td>
<td>1.50</td>
<td>1.50</td>
<td>1.50</td>
</tr>
<tr>
<td>Surplus (Deficit)</td>
<td>(2.17)</td>
<td>(2.44)</td>
<td>(2.63)</td>
<td>(3.08)</td>
</tr>
<tr>
<td>Transfer from 276 North</td>
<td>2.17</td>
<td>2.44</td>
<td>2.63</td>
<td>3.08</td>
</tr>
<tr>
<td>Resulting Surplus (Deficit)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Remaining in 276 North³</td>
<td>2.05</td>
<td>3.01</td>
<td>1.93</td>
<td>(0.67)³</td>
</tr>
</tbody>
</table>

1 Includes demand for the 730 Alabama Hill, 780 Birch Street, 660 Huntington, and 530 King Mountain pressure zones, which are all closed zones served directly from the 519 Dakin & Consolidation Pressure Zone.

2 These values include the subtraction of surplus 276 North storage capacity to entirely mitigate the deficit in the 457 South Pressure Zone over the 20-year planning horizon.

3 This deficit is shown as being in the 276 North Pressure Zone given the high pumping capacity from the 276 North Pressure Zone to the 519 Dakin & Consolidation Pressure Zone. However, this future deficiency could also be addressed with new storage in the 519 Dakin & Consolidation Pressure Zone.

Note that the remaining storage in the 276 Pressure Zone, as presented in Table 3-16 includes meeting the full storage deficit for the 457 South Pressure Zone of the 20-year planning horizon. Therefore, the storage needs of the 519 Dakin & Consolidation Pressure Zone can only be met through the 10 year planning horizon. After that, additional storage is projected to be necessary.

3.3.5 696 Padden Yew

A summary of the storage evaluation for the 696 Padden Yew Pressure Zone is presented in Table 3-17. As shown in Table 3-17, there is insufficient storage in the 696 Padden Yew Pressure Zone. However, as stated above, there is surplus excess storage in the 276 North Pressure Zone, which directly supplies the 519 Dakin & Consolidation Pressure Zone and the 457 South Pressure Zone. The 696 Padden Yew Pressure Zone is supplied from the combined capacity of the
### TABLE 3-17
**696 Padden Yew Pressure Zone Storage Evaluation** (million gallons)^1

<table>
<thead>
<tr>
<th>Storage Component</th>
<th>2012</th>
<th>2018</th>
<th>2022</th>
<th>2032</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational</td>
<td>0.07</td>
<td>0.07</td>
<td>0.07</td>
<td>0.07</td>
</tr>
<tr>
<td>Equalization</td>
<td>0.06</td>
<td>0.06</td>
<td>0.08</td>
<td>0.08</td>
</tr>
<tr>
<td>Standby</td>
<td>0.86</td>
<td>0.93</td>
<td>1.15</td>
<td>1.12</td>
</tr>
<tr>
<td>Fire Suppression</td>
<td>0.18</td>
<td>0.18</td>
<td>0.18</td>
<td>0.18</td>
</tr>
<tr>
<td>Total Required</td>
<td>1.00</td>
<td>1.07</td>
<td>1.30</td>
<td>1.27</td>
</tr>
<tr>
<td>Existing Storage</td>
<td>0.80</td>
<td>0.80</td>
<td>0.80</td>
<td>0.80</td>
</tr>
<tr>
<td>Surplus (Deficit)</td>
<td>(0.20)</td>
<td>(0.27)</td>
<td>(0.42)</td>
<td>(0.47)</td>
</tr>
<tr>
<td>Transfer from 276 North</td>
<td>0.20</td>
<td>0.27</td>
<td>0.42</td>
<td>None</td>
</tr>
<tr>
<td>Resulting Surplus (Deficit)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>(0.47)</td>
</tr>
<tr>
<td>Remaining in 276 North^2</td>
<td>1.85</td>
<td>2.74</td>
<td>1.51</td>
<td>(0.67)^3</td>
</tr>
</tbody>
</table>

---

1. Includes demand for the 830 Reveille Pressure Zone, which is a closed zone served directly from the 696 Padden Yew Pressure Zone.
2. These values include the subtraction of surplus 276 North storage capacity to entirely mitigate the deficit in the 457 South Pressure Zone over the 20-year planning horizon, as well as meeting the storage deficit of the 519 Dakin & Consolidation Pressure Zone through the 10-year planning horizon.
3. As stated in Footnote 3 of Table 3-16, this deficit is shown as being in the 276 North Pressure Zone. However, this deficiency could also be addressed in part or in whole with new storage in the 519 Dakin & Consolidation Pressure Zone, the 457 South Pressure Zone, or the 696 Padden Yew Pressure Zone, or the future 870 Samish Hill Pressure Zone.

Consolidation Pump Station and the 38th Street Pump Station, which are supplied from the 519 Dakin & Consolidation Pressure Zone and 457 South Pressure Zone, respectively.

Consequently, even though the surplus storage in the 276 North Pressure Zone has already been accounted in evaluating the storage needs of the 519 Dakin & Consolidation Pressure Zone and the 457 South Pressure Zone, there remains additional surplus capacity, as presented in Table 3-16, after the storage deficits of these two pressure zones are met through the 10-year planning horizon but not for the 20-year horizon. There is adequate surplus storage capacity from the 276 North Zone through the 6-year planning horizon to meet the storage deficiencies of the 519 Dakin & Consolidation Pressure Zone, the 457 South Pressure Zone, as well as the higher-elevation 696 Padden Yew Pressure Zone. It is possible to account the remaining surplus capacity from the 276 North Pressure Zone in the 696 Padden Yew Pressure Zone because the combined capacity of the Consolidation Pump Station and the 38th Street Pump Station meet the PHD requirements of the 696 Padden Yew Pressure Zone.

In summary, no additional storage is needed for the 696 Padden Yew Pressure Zone through the 10-year planning horizon.

### 3.3.6 873 Governor Road

A summary of the storage evaluation for the 873 Governor Road Pressure Zone is presented in Table 3-18. As shown in Table 3-18, there is a slight storage deficiency in the 873 Governor Road Pressure Zone. However, as stated above for the 276 North Pressure Zone, and re-iterated for the 519 Dakin & Consolidation Pressure Zone, the 457 South Pressure Zone, and the 696 Padden Yew
### TABLE 3-18

873 Governor Road Pressure Zone Storage Evaluation (million gallons)

<table>
<thead>
<tr>
<th>Storage Component</th>
<th>2012</th>
<th>2018</th>
<th>2022</th>
<th>2032</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational</td>
<td>0.06</td>
<td>0.07</td>
<td>0.07</td>
<td>0.07</td>
</tr>
<tr>
<td>Equalization</td>
<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
<td>0.06</td>
</tr>
<tr>
<td>Standby</td>
<td>0.12</td>
<td>0.13</td>
<td>0.25</td>
<td>0.83</td>
</tr>
<tr>
<td>Fire Suppression</td>
<td>0.09</td>
<td>0.09</td>
<td>0.09</td>
<td>0.09</td>
</tr>
<tr>
<td>Total Required</td>
<td>0.19</td>
<td>0.22</td>
<td>0.34</td>
<td>0.96</td>
</tr>
<tr>
<td>Existing Storage</td>
<td>0.18</td>
<td>0.18</td>
<td>0.18</td>
<td>0.18</td>
</tr>
<tr>
<td>Surplus (Deficit)</td>
<td>(0.01)</td>
<td>(0.04)</td>
<td>(0.16)</td>
<td>(0.78)</td>
</tr>
<tr>
<td>Transfer from 276 North</td>
<td>0.01</td>
<td>0.04</td>
<td>0.16</td>
<td>None</td>
</tr>
<tr>
<td>Resulting Surplus (Deficit)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>(0.78)</td>
</tr>
<tr>
<td>Remaining in 276 North</td>
<td>1.84</td>
<td>2.7</td>
<td>1.35</td>
<td>(0.67)</td>
</tr>
</tbody>
</table>

Pressure, there is surplus storage 276 North Pressure Zone that be accounted in the 873 Governor Road Pressure Zone through the 10-year planning horizon. Refer to the discussion above for the 696 Padden Yew Pressure Zone regarding how surplus storage can be accounted in the 696 Padden Yew Pressure Zone. The 873 Governor Road Pressure Zone is supplied from the 696 Padden Yew Pressure Zone via the Governor Road Pump Station. The Governor Road Pump Station has sufficient capacity to meet PHD to transfer the surplus storage from the 276 North Pressure Zone to the 873 Governor Road Pressure Zone.

In summary, similar to the 696 Padden Yew Pressure Zone, no additional storage is needed for the 873 Governor Road Pressure Zone through the 10-year planning horizon. However, similar to the 696 Padden Yew Pressure Zone, additional storage for the 20-year horizon, is projected to be necessary.

### 3.4 Water Age Analysis

The City has observed a loss of chlorine residual at the Kearney Road Reservoir and the Marietta Reservoir – both serving the City’s 276 North Pressure Zone. Neither of these reservoirs have pump stations that directly draw water from them to higher pressure zones. Therefore, these reservoirs experience limited turnover unless water level in the entire 276 North Pressure Zone, including at Whatcom Falls Reservoir I and Whatcom Falls Reservoir II is purposely drawn down by reducing production at the Whatcom Falls Water Treatment Plant to a level below customer water usage for several days. Limited turnover in the reservoirs results in elevated water age, a resulting loss of chlorine residual, and a corresponding potential for bacteriological contamination.

Over the past two years, on a weekly basis, the City draws down reservoir levels in the 276 North Pressure Zone on a weekly basis to promote turnover of the reservoirs. This operational approach has resulted in maintaining chlorine residual throughout the system. The City plans to continue this operational approach indefinitely, as long as it remains successful. However, the City has also evaluated alternative improvement approaches to enhance water age conditions at both Marietta Reservoir and Kearney Road Reservoir. Some of these improvement approaches are either
underway or planned for implementation, while others will only be implemented if determined in the future to be necessary.

In addition to drawing down the reservoirs in the 276 North Pressure Zone, including the Marietta Reservoir, to enhance maintenance of a chlorine residual, the City has modified the single-inlet/outlet reservoir connection so that the inlet is on one side of the reservoir and the outlet on the other. Check valves restrict inlet water flows into the reservoir to the inlet line and outlet water flows to the separate outlet line. In tandem with this improvement, the City plans to change its primary supply location to Water District No. 2 from the Marine Dr/Bennett Dr meter location to near the outlet of the Marietta Reservoir. Supplying Water District No. 2 from the Marietta Reservoir will increase the volume of water flowing through the Marietta Reservoir and reduce water age at this location.

At the Kearney Road Reservoir, where chlorine residual has fallen at times to undetectable levels on the outlet of the reservoir, the City has analyzed the impact of installing a small pump station that would lift water from the outlet of the Kearney Road Reservoir to the 519 Dakin & Consolidation Pressure Zone. This pump station would force water to flow through the Kearney Road Reservoir and substantially reduce water age. Because the 519 Dakin & Consolidation Pressure Zone is already served from two other large-capacity pump stations, this new pump station could be a relatively simple station with two equal-sized, single-speed pumps operated as the primary means of lifting water to the 519 Dakin & Consolidation Pressure Zone. On-site back-up power would not be necessary because of the surplus of existing pumping capacity. Alternatively, should the City decide to implement this improvement, the discharge of the pump station could be to the 350 Cordata Pressure Zone instead of the 519 Dakin & Consolidation Pressure Zone. A pump station supplying the 350 Cordata Pressure Zone would be somewhat more complicated with either a re-circulation loop for single-speed pumps or variable speed drives. The better discharge alternative would need to be evaluated closer to the time of implementation in consideration of development pressure and patterns in the local area. If discharge is to the 519 Dakin & Consolidation Pressure Zone, control of the existing Dakin & Consolidation Pump Station and Woburn Street Pump Station would be revised to provide peak demand and fire flow capacity, periodic operation, and redundant back-up operation.

Water age was modeled to evaluate the beneficial impacts of the improvements described above at the Marietta Reservoir and Kearney Road Reservoir sites using the City’s existing distribution system hydraulic model. The results of the modeling are presented in Figure 3-4 for the Marietta Reservoir and Figure 3-5 for the Kearney Road Reservoir.

What is clear from Figure 3-4 is that water age at the Marietta Reservoir will continue to be elevated. This reservoir is located at the end of the distribution system with minimal use nearby to promote cycling or turnover. Whether or not the improvements described above are enough to enable maintenance of a detectable chlorine residual is uncertain. If after implementation of the improvements, it is still not possible to maintain a detectable chlorine residual, a re-chlorination station will be necessary at the Marietta Reservoir. If a re-chlorination station is determined to be necessary, it will be implemented, but for the purposes of this planning effort, it is assumed that it will not be necessary and therefore is not included in the Improvement Program within the 6-year planning horizon. If needed, the new re-chlorination station could be comprised of a small pre-engineered building housing a chlorine metering pump, a chlorine residual analyzer, SCADA monitoring, and space for two 55-gallon drums of sodium hypochlorite.
FIGURE 3-4
Marietta Reservoir Water Age Evaluation

FIGURE 3-5
Kearney Reservoir Water Age Evaluation
As presented in Figure 3-5, for the Kearney Road Reservoir, the potential new pump station to the 519 Dakin & Consolidation Pressure Zone drastically reduces water age and could enable maintenance of a chlorine residual at this location. Supplying the 519 Dakin & Consolidation Pressure Zone from the Kearney Road Reservoir instead of the existing pump stations increases water age within the 519 Dakin & Consolidation Pressure Zone by up to two days under ADD conditions. However, this additional water age would not be expected to create any water quality challenges.

### 3.5 Anticipated Development / Planned Improvements

The City regularly receives development interest and proposals throughout the City. Where such development is relatively small and involves filling in small undeveloped portions of already-developed areas, the need for additional water system infrastructure is minimal and typically limited to pipeline extensions. In these cases, development does not prompt the need for additional pumping and storage facilities. However, where development proposals are more extensive and reach to areas lacking water service, additional pumping and storage facilities are typically needed in addition to pipeline extensions.

The addition of these pumping and storage facilities must be thoughtfully planned and coordinated with other, existing storage and pumping facilities to avoid excessive facility redundancy and the associated service inefficiency and higher operating costs. Via comprehensive, pro-active utility planning, the City incorporates pumping and storage infrastructure needs for these more extensive development proposals, where applicable, into mitigating other known or anticipated system deficiencies and improving overall system efficiency. In other words, in some cases it is possible to address pumping or storage deficiencies within the existing system with pumping and storage facilities that serve new development.

Two particular areas within the City where development interest has existed for several years, are the King Mountain area on the north side of the City and the Samish Hill area east of Interstate 5 and north of Lake Padden, just to the east of the 696 Padden Yew Zone. Water service to these two development areas is presented in the two sections below.

#### 3.5.1 King Mountain Area

The King Mountain area is situated primarily to the north of the 350 Cordata Pressure Zone and west of the existing 530 King Mountain Pressure Zone. Lower-elevation portions of the King Mountain area could be served in the near-term future from the 350 Cordata Pressure Zone, or with recent extension of the 519 Dakin & Consolidation Pressure Zone, service directly from that zone is possible.

Development at higher elevations on King Mountain would require a new continuously-operating pump station serving a closed pressure zone. This pump station, referred to hereinafter as the King Mountain Pump Station, would be situated at the Kearney Road Reservoir Site and would lift water from the outlet of the Kearney Road Reservoir at a hydraulic gradient of 276 feet elevation to a hydraulic gradient of 630 feet elevation. Alternatively, suction to this pump station could be from the 519 Dakin & Consolidation Pressure Zone at or near the Kearney Road Reservoir, or more likely adjacent to the existing James Street Pump Station. In either case, a new transmission pipeline
connected to the pump station discharge would be necessary to connect the new pump station to the distribution area. Evaluation of these two alternatives will be undertaken at the time planning for development in this area is initiated.

