Whatcom County
South Lake Samish
Regional Source Feasibility Study

Department of Health Contract N20513
Deliverable Number 3
Final Feasibility Study

November 25, 2014

Prepared for:
Public Utility District No.1
Of Whatcom County
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Executive Summary

The goal of the feasibility study is to evaluate water system restructuring / consolidation options on south Lake Samish to ensure safe and reliable drinking water for the decades to come. The study includes review of regional sources of supply and treatment options in the Lake Samish basin. It also looks at governance and finance issues associated with implementing long-term solutions. The study is intended to inform and engage the south Lake Samish community so that they can choose the option that best meets their needs.

Approximately 95% of the 560 existing residents living around Lake Samish rely on the lake for their domestic water because there is no Municipal Public Water system serving the Samish basin. In 1969 Bellingham and Whatcom County Health Department concluded that the water of Lake Samish is not suited for human consumption due to the very high bacteria count. While the lake does not generally exceed surface water quality standards, the residents drawing their water from the south end of Lake Samish are particularly susceptible to blue-green Algae blooms in the late summer months which periodically result in warnings from the health department to stop using lake water as a potable supply due to the potential health effects of cyanobacteria toxins to humans and animals.

A community meeting was held on August 2, 2014 where preliminary findings were presented.

- The existing Calmor Cove Community water treatment plant is at the end of its design life. This presents a unique, limited time, opportunity to pool resources to secure a long-term drinking water supply for not only Calmor Cove members, but for an expanded south Lake Samish community.

- Skagit PUD Judy Reservoir water is the most economically viable, reliable, and sufficient source of supply when compared to life cycle costs of replacing / expanding existing water treatment facilities over a similar time period. Implementation of this option requires investment in a 4 mile transmission main and storage by Skagit PUD, plus new distribution piping at the south end of the lake. In general, the more people participating in this solution, the less costly it will be per connection.

- Other benefits to importing water into the Lake Samish basin include reduced demand on the lake and improved in-stream flows to Friday Creek

- Low interest State Revolving Fund loans are available through the Washington State Department of Health to finance infrastructure construction. If water system consolidations occurs, up to 50% of construction costs may be subsidized.

The study recommends formation of a non-profit property owners association to survey and inform community members on their preferred option. The association, speaking with one voice, is then positioned to request assistance from the Samish Water District or Whatcom PUD in the formation of a local improvement district to implement the preferred solution. If Skagit PUD is unable to supply water to the south Lake Samish community, the non-profit property owners association would then be positioned to pursue an expanded community water treatment facility.
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- Source Information/Water Rights from Ecology Water Resources Explorer Data Base
- Water Facilities Inventory (Sentry Data Base)
- Water Quality/Exceedances (Sentry Data Base)
Introduction

The Washington State Department of Health (DOH) has entered into an interagency agreement with the Public Utility District No. 1 of Whatcom County (PUD) to prepare and submit a South Lake Samish Regional Source Feasibility Study. Cornerstone Management has been retained as a consultant by the PUD to manage this study.

The primary goal of this feasibility study is to evaluate regional source and treatment options to provide safe and reliable drinking water to South Lake Samish property owners and associated water utility ownership and governance options. Source options include wheeling drinking water from Skagit PUD and Lake Samish surface water which requires treatment.

The secondary goal will be to evaluate regional drinking water supply opportunities that would result in restructuring or consolidation of neighboring drinking water systems in the study area including individual sources. The regional source solution is not intended to provide water for future growth beyond the proposed service area which include existing water systems and individual residential drinking water demand.

There have been several efforts to establish a public drinking water system in the Samish basin around Lake Samish but in each case those broad efforts failed to achieve public support. In 2010 a grass roots effort among property owners at the south end of Lake Samish began pursuing the possibility of a smaller regional public water supply for South Lake Samish residents. The primary issue driving this grass roots effort is water quality concerns associated with periodic blooms of cyanobacteria (blue-green algae) during the summer months and the potential health effects of cyanobacteria toxins to humans and animals.