Additional storage at King Mountain is not currently necessary. However, if at some point in the longer-term future, storage is needed to mitigate a system-wide need, a new storage reservoir could be implemented to serve the existing 350 Cordata Pressure Zone, which is a closed zone – not served directly from a storage reservoir. The City has identified this potential future reservoir as the King Mountain Reservoir. Tentatively, the overflow elevation of this reservoir would be 370 feet, and it would serve to raise the hydraulic gradient of the existing 350 Cordata Pressure Zone to 370 feet. It would be supplied from the existing Short Street Pump Station with minor facility modifications. Additional distribution system pipeline improvements may be necessary to improve flow from the Short Street Pump Station to the new reservoir, which would need to be evaluated during the planning phase for this potential future project.

Raising the gradient to 370 feet elevation would expand the reach of the future 370 Cordata Pressure Zone to the west side of King Mountain. The volume of the potential future King Mountain Reservoir will be determined closer to the time it is implemented. Additionally, alternative locations (even locations beyond the King Mountain area) will be evaluated if/when additional storage is determined to be necessary for the overall water system.

### 3.5.2 Samish Hill Area

The more-southerly area of development interest exists between the existing 830 Reveille Pressure Zone and the 873 Governor Road Pressure Zone. The addition of a future storage reservoir, a future pump station, and associated connecting transmission pipeline to serve this higher-elevation area will enable combination of the 830 Reveille Pressure Zone and the 873 Governor Road Pressure Zone into a new 870 Samish Hill Pressure Zone. Doing so will result in fire flow capacity to the existing 830 Reveille Pressure Zone and enable replacement of the Reveille Pump Station, Parkhurst Reservoir, and Governor Road Pump Station. The new, replacement facilities will include a single, new pump station at the 40th Street Reservoir site (future 40th Street Pump Station), a single new storage reservoir (future Samish Hill Reservoir) that would have an overflow elevation of 870 feet, and a connecting transmission pipeline between the two. The volume of this reservoir will be determined closer to the time of its implementation. These additional facilities are necessary to extend service to most of the Samish Hill area. However, if development of the Samish Hill area does not occur, these additional facilities will not be necessary, including the Samish Hill Reservoir.

In addition, the existing 980 Pressure Zone that was recently extended from the 873 Governor Road Pressure Zone via the Samish Heights Pump Station, which does not have fire flow capacity, would be replaced by a new pump station lifting water to a larger 980 Pressure Zone area. This new pump station is referred to as the “980 Pump Station,” and it would have fire flow capacity and supply all of the surrounding higher-elevation areas that are too high to be served from the future Samish Hill Reservoir.
3.6 Summary of Pumping and Storage Deficiencies

Pumping and storage deficiencies identified via the evaluations presented in the sections above are summarized in Table 3-19. Note that there are no storage deficiencies projected within the 6-year planning horizon and only two pumping deficiencies projected within the 10-year planning horizon. More discussion of these deficiencies is presented in the subsections below. The future Kearney Road Pump Station is not addressed in this section because it is not a deficiency related to an existing pump station, but instead an improvement to alleviate the excessive water age issue at Kearney Road Reservoir.

<table>
<thead>
<tr>
<th>Summary of Pumping and Storage Deficiencies (gpm for pumping and million gallons for storage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deficiencies</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td><strong>Pumping</strong></td>
</tr>
<tr>
<td>Short Street</td>
</tr>
<tr>
<td>James Street</td>
</tr>
<tr>
<td>Balsam Lane</td>
</tr>
<tr>
<td>Governor Road</td>
</tr>
<tr>
<td>Reveille</td>
</tr>
<tr>
<td><strong>Storage</strong></td>
</tr>
<tr>
<td>System Wide</td>
</tr>
<tr>
<td>276 North Pressure Zone</td>
</tr>
<tr>
<td>696 Padden Yew Pressure Zone</td>
</tr>
<tr>
<td>873 Governor Road Pressure Zone</td>
</tr>
</tbody>
</table>

1 Refer to Tables 3-14 through 3-18 for review of how the transfer of surplus storage in the 276 North Pressure Zone results in an estimated future deficiency in the 276 North Pressure Zone. Estimated future deficiency in the 276 North Pressure Zone is anticipated to be corrected by additional storage in higher-elevation pressure zones – not additional storage in the 276 North Pressure Zone.

3.6.1 Pumping

The only deficiencies at existing pump stations within the 10-year planning horizon are at Balsam Lane and at Reveille. In these two cases, the deficiencies exist now, and in both cases PHD needs are met, but the combined fire flow / PHD requirement is not met. Deficiencies were identified at the 20-year planning horizon for these two pump stations, as well as for three other pump stations – Short Street, James Street, and Governor Road. Discussion of how the City plans to address each of these deficiencies is presented in Section 3.7.1.

3.6.2 Storage

No storage deficiencies are identified within the 10-year planning horizon. At the 20-year planning horizon the projected total storage deficiency will be approximately two million gallons. Storage deficiencies are shown in Table 3-19 at the 20-year planning horizon for the overall distribution system, the 276 North Pressure Zone (because of transfers to higher pressure zones), the 696 Padden Yew Pressure Zone, and the 873 Governor Road Pressure Zone. Surplus storage from the
276 North Pressure Zone was used, to the extent available, to mitigate deficiencies for all of the higher-elevation pressure zones.

The projected future storage needs at the 20-year planning horizon, as presented in Table 3-19, are planned to be met via storage improvements that will be needed to accommodate development, as described in Section 3.5, in the Samish Hill area and/or on King Mountain. The timing and pace of development in these areas is uncertain at this time. In the event growth does not occur in these areas soon enough to enable the associated storage facilities to mitigate any storage deficiencies within the City’s overall system that might exist at the time, storage volume expansion could be pursued by replacing one or more existing, smaller reservoirs within the upper-elevation pressure zones with larger ones. This would also be an opportunity to replace a future aging and deteriorating storage reservoir with a larger, new reservoir.

3.7 Planned Pumping and Storage Improvements

The planned distribution system improvements presented in this section are based on the evaluations presented in Sections 3.2, 3.3, and 3.4 and the resulting deficiencies summarized in Section 3.6. Where applicable and practical, the deficiencies summarized in Section 3.6 will be addressed in coordination with anticipated development presented in Section 3.5. The planned improvements presented herein include only one pumping improvement to be implemented within the 6-year planning horizon. The remainder of the improvements will be implemented at an unspecified time after the 6-year planning horizon.

Discussion of these improvements is presented in Sections 3.7.1 and 3.7.2 and a summary of the improvements is presented in Section 3.7.3.

3.7.1 Pumping Improvements

The pump station deficiencies identified in Table 3-19 are planned to be addressed as described below:

♦ **Short Street Pump Station**: This projected 20-year deficiency will be addressed with the addition of the King Mountain Reservoir, which will add storage to the existing closed 350 Cordata Pressure Zone. The new King Mountain Reservoir will have an overflow elevation of 370 feet elevation to extend the reach of the existing 350 Cordata Pressure Zone. The existing Short Street Pump Station will not need to simultaneously provide fire flow and PHD and therefore will no longer have a capacity deficiency.

♦ **James Street Pump Station**: This projected 20-year deficiency will be addressed in the long-term future by the replacement of the existing pumps with pumps of higher capacity. In the event that development high on the west side of King Mountain results in a new King Mountain Pump Station (refer to Section 3.5.1 and below in this section) and a new closed pressure zone, the existing 530 King Mountain Pressure Zone would be incorporated into the new 630 King Mountain Pressure Zone and the existing James Street Pump station would be removed from service.

♦ **Balsam Lane Pump Station**: This deficiency is planned to be addressed by replacement of the existing pumps with pumps of higher capacity. An additional pump will not be necessary, but
improvements to electrical switchgear and connecting piping will be necessary. This improvement is planned to be implemented beyond the 6-year planning horizon when the existing pumps have reached their useful service life.

♦ **Governor Road Pump Station:** This projected 20-year deficiency will be addressed with the new storage and pumping facilities associated with the anticipated new development in the Samish Hill area. With the implementation of this new development, the Governor Road Pump Station will be replaced by a new, higher-capacity pump station at the 40th Street Reservoir site – the 40th Street Pump Station.

♦ **Reveille Pump Station:** Similar to the projected 20-year deficiency at the Governor Road Pump Station, the current deficiency at the Reveille Pump Station will be addressed with the new storage and pumping facilities associated with the anticipated new development in the Samish Hill area. With the implementation of this new development, the Reveille Pump Station will be replaced by a new, higher-capacity pump station at the 40th Street Reservoir site – the 40th Street Pump Station.

In addition to the pumping improvements described above that address deficiencies with existing pump stations. The City has identified a potential improvement, the **Kearney Road Pump Station**, that it will consider implementing in the future if deemed necessary to reduce excess water age at the Kearney Road Reservoir, as described in Section 3.4. This potential pump station is included for implementation within the 20-year planning horizon, but is not budgeted within the 6-year planning horizon.

Three additional pump stations will be necessary to support long-term future growth in the two development areas described in Section 3.5. The timing for each of these future pump stations depends on the timing and pace growth and development, but each are anticipated beyond the 6-year planning horizon. These three pump stations are described below:

♦ **40th Street Pump Station:** This pump station will be necessary to lift water to the future Samish Hill Reservoir, which is described in Section 3.5.2 above and in Section 3.7.2 below. It will be situated at the existing 40th Street Reservoir Site and lift water from the 696 Padden Yew Pressure Zone. It would have a capacity of approximately 1,500 gpm and be equipped with three equal-sized (500 gpm) pumps. A transmission pipeline from this pump station to the new Samish Hill Reservoir would also be included as part of this project.

♦ **980 Pump Station:** As described in Section 3.5.2, this pump station would supply development at the highest elevations in the Samish Hill area – elevations too high to be served from the future 870 Samish Hill Pressure Zone. It would be situated at the future Samish Hill Reservoir site and be supplied from that reservoir. New distribution system piping would convey water from this pump station to new service connections.

♦ **King Mountain Pump Station:** As described in Section 3.5.1, this pump station would supply development at the highest elevations on King Mountain and would be situated at the Kearney Reservoir Site. It could be developed as an expansion of the planned Kearney Road Pump Station, housed within the same building, or it could be developed as a stand-alone pump station elsewhere on or near the same site, or adjacent to the existing James Street Pump Station. The King Mountain Pump Station will be a more complex pump station than the Kearney Road Pump Station, and it is not anticipated to be needed until beyond the 6-year
planning horizon. This new pump would include a new transmission pipeline extending from the pump station discharge to the new King Mountain distribution system.

### 3.7.2 Storage Improvements

The storage deficiencies identified in Table 3-19 for the 20-year planning horizon are planned to be addressed as part of the anticipated development on King Mountain and in the Samish Hill area. No storage deficiencies were identified within the 6-year and 10-year planning horizon. Therefore, no specific reservoir improvements are identified for this timeframe. The two reservoirs associated with the King Mountain development area and the Samish Hill development area, include: the King Mountain Reservoir and Samish Hill Reservoir, respectively. These two reservoirs are anticipated to meet the projected 20-year deficiencies presented in Tables 3-19 for the water system as a whole, as well as for the identified per-zone deficiencies. The King Mountain Reservoir will be supplied from the existing Short Street Pump Station, with some minor improvements, and the project will require some distribution system capacity improvements to enable effective filling from the Short Street Pump Station. The timing of these two reservoirs is based primarily on the timing of development, but is generally anticipated beyond the 6-year planning horizon.

### 3.7.3 Summary of Pumping and Storage Improvements

A summary of planned pumping and storage improvements is presented in Table 3-20. Improvements (additions) that impact the City’s distribution system hydraulic profile are reflected in Figure 3-6 at the of this WSP Update. The decommissioning of pumping and storage facilities described above are also reflected in the hydraulic profile.

**TABLE 3-20**

<table>
<thead>
<tr>
<th>Improvement</th>
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</tr>
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<td><strong>Pumping</strong></td>
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<td>Kearney Road Pump Station</td>
<td>PS-1</td>
</tr>
<tr>
<td>Balsam Lane Pump Station Capacity Expansion</td>
<td>PS-2</td>
</tr>
<tr>
<td>40th Street Pump Station</td>
<td>PS-3</td>
</tr>
<tr>
<td>980 Pump Station</td>
<td>PS-4</td>
</tr>
<tr>
<td>King Mountain Pump Station</td>
<td>PS-5</td>
</tr>
<tr>
<td><strong>Storage</strong></td>
<td></td>
</tr>
<tr>
<td>Samish Hill Reservoir</td>
<td>ST-1</td>
</tr>
<tr>
<td>King Mountain Reservoir</td>
<td>ST-2</td>
</tr>
</tbody>
</table>
4. Treatment Analysis

In late July and August of 2009 the filters at the City’s WTP began clogging much earlier in filter runs than typical. Filter runs became substantially shorter than normal, requiring more frequent filter backwashing. The result of shorter filter runs and increased filter backwashing was greatly reduced WTP capacity – to the point the City implemented mandatory water restrictions, for the first time, to reduce customer demand. It should be noted that voluntary water restrictions are implemented each summer as a means of encouraging conservation during this time of typically-high customer water demand. The water restrictions were successful in reducing customer demand to match WTP capacity. Toward the end of August and into September, filter runs gradually began to return to normal and customer demand dropped, as it customarily does at that time of the year.

Filter clogging was attributed to algae in Lake Whatcom. Monitoring revealed higher than typical counts of most algae species. Although the reasons for the intense algae bloom of the summer of 2009 is the subject of varied speculation, historical and on-going algae monitoring shows that summertime algae blooms in Lake Whatcom have been increasing over the past decade. It is speculated that despite efforts to reverse this trend, summertime algae blooms in Lake Whatcom will continue to increase in intensity and duration over the near-term future. Increased Lake Whatcom algae could again result in summertime algae blooms that prevent the WTP from treating sufficient supply to meet customer demand in the future.

In response to the 2009 algae event, the City completed a study that is presented in a report entitled “Filter-Clogging Algae Mitigation Evaluation,” dated June 2012 – hereinafter referred to as the Algae Mitigation Report. The Algae Mitigation Report included a recommendation for the City to implement Dissolved Air Flotation (DAF) to mitigate adverse algae conditions.

The purpose of this section is two-fold:

♦ **Dissolved Air Flotation**: Formally incorporate DAF into the City’s water system planning strategy and reference the alternative evaluation and pilot testing work supporting the planned implementation of DAF.

♦ **Filtration Capacity**: Address the need for additional filtration capacity at the WTP in light of recent water use trends as well as the City’s plan to implement DAF.

These two topics are addressed in the following subsections.

4.1 Dissolved Air Flotation

As presented in the Algae Mitigation Report, several alternatives to mitigate the adverse impacts of Lake Whatcom algae on WTP capacity were evaluated. The alternatives evaluated were grouped into three main categories, treatment, intake, and lake management, and are presented in Table 4-1. In addition to the alternatives in Table 4-1, the “No Action” alternative was included in a Triple Bottom Line Plus evaluation phase to establish a lowest-cost baseline for comparison.