Acknowledgement
This study could not have been accomplished without the assistance and proactive efforts of the community and in particular Roy Bush and Stuart Affleck of Calmor Cove, and Stewart Thomas of Shallow Shores. Roy, Stuart, and Stewart were instrumental in the grass roots effort to explore opportunities for a community water system.
Background

Lake Samish Community
Lake Samish is located in the southwest corner of Whatcom County, Washington just south of the City of Bellingham. The 8160 acre lake is a valuable resource for public recreation such as boating, fishing, swimming, and other water and lakeshore activities. Heavily traveled I-5 traverses the watershed and runs adjacent to the eastern lakeshore for three miles. Forestry land comprises 67% of the basin area, with active logging typically underway somewhere in the basin at all times. The lake serves as a water supply for 95 percent of the 560 existing residences with an estimated population of 1,300 that live around its shores. While a public sewer system currently serves most residential development around the lake, there is no Municipal Public Water system serving the Samish basin around the lake.

The residents living around Lake Samish rely on the lake for their domestic water needs through surface water diversions or wells. The majority of residents employ point-of-use residential water treatment systems or use the water untreated. However, there are several small private and non-profit water systems around the lake with about 173 calculated connections representing an estimated residential population of 161 and non-residential population of 210. (See Map 1a: Lake Samish Water System Service Areas)

Lake Samish Water Systems
Lake Samish water systems include four at the north end: one Group B Water System (Autumn Mobile Home Park #03421-Surface Water), two Group A Transient Non-Community water systems (Samish Park #15064-Ground Water/Spring and Camp Lutherwood #12641-Surface Water), and one Group A Community water system (Lake Samish Terrace Mobile Home Park #445402-Ground Water Well); and four at the south end: three Group B water systems (Samish Woods North #AD085, Samish Woods South #AB841, and Samish Woods East #AD111-Ground Water Wells), and one Group A Community water system (Calmor Cove #105628-Surface Water). Information for each of these systems is found in the Appendix as Exhibit 1-8 and includes where applicable:

- General Information from Department of Health Sentry Data Base
- Source Information/Water Rights from Ecology Water Resources Explorer Database
- Water Facilities Inventory (Sentry Data Base)
- Water Quality/Exceedances (Sentry Data Base)

Drinking Water Planning
Since its formation in 1973, Samish Water District (SWD) (formerly Whatcom County Water District No. 12) has maintained an up-to-date comprehensive sewer plan for the public sewer system surrounding Lake Samish. Samish Water District Service Area can be seen outlined in orange on Map 2 in the Appendix. On three separate occasions (circa 1975, 1992, and 2001), the District undertook comprehensive drinking water supply planning at the request of residents. Each of these planning efforts explored the feasibility and cost of implementing a public water system to serve residents around the lake. Each effort failed to garner sufficient public support for implementation and there are currently no known planning efforts for establishment of a Municipal Public Water System in the basin.

In 2010, a group of south Lake Samish residents presented a proposal to Samish Water District for the District to provide public water to the South Lake Samish Community. Samish Water District hired Wilson Engineering to review the presentation by the South Lake Samish Group and the report was presented at the October 14 2010 Commissioners meeting. The report outlined the issues and questions that would need to be addressed before moving forward.
Water Quality
A public water system must furnish its consumers with safe reliable drinking water that meets or exceeds the Safe Drinking Water standards. Safe Water may be defined as one free of pathogenic organisms, poisonous substances, and excessive amounts of mineral and organic matter; aesthetically pleasing water may be defined as free or nearly free of color, turbidity, taste, and odor, of moderate temperature, and aerated.

In 1969 Bellingham and Whatcom County Health Department conducted a study with respect to Lake Samish water quality for human consumption and concluded that the water of Lake Samish is not suited for human consumption due to the very high bacteria count. The source of the lake pollution is from one or all of three sources: human waste material, primarily from septic tank drain fields leaching into the lake; animal contaminants; and surface run-off that can contain organic, inorganic, and biological contaminants.

In 1997, Samish Water District initiated a three-year water quality study to determine the overall quality of the lake for public water supply use and to establish baseline levels for selected chemicals in the lake. Water Samples were analyzed for metals, fecal coliform, petroleum hydrocarbons, herbicides, pesticides, nitrate, nitrite, and hardness. While no immediate health risks were identified by this study, final recommendations called for periodic future sampling of the lake to determine trends.

Lake Samish residents are keenly aware of the potential for both acute and chronic risks to water quality. However, the lake does not generally exceed surface water quality standards, so protection and preventing further degradation is the goal.

Land use in the basin includes forestry, recreational activity near the lakeshore and on the lake. Each of these land uses can impair water quality in the basin by introduction of nutrients, pollutants, and sediment into runoff to the lake and its tributaries. (See Map 2: Lake Samish Land Use) Urban-quality storm water runoff contains sediment, nutrients, fecal coliform, petroleum hydrocarbons and metals, which are all of concern. Sediment from residential development, forestry, and lake shore recreation creates alluvial fans at creek mouths and collots behind the Friday Creek outlet dam.