Each of the treatment alternatives evaluated are commonly used in the municipal water treatment industry and are commonly-considered alternatives for algae removal. Each would be implemented somewhere at the existing WTP site. Each of the intake alternatives includes withdrawing water
TABLE 4-1  
Summary of Alternatives Evaluated

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Intake</th>
<th>Lake Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissolved Air Flotation</td>
<td>Secondary Intake via In-Water Pipeline</td>
<td>Lake Management</td>
</tr>
<tr>
<td>Ballasted Sedimentation</td>
<td>Secondary Intake via Over-Land Pipeline</td>
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<td>Plate and Tube Settling</td>
<td>New Dual-Intake System</td>
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<td>Upflow Clarification</td>
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<tr>
<td>Conventional Sedimentation</td>
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<tr>
<td>Micro-Screening</td>
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<tr>
<td>Ozonation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Additional Filters</td>
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</tbody>
</table>

from Lake Whatcom at a location different from the existing intake location that has a substantially lower concentration of algae. Each of the intake alternatives includes the capability to withdraw water at more than one depth. The Lake Management alternative is essentially the ongoing Lake Whatcom Management Program, which comprises the City’s, Whatcom County’s, and Lake Whatcom Water and Sewer District’s ongoing and long-term efforts to improve Lake Whatcom water quality. Lake management will continue to be implemented regardless of the results of the evaluation. It was included as part of the mitigation evaluation to assess whether it could be successful as a stand-alone approach instead of a complementary approach to a treatment or intake approach.

As presented in the Algae Mitigation Report, DAF was determined to be the technically superior treatment approach with respect to mitigating the algae problem, as well as being one of the lower cost treatment alternatives. DAF was also determined to be technically superior and far less costly than any of the intake alternatives. Lake Management was determined to be inadequate as a stand-alone mitigation approach because of the many years that will pass before improved water quality with respect to algae will be observed.

In recognition that DAF was the best approach for mitigating the adverse impacts of Lake Whatcom algae, DAF was pilot tested during the late summer of 2011. Pilot testing showed DAF to be effective at mitigating the algae impacts — restoring filtration capacity to levels when algae concentrations in Lake Whatcom are negligible. The results of the pilot testing are included under separate cover, entitled: “Whatcom Falls Water Treatment Plant Dissolved Air Flotation Pilot Testing,” dated March 2012. This same pilot testing report is also appended to the Algae Mitigation Report.

The City intends to pursue the design and construction of a new DAF facility in a phased approach. The phased approach will be based on an initial two-train DAF facility with easy expansion for a future third train, which would likely not be needed for many years into the future. Each of the trains would have a nominal capacity of 10 mgd. The timing for the third train would depend on the intensity of algae blooms in the future in combination with growth in water use. The phased implementation of DAF minimizes the initial capital cost of a DAF facility and eliminates the potential for constructing more DAF capacity than is necessary.

This phased DAF-implementation approach complements the City’s on-going commitment to lake management, water quality improvement in Lake Whatcom, and TMDL compliance via the Lake
Whatcom Management Program. Over the long-term future, as phosphorous-reducing lake management measures demonstrate success at improving water quality and reducing algae blooms, the need for further expansion of the initial phase of DAF implementation could potentially be avoided entirely.

In general, the schedule for DAF implementation includes preliminary and detailed design beginning in 2014 — including the DOH-required submittals for the Project Report and the Construction Documents. Construction and commissioning would begin in late 2015 and extend into 2017.

In addition to the planned DAF improvement, the City will undertake two related projects that will be precipitated by DAF implementation. First, the existing gas chlorine system at the Plant does not include a chlorine neutralization system. Upgrading this condition or switching to an alternative disinfection system, such as bulk sodium hypochlorite or on-site generated hypochlorite will need to be addressed simultaneous to DAF implementation. The project will include evaluation of alternative disinfection systems and design and construction of an upgrade of the existing system or a new system. Obtaining a building permit for the new DAF facility is anticipated to prompt the upgrade of the existing chlorine system. This project is referred to in the Improvement Program as “T-3: Disinfection Improvements.”

Second, the existing Screen House facility upstream of the Plant is an aging structure whose current primary function is screening to keep fish and large debris out of the Plant. Its traveling screens are 70 years old and are in relatively good condition, but the City intends to pro-actively move this screening function to the Plant – just upstream of the DAF process. Other component elements of the Screen House facility are showing signs of deterioration. Once the screening function has been relocated to the future DAF facility at the Plant, the City plans to bypass the Screen house facility. The bypass improvements will include new buried pipelines and valves that will connect to the existing pipelines leading to the Plant and to the industrial (untreated) supply system. This project is referred to in the Improvement Program as “T-4: Screening Relocation Improvements.”

An additional benefit of the DAF facility is added chlorine disinfection contact credit. Currently, the City is required to provide “1-log” of chlorine disinfection for giardia inactivation, which is the requirement for filtration facilities without pre-filtration clarification processes. This disinfection contact is provided in the Whatcom Falls II Reservoir. The City reserves the bottom 5 million gallons of the reservoir to ensure sufficient chlorine contact volume. With the addition of DAF, the City will be eligible to receive from DOH an addition 0.5-log credit for giardia inactivation, which will reduce the volume it needs to reserve in Whatcom Falls II Reservoir to 2.5 million gallons. This reduction in storage volume allocated to chlorine contact helps to defer the need for additional distribution system storage. This reduction is acknowledged in the footnote of Table 3-13 and is accounted throughout the storage evaluation presented in Section 3.3.

4.2 Filtration Capacity

A description of the City’s Whatcom Falls Water Treatment Plant is presented in Section 3.3.2 of the 2009 Water System Plan. When the WTP is not being adversely impacted by algeae, it has a capacity of 24 mgd with one of its six filters out of service for backwashing.

The 2009 Water System Plan identified the need for additional filtration capacity based on the projected intersection of estimated water use and the 24-mgd capacity of the WTP. That project
intersection was 2014. As stated above in Section 2.2 of this WSP Update, the updated estimated future water use is much less than what was estimated in the 2009 Water System Plan. The 20-year estimate of WTP production is 20.8 mgd, which is less than the 24-mgd capacity of the WTP with one filter out of service for backwashing. Therefore, discounting the impact of algae on the WTP capacity, there is no need to add new filters at the WTP.

However, summertime algae blooms do adversely impact filtration capacity at the WTP. The magnitude of reduced capacity depends on the severity and intensity of the algae bloom, which is different each summer. Only in the summer of 2009 has algae reduced WTP capacity to a point below total customer demand. Therefore, the only data point reflecting the extent to which WTP capacity was reduced by algae is from the summer of 2009.

During the summer of 2009, mandatory water restrictions, were implemented when the WTP could not meet customer demand, which was approximately 17 mgd at the time the mandatory water restrictions were implemented. One day after mandatory water restrictions were implemented, customer demand dropped to approximately 10 mgd. Operations staff adjusted the filter loading rate to as high as 4.82 gallons per minute per square foot (gpm/sf) to maximize plant capacity to meet the reduced demand. It was not possible to increase the filter loading rate beyond this point because of the excessive filter backwash frequency. Filter run times had reduced to 3.5 hours during this time from a typical summer run time of 15 hours. The result was a WTP capacity of approximately 10 mgd under the algae conditions observed in early August of 2009.

It should be noted that the impact of algae on the capacity of the WTP is extremely variable – depending heavily on actual algae biomass as well as algae species configuration. The WTP capacity of 10 mgd in 2009 represents an apparent historical “maximum-impact” administered by Lake Whatcom algae. The impact of Lake Whatcom algae on WTP capacity has been less severe in 2010, 2011, and 2012 than in 2009, even though there was substantial reduction in WTP capacity during these past three years. The WTP production capacity was adequate during these years because peak summertime customer demand was relatively low in comparison to previous years.

The addition of DAF is necessary to mitigate the adverse impacts of summertime algae blooms will be completely mitigated and enable the filtration capacity at the WTP to be 24-mgd based on a maximum filter loading rate of 6 gallons per minute per square foot (gpm/sf). Consequently, given the City’s plan for implementing DAF over the next few years, there is no need for additional filtration capacity at the WTP within the 6-year and 20-year planning horizons.
5. Improvement Program

The Improvement Program presented herein replaces what was developed for the 2009 Water System Plan. The Improvement Program from the 2009 Water System Plan is presented in Appendix A with comments regarding the status of each of the listed projects. Note that most of the projects presented in Appendix A were not undertaken because anticipated development did not occur and because actual water use and estimated future water use are lower than cited in the 2009 Water System Plan.

Each improvement project is designated with an improvement project number related to the type of improvement to facilitate, as applicable, referencing between the narrative discussion presented in Sections 3 and 4, Table 3-20, Table 5-1, and Figure 5-1 (at the end of this WSP Update). The treatment, storage, pumping, and pipeline projects are each presented in Sections 3 and 4 of this WSP Update. The metering project is presented in Section 4 of the 2009 Water System Plan. The planning, watershed, hydropower, and supply projects are described in the following paragraph. The letter designations relating to improvement type for each of the improvement numbers are listed below:

- Treatment (T)
- Storage (ST)
- Pumping (PS)
- Pipeline (PL)
- Metering (M)
- Planning (PN)
- Watershed (WS)
- Hydropower (HP)
- Supply (S)

**Planning (PN).** The planning project, PL-1, is the next water system plan update the City intends to execute. It is understood that actual timing for this project may vary, but in no case will it extend beyond the timeframe required by WADOH.

**Watershed (WS).** Property Acquisitions in Lake Washington (WS-1) is part of the City’s on-going program to reduce phosphorous loading to Lake Whatcom. Water Quality Projects in Lake Whatcom Watershed (WS-2) are those improvement projects also intended to reduce runoff and phosphorous loading to Lake Whatcom.

**Hydropower (HP).** The GP Hydropower Project (HP-1) is intended to generate hydropower from the pipeline that formerly conveyed water to the Georgia Pacific Mill.

**Supply (S).** The Nooksack River Dam and Pipeline Improvements (S-1) will be implemented to make improvements to the fish screens at the Nooksack River diversion dam and to make improvements that are anticipated to be necessary on the existing Nooksack River transmission pipeline between the Nooksack River diversion and Lake Whatcom. The scope of improvements to the diversion dam and pipeline will be determined during the planned initial evaluation.
The schedule for implementation of the Improvement Program is presented in Table 5-1. Estimated project costs presented in Table 5-1 are planning-level Class V estimates as defined by the Association for the Advancement of Cost Engineering International (AACEI).

The estimated costs were prepared for guidance in utility budgeting and securing adequate funding based on information available at the time of the estimate. The final cost of the project will depend upon the actual labor and material costs, competitive market conditions, implementation schedule, and other variable factors. As a result, final project costs will vary from the estimates presented herein.
**TABLE 5-1**

*Improvement Program*

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<td>King Mountain Reservoir</td>
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<td>Nooksack River Dam and Pipeline Improvements</td>
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<td>$18,600,000</td>
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</tbody>
</table>

<sup>1</sup> Each of the projects designated with an “X” in the timeframe beyond the 6-year planning horizon were not incorporated into the financial program for the water utility. Therefore, estimated costs were not developed for these improvements.

<sup>2</sup> The total project for the GP Hydro Project is preliminarily estimated to be approximately $3,000,000. The amount beyond the initial evaluation is not shown in the table because it is assumed the project will not be completed until beyond the 6-year planning horizon.
6. Financial Program

The City recently completed a rate study for its water and sewer utilities, entitled “2012 Water and Sewer Rate Update.” A copy of the executive summary of the rate study is included as Appendix B. The study presented a 6-year financial plan from 2013 through 2018. Key findings and recommendations resulting from the study include rate increases of 9.0% in 2013, 8.0% per year from 2014 through 2016, 6.0% for 2017 and 2018. Key factors prompting the need for these increases include:

♦ **O&M:** Operating costs are expected to increase by 2% – 5% per year, with a higher near-term impact due to costs associated with the metering program. When the metering program has been completed (by 2017), these incremental costs are expected to go away.

♦ **Debt:** The proposed 2013 – 2018 water utility capital funding strategy contemplates a total of $35.5 million in revenue bond proceeds (net of issuance costs and reserve requirements) to fund the projected capital costs. An $11.6-million bond issue in 2015 is expected to increase the water utility’s annual debt burden by about $983,000 per year beginning in 2016; a 2018 bond issue of $23.9 million would increase annual debt service by an additional $2.1 million (for a total of $3.1 million per year by the end of the study period). In addition, with the planned transfer of $5 million of existing bond proceeds from the sewer utility to the water utility, the water utility is assumed to fund a proportionate share of debt service on the 2011 Revenue Bond. In the near-term, this amounts to about $270,000 per year.

♦ **Capital:** Consistent with prior recommendations, the forecast incorporates a policy to fund system reinvestment through water rates. The prior water rate study completed in 2007 established an annual funding level based on annual depreciation expense, net of debt principal. However, given the projected increases in debt service discussed above, this analysis reflects a revised benchmark (50% of annual depreciation expense) to stabilize the annual funding level. By the end of the study period, the annual transfers for system reinvestment are projected to increase to about $1.4 million. This is in addition to cash funding provided through system development charges.

♦ **Reserve Funding:** Consistent with the prior study, this analysis reflects a policy assumption that the water utility maintains an operating (or “working capital”) reserve with a balance sufficient to cover 60 days of projected operating expenses. Because the City has currently been maintaining an operating reserve balance of 5% (about 18 days) of budgeted expenses, this analysis phases in the higher reserve target over several years. In addition, this analysis introduces a separate “rate stabilization reserve” intended to provide additional security against revenue risk associated with volumetric revenues, preserving the City’s ability to meet its debt obligations even in low sales years. The target balance for this reserve is 50% of annual debt service for debt issued on or after January 1, 2011. Debt issued prior to 2011 is not included in this calculation because the covenants for that debt do not allow use of a rate stabilization reserve to meet bond coverage requirements.

♦ **Expansion of Reduced-Rate Program:** This study included the evaluation of the incremental impact of expanding the City’s reduced-rate program based on the low-income threshold established by Whatcom County ($35,000 per year). Based on staff recommendations, the adopted rates assume that this program is expanded.
The rate study included accounting for capital investment that matches the quantity presented in the Improvement Program in Table 5-1. Because the rate study was completed just prior to completion of this WSP Update, it also includes some planned improvements from the 2009 WSP Update that are no longer anticipated within the 6-year planning horizon. As a result, the rate increases planned for implementation by the City are anticipated to be more than adequate to cover utility expenses, including planned capital improvements.
Figure 3-6
Future Hydraulic Profile
City of Bellingham
2012 Water System Plan Update

- Raymond pump station serves 1 home.
- Bonanza pump station serves 4 homes.
## Appendix A - Status of Improvement Program from 2009 Water System Plan

<table>
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<th>Project</th>
<th>ID Number</th>
<th>Project Cost</th>
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<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
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August 27, 2012

Mr. Bob Bandarra, Superintendent of Operations  
City of Bellingham  
210 Lottie Street  
Bellingham, WA 98225

Subject: 2012 Water & Sewer Rate Update

Dear Mr. Bandarra:

FCS GROUP is pleased to submit this final draft report documenting the findings and recommendations of the 2012 Water & Sewer Rate Update conducted for the City of Bellingham. Enclosed is a description of the background and methodology followed for each major task in the study, a discussion of findings and policy implications, and a description of the final recommendations.

It has been a pleasure to work with City staff on this effort. We look forward to working with you in the future, and we encourage the City to direct any comments or questions regarding this study to us at (425) 867-1802.