While some gradual changes in lake trophic status are naturally occurring, stakeholders do not want to accelerate any process that leads to excess algal growth and murky waters unsuitable for drinking and contact recreation.

Water Quality Issues and Risks as a Public Water Supply
Residents that draw their potable water from the south end of Lake Samish are impacted by shallower, warmer water that is prone to blue-green Algae blooms in the late summer months. During Algae blooms both private and community treatment systems at the south end of the lake may not meet water quality standards. Poor lake water quality due to blue-green Algae blooms has periodically resulted in warnings from the health department to stop using lake water as a potable supply.

Lake Samish also faces significant risk of sudden contamination from three different sources: (1) a hazardous material spill from traffic on I-5, (2) and overflow or breach of the Samish Water District sanitary sewer facilities around the lake, or (3) an isolated residential spill that enters the drainage system flowing to the lake. A significant spill of aviation fuel resulted from an accident on I-5 in 1995. A much smaller fuel spill (10-15 gallons to the I-5 roadside) occurred in 2010. There have been no known leaks or overflows from the public sewer system within the last 15 years, but the potential exists since a portion of the sewer is actually underwater at the lake’s edge.

Sedimentation is also a challenge at the outflow of the lake further impacting water quality and quantity concerns in the Lake Samish Basin and watershed.
Water Quantity & Instream Flow

The Samish Basin is located in Water Resources Inventory Area (WRIA) No. 3, and is entirely outside the City of Bellingham Urban Growth Area (UGA) in unincorporated Whatcom County. (See Map 3: Lake Samish Basin) Lake Samish discharges at the outlet of the Samish Basin into Friday Creek, a salmon spawning tributary of the Samish River. Friday Creek drains the lake through a series of wetlands and beaver ponds on the lake’s south end. Although stream flow exceeds 500 cubic-feet per second (cfs) during winter storms, the late-summer low streamflow approaches zero which reduces fish habitat and concerns the Washington Department of Fish and Wildlife (WDFW).

The low flows occur naturally, but are exacerbated to some extent by the lake withdrawals. Ecology is aware that the basin outlet, Friday Creek, may not have sufficient flow and this is a priority for the Department of Ecology. After a 1992 agreement between Ecology and Whatcom County Lake Management District No. 1 there were approximately 280 appropriations approved in the Lake Samish basin. Ecology is not currently processing applications in this watershed.

Residents of Lake Samish withdraw about 140 acre-ft. year of water from the lake and most of the Lake Samish area is served by sewer which is exported from the watershed thereby reducing the mean-annual streamflow of Friday Creek. Although withdrawals consume only a small portion of the 32,000 acre-feet of water stored in the lake, they do effect streamflow in Friday Creek, especially low flows in the late summer and there is concern that this loss of water significantly impacts the fisheries resources of Friday Creek, the outflow of Lake Samish. The lake withdrawals have their greatest effect for a period of about six days, usually in August although there have been very low flows in September and October before fall rains arrive. This is usually when the weir has exhausted its reserves of stored water. Withdrawals cause lowest streamflow to occur about three days earlier and to last about three days longer than under natural conditions. Continued development around the lake will require more withdrawals.

Whatcom County Lake Management District No. 1 (LMD No. 1)

In 1989, Ecology informed the residents of Lake Samish that several Washington State resource agencies, Whatcom County Planning and Development Services, Whatcom County Health Department, and several Lake Samish riparian landowners were concerned about the long-term effects of increasing water withdrawals from Lake Samish and Friday Creek due to population growth in the basin. The impacts of low streamflow on fish habitat were a major concern. Ecology indicated at that time that property owners around the lake would be required to stop drawing water from the lake unless they developed and implemented a plan to augment the streamflow in Friday Creek (the outlet of Lake Samish).

In 1991, lake residents petitioned Whatcom County for the formation of a lake management district, which would control lake level in order to attain the required minimum instream flows. Whatcom County Council created the Lake Management District No. 1 in 1992, and that entity became responsible for operation and maintenance of the flow control dam at the lake outlet. The dam’s wall height is typically raised in mid-April and lowered in mid-September each year. Operation and maintenance of the flow control dam is now performed by Whatcom County Public Works.