Sincerely,

Ed Cebron  
Principal

Gordon Wilson  
Project Manager

Chris Gonzalez  
Project Consultant
EXECUTIVE SUMMARY

The City engaged FCS GROUP in February 2012 to perform a comprehensive rate study for its water and sewer utilities. The rate study includes the following components:

- A review of water and sewer utility revenue requirements incorporating:
  - A revised metering schedule reflecting the conversion of the City’s unmetered water customers to metered water service by January 22, 2017, as required by the Water Use Efficiency Rule established by the Washington State Department of Health
  - Recent trends in water demands suggesting that per capita water usage has been declining, and will continue to decline
  - Recent economic conditions that have impacted both the behavior of existing customers and the addition of new customers to the water and wastewater systems
  - A change in customer service policy to allow credit cards to be used for monthly utility payments without a separate transaction fee

- Development of recommended water and sewer rates based on projected revenue needs and an updated cost-of-service analysis for each utility
  - For water, shifting separately metered condos from the non-single family to the single-family customer class

In addition to development of projected rates, this report addresses the following elements:

- A review of the City’s cost of providing fire protection service, in response to the Washington State Supreme Court’s decision in *Lane v. Seattle*
- An update of rates for untreated water service
- An update of sewer rates for the City’s special industrial users (SIUs)
- A potential expansion of the existing low-income discount program
- The rate impact of monthly billing

We are preparing separate issue papers that discuss:

- An update of water and sewer SDCs to reflect current estimates of the City’s investment in infrastructure and system growth
- A review of the City’s methodology for recovering costs from Lake Whatcom Water & Sewer District (LWWSD)
- Development of a wholesale water rate to facilitate possible water sales to other communities

This study developed a multi-year financial plan integrating these various elements, projecting operating and capital costs for the six-year planning period from 2013 to 2018.
Key findings and recommendations resulting from the study include:

**Water**

- Overall water rate revenue should be increased by 9.0% in 2013, 8.0% per year from 2014 – 2016, and by 6.0% per year from 2017 – 2018. Key factors that drive these adjustments are:
  - **O&M:** Operating costs are expected to increase by 2% – 5% per year, with a higher near-term impact due to costs associated with the metering program. When the metering program has been completed (by 2017), these incremental costs are expected to go away.
  - **Debt:** The proposed 2013 – 2018 water utility capital funding strategy contemplates a total of $35.5 million in revenue bond proceeds (net of issuance costs and reserve requirements) to fund the projected capital costs. An $11.6-million bond issue in 2015 is expected to increase the water utility’s annual debt burden by about $983,000 per year beginning in 2016; a 2018 bond issue of $23.9 million would increase annual debt service by an additional $2.1 million (for a total of $3.1 million per year by the end of the study period). In addition, with the planned transfer of $5 million of existing bond proceeds from the sewer utility to the water utility, the water utility is assumed to fund a proportionate share of debt service on the 2011 Revenue Bond. In the near-term, this amounts to about $270,000 per year.
  - **Capital:** Consistent with prior recommendations, the forecast incorporates a policy to fund system reinvestment through water rates. The prior water rate study completed in 2007 established an annual funding level based on annual depreciation expense, net of debt principal. However, given the projected increases in debt service discussed above, this analysis reflects a revised benchmark (50% of annual depreciation expense) to stabilize the annual funding level. By the end of the study period, the annual transfers for system reinvestment are projected to increase to about $1.4 million. This is in addition to cash funding provided through SDCs.
  - **Reserve Funding:** Consistent with the prior study, this analysis reflects a policy assumption that the water utility maintains an operating (or “working capital”) reserve with a balance sufficient to cover 60 days of projected operating expenses. Because the City has currently been maintaining an operating reserve balance of 5% (about 18 days) of budgeted expenses, this analysis phases in the higher reserve target over several years. In addition, this analysis introduces a separate “rate stabilization reserve” intended to provide additional security against revenue risk associated with volumetric revenues, preserving the City’s ability to meet its debt obligations even in low sales years. The target balance for this reserve is 50% of annual debt service for debt issued on or after January 1, 2011. Debt issued prior to 2011 is not included in this calculation because the covenants for that debt do not allow use of a rate stabilization reserve to meet bond coverage requirements.
  - **Expansion of Reduced-Rate Program:** This study included the evaluation of the incremental impact of expanding the City’s reduced-rate program based on the low-income threshold established by Whatcom County ($35,000 per year). Based on staff recommendations, the adopted rates assume that this program is expanded.

- The water rate schedule shown in Table EX-1 is recommended for adoption as inside-City rates. Per City policy, outside-City customers would pay rates that are 1.5 times the rates shown in Table EX-1.
### Table EX-1: Summary of Proposed 2013 – 2018 Inside-City Water Rates

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Outside-City rates are 1.5 times the rates shown above.
The rate forecast shown in Table EX-1 reflects:

- Across-the-board increases to the unmetered rate structure, based on the aggregate rate revenue increases of 9.0% in 2013, and 8.0% per year from 2014 – 2016. Based on the planned metering schedule, no customers will be in this class beyond 2016.

- Separation of water districts from other single-family customers. A review of recent water consumption patterns suggests that the water districts served by the City use water in a materially different way than the City’s other metered single-family customers. These districts equate to roughly 300 homes based on the master meters that are tracked in the City’s billing system, but appear to be using as much water as 2,100 homes. Consequently, the proposed rate structure improves equity by establishing a separate rate structure for these districts. Note that this study also included the development of a potential resale rate structure for future wholesale customers, which could also serve as a basis for recovering costs from these customers.

- Introduction of a customer class for newly metered customers, designed to recover approximately 65% of costs from fixed charges and 35% from volume rates. Excluding water districts from other single-family residences as discussed above, the existing metered single-family rate structure currently generates about 56% of its revenue from fixed charges – under the proposed strategy, it would gradually increase its reliance on the fixed charge until it reaches the 65% target after three years. After three years the two customer classes would be merged. This three-year transition period in which there would be two single-family metered classes moderates the increases to both groups – those who are moving from unmetered to metered, and the existing metered customers whose rates will be shifting to a greater reliance on fixed charges.

- Linking of the untreated water rate structure to the non-residential rate structure. Because roughly 20% of the revenue requirement is attributable to water treatment, the untreated water rate structure is set at 80% of the non-residential rate structure. The City’s current untreated water customer will pay significantly less under this structure, which is an equitable outcome given that the existing structure is primarily a fixed rate and was based on the historical demand patterns of a different (and significantly larger) industrial customer. In addition to improving equity, this change also makes it easier to attract future customers for untreated water.

Sewer

- Overall sewer rate revenue should be increased by 6.5% in 2013 (the increase in the previously adopted 2013 rate structure), 8.0% in 2014, 7.0% per year from 2015 – 2016, 6.0% in 2017, and 4% in 2018. The key factors driving the proposed adjustments are:

  - **O&M:** Operating costs are generally expected to increase by 2% – 5% per year.

  - **Debt:** The proposed 2013 – 2018 sewer utility capital funding strategy contemplates a total of $32.2 million in debt proceeds (net of issuance costs and reserve requirements) to fund projected capital costs. Public Works Trust Fund (PWTF) loans are assumed to account for $13 million of this debt, adding about $740,000 to the sewer utility’s annual debt service burden beginning in 2014. The remaining $19.2 million is assumed to come from additional bond issuance from 2015 – 2018, which is expected to add about $1.6 million to the sewer utility’s annual debt service. As previously noted, the sewer utility’s annual debt service is reduced to account for a transfer of $5 million of bond proceeds (and related debt service obligations) to the water utility.

  - **Capital:** Consistent with prior recommendations, the forecast incorporates a policy to fund system reinvestment through sewer rates. The sewer rate study done as part of the
City’s 2009 Comprehensive Sewer Plan established an annual funding level based on annual depreciation expense, net of debt principal. For consistency with the water utility, this analysis reflects a revised benchmark, 50% of annual depreciation expense. By the end of the study period, annual transfers for system reinvestment are projected to increase to about $2.1 million.

- **Reserve Funding:** Consistent with the prior study, this analysis reflects a policy assumption that the sewer utility maintains an operating (or “working capital”) reserve with a balance sufficient to cover 60 days of projected operating expenses. In addition, this analysis introduces a separate “rate stabilization reserve” that intends to provide additional security against revenue risk associated with volumetric revenues, preserving the City’s ability to meet its debt obligations even in low sales years. The target balance for this reserve is 50% of annual debt service. The sewer utility’s sole outstanding revenue bond allows the use of a rate stabilization reserve.

- The sewer rate schedule shown in Table EX-2 is recommended for adoption as inside-City rates. Consistent with City policy, outside-City customers would pay rates that are 1.5 times the rates shown in Table EX-2.

### Table EX-2: Summary of Proposed 2013–2018 Inside-City Sewer Rates

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<thead>
<tr>
<th>Sewer Rate Structure</th>
<th>2012</th>
<th>2013</th>
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<th>2016</th>
<th>2017</th>
<th>2018</th>
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<td>$39.47</td>
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<tr>
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<td>$35.07</td>
<td>$37.24</td>
<td>$39.47</td>
<td>$41.66</td>
<td>$43.16</td>
</tr>
<tr>
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<td>$4.09</td>
<td>$4.66</td>
<td>$4.99</td>
<td>$5.43</td>
<td>$5.80</td>
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<td>$4.99</td>
<td>$5.43</td>
<td>$5.80</td>
<td>$6.07</td>
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</tr>
<tr>
<td>Volume Rate per ccf (&gt; 8 ccf per Month)</td>
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<td>$4.09</td>
<td>$4.66</td>
<td>$4.99</td>
<td>$5.43</td>
<td>$5.80</td>
<td>$6.07</td>
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<tr>
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<td>$7.83</td>
<td>$8.44</td>
<td>$8.98</td>
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The rate forecast shown in Table EX-2 reflects:

- Creation of three strength classes for non-single-family customers.
  - Domestic-Strength Non-Residential: Includes metered duplexes, residential properties with multiple dwelling units, and the City’s current commercial customers. Based on system planning criteria in the City’s Comprehensive Sewer Plan, this class (and the single-family residential class) is assumed to generate wastewater with an average concentration of 235 mg/L of biochemical oxygen demand (BOD) and 270 mg/L of suspended solids (SS).
  - Medium-Strength Non-Residential: Includes customers that generate wastewater averaging between 250 mg/L and 500 mg/L of BOD and/or between 300 mg/L and 500 mg/L of SS. Based on average strength ratings of the customers included in this
class, this class is assumed to generate wastewater with an average strength of 355 mg/L of BOD and 155 mg/L of SS for the purpose of allocating costs.

- High-Strength Non-Residential: Includes customers that generate wastewater averaging over 500 mg/L of BOD and/or SS. Based on average strength ratings of the customers included in this class, this class is assumed to generate wastewater with an average strength of 1,131 mg/L of BOD and 235 mg/L of SS for cost allocations.

With respect to the strength standards, a customer’s higher strength rating defines their class. For example, a customer generating wastewater with an average strength of 320 mg/L of BOD and 150 mg/L of SS would be grouped in the “medium-strength” class. It is worth noting that in this analysis, the “medium-strength” and “high-strength” classes only include special industrial users (SIUs) due to a lack of data identifying the business types (and related wastewater strengths) of specific commercial customers. As a future enhancement to this structure, the City should consider reviewing its commercial customer base and moving certain types of businesses to higher strength classes based on their average strength ratings. With this change, it would be prudent for the City to develop a list of best-management practices (BMPs) that customers can follow to be considered for reclassification into a lower strength class.

- Elimination of the industrial strength surcharges included in the existing SIU rate structure ($0.19 per pound of BOD; $0.16 per pound of SS). City staff indicated that the City has not actually been able to impose these surcharges due to an inability to directly measure BOD and SS discharges with the equipment currently in place. The proposed rate structure uses average BOD and SS discharges as the basis for developing differential fixed and volume-based rates.

- For 2013, the fixed charge for domestic-strength non-residential customers is kept at its current level. The fixed charges for single-family and multiple-dwelling-unit customers are increased to match the domestic-strength fixed charge, based on the assumption that these three classes generate wastewater of comparable strength. The SIU rates are increased to match the domestic-strength residential rates. For 2014 – 2015, the high-strength non-residential rates are phased to reflect the differential BOD and SS discharges. The other rates are adjusted accordingly to generate the targeted amount of revenue. A review of the costs allocated to the medium-strength class suggested that based on estimated BOD and SS loadings, its rates should be approximately the same as the domestic-strength rates. Consequently, the rate forecast shown in Table EX-2 reflects the assumption that medium-strength rates are equal to domestic-strength rates through 2018. It is worth noting that the medium-strength class’ wastewater characteristics may change if the City expands the class (the medium-strength class now includes only one customer), possibly warranting a separate rate structure in the future.

- Consider a more detailed review of the City’s state excise tax reporting practices. A cursory review of City tax worksheets found that the City might have an opportunity to reduce its tax expenses, given various deductions and exemptions allowed under State law. This review may also provide the supporting documentation that the City would need in order to request a refund from the Department of Revenue for historical tax payments. The findings presented in this report assume the implementation of the identified refinements moving forward, but do not incorporate an assumed refund of past payments.
APPENDIX C
Filter Clogging Algae Mitigation Evaluation
(Executive Summary only)
Final Report

Filter-Clogging Algae Mitigation Evaluation

Prepared for
City of Bellingham
Washington

Prepared by
CH2M HILL
21 Bellwether Way, Unit 111
Bellingham, WA 98225

June 2012
Executive Summary

This report presents the study undertaken by the City of Bellingham (City) to evaluate alternatives to mitigate the adverse impacts of seasonal algae in Lake Whatcom to the City’s Whatcom Falls Water Treatment Plant (WTP). This study was undertaken in the second half of 2011 and completed in early 2012.

ES.1 Background and Purpose

In late July and August of 2009 the filters at the City’s WTP began clogging much earlier in filter runs than typical, requiring more frequent filter backwashing. The result was greatly reduced WTP capacity – to the point the City implemented mandatory water restrictions, for the first time, to reduce customer demand to match the reduced WTP capacity.

Filter clogging was attributed to algae in Lake Whatcom – the City’s source water. Although the reasons for the intense algae bloom of the summer of 2009 is the subject of varied speculation, historical and on-going algae monitoring shows that summertime algae blooms in Lake Whatcom have been increasing over the past decade.

In 1998, Lake Whatcom water quality failed to meet the Washington State dissolved oxygen standard and was placed on Washington’s list of polluted waters (Section 303d of the Clean Water Act). As a result of the listing, Ecology initiated a Total Maximum Daily Load (TMDL) study to restore lake water quality. The TMDL study showed that human actions were causing increased phosphorous loading and therefore reduced dissolved oxygen. Meeting the TMDL requirements for phosphorous and dissolved oxygen is expected to take many years to complete, and compliance with the TMDL requirements is the cornerstone of the long-term response to improving lake quality.

Despite on-going coordinated efforts, via the Lake Whatcom Management Program, by the City, Whatcom County, and Lake Whatcom Water and Sewer District to reverse this trend, summertime algae blooms are expected to continue increasing in intensity over the near-term future. Recognizing that it is unacceptable to be in a position wherein it risks falling short of meeting summertime customer water demand, the City initiated this study to evaluate alternative solutions and select a path forward for subsequent implementation.

ES.2 Alternatives Evaluated

The alternatives evaluated for mitigating clogging of the filters at the City’s WTP were grouped into three main categories: treatment, intake, and lake management. These alternatives are presented in Table ES-1. In addition to these pro-active alternatives, the “No Action” alternative was included in the Triple Bottom Line Plus evaluation phase as a means of establishing a lowest-cost baseline for comparison.

Each of the treatment alternatives considered for this study are commonly used in the municipal water treatment industry and are commonly-considered alternatives for algae removal. Each would be implemented somewhere at the existing WTP site. They are not, however, equal with respect to removal performance, advantages, disadvantages, and cost.
ES.3 Evaluation of Alternatives

Evaluation of the alternatives to mitigate the adverse impacts of filter-clogging algae at the City’s water treatment WTP was implemented in three distinct phases. These three phases include:

- **Screening of Alternatives:** This first phase, “screening of alternatives,” was implemented to eliminate from further consideration and evaluation alternatives that were deemed “not selectable” based on one or more screening criteria. This approach enabled more subsequent focus and effort in developing and evaluating those alternatives that were deemed to have greater promise for selection and implementation. Three treatment alternatives, one intake alternative, and the lake management alternative were eliminated from further consideration during screening because they did not meet all of the screening criteria.