Since 1992, an agreement between the Washington State Department of Ecology (Ecology) and Whatcom County Lake Management District No. 1 (LMD) has required that the outflow from Lake Samish into Friday Creek be sustained at 2 cubic-feet per second (cfs) or higher to preserve fish habitat. The current method for sustaining instream flow throughout the summer is to raise the lake level during the wet season and draw down the level during the dry season by increasing the weir height of the retention dam at the outlet of the lake.

As part of the agreement between Ecology and LMD, about 280 water right permits were issued to property owners with existing diversions around the Lake Samish basin in an effort for resolve unauthorized use in the basin. Included in the permits issued are provisions to help ensure that the flows
at the outflow from Lake Samish into Friday Creek are sustained at 2 cfs. One of the provisions states that all non-essential water use, such as outdoor irrigation, authorized under the permit may be curtailed in extreme drought years. Essentially this would apply to periods when the minimum flow of 2.0 cfs is not maintained in Friday Creek. A copy of the provisions provided as Exhibit 9.

Prior to Ecology issuing the permits as part of the 1992 Agreement, an extensive effort was made by Ecology to ensure that all existing diversions and/or withdrawals were identified and further that all property owners were given an opportunity to submit a permit application. Based on this effort by Ecology it is believed there are very few if any unpermitted diversions around the lake.

Instream Flow Rule Making
The Samish Basin, from which Calmar Cove and individual residents around Lake Samish draw their water, is expected to undergo review for instream flow rule. At the basin outlet, Friday Creek needs to maintain sufficient streamflow to support fish habitat. As previously noted, the 1992 agreement between Ecology and LMD has required that the outflow from Lake Samish into Friday Creek be sustained at 2 cubic feet per second (cfs) or higher to preserve fish habitat but, no instream rule has been formally adopted.

If an instream flow rule is adopted, the next step will be management and enforcement of the rule. Prior to the 1992 agreement between Ecology and LMD, Ecology had indicated that property owners around the lake would be required to stop drawing water from the lake unless they developed and implemented a plan to augment the stream flow in Friday Creek (the outlet of Lake Samish). Ecology is aware that existing streamflow still may not be sufficient to support fish habitat and therefore further measures may be required in the basin to achieve adequate streamflow in addition to existing water right provisions shown in Exhibit 9. It is important to note that the WDFW has already recommended closure of the Friday Creek drainage shown in dark green with red border directly below Lake Samish in Map 4.

Water Rights
The Samish Basin is geographically small with a finite amount of water and the goal is to ensure sufficient water both in quality and quantity for both people and fish. As water quantity becomes scarce and water quality deteriorates, there is increasing concerns about how the resource is shared. This study considers augmenting Samish Basin water with a new source of drinking water originating outside the basin, helping to ensure sufficient quality and quantity for both people and fish.

It is important at this point to understand that Washington State Water Law is based on the principle of “First in Time, First in Right”. This means that the most senior water rights (oldest) have priority over junior water rights. In the event of a water shortage junior water rights holders may be required to reduce or stop using water until the demand of senior water holders is satisfied. It is also possible, although unlikely, that the basin could be subject to adjudication of all water rights. This means that the courts identify all water rights in the basin, review them for validity and list them in order of seniority. Then based on the water determined to be available in the basin, water is allocated based on seniority.

Watershed Planning
In August 2003, the Skagit Watershed Planning Unit issued the Water Resource Inventory Area #3 (WRIA 3) Samish River Sub-basin Watershed Management Plan. (See Map 4: WRIA 3 Lower Skagit River) The goal of the planning effort was to ensure adequate water supplies remain available. The plan recommended various alternative and strategies to manage in stream flow needs and the water withdrawal needs for agriculture use, commercial use, and population and economic growth.

Inter-Agency and Stakeholder Cooperation within the Basin
Due to its geographic location, land use, zoning, recreational opportunities, and the presence of I-5, the
Lake Samish Basin involves many significant public and private stakeholders. Because the basin drains south through Skagit County to Samish Bay, there are even more downstream stakeholders reliant, in part, on the quality and quantity of flow from the basin. Success of basin management activities for Lake Samish area will be dependent upon the level of interagency and stakeholder cooperation.
Methodology

A high level of community interest in developing a south Lake Samish community water system is driven by several unique circumstances including exposure to several types of public health and safety risk, compelling opportunities for collaboration, area-wide economies of scale, and drinking water quality challenges facing the residents of South Lake Samish Community.

As presented in the background, there is very little community support for a public drinking water system around Lake Samish. In addition to being cost prohibitive, the Lake Samish community is very concerned about the potential impacts that public water availability would have to the lakes water quality, quantity, and community culture. Currently, there are no new appropriations of water available from the Lake Samish Basin and exempt ground water wells are generally not feasible due to poor water quality. Therefore, lack of water in addition to other land use limitations is a barrier to further growth and development in the basin. Water quality at the north end of the lake is significantly better than at the south end of the lake which polarizes the community to some degree with regards to the need for a public water supply around the lake.

The primary intent of this study is to determine the most feasible means of providing safe and reliable potable water to the existing south Lake Samish property owners. A regional source solution is focused on resolving health related issues and is not intended to provide water for future growth in the region beyond the proposed service area which includes existing water systems and individual residential drinking water demand. The feasibility study will also evaluate the possibility of consolidation among the individual residential diversions and existing water systems at the south end of the lake with the goal of improving long term technical, managerial, and financial capacity within the region.

**Study Area**

While a broad understanding of the Lake Samish Basin is important to this study and was presented as background, the study area is focused on the south end of Lake Samish because there is little support for a broader public water system around Lake Samish, and the south end of the lake is subject to seasonally poor water quality. South Lake Samish is also the focus of this study in large part due to the persistent grass roots effort in the community to establish a water system at the south end of the lake. Therefore the study will explore options for potable water supply limited to the South Lake Samish community.

At this time it is not known which individual residential properties would participate in a South Lake Samish Water System. Calmor Cove is the most likely participate because they represent about twenty five percent of the potential connections in the proposed service area and they already operate a Group A Community Water System with surface water treatment. Calmor Cove’s existing treatment facility is also at the end of its useful life and will need extensive upgrades or replacement in the near future.

We began the study area delineation process by including the residents of the Calmor Cove service area. We then included the area surveyed by the Grass Roots Community Group (represented by diagonal lines in Map 5) which indicated strong support for a public water system. Next we included the service areas of three Group B water systems in the vicinity. Finally, we took into consideration a variety of factors including but not limited to: geographic and political boundaries, the I-5 Corridor, population density and zoning, requests for service, and proximity to existing facilities. Once the study area boundary was delineated we added a 300 foot buffer for further consideration. The resulting Study Area Boundary, Survey Area within the boundary, and buffer is shown below and in Appendix Map 5.
Community Participation

Community participation has played an important role prior to and during the development of this study. Public input has thoroughly informed the plan and shaped the recommendations. At this early stage of planning it is important for Stakeholders to adopt roles and responsibilities that will be necessary to move forward with the findings and recommendations.

In addition to the research conducted for this study, community representatives participated in a variety of meetings to assist with the development of and support for this study.

- Informal stakeholders meetings were held with Calmor Cove and property representatives.
- Presentations were made to the Board of Directors and Members of the Calmor Cove Club.
- A community meeting was held at Camp Lutherwood to present the findings and conclusions of the study and solicit public input.
- Since the community meeting, representatives from each of the Zones have met and formed a strategy to move forward based on the information and findings of the feasibility study.

It is recognized at the outset that a complete solution will require a considerable amount of time and many parts, each building on the other, ultimately resulting in a local Water System Plan (WSP) that can be implemented with proper governance and funding to towards the ultimate goal of providing safe reliable drinking water for the community.

This remaining portion of this study is focused on gathering and analyzing information to determine if the essential elements are present to continue and engage the parties.
Feasibility Study: Findings

Regional Source Options
Historically, several potential sources of domestic water have been explored for the Lake Samish Area including springs, wells, the City of Bellingham, Skagit County Public Utility District No. 1, and Lake Samish.

The City of Bellingham has an adequate supply of water to serve the Lake Samish basin and no additional treatment would be required. If water were to be supplied from the City of Bellingham, approximately 5 miles of transmission main costing an estimated $4.6 million dollars would be needed to connect to the City’s distribution system west of Lake Padden to the south end of the lake. Map 2 shows the proximity of Bellingham city limits to the south end of Lake Samish. However, Bellingham is not currently willing to serve outside of its corporate limits and therefore Bellingham is not being considered as a viable source of water for south Lake Samish.

Skagit County PUD No. 1
Skagit County PUD No. 1 has an adequate supply of water to serve the south Lake Samish community. Skagit PUD supplies domestic drinking water to the western portion of Skagit County and north to the border of Whatcom County. They operate both transmission and distribution systems. If water were to be supplied by Skagit PUD from the Judy Reservoir System, over 4 miles of transmission main and additional storage would be required to provide service to the Skagit County Line at the corner of Lake Samish Road and Nulle Road for an estimated cost of $5 Million. No additional treatment would be anticipated if Skagit PUD was the source of water. From the view of water quality and quantity Skagit PUD would be a viable source.