- **Evaluation of Alternatives:** This second phase of the evaluation process reflects a more-detailed evaluation of the remaining alternatives. This evaluation phase resulted in identification of the best alternative within categories as well as a best overall alternative based primarily on technical criteria. During this evaluation phase Dissolved Air Flotation (DAF) was determined to be the best treatment alternative and “Secondary Intake via In-Water Pipeline” (Intake Alternative 1) was determined to be the best intake alternative. DAF was determined to be the best overall alternative based on technical performance criteria.
**Triple Bottom Line Plus Evaluation:** This third phase of the evaluation process reflects evaluation based on a “Triple Bottom Line Plus” (TBL+) approach for the best alternatives per category (as determined in the second phase of evaluation). Additionally, the “No Action” alternative was evaluated as a baseline comparison. This approach enabled scrutiny with respect to financial, social, environmental, and technical objectives. The alternatives evaluated using the TBL+ approach included: DAF, Intake Alternative 1, Additional Filters, and No Action.

The results of the TBL+ evaluation are presented in Figure ES-1 at the end of the Executive Summary. The evaluation criteria are presented in Section 7 of the main body of the report. The TBL+ evaluation results, as well as the results of the more-technically-based second phase of the evaluation process, showed DAF to be the superior alternative for mitigating the filter-clogging algae condition at the City’s WTP.

In recognition of the fact that DAF technology is ideally suited to address the filter-clogging algae issue at the Lake Whatcom Water Treatment Plant, DAF was pilot testing during the summer of 2011 to confirm its performance. The pilot testing showed that DAF was very effective at removing algae from the Lake Whatcom supply. Not only was it effective at removing algae, but it was also shown to be effective at removing total organic carbon (TOC), reducing (by up to 25 percent) the formation potential for total trihalomethanes (TTHMs) – a key disinfection byproduct, and most importantly it was shown to greatly extend filter runs. Extended filter runs result in increased total filter production during algae bloom conditions, which was the primary limitation during the 2009 Lake Whatcom algae bloom.

**ES.4 DAF Implementation**

In recognition of DAF’s ranking as the best alternative for filter-clogging algae mitigation at the City’s WTP, a discussion of DAF implementation was developed. Key elements of the implementation discussion relate to project schedule and options for reducing initial capital cost – should the City decide to pursue implementation of a DAF system. An example project schedule that reflects compliance with key Washington State Department of Health requirements and milestones is presented in Figure ES-2 at the end of this Executive Summary. The example schedule conveys the overall timeframe for DAF implementation.

A summary of the initial capital cost (construction and non-construction) for three DAF facility capacities, ranging from 30 mgd to 16 mgd is presented in Table ES-2. A three-train DAF system offers maximum redundancy and capacity to meet significant growth in long-term future customer water demand. The 2-train DAF options are geared toward matching initial capacity with recent trends in peak customer water demand and minimizing initial capital cost. Regardless of the initial capacity and the number of parallel treatment trains, a new DAF facility would be designed to be easily expanded if customer water demand changes.

**TABLE ES-2**

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<thead>
<tr>
<th></th>
<th>3-Train 30-mgd system</th>
<th>2-Train 20-mgd system</th>
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ES.5 Recommendation

Annual seasonal Lake Whatcom algae blooms present an on-going seasonal risk to the City with respect to meeting the supply needs of its customers. As a result, the City should pursue the design and construction of a new DAF facility in a phased approach based on an initial two-train DAF facility with easy expansion for a potential future third train. The overall timeframe for this first phase of implementation, as well as key milestones, would be similar to that presented in Figure ES-2. A key ancillary benefit of DAF implementation based on the pilot testing completed in the late summer of 2011 is that DAF can be expected to lead to a reduction of the City’s TTHMs by 25 percent.

The phased approach will eliminate the potential for constructing more DAF capacity than is necessary to ensure a continuous, reliable, high-quality drinking water supply – even during intense algae blooms in Lake Whatcom. The phased DAF-implementation approach complements the City’s on-going commitment to lake management, water quality improvement, and TMDL compliance via the Lake Whatcom Management Program. Over the long-term future, as phosphorus-reducing lake management measures demonstrate success at improving water quality and reducing algae blooms, the need for further expansion of the initial phase of DAF implementation could potentially be avoided entirely.
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<td><strong>Technical</strong></td>
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### Summary of Criteria

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**FIGURE ES-2**

Example DAF Project Schedule
**Determination of Non-Significance (DNS)**

Date of Issuance of Threshold Determination: August 7, 2013

**Description of Proposal:** Update to the City's 2009 Water System Plan. This update is a non-project action and does NOT replace the 2009 Water System Plan. The purpose of the 2013 Water System Plan Update (WSP Update) is to supplement the existing 2009 Plan with water system planning for the 6 and 20-year planning period AND to include the planned implementation of Dissolved Air Flotation (DAF) at the Whatcom Falls Water Treatment Plant. Elements of the 2013 WSP Update may be incorporated into the City's 2016 Comprehensive Plan Update.

**Project Location:** The WSP Update applies to the Bellingham Service Area (city limits) and those areas outside the city limits where water is provided by the city to other entities for distribution including: Whatcom County Water District #s 2 and 7, Lummi Water and Sewer District, Deer Creek Association, Glen Cove Water Co-Op, Lake Whatcom Water and Sewer District, California Street and Montgomery Road Water Associations.

**Proponent:** City of Bellingham Public Works Department, Martin Kjelstad, contact, 360-778-7941 or email: mkjelstad@cob.org

**Lead Agency:** City of Bellingham, Planning and Community Development Department (PCDD).

**Environmental Information Considered:** SEPA Checklist including Part D Supplemental Sheet for non-project actions dated 7/17/2013 and Preliminary 2013 Water System Plan Update dated 1/13/2013 by CH2M Hill.

The lead agency for this proposal has determined that the project does not have a probable adverse impact on the environment. An environmental impact statement is not required under RCW 43.21C.030 (2) c. This decision was made after review of a completed environmental checklist on file with the lead agency. This information is available to the public on request.

This DNS is issued under WAC 197-11-340(2); the lead agency will not act on this proposal for 14-days from the date of this DNS. Comments must be submitted by Wednesday August 21, 2013.

**Responsible Official:**  
Jeff Thomas, Director  
Planning and Community Development Department  
210 Lottie Street, Bellingham, WA 98225

**Staff Contact:**  
Steven Sundin, Planner  
Planning and Community Development Department  
210 Lottie Street, Bellingham, WA 98225  
(360) 778-8359 or email: ssundin@cob.org

**Appeal rights:** Pursuant to BMC 16.20.210(D), there is no administrative appeal of this environmental determination. The City of Bellingham seeks to comply with the American Disabilities Act. If you have special needs, please call (360) 778-8300 (voice) or (360) 676-6883 (TDD).
Land Use Application

Check all permits you are applying for in the boxes provided. Submit this application form, the applicable materials listed in the corresponding permit application packet(s) and application fee payment.

<table>
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<tr>
<th>Accessory Dwelling Unit</th>
<th>Parking Adjustment Application</th>
<th>Office Use Only</th>
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<tr>
<td>Binding Site Plan</td>
<td>Planned Development</td>
<td>Date Rcvd: 7/17/2013</td>
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<tr>
<td>Clearing Permit</td>
<td>Rezone</td>
<td>Case #: SE#2013-27</td>
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<tr>
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<td>Design Review</td>
<td>Subdivision-Short Plat/Lot Line Adjustment</td>
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<tr>
<td>Grading Permit</td>
<td>Subdivision-Preliminary Plat</td>
<td>Pre-Ap. Meeting:</td>
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<td>Home Occupation</td>
<td>Subdivision-Final Plat</td>
<td>Concurrency:</td>
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<td>Wireless Communication</td>
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<td>Legal Lot Determination</td>
<td>Zoning Compliance Letter</td>
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<td>Nonconforming Use Certificate</td>
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</tbody>
</table>

Project Address: 210 Lottie Street

Project Description: 2013 Water Plan Update

Applicant/Agent: ✗ Primary Contact for Application

Name: 
Address: 210 Lottie St
City, State, Zip: Bellingham, WA 98225
Phone: 360-778-7900
Fax: 360-778-7901
E-mail: 

Owner(s) 

Name: Martin Yoder, Project Engineer
Address: 210 Lottie St
City, State, Zip: Bellingham, WA 98225
Phone: 360-778-7941
Fax: 360-778-7901
E-mail: Mkjelstad@cob.org

Property Owner(s)

I am the owner of the property described above or am authorized by the owner to sign and submit this application. I grant permission for the City staff and agents to enter onto the subject property at any reasonable time to consider the merits of the application and post public notice. I certify under penalty of perjury of the laws of the State of Washington that the information on this application and all information submitted herewith is true, complete and correct.

I also acknowledge that by signing this application I am the responsible party to receive all correspondence from the City regarding this project including, but not limited to, expiration notifications. If I, at any point during the review or inspection process, am no longer the Applicant for this project, it is my responsibility to update this information with the City in writing in a timely manner.

Signature by Owner/Applicant/Agent

City and State where this application is signed: Bellingham, WA
Exhibit C
State Environmental Policy Act
Environmental Checklist

The State Environmental Policy Act (SEPA), chapter 43.21C RCW, requires all governmental agencies to consider the environmental impacts of a proposal before making decisions. An environmental impact statement (EIS) must be prepared for all proposals with probable significant adverse impacts on the quality of the environment. The purpose of this checklist is to provide information to help you and the agency identify impacts from your proposal (and to reduce or avoid impacts from the proposal, if it can be done) and to help the agency decide whether an EIS is required.

Checklist

The following sections contain the completed checklist. Checklist questions are in normal font and responses are in italic font.

Background

1. Name of proposed project, if applicable: City of Bellingham 2013 Water System Plan Update
2. Name of applicant: Martin Kjelstad, Utilities Project Engineer, City of Bellingham
3. Address and phone number of applicant and contact person:
   210 Lottie Street
   Bellingham, WA 98225
   Phone: (360) 778-8000
4. Date checklist prepared: 7/16/2013
5. Agency requesting checklist: City of Bellingham
6. Proposed timing or schedule (including phasing, if applicable):
   The Plan Update will take effect after adoption by the City Council, and approval by WADOH, which is expected in mid 2013.
7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.
   The plan update documents the City's strategy for continuing to provide safe and reliable potable water service to existing customers and increased service capacity. The proposal anticipates that growth based on the adopted population projections will result in increased demand for municipal water service. This demand will in turn create a need for extension of water distribution lines,
storage, and treatment facilities. The plan Update will be an element of the City Comprehensive Plan, and serves as a guide for the maintenance and expansion of the utility within the service area, in accordance with local, county, and state requirements.

This plan Update is a guidance document for planning and design of future water system facilities and to help the City use its water resources in the most efficient manner possible. The City's water system provides water for about 27,380 household and businesses. The plan addresses all aspects of the City's water system in compliance with state requirements. The plan documents the existing water resources available to the City and evaluates supply enhancement options, provides a water conservation strategy, as well as operations and maintenance recommendations. The plan update provides a capital improvement program tied to the City's CIP that assures financial capability for phased implementation of the planning recommendations.

Projects listed in the capital improvement program are subject to review under WAC 197-11-704 and 197-11-800 and City of Bellingham Critical Area, BMC 16.55 and City of Bellingham Shoreline Master Program, BMC 22. While some projects might be categorically exempt, others will require preparation of a separate detailed checklist and SEPA threshold determination.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

Under the authority of Chapter 197-11-635 WAC, the SEPA documents prepared for Bellingham' Comprehensive Plan are incorporated by reference herein. Additional documents directly related to the proposed Water System Plan include:

a. Whatcom County Coordinated Water System Plan Update, 2009

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

No other applications are known.

10. List any government approvals or permits that will be needed for your proposal, if known.

The Water System Plan Update needs the approval of the City Council and WADOH. Individual elements of the capital improvement plan and extension of water lines greater than 8-inch-diameter will be subject to project SEPA review, and Whatcom County, or Bellingham Critical Area Review.

Some projects that involve work in surface waters likely would require Hydraulic Project Approval from the Washington State department of Fish and Wildlife. Separate SEPA checklists must be prepared for projects that are not categorically exempt under Chapter 197-11-800 WAC and City of Bellingham Critical Area, BMC 16.55 and City of Bellingham Shoreline Master Program, BMC 22.

11. Give a brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you
to describe certain aspects of your proposal. You do not need to repeat those answers on this page.

The City proposes to update its Water System Plan. The Plan Update is prepared to comply with the requirements of the WADOH as set forth in WAC 246-290-100. Adoption of this document is a non-project action designed to improve and update the existing Plan that was adopted by ordinance effective in 2009. The plan will apply throughout the incorporated limits of the City, areas of unincorporated Whatcom County specified as the out-of-city service area and where applicable, to users of contractual water service or supply.

This checklist covers the potential significant environmental impacts resulting from the adoption of the plan described above. Following adoption of this plan, other detailed regulations which implement the plan may be developed. Future SEPA reviews may be required for project actions undertaken to implement the adopted Plan (that is, construction of capital facilities).

The City retains the authority to impose site-specific mitigation measures to address probable significant adverse environmental impacts within the City limits or on water system projects where the City assumes lead agency. Under the authority of Chapter 197-11-635 WAC, the SEPA documents prepared for Bellingham’s Comprehensive Plan are incorporated by reference herein; these documents include the Bellingham Comprehensive Plan.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

SEPA review for this plan will apply to the entirety of the Bellingham Service Area. The service area is outlined in Figure 1-1 of the Water System Plan. The Water System Comprehensive Plan (the plan) applies to the water service utility of the City of Bellingham. In addition to serving commercial, residential and industrial connections within the city limits, the system provides water to the Whatcom County WD 2, Whatcom County WD 7, Lummi Water and Sewer District, Deer Creek Association, Glen Cove Water Co-Op, Lake Whatcom Water & Sewer District, California Street Water Association, and the Montgomery Road Water Association. The plan included under this SEPA review will apply to all areas within Bellingham’s retail water service area and wholesale water service area.

**Environmental Elements**

1.  Earth

   a.  General description of the site: Flat, rolling, hilly, steep slopes, and mountainous.

   Bellingham rings the shore of Bellingham Bay to the west. It lies east of Mount Baker and Lake Whatcom. The water system planning area can be characterized as rolling with a series
of east to west trending valleys formed by streams and rivers traveling through the area of
the City.

b. What is the steepest slope on the site (approximate percent slope)?

Steep slopes greater than 30 percent represent a relatively small percentage of the City’s total
acreage. A majority of Bellingham’s existing development has taken place in areas with
slopes of less than 15 percent. Areas of steep slopes are concentrated on the City’s perimeter,
adjacent to the saltwater bodies that surround the area as well as along the creeks and rivers
that flow through the City.

c. What general types of soils are found on the site (for example, clay, sand, gravel,
peat, muck)? If you know the classification of agricultural soils, specify them and
note any prime farmland.

The soils within Bellingham reflect the region’s glacial geologic history. Sedimentary rocks of
the Chuckanut Formation with a metamorphic rock called phyllite and glacially derived sand
and gravel are exposed at the far south end of Lake Whatcom. The Chuckanut Formation,
often referred to as Chuckanut Sandstone, extends from the Cascade Range to Lummi Island
and is a group of rocks that includes layers of sandstone, conglomerate, shale, and coal.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If
so, describe.

Areas with a history of unstable soils exist in a number of locations throughout the City,
including the vertical bluffs along the creeks and rivers that flow through the City. These
areas are relatively stable under ordinary conditions. However, seismic events of moderate to
high magnitude could cause slope failures, or exacerbate erosion and landslide hazards in
areas where the bluff is fractured, or where talus slopes are low.

e. Describe the purpose, type, and approximate quantities of any filling or grading
proposed. Indicate source of fill.

As a non-project action, the proposal does not involve site alterations of any kind. Future
project actions that are not categorically exempt pursuant to Chapter 197-11-800 WA and
City of Bellingham Critical Area, BMC 16.55 and City of Bellingham Shoreline Master
Program, BMC 22, and which require issuance of a City license or permit will be subject to
review under the City and Whatcom County SEPA Ordinances (Chapter 16.20 BMC,
Chapter 16.08 WCC). After reviewing applications for such project actions, the City may
determine that mitigation measures are necessary to avoid probable significant adverse
environmental impacts.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally
describe.

Because the proposal is a non-project action, it will not result in clearing or construction-
related erosion. Future project-level actions which require issuance of any state or local
permit or license; and that are not categorically exempt under Chapter 197-11-800 WAC
and City of Bellingham Critical Area, BMC 16.55 and City of Bellingham Shoreline Master
Program, BMC 22 will be subject to review under the City and County SEPA Ordinances (Chapter 16.20 BMC, Chapter 16.08 WCC). After reviewing applications for such project actions, the City of Bellingham or Whatcom County may determine that mitigation measures are necessary to avoid probable significant adverse environmental impacts.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

The proposal is a non-project action that does not involve construction of impervious surfaces.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

Future project-level actions which require issuance of any state or local permit or license; and that are not categorically exempt under Chapter 197-11-800 WAC and City of Bellingham Critical Area, BMC 16.55 and City of Bellingham Shoreline Master Program, BMC 22 will be subject to review under the City and County SEPA Ordinances (Chapter 16.20 BMC, Chapter 16.08 WCC). After reviewing applications for such project actions, the City of Bellingham or Whatcom County may determine that mitigation measures are necessary to avoid probable significant adverse environmental impacts.

2. Air

a. What types of emissions to the air would result from the proposal (that is, dust, automobile, odors, and industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known.

Because the proposal is a non-project action, it does not involve construction, and will not result in emissions to the air. It is acknowledged, however, that regardless of the proposed action reviewed herein, continued development activity will increase the amount of air pollution in the Bellingham Area (for example, through the location of new sources or through increases in automobile traffic).

Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

No. As a non-project action, the proposal will neither result in any emissions or odors, nor will it be affected by such emissions.

b. Proposed measures to reduce or control emissions or other impacts to air, if any:

Future project-level actions which require issuance of any state or local permit or license; and that are not categorically exempt under Chapter 197-11-800 WAC and City of Bellingham Critical Area, BMC 16.55 and City of Bellingham Shoreline Master Program, BMC 22 will be subject to review under the City and County SEPA Ordinances (Chapter 16.20 BMC, Chapter 16.08 WCC). After reviewing applications for such project actions, the City or County may determine that mitigation measures are necessary to avoid probable significant adverse environmental impacts.
3. Water
   a. Surface:
      i. Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

         Numerous named and unnamed streams flow through the water system's planning area into Bellingham Bay. Named streams include Whatcom Creek, Squalicum Creek, Chuckanut Creek, and Padden Creek.

      ii. Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

         No. Because the action is a non-project proposal, it will not involve any work over, in, or adjacent to the waters described above. The City and County will continue to require either a shoreline substantial development permit or a shoreline permit exemption for any project-related work occurring within 200 feet of the jurisdictional waters described above. Operation of the municipal diversions and transmission pipeline will continue to require operation in, over and adjacent to various water bodies including the Middle Fork of the Nooksack River, Whatcom Creek, Anderson Creek, and Lake Whatcom.

      iii. Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

         Because the proposal is a non-project action, it does not involve fill and dredge material. Future project applications that involve the removal or placement of dredge or fill materials would be subject to review and mitigation under the City's Shoreline Management Master Program.

         Future project-level actions which require issuance of any state or local permit or license; and that are not categorically exempted under Chapter 197-11-800 WAC and City of Bellingham Critical Area, BMC 16.55 and City of Bellingham Shoreline Master Program, BMC 22. will be subject to review under the City and County SEPA Ordinances (Chapter 16.20 BMC, Chapter 16.08 WCC). After reviewing applications for such project actions, the City or County may determine that mitigation measures are necessary to avoid probable significant adverse environmental impacts.

      iv. Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

         Bellingham water source is a diversion from the Middle Fork of the Nooksack River under the Safe Drinking Water Act.

      v. Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.
Portions of the water system plan's planning area lie within 100-year floodplains.

vi. Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

None. Because the proposal is a non-project action, it does not involve any discharges of waste materials.

b. Ground

i. Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known.

No

ii. Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals...; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

No

c. Water runoff (including stormwater)

Because the proposal is a non-project action, it will not result in additional sources of runoff. Development that is fostered by the availability of public water service could increase the City’s cumulative total of impervious surfaces, leading to increases of stormwater flow. The potential increase of runoff in the City and County has not been assessed.

i. Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

As a non-project action, the proposal does not include any measures designed specifically to reduce or control surface, ground, and runoff water impacts. Future project-level actions which require issuance of any state or local permit or license; and that are not categorically exempt under Chapter 197-11-800 WAC and City of Bellingham Critical Area, BMC 16.55 and City of Bellingham Shoreline Master Program, BMC 22 will be subject to review under the City and County SEPA Ordinances (Chapter 16.20 BMC, Chapter 16.08 WCC). After reviewing applications for such project actions, the City or County may determine that mitigation measures are necessary to avoid probable significant adverse environmental impacts.

ii. Could waste materials enter ground or surface waters? If so, generally describe.

As a non-project action the proposal does not involve the discharge of waste materials. Discharge of treated wastewater to Bellingham Bay will increase in proportion to population growth. Future project-level actions which require issuance of any state or
local permit or license; and that are not categorically exempt under Chapter 197-11-800 WAC and City of Bellingham Critical Area, BMC 16.55 and City of Bellingham Shoreline Master Program, BMC 22 will be subject to review under the City and County SEPA Ordinances (Chapter 16.20 BMC, Chapter 16.08 WCC). After reviewing applications for such project actions, the City or County may determine that mitigation measures are necessary to avoid probable significant adverse environmental impacts.

d. Proposed measures to reduce or control surface, ground, and runoff water impacts, if any:

As a non-project action, the proposal does not include any measures designed specifically to reduce or control surface, ground, and runoff water impacts. However, future project-level actions which require issuance of any state or local permit or license; and that are not categorically exempt under Chapter 197-11-800 WAC and City of Bellingham Critical Area, BMC 16.55 and City of Bellingham Shoreline Master Program, BMC 22 will be subject to review under the City and County SEPA Ordinances (Chapter 16.20 BMC, Chapter 16.08 WCC). After reviewing applications for such project actions, the City or County may determine that mitigation measures are necessary to avoid probable significant adverse environmental impacts.

4. Plants

a. Check or circle types of vegetation found on the site:

- X deciduous tree: alder, maple, aspen, other
- X evergreen tree: fir, cedar, pine, other
- X shrubs
- X grass
- X pasture
- X crop or grain
- X wet soil plants: cattail, buttercup, bulrush, skunk cabbage, other
- X water plants: water lily, eelgrass, milfoil, other
- X other types of vegetation

Bellingham and the out-of-city service areas support a diversity of native and nonnative plants, including all of the species listed above. Native shrubs, herbs, grasses, and wetland plants also exist within the Planning Area. The shorelines support a variety of estuarine and marine aquatic vegetation.

b. What kind and amount of vegetation will be removed or altered?
Because the proposal is a non-project, programmatic action, it would not involve the removal or alteration of vegetation. Continued development activity will result in increased native vegetation removal.

c. List threatened or endangered species known to be on or near the site.

Documented habitats for endangered, threatened, and priority species are known to exist within Bellingham and the out-of-city service area. These areas have been designated on Whatcom County Critical Area maps.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

Because the proposal is a non-project, programmatic action, it does not directly involve landscaping or vegetation enhancement. Vegetation removal in Critical Areas is reviewed and conditioned under City and County ordinances.

Future project-level actions which require issuance of any state or local permit or license; and that are not categorically exempt under Chapter 197-11-800 WAC and City of Bellingham Critical Area, BMC 16.55 and City of Bellingham Shoreline Master Program, BMC 22 will be subject to review under the City and County SEPA Ordinances (Chapter 16.20 BMC, Chapter 16.08 WCC). After reviewing applications for such project actions, the City or County may determine that mitigation measures are necessary to avoid probable significant adverse environmental impacts.

5. Animals

a. List any birds and animals which have been observed on or near the site or are known to be on or near the site:

birds: hawk, heron, eagle, songbirds, other
mammals: deer, bear, elk, beaver, other
fish: bass, salmon, trout, herring, shellfish, other

The water service area and the source watershed contains a variety of habitat types that provide shelter, feeding and breeding sites for a number of migrating and indigenous bird species. Rare and endangered species sighted in Whatcom County include the northern bald eagle and the peregrine falcon. Important bird species known to exist within the area include: great blue heron; common loon; brandt geese; harlequin ducks; pigeon guillemots; coots; ruddy ducks; hooded mergansers; red winged blackbirds; belted kingfishers; and mallard ducks.

Large and medium sized mammals such as deer, coyotes, skunks, and otters are found within the City limits. Bear, cougar, fox, beaver, and elk occur in the out-of-town service area and related watersheds. For further information, refer to the Comprehensive Plan.

Puget Sound bull trout, chinook salmon and Hood Canal summer chum have been listed as threatened under Endangered Species Act. Additional fish in the vicinity of the service area
include coho and pink salmon, steelhead and cutthroat trout and variety of saltwater species. Shorelines and creeks provide habitat for various life stages of these fish.

b. List any threatened or endangered species known to be on or near the site.

As noted above, rare and endangered species sighted in the service area and watersheds include bull trout, chinook and Hood Canal summer chum salmon, northern spotted owl, marbled murrelet, and the northern bald eagle. The Southern Resident area whale, listed as an endangered species, range includes water in the vicinity of Bellingham.

c. Is the site part of a migration route? If so, explain.

The water service area and municipal watershed lie within the Pacific Flyway. Consequently, numerous waterfowl use the wetlands, ponds, and surrounding marine waters as a migratory rest stop, or as a permanent wintering area.

d. Proposed measures to preserve or enhance wildlife, if any:

Because the proposal is a non-project, programmatic action, it does not directly involve impacts to wildlife.

Future project-level actions which require issuance of any state or local permit or license; and that are not categorically exempt under Chapter 197-11-800 WAC and City of Bellingham Critical Area, BMC 16.55 and City of Bellingham Shoreline Master Program, BMC 22 will be subject to review under the City and County SEPA Ordinances (Chapter 16.20 BMC, Chapter 16.08 WCC). After reviewing applications for such project actions, the City or County may determine that mitigation measures are necessary to avoid probable significant adverse environmental impacts.

6. Energy and natural resources

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

The principal energy sources associated with the planning area are electricity, propane, natural gas, and petroleum. Electrical power, propane, natural gas, and petroleum have historically all been provided for heating, lighting, operation of electrical appliances and manufacturing. Population growth is likely to occur regardless of this non-project proposal. As this growth and associated development occurs, the demand for sources of energy will increase. As a non-project action, the proposal would not create any additional needs for energy. Future water treatment requirements may require technologies such as ultraviolet light disinfection, which would increase the water system electric energy usage.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

As a non-project action, the proposal would not affect solar energy by adjacent properties.
c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

Because the proposal is a non-project action, no specific energy conservation measures are proposed.

Future project-level actions which require issuance of any state or local permit or license; and that are not categorically exempt under Chapter 197-11-800 WAC and City of Bellingham Critical Area, BMC 16.55 and City of Bellingham Shoreline Master Program, BMC 22 will be subject to review under the City and County SEPA Ordinances (Chapter 16.20 BMC, Chapter 16.08 WCC). After reviewing applications for such project actions, the City or County may determine that mitigation measures are necessary to avoid probable significant adverse environmental impacts.

7. Environmental Health

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste that could occur as a result of this proposal? If so, describe.

Because the proposal is a non-project action, no environmental health hazards are posed.

i. Describe special emergency services that might be required.

Because the proposal is a non-project action, no emergency services will be required.

Future project-level actions which require issuance of any state or local permit or license; and that are not categorically exempt under Chapter 197-11-800 WAC and City of Bellingham Critical Area, BMC 16.55 and City of Bellingham Shoreline Master Program, BMC 22 will be subject to review under the City and County SEPA Ordinances (Chapter 16.20 BMC, Chapter 16.08 WCC). After reviewing applications for such project actions, the City or County may determine that mitigation measures are necessary to avoid probable significant adverse environmental impacts.

ii. Proposed measures to reduce or control environmental health hazards, if any:

Because the proposal is a non-project action, no specific measures are proposed to reduce or control environmental health hazards.

b. Noise

i. What types of noise exist in the area which may affect your project (for example, traffic, equipment, operation, other)?

Because the proposal is a non-project action, it will not be affected by, noise.
ii. What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

Because the proposal is a non-project action, it will not generate noise on either a short or a long-term basis.

iii. Proposed measures to reduce or control noise impacts, if any:

None are proposed.

8. Land and shoreline use

a. What is the current use of the site and adjacent properties?

The proposal is to adopt a water system plan that includes strategies for providing future water service to land within the City of Bellingham and areas of unincorporated Whatcom County. The Water System Comprehensive Plan is a functional element of the City Comprehensive Plan that provides a more detailed report on existing conditions within the City. The plan implements the goals and policies of the City of Bellingham Comprehensive Plan and is consistent with land use regulations adopted in accordance with the Comprehensive Plan.

b. Has the site been used for agriculture? If so, describe.

Citywide, Bellingham does not have any land exclusively zoned for agricultural uses. There are areas in the UGA zoned for commercial forest and rural use that allow for a wide range of agricultural uses.

c. Describe any structures on the site.

Bellingham possesses a diverse range of residential, commercial, manufacturing, and public/institutional structures, including many Victorian era homes and downtown commercial and public buildings.

d. Will any structures be demolished? If so, what?

No. Because the proposal is a non-project action, it will not involve the demolition of any structures.

e. What is the current zoning classification of the site?

Zoning varies within City Limits as described in Title 20 of the BMC and within the UGA and other service areas according to WCC Title 20.

f. What is the current comprehensive plan designation of the site?

Bellingham Comprehensive Plan, was adopted in June, 1980 and last updated in 2005 designates the city's retail service area as Urban. The Whatcom County Comprehensive Plan was adopted in 1996 and last revised in 2008 established the Urban Growth Area that the City serves with potable water.
g. If applicable, what is the current shoreline master program designation of the site?
   None of the proposed policy changes directly relate to shorelines.

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.
   Yes, The City keeps a map of environmentally sensitive areas on file. An assessment of the Critical Areas in the out-of-city service area in Whatcom County is on file with Whatcom County.

i. Approximately how many people would reside or work in the completed project?
   Because the proposal is a non-project action this question is inapplicable. The 2000 census estimated the population within Bellingham was 67,171.

j. Approximately how many people would the completed project displace?
   Because the proposal is a non-project action no displacement impacts are anticipated.

k. Proposed measures to avoid or reduce displacement impacts, if any:
   Because the proposal is a non-project action, no displacement impact mitigation is proposed.

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:
   The proposal is a non-project action; however, it is a component of and consistent with the Bellingham Comprehensive Plan.

   Future project-level actions which require issuance of any state or local permit or license; and that are not categorically exempt under Chapter 197-11-800 WAC and City of Bellingham Critical Area, BMC 16.55 and City of Bellingham Shoreline Master Program, BMC 22 will be subject to review under the City and County SEPA Ordinances (Chapter 16.20 BMC, Chapter 16.08 WCC). After reviewing applications for such project actions, the City or County may determine that mitigation measures are necessary to avoid probable significant adverse environmental impacts.