Whatcom County PUD No. 1 general manager and Skagit PUD No. 1 general manager met to discuss the availability of supply to the Lake Samish area. During the meeting it was confirmed that Skagit PUD has adequate supply of potable water available, including water rights, and is willing to sell water from the Judy Reservoir system to the Skagit county line. Skagit PUD engineers provided additional planning level information for this study.

Skagit PUD Transmission Improvements
Based on information provided by Skagit PUD, the existing pipeline and related booster system improvements located near the intersection of Bow Hill Road and Old Highway 99 have adequate capacity to supply water to the Lake Samish basin. However, about 4 miles of additional 12” transmission main (shown in yellow on Map 6) need to be constructed from Bow Hill Road, north along Old Highway 99 to Cain Lake Road in Alger in order to provide additional source of supply from the Judy Reservoir system to the Alger Water System which is also owned and operated by Skagit PUD.

Alger Water System
Skagit PUD operates the Alger Water System ID No. 01400K (See General Information in Appendix Exhibit 15) which includes a well located south of Cain Lake, 125,000 gallons of storage, and a 12” distribution system (shown in purple on Map 6) that runs from the well site in Alger west along Cain Lake Road, across Interstate 5, and continues north along Lake Samish Road to the Skagit County Line where it ends at the intersection of Lake Samish Road and Nulle Road near the south end of Lake Samish.

The Alger Water System existing 12” distribution mains are adequate to deliver water from the intersection of Old Highway 99 and Cain Lake Road in Alger to the intersection of Samish Lake Road
and Nulle Road. However, the Alger Water System does not currently have adequate storage capacity or existing water rights to serve the south Lake Samish area.

The well serving the Alger Water System has a water right for 100 gpm and 100 annual acre-ft. The Alger well is currently operating at 75 gallons per minute and does not have adequate water rights available to serve the proposed South Lake Samish Water System. Skagit PUD is also not willing to draw more than the current rate of 75 gallons per minute from the Alger well due to commitments and ongoing work with the Skagit Tribal Community. Therefore, the Alger well does not appear to be a viable source of water to serve the south Lake Samish community.

As discussed in the background Friday Creek at the basin outlet may not have sufficient flow. As part of a comprehensive plan to improve instream flow in Friday Creek, consideration may be given to the drawing ground water from the Alger Water System source to supply the south Lake Samish community with quality domestic supply in exchange for a corresponding reduction in the diversion from Lake Samish thereby mitigating the impact on Friday Creek.

Skagit PUD Improvement’s required
Skagit PUD engineers provided the following planning level information regarding improvements that would be required in order to serve the south Lake Samish area based on domestic service to an estimated 200 single family residences and fire flow of 500 gpm.

- 23,000 feet of 12” pipeline along Old Highway 99 is required to deliver water from Bow Hill to the Alger distribution system. (Map 6: Yellow Line)
- 6” compound meter, Vault, and Reduced Pressure Backflow Assembly at the point of delivery (Skagit County Line near the intersection of Nulle Road and Lake Samish Road).
- System Development Fee based on a 6” meter ($215,250).
- 250,000 gallons of additional storage:
  - Skagit PUD standards require 800 gallons of storage per residential connection to provide 48 hours of storage. Skagit engineers estimate that a 250,000 gallon concrete storage tank would be required to meet the storage requirement for 200 residential connections. This estimate is based on Alger water systems Average Daily Demand (ADD) of 164 Gallons Per Day (gpd) per equivalent residential unit (ERU). Maximum Day Demand (MDD) is estimated at 328 gpd per ERU or two times ADD. Peak hourly demand for the Alger water system is 287 gpm or 1.75 times ADD. It is unclear if the additional storage can be constructed adjacent to the Alger Water System’s existing storage tank. If not a second site would need to be purchased along with additional distribution piping. Alternatively, storage and a booster system may be required as part of a South Lake Samish Water System. A more thorough analysis of each option would be part of the engineering analysis and Comprehensive Water System.
The planning cost estimate for a 12" transmission main from Bow Hill Road, north along Old Highway 99 to Cain Lake Road in Alger is shown below and also included as Exhibit 16

**PUD #1 OF SKAGIT COUNTY**

**BOW HILL PIPELINE**

**PLANNING COST ESTIMATE**

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Subtotal: $2,875,000

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**Design Engineering @ 2.0%** $73,888

**Construction Engineering @ 4.0%** $147,775

**Geotechnical @ 1.0%** $36,944

**Surveying @ 1.0%** $36,944

**Administration @ 0.5%** $18,472

**Legal @ 0.5%** $18,472

**Land/Easements @ 0.0%** $0

**Project Total** $4,026,869

ROUND $4,100,000

Planning level costs anticipated in addition to the 12" transmission line are summarized below.