9. Housing

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.
   No housing will be provided as part of this project.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.
   No housing will be eliminated as part of this project.

   Future project-level actions which require issuance of any state or local permit or license; and that are not categorically exempt under Chapter 197-11-800 WAC and City of
Bellingham Critical Area, BMC 16.55 and City of Bellingham Shoreline Master Program, BMC 22 will be subject to review under the City and County SEPA Ordinances (Chapter 16.20 BMC, Chapter 16.08 WCC). After reviewing applications for such project actions, the City or County may determine that mitigation measures are necessary to avoid probable significant adverse environmental impacts.

c. Proposed measures to reduce or control housing impacts, if any:
   None needed.

10. Aesthetics

   a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?
      As a non-project programmatic action, the proposal does not involve the construction of any structures.

   b. What views in the immediate vicinity would be altered or obstructed?
      As a non-project programmatic action, the proposal does not involve the alteration or obstruction of views.

   c. Proposed measures to reduce or control aesthetic impacts, if any:
      Future project-level actions which require issuance of any state or local permit or license; and that are not categorically exempt under Chapter 197-11-800 WAC and City of Bellingham Critical Area, BMC 16.55 and City of Bellingham Shoreline Master Program, BMC 22 will be subject to review under the City and County SEPA Ordinances (Chapter 16.20 BMC, Chapter 16.08 WCC). After reviewing applications for such project actions, the City or County may determine that mitigation measures are necessary to avoid probable significant adverse environmental impacts.

11. Light and glare

   a. What type of light or glare will the proposal produce? What time of day would it mainly occur?
      Because the proposal is a non-project programmatic action, it would not produce any light or glare. Levels of artificial lighting and glare will increase with population and business growth in the Planning Area.

   b. Could light or glare from the finished project be a safety hazard or interfere with views?
      Because the proposal is a non-project action, it would not create light or glare safety hazards or view obstructions. Future project-level actions which require issuance of any state or local permit or license; and that are not categorically exempt under Chapter 197-11-800 WAC and City of Bellingham Critical Area, BMC 16.55 and City of Bellingham Shoreline Master Program, BMC 22 will be subject to review under the City and County SEPA Ordinances (Chapter 16.20 BMC, Chapter 16.08 WCC). After reviewing applications for such project
actions, the City or County may determine that mitigation measures are necessary to avoid probable significant adverse environmental impacts.

c. What existing off-site sources of light or glare may affect your proposal?
   None. As a non-project action, the proposal would not be affected by light or glare.

d. Proposed measures to reduce or control light and glare impacts, if any:
   No measures are proposed. Future project-level actions which require issuance of any state or local permit or license, and that are not categorically exempt under Chapter 197-11-800 WAC and City of Bellingham Critical Area, BMC 16.55 and City of Bellingham Shoreline Master Program, BMC 22 will be subject to review under the City and County SEPA Ordinances (Chapter 16.20 BMC, Chapter 16.08 WCC). After reviewing applications for such project actions, the City or County may determine that mitigation measures are necessary to avoid probable significant adverse environmental impacts.

12. Recreation
   a. What designated and informal recreational opportunities are in the immediate vicinity?
      The City has many parks, a waterfront trail, and a boat launch. Additional recreation opportunities abound in the mountains to the east of Bellingham.
   b. Would the proposed project displace any existing recreational uses? If so, describe.
      No, because the proposal is a non-project action it would not affect existing recreational uses.
   c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:
      None required.

13. Historic and Cultural Preservation
   a. Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe.
      Because the proposal is a non-project action, it would not directly affect historical sites. The City has a long history and many historic buildings.
   b. Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site.
      Several Native American tribes populated the area well before the City was founded. There were also several small communities that developed and receded during the boom and bust cycles of the 1800s. This history indicates that archaeologically and historically important sites likely exist within the planning area.
c. Proposed measures to reduce or control impacts, if any:

Future project-level actions which require issuance of any state or local permit or license; and that are not categorically exempt under Chapter 197-11-800 WAC and City of Bellingham Critical Area, BMC 16.55 and City of Bellingham Shoreline Master Program, BMC 22 will be subject to review under the City and County SEPA Ordinances (Chapter 16.20 BMC, Chapter 16.08 WCC). After reviewing applications for such project actions, the City or County may determine that mitigation measures are necessary to avoid probable significant adverse environmental impacts.

14. Transportation

a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.

Because the proposal is a non-project action, it is not directly served by public streets.

b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?

Because the proposal is a non-project action, it does not directly affect public transit operations.

The Whatcom Transit Authority provides service to the Planning Area.

c. How many parking spaces would the completed project have? How many would the project eliminate?

Because the proposal is a non-project action, it does not directly involve the creation or elimination of parking spaces.

d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private).

Because the proposal is a non-project action, it does not directly involve the creation of new streets or improvement to existing roads.

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

The proposed action would not seek to employ water, rail, or air transportation facilities.

f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.

Because the proposal is a non-project action, it would not directly generate any vehicle trips.

g. Proposed measures to reduce or control transportation impacts, if any:

None are proposed.
15. Public Services

a. Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe.

Because the proposal is a non-project action, it will not generate a requirement for increased public services. The plan provides analysis of existing conditions with regard to water service available for potable use and fire protection. This analysis allows for development of improvement recommendations consistent with the goals and policies of the City Comprehensive Plan. The Plan defines the City's intended measures to reduce or control impacts of growth with regard to water service and related public services.

b. Proposed measures to reduce or control direct impacts on public services, if any.

Implementation of the Capital Improvement Element of the Bellingham Comprehensive Plan will reduce or control future impacts to public services. Future project-level actions which require issuance of any state or local permit or license; and that are not categorically exempt under Chapter 197-11-800 WAC and City of Bellingham Critical Area, BMC 16.55 and City of Bellingham Shoreline Master Program, BMC 22 will be subject to review under the City and County SEPA Ordinances (Chapter 16.20 BMC, Chapter 16.08 WCC). After reviewing applications for such project actions, the City or County may determine that mitigation measures are necessary to avoid probable significant adverse environmental impacts.

16. Utilities

a. The following utilities are currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system.

All of the above utilities are found in the planning area. For more detailed information, please refer to the Comprehensive Plan.

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

As growth and development occurs, demands for public services will increase. The Capital Facilities & Utilities Element of the Comprehensive Plan is intended to ensure that new growth and development is provided with adequate public services and facilities concurrent with the approval of new development.

Signature

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: [Signature]

[Date]: 7/17/13
Supplemental Sheet for Non-Project Actions

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?

The proposed adoption of the Water System Comprehensive Plan will not alter any existing requirements for environmental review under Chapters 16.20 BMC (that is, the SEPA Implementing Ordinance). Environmental review for plan related proposals in the UGA would be conducted under existing Whatcom County Ordinance. These provisions will continue to be employed in the review and mitigation of individual project applications. Possible indirect effects of the proposed action relating to water, air, environmental health, and noise are summarized below:

Withdrawal and/or Discharges to Water: The City of Bellingham Water System Comprehensive Plan outlines a program to utilize the existing water rights. Growth in the City and UGA will cause an increase in the amount of wastewater discharged to Bellingham Bay.

Emissions to air, release of toxic or hazardous substances, and noise: The potential adverse environmental impacts of urban growth relating to increased emissions are not significant as discussed in the Bellingham Comprehensive Plan.

Proposed measures to avoid or reduce such increases are:

Withdrawals of Surface and Ground Water: The Conservation Chapter of the Water System Plan outlines the City’s programs to promote the efficient use of water resources. As feasible opportunities are identified the City will also pursue wastewater reuse to reduce demands on the water system.

Emissions to air, release of toxic or hazardous substances, and noise: No measures are proposed beyond project specific environmental review and enforcement of implementing ordinances in compliance with the City Comprehensive Plan.

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

The Plan will not directly affect plants, animals, fish, or marine life. Growth and development within the service area may negatively impact plant and animal populations. Surface water
withdrawals could impact these resources through lower instream flows that affect the migration, spawning, and rearing habitat of fish.

Proposed measures to protect or conserve plants, animals, fish, or marine life are:

Adoption of this water system plan would not require inclusion of any specific measures to conserve plants, animals, fish, or marine life. City of Bellingham Critical Area, BMC 16.55 and City of Bellingham Shoreline Master Program, BMC 22 will require mitigation for the protection and conservation of plants, animals, fish and marine life.

3. How would the proposal be likely to deplete energy or natural resources?

The proposal would not directly deplete energy or natural resources. Growth and development in the service area will consume energy and natural resources.

Proposed measures to protect or conserve energy and natural resources are:

The proposal does not require inclusion of any specific measures to conserve energy. The City's watershed management programs and water conservation programs conserve and protect a broad range of natural resources. City of Bellingham Critical Area, BMC 16.55 and City of Bellingham Shoreline Master Program, BMC 22 will require the protection or avoidance to reduce impacts.

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?

The proposal would not affect environmentally sensitive areas or areas designated for governmental protection.

Proposed measures to protect such resources or to avoid or reduce impacts are:

City of Bellingham Critical Area, BMC 16.55 and City of Bellingham Shoreline Master Program, BMC 22 will require the protection or avoidance to reduce impacts.

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?

Availability of water within the designated service area is consistent with the adopted land use plans of both the City of Bellingham and Whatcom County. The Water System Plan is also consistent with shoreline designations in the City of Bellingham Shoreline Master Program. Potential impacts of changes in land and shoreline use were assessed in the City of Bellingham's and Whatcom County's Comprehensive Plans.

No specific measures have been proposed.

Proposed measures to avoid or reduce shoreline and land use impacts are:

No specific measures have been proposed. The plan contains policies that assure compatibility with adopted land use designations including those within the Shoreline Management Program.
jurisdiction within the City of Bellingham and in the unincorporated areas of Whatcom County. City of Bellingham Critical Area, BMC 16.55 and City of Bellingham Shoreline Master Program, BMC 22 will require the protection or avoidance to reduce impact and provide mitigation.

6. How would the proposal be likely to increase demands on transportation or public services and utilities?

The proposal provides mechanism to assure adequate public water service and supply to the adopted water service area.

Proposed measures to reduce or respond to such demand(s) are:

Not applicable.

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

No aspect of the proposal is in conflict with local, state, or federal laws, or requirements for the protection of the environment. The proposal complies with the Washington State enforcement of the Federal Safe Drinking Water Act and the WADOH requirements under 246-290-100 WAC regarding water system plans.
Determination of Non-Significance (DNS)

Date of Issuance of Threshold Determination: August 7, 2013

Description of Proposal: Update to the City's 2009 Water System Plan. This update is a non-project action and does NOT replace the 2009 Water System Plan. The purpose of the 2013 Water System Plan Update (WSP Update) is to supplement the existing 2009 Plan with water system planning for the 6 and 20-year planning period AND to include the planned implementation of Dissolved Air Floation (DAF) at the Whatcom Falls Water Treatment Plant. Elements of the 2013 WSP Update may be incorporated into the City's 2016 Comprehensive Plan Update.

Project Location: The WSP Update applies to the Bellingham Service Area (city limits) and those areas outside the city limits where water is provided by the city to other entities for distribution including; Whatcom County Water District #’s 2 and 7, Lummi Water and Sewer District, Deer Creek Association, Glen Cove Water Co-Op, Lake Whatcom Water and Sewer District, California Street and Montgomery Road Water Associations.

Proponent: City of Bellingham Public Works Department, Martin Kjelstad, contact, 360-778-7941 or email: mkjelstad@cob.org

Lead Agency: City of Bellingham, Planning and Community Development Department (PCDD).

This DNS is issued under WAC 197-11-340(2); the lead agency will not act on this proposal for 14-days from the date of this DNS. Comments must be submitted by Wednesday August 21, 2013.

Staff Contact: Steven Sundin, Planner
Planning and Community Development Department
210 Lottie Street, Bellingham, WA 98225
(360) 778-8359 or email: ssundin@cob.org

Fiona Starr, Office Assistant
Planning & Community Development, City of Bellingham
210 Lottie Street, Bellingham WA 98225
360-778-8300 (main) 360-778-8357 (direct)
fstarr@cob.org

My incoming and outgoing e-mail messages are subject to public disclosure Requirements per RCW 42.56
DECLARATION OF MAILING

Project/Permit No.: SEP2013-00029

I, Fiona Starr, declare the following:

I am an employee of the City of Bellingham Planning and Community Development Department, over the age of 18, a resident of the State of Washington and have no interest in the proposal described in the attached notice. I certify that I mailed a true and correct copy of the attached notice to recipients on the attached list, postage prepaid.

Dated this 7th day of August, 2013 at Bellingham, Washington.

Signature
DNS MAILING LIST  
Last updated 03/21/2012

DEPT OF ECOLOGY  
ENVIRON REVIEW SECTION  
P O BOX 47703  
OLYMPIA, WA 98504-7703

DNS and Checklist, REQUIRED NOTIFICATION, ALL PUBLISHED SEPAS  
E-MAIL: sepaunit@ecy.wa.gov

SUSAN MURRON  
DEPT OF ECOLOGY  
1440 10TH ST STE 102  
BELLINGHAM WA 98225-7028

DNS and Checklist, REQUIRED NOTIFICATION, ALL PUBLISHED SEPAS  
E-MAIL: susan.murron@ecy.wa.gov

CHAD YUNGE  
DEPT OF ECOLOGY  
1440 10TH ST STE 102  
BELLINGHAM WA 98225-7028

FOR SHORELINE PERMITS ONLY - DNS & Checklist, REQUIRED NOTIFICATION, ALL PUBLISHED SEPAS  
E-MAIL: cyun461@ecy.wa.gov

US ARMY CORP OF ENG  
Attn: Randal Perry  
1440 10th St #102  
BELLINGHAM, WA 98225

DNS and Checklist, Anything involving wetlands  
E-MAIL: randal.j.perry@usace.army.mil

WDFW, REGION 4  
ATTN: SEPA COORDINATOR  
16018 MILL CREEK BLVD  
MILL CREEK, WA 98012-1296

DNS and Checklist, Anything involving fish or wildlife

JEFF KAMPS  
WDFW, REGION 4  
PO BOX 1100  
LA CONNER, WA 98257-1100

DNS and Checklist, FRESH WATER including Lake Whatcom and fish and wildlife within City of Bellingham.

BRIAN WILLIAMS  
WDFW, REGION 4  
Same address

DNS and Checklist, MARINE WATERS including estuaries

DNR NW REGIONAL OFFICE  
919 TOWNSHIP STREET  
SEDRO-WOOLLEY, 98284-9384.