23,000’ of Pipeline (Detailed Above) $4,100,000

250,000 Gallon Concrete Storage (Current Location) $205,000

6" Service Meter Installation Fee $5,000

6" Backflow Assembly (RPBA) $10,000

Standard Development Fee $215,250

Subtotal $4,535,250

Skagit PUD has indicated from the outset that the costs of any capital improvements required for Skagit PUD to deliver service to the south Lake Samish area must be funded by those requesting service. Skagit PUD is able to explore the possibility of cost sharing or reduced System Development Fees until a formal proposal is presented to Skagit PUD by the organization representing the south Lake Samish community.

**Lake Samish**

The residents living at the south end of Lake Samish rely on the lake for their domestic water needs through surface water diversions or wells. The lake does not generally exceed surface water quality standards, however the majority of residents and small water systems at the south end of the lake employ some form of water treatment system. The residents drawing their water from the south end of Lake Samish are particularly susceptible to blue-green Algae blooms in the late summer months when both private and community treatment systems may meet drinking water quality standards.

Although lake water quality has improved over the years through best management practices and public sewer, in order to use the lake as a source of public water supply, it must be treated to meet the water quality standards set under the Safe Drinking Water act. From the viewpoint of water quality, Lake Samish is a viable source of supply with proper treatment.

As discussed in the background, it is believed that all the existing residents and small water systems in the study area have valid water rights. In order to have adequate water rights to serve a South Lake Samish Water System, the existing water rights of those participating in the community water system would need to be consolidated into a single portfolio of water rights to be withdrawn at a single point of diversion in the lake.
**Water Quantity and Water Rights**

Of the 560 residents withdrawing water from the Samish basin, about 330 are served by individual water rights including about 280 Permits with provisions to maintain 2 cfs in Friday Creek. The remaining 230 residents are by Claims, Exempt Wells, or accounted for by multiple users serviced by a single water right. Examples of multiple users on one water right are the Group A and Group B water systems discussed earlier in the study. South Lake Samish Wells & Diversions can be seen in Map 7.

Calmor Cove holds a water right certificate adequate to serve their existing demand. Calmor Cove’s water right Certificate No. S1-24911C has a priority date of October 1, 1986 and was approved for 19.74 gpm and 18.0 annual acre feet based on use dating back to 1946. The place of use is the area served by the Calmor Cove Water System and the purpose of use is Community Domestic Supply – continuously. When reviewing any water right it is important to consider the “Report of Examination” which is an integral part of the water rights approval process and the approved water right. The Calmor Cove water right “Report of Examination” clearly indicates that the current water right certificate was granted on the basis of a Fisheries statement that “the requested amount corresponds to the historic use and does not represent an expansion”. A copy of the water right and report of exam can be found in the Appendix Exhibit 5.

It is important to note that Calmor Cove water rights are approved for use by the Calmor Cove services based on historical use and not for additional services or expansion. This means that any inchoate (unused) water rights are not inherently available to serve additional connections beyond Calmor Cove Club. However, this does not preclude the Calmor Cove water right from being included as part of a larger water system.

**Consolidation of Individual and Exempt Water Rights**

The Department of Ecology supports the effort to consolidate diversions and withdrawals at the south end of Lake Samish. Fewer diversions and withdrawals are easier to manage and allow for better allocation of resources. Ecology is also in favor of a consolidated entity because local management of resources tend to self-regulate their use of water resources on behalf of their users.

Larger entities generally promote water use efficiency which is beneficial to the basin and they are typically more aware of the need to maintain their facilities including the point of diversion. WDFW and Ecology support minimizing the number of diversions which leads to better management of intake screens that protect fish rearing in the lake.

Although a formal process would need to be developed in cooperation with Ecology for the consolidation of individual water rights into a single water right for use by a new community water system the following summarizes the general process that would be needed.

Once an organization is formed to represent the new water system, and prior to submitting an application for water rights, those to be served by the new water system would participate in an agreement or memorandum of understanding whereby they agree to transfer their water right into trust in exchange for domestic water service to be provided under a new water right to be issued. The memorandum of understanding would be an essential part of the application submittal.

The goal would then be to submit a new “non-consumptive” water right application. Non-consumptive means that the new water right would include all the individual water rights that want to join the water system and the new water rights would have only that water that was available through the existing individual water rights. A non-consumptive application can be expedited through a Cost Reimbursement Agreement with Ecology. The new water right “Purpose of Use” would be to continue to be for community domestic supply, the “Place of Use” would be the service area of the new water system, and the “Point of
Diversion would be the diversion to be used for drawing water from the lake. Ecology estimates that to hire a consultant to process this water right application would cost up to $25,000 and may take as long two years.

As part of the approved Water Rights Application “Report of Examination”, a schedule of development would be established including the process by which each existing water right would be transitioned to the new water right. For example, a property would continue to use their existing water right until water service from the new organization was connected to their property. At the point when a new water service is turned on and the existing diversion or withdrawal is decommissioned, an inspection would be done most likely by Ecology following which the transition of the water right associated with that property would be complete. A record of development would be maintained during process until the transition of all individual rights is complete. Once the transition of all water rights is complete and the development is complete a final water right certificate would be issued.

Ecology has indicated that each existing individual water right or permit quantity would be put into permanent trust in exchange for the offsetting quantity to be issued as part of the new consolidated water right application. It is unclear at this point how the priority dates of existing individual rights will be impacted during the transition and this will need to be addressed, especially for those rights that were not issued as part of the 1992 agreement.

**Calmor Cove Water Rights**
The Calmor Cove water right would likely remain unchanged and simply be included in the portfolio of water rights used by the new consolidated water system. It may be appropriate at some point to change the Calmor Cove water right “Place of Use” to include the new water system service area. (See Map 9: Calmor Cove Service Area)

**Samish Water District Water Rights**
Although Lake Samish Water District is not considering development of a public water system at this time, it should be noted that on April 14, 1992 Samish Water District submitted to the Department of Ecology an Application for Permit to construct a well field of 2 or more wells approximately 300 feet deep in the vicinity of Cain Lake. The water was to be conveyed via 8” pipeline to a reservoir at the summit of Palmer Lake Gap and then into the Lake Samish District Service Area by a network of 8”-12” pipes. The Application for Permit does not appear to have been processed. A copy of the Application is found in the Appendix as Exhibit 14.

**Water Treatment**
In order to use Lake Samish as a source of public water supply, it must be treated to meet the water quality standards set under the Safe Drinking Water act. The minimum treatment acceptable by DOH for surface water sources is 4 log removal and the treatment necessary to meet these criteria may include coagulation, sedimentation, filtration, disinfection, or combinations of these methods. Treatment is required to meet the provisions of WAC 246-290-250 Part 6. From the viewpoint of water quality, Lake Samish is a viable source of supply with proper treatment.

The general requirements for operation of a Group A Public Water Supply are set forth in WAC 246-290. Part 6 of WAC 246-290 establishes treatment requirements for water systems using surface water or ground water under the influence of surface water (GWI). Part 6 treatment technique requirements are established in lieu of maximum contaminant levels (MCLs) for: Giardia Lamblia; Viruses; Heterotrophic plate count bacteria; Legionella; Cryptosporidium; and Turbidity

**Calmor Cove Water System Facilities**
Calmar Cove’s existing water distribution system provides water primarily to mobile homes located on the southwest shore of Lake Samish. The service area includes a build out of 52 Equivalent Residential Units (ERU’s) comprised of a mobile home park with a mix of 24 full time residents and 25 part time residents, one unused site plus, and two existing homes immediately adjacent to Calmar Cove that in the past have been connected to the system. The area served by Calmar Cove is shown in Map 9.

Calmar Cove currently does not have a formal approval and operates with a “Blue” permit, meaning that there is no immediate health risk but the system does not meet all DOH (Washington State Department of Health) requirements for a Group A water system. In order to obtain a “Green” permit, the system capacity must be analyzed and a water system plan approved.

A detailed Water System Analysis was completed on June 20, 2011 for Calmar Cove and is included in the Appendix as Exhibit 10. The Water System Analysis established a Maximum Day Demand (MDD) of 250 gallons per day and an Average Daily Demand (ADD) of 125 gallons per day per ERU (Equivalent Residential Unit) based on historical