DNS and Checklist, Anything involving logging or major clearing

NOOKSACK TRIBAL COUNCIL  
C/O FISHERIES MANAGER  
P O BOX 157  
DEMING, WA 98244

DNS Only, Anything involving fish-bearing water bodies

LUMMI NATION  
TRIBAL HISTORIC OFFICE  
2816 KWINA ROAD  
BELLINGHAM, WA 98226

DNS and Checklist, Anything involving fish-bearing water bodies

WHATCOM CO. HEALTH DEPT  
Inter-Office Mail

DNS and Checklist, Anything involving septic systems or potable water

RON COWAN  
BHAM SCHOOL DISTRICT  
1306 DUPONT  
BELLINGHAM, WA 98225

DNS and Checklist, Anything involving schools or significant enrollment increases

NEIGHBORHOOD REP  

DNS Only, Courtesy Notice, All

1_DNS Mailing List.docx updated 3/21/2012
(SEE LIST OF MAYOR'S REPS) published SEPAS

11 NSEA info@n-sea.org DNS Only, Courtesy Notice, Anything involving water. Email notification.

12 BELLINGHAM HERALD Community News Department 1155 North State St Bellingham, WA 98225 DNS Only, Large or Controversial Projects Only

13 OFFICE OF ARCHAEOLOGY & HISTORIC PRESERVATION P O BOX 48343 OLYMPIA, WA 98504-8343 DNS and Checklist, Anything involving historic buildings or archaeology

14 MIKE STONER PORT OF BELLINGHAM P.O. BOX 1677 BELLINGHAM, WA 98227-1677 DNS and Checklist, Anything involving the Port of Bellingham

15 DEPT. OF TRANSPORTATION ROLAND STORME (no physical address listed) DNS and Checklist, Anything involving State Highways e-mail: roland.storme@wsdot.wa.gov

16 NW CLEAN AIR AGENCY 1600 S 2ND ST MT VERNON, WA 98273 DNS and Checklist, Anything involving dust, discharges to air, or asbestos

17 J.E. "SAM" RYAN, CBO WHATCOM CO. PLANNING DEPT. 5280 NORTHWEST DR, STE B BELLINGHAM, WA 98226 DNS and Checklist, Anything involving Whatcom County or Lake Whatcom email: pds@co.whatcom.wa.us

18 EPA 1200 8TH AVE SEATTLE, WA 98101 DNS and Checklist, NEPA Only

19 RENEE LaCROIX ENVIRONMENTAL RESOURCES DIV PUBLIC WORKS DEPARTMENT DNS for any project involving development adjacent to streams, wetlands or Bellingham Bay.

20 Entire Planning Group E_MAIL: grp_pcd@cob.org DNS and Checklist, Anything involving the Northern UGA email: JoriBurnett@cityofferndale.org

l_DNS Mailing List.docx updated 3/21/2012
Whatcom County Water District #7
  
  WCWD #2
  
  1615 Bayou Road
  Bellingham, WA 98225

Lummi Water and Sewer District
Lummi Tribal Sewer and Water District
  2156 Lummi View Drive
  Bellingham, WA 98226

Deer Creek Water Association
  
  PO Box 30230
  Bellingham, WA 98229

Lake Whatcom Water and Sewer District
  
  1220 Lakeway Drive
  Bellingham WA 98226

Glen Cove Water Cooperative
  
  1623 Euclid Ave
  Bellingham  98229
Local Government Consistency Review Checklist

Water System Name: City of Bellingham  PWS ID: 05600

Planning/Engineering Document Title: 2013 Water System Plan Update  Plan Date: 1/2013

Local Government with Jurisdiction: City of Bellingham

WAC 246-290-108 Consistency with local plans and regulations:
Consistency with local plans and regulations applies to planning and engineering documents under WAC 246-290-106, 246-290-107, and 246-290-110(4)(b)(ii).

1) Municipal water suppliers must include a consistency review and supporting documentation in its planning or engineering document describing how it has addressed consistency with local plans and regulations. This review must include specific elements of local plans and regulations, as they reasonably relate to water service as determined by Department of Health (DOH). Complete the table below and see instructions on back.

<table>
<thead>
<tr>
<th>Local Government Consistency Statement</th>
<th>Page(s) in Planning Document</th>
<th>Yes – No – Not Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) The water system service area is consistent with the adopted land use and zoning within the applicable service area.</td>
<td>Original WSP</td>
<td></td>
</tr>
<tr>
<td>b) The six-year growth projection used to forecast water demand is consistent with the adopted city/county’s population growth projections. If a different growth projection is used, provide an explanation of the alternative growth projection and methodology.</td>
<td>Original Water System Plan</td>
<td></td>
</tr>
<tr>
<td>c) Applies to cities and towns that provide water service: All water service area policies of the city or town are consistent with the utility service extension ordinances of the city or town.</td>
<td>Original WSP</td>
<td></td>
</tr>
<tr>
<td>d) Service area policies for new service connections are consistent with the adopted local plans and adopted development regulations of all jurisdictions with authority over the service area [City(ies), County(ies)].</td>
<td>Original WSP</td>
<td></td>
</tr>
<tr>
<td>e) Other relevant elements related to water supply are addressed in the water system plan, if applicable; Coordinated Water System plans, Regional Wastewater plans, Reclaimed Water plans, Groundwater Area Management plans, and Capital Facilities Element of Comprehensive plans.</td>
<td>Original Water System Plan</td>
<td></td>
</tr>
</tbody>
</table>

I certify that the above statements are true to the best of my knowledge and that these specific elements are consistent with adopted local plans and development regulations.

Signature: [Signature]

Date: 7/17/13

Printed Name, Title, & Jurisdiction: Martin Kyelstad, Project Engineer, City of Bellingham Public Works

September 2009
Page 1 of 2
Consistency Review Guidance

For Use by Local Governments and Municipal Water Suppliers

This checklist may be used to meet the requirements of WAC 246-290-108. When using an alternative format, it must describe all of the elements; 1a), b), c), d), and e), when they apply.

For water system plans (WSP), a consistency review is required for the retail service area and any additional areas where a municipal water supplier wants to expand its water right’s place of use.

For small water system management programs, a consistency review is only required for areas where a municipal water supplier wants to expand its water right’s place of use. If no water right place of use expansion is requested, a consistency review is not required.

For engineering documents, a consistency review is required for areas where a municipal water supplier wants to expand its water right’s place of use (water system plan amendment is required). For non-community water systems, a consistency review is required when requesting a place of use expansion. All engineering documents must be submitted with a service area map per WAC 246-290-110(4)(b)(ii).

A) Documenting Consistency: Municipal water suppliers must document all of the elements in a consistency review per WAC 246-290-108.

1 a) Provide a copy of the adopted land use/zoning map corresponding to the service area. The uses provided in the WSP should be consistent with the adopted land use/zoning map. Include any other portions of comprehensive plans or development regulations that are related to water supply planning.

1 b) Include a copy of the six-year growth projections that corresponds to the service area. If the local population growth rate projections are not used, provide a detailed explanation on why the chosen projections more accurately describe the expected growth rate. Explain how it is consistent with the adopted land use.

1 c) Include water service area policies and show that they are consistent with the utility service extension ordinances within the city or town boundaries. This applies to cities and towns only.

1 d) Include all service area policies for how new water service will be provided to new customers.

1 e) Other relevant elements related to water supply planning as determined by the department (DOH). See Local Government Consistency – Other Relevant Elements, Policy B.07, September 2009.

B) Documenting an Inconsistency: Please document the inconsistency, include the citation from the comprehensive plan or development regulation, and provide direction on how this inconsistency can be resolved.

C) Documenting Lack of Consistency Review by Local Government: Where the local government with jurisdiction did not provide a consistency review, document efforts made and the amount of time provided to the local government for their review. Please include: name of contact, date, and efforts made (letters, phone calls, and e-mails). In order to self-certify, please contact the DOH Planner.

The Department of Health is an equal opportunity agency. For persons with disabilities, this document is available on request in other formats. To submit a request, please call 1-800-525-0127 (TTY 1-800-833-8388).

September 2009
Page 2 of 2
APPENDIX F
Dept of Commerce – Notice of Intent to Adopt Amendment
Notice of Intent to Adopt Amendment
60 Days Prior to Adoption

Indicate one (or both, if applicable):

- Comprehensive Plan Amendment
- Development Regulation Amendment

Pursuant to RCW 36.70A.106, the following jurisdiction provides notice of intent to adopt a proposed comprehensive plan amendment and/or development regulation amendment under the Growth Management Act.

<table>
<thead>
<tr>
<th>Jurisdiction:</th>
<th>City of Bellingham, Public Works</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mailing Address:</td>
<td>210 Lottie Street</td>
</tr>
<tr>
<td></td>
<td>Bellingham, WA 98225</td>
</tr>
<tr>
<td>Date:</td>
<td>6/19/2013</td>
</tr>
</tbody>
</table>

Contact Name: Martin Kjelstad
Title/Position: Project Engineer
Phone Number: 360-778-7941
E-mail Address: mkjelstad@cob.org

**Brief Description of the Proposed/Draft Amendment:**
Update to the Water System Plan Dated 2009. Added Projects and Information to match the existing Capital Improvement Program.

**Is this action part of the periodic review and update?**
Yes: X
No: ___

**Public Hearing Date:**
Council Council:

**Proposed Adoption Date:**
Fall 2013

**REQUIRED:** Attach or include a copy the proposed amendment text.
June 20, 2013

Martin Kjelstad
Project Engineer
City of Bellingham
210 Lottie Street
Bellingham, Washington 98225

Dear Kjelstad:

Thank you for sending the Washington State Department of Commerce (Commerce) the following materials as required under RCW 36.70A.106. Please keep this letter as documentation that you have met this procedural requirement.

City of Bellingham - Proposed update to the Water System Plan Dated 2009. Added projects and information to match the existing Capital Improvement Program. These materials were received on June 20, 2013 and processed with the Material ID # 19268.

We have forwarded a copy of this notice to other state agencies.

If this submitted material is an adopted amendment, then please keep this letter as documentation that you have met the procedural requirement under RCW 36.70A.106.

If you have submitted this material as a draft amendment, then final adoption may occur no earlier than sixty days following the date of receipt by Commerce. Please remember to submit the final adopted amendment to Commerce within ten days of adoption.

If you have any questions, please contact Growth Management Services at reviewteam@commerce.wa.gov, or call Dave Andersen (509) 434-4491 or Paul Johnson (360) 725-3048.

Sincerely,

Review Team
Growth Management Services
Public invited to learn about Water System Plan Update

Posted: September 10, 2013 8:36:27 AM PDT

The public is invited to learn about the Water System Plan Update at 10 a.m. on Monday, September 30 at the Bellingham Public Library Lecture Room, 210 Central Ave.

This update to the 2009 Water System Plan (Plan) incorporates the planned implementation of a pre-treatment method known as Dissolved Air Flotation (DAF) at the Whatcom Falls Water Treatment Plant. The update includes an analysis of the related key treatment issues that have developed since the completion of the 2009 Plan as well as analysis related to recent modifications to the distribution system related to distribution system water quality.

Most of the content of the 2009 Plan remains valid and continues to document the City's overall plan for the water system. The update document is intended to supplement and update the 2009 Plan for form the City's overall water system planning approach for the six-year and 20-year planning horizons.

To view the complete Plan update visit the city website:

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Media Contact:
Eric Johnston, Assistant Director, Operations
Public Works Department
(360-778-7710
ecjohnston@cob.org
Description

This update to the 2009 Water System Plan (Plan) incorporates the planned implementation of a pre-treatment method known as Dissolved Air Flotation (DAF) at the Whatcom Falls Water Treatment Plant. The update includes an analysis of the related key treatment issues that have developed since the completion of the 2009 Plan as well as analysis related to recent modifications to the distribution system related to distribution system water quality.

Most of the content of the 2009 Plan remains valid and continues to document the City's overall plan for the water system. The update document is intended to supplement and update the 2009 Plan for form the City's overall water system planning approach for the six-year and 20-year planning horizons.


Time

Start: 10:00 AM
End: 11:00 AM

Location

Bellingham Public Library Lecture Room, 210 Central Ave.
Bellingham

Contact

Martin Kjelstad, Engineer
mkjelstad@cob.org
360-778-7941
Please sign in...thank you!

<table>
<thead>
<tr>
<th>NAME</th>
<th>STREET ADDRESS</th>
<th>ZIPCODE</th>
<th>PHONE</th>
<th>EMAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ray Nickel</td>
<td>1019 39th Ave SE Suite 200</td>
<td>98374</td>
<td>253-604-6604</td>
<td><a href="mailto:rnickel@parameatrix.com">rnickel@parameatrix.com</a></td>
</tr>
<tr>
<td>Larry Magura</td>
<td>Starrcrest Rd # 700</td>
<td>97035</td>
<td>503-413-2411</td>
<td>magura.bwq6.com</td>
</tr>
</tbody>
</table>

Providing this information is voluntary per the Open Public Meetings Act (RCW 42.30).

Project Neighborhood Meeting
Subject: 2013 Water System Plan Update Approval

Summary Statement: In 2012 at the direction of the City Council, the City began work on an update to the Comprehensive Water System Plan. As required by state law, the Water System Plan is required to be updated on a regular basis. The Water System Plan, once approved by the City and appropriate state agencies, is incorporated into the overall City Comprehensive Plan. The draft plan has been reviewed by the public, County and state agencies; all comments have been addressed and a SEPA determination has been issued. The Water System Plan is ready for final, formal approval by the City Council. With this approval, the Water System Plan will be used in managing the system and incorporated as a technical element of the Comprehensive Plan.

Previous Council Action: March 2013 Council approval of draft for submittal and review; December 2012 adoption of service charge revisions; April 2012 Council direction to proceed with Water System Plan update.

Fiscal Impact: Projects and policies contained in the water system set the agenda for future actions by the water utility. The plan includes a financial analysis and rate study to support the recommendations of the plan.

Funding Source: Water Fund

Attachments: Resolution
Executive Summary - Draft 2013 Water System Plan
NOTE: Full Water System Plan Update available on the City’s website under Quick Links http://www.cob.org/services/utilities/water.aspx
Public Hearing Notice
Written Comment to City Council

Meeting Activity | Meeting Date | Staff Recommendation | Presented By | Time
--- | --- | --- | --- | ---
Public Hearing Council Vote Requested | 14-Oct-2013 | Pass Resolution | Ted Carlson, PW Director, Eric Johnston, Asst. PW Director, Operations | 15 min

Council Committee:
Public Works / Public Safety
Stan Snapp, Chair
Terry Bornemann; Gene Knutson

Committee Actions:

Council Action:

Agenda Bill Contact:
Eric Johnston 360-778-7710
ejohnston@cob.org
Reviewed By
Ted Carlson, PW Director

Initials | Date
--- | ---
Tse  | 9/24/13

Legal Mayor

Initials | Date
--- | ---
MK | 9/25/13
KL | 9/24/13
RESOLUTION NO. 2013-21

RESOLUTION APPROVING THE CITY OF BELLINGHAM 2013 WATER SYSTEM PLAN

WHEREAS, the City of Bellingham is required to maintain and update a water system plan in accordance with WAC 246-290; and

WHEREAS, the water system plan sets forth the policies, practices and capital projects necessary to maintain and operate the water system and protect the public health and welfare of the citizens of Bellingham; and

WHEREAS, as directed by the City Council, staff with the assistance of the consulting firm CH2M Hill has prepared a Water System Plan conforming to the state requirements; and,

WHEREAS, as directed by the City Council, staff with the assistance of the consulting firm CH2M Hill has prepared a Water System Plan Update conforming to State requirements; and,

WHEREAS, the plan has been reviewed by the Washington State Department of Health and Department of Ecology; and,

WHEREAS, the plan is been reviewed for conformance with the State Environmental Policy Act (SEPA) as required and a determination of non-significance has been issued; and,

WHEREAS, the plan has been available for review by customers inside the City’s service area, all adjacent water purveyors and the general public as required; and

WHEREAS, the policies and projects contained in the 2013 City of Bellingham Water System Plan Update are consistent with the goals and objectives of the City and generally conform to the overall comprehensive plan.

NOW THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF BELLINGHAM THAT:

The City of Bellingham 2013 Water System Plan Update, from which the executive summary is attached and a full version is available through the City of Bellingham website, is hereby approved for use.

City of Bellingham
City Attorney
210 Lottie Street
Bellingham, Washington 98225
360-778-8270
PASSED by the Council this 28th day of October, 2013.

[Signature]
Council President

APPROVED by me this 31st day of October, 2013.

[Signature]
Mayor

ATTEST: [Signature]
Finance Director

APPROVED AS TO FORM:

[Signature]
Office of the City Attorney

City of Bellingham
City Attorney
210 Lottie Street
Bellingham, Washington 98225
360-778-8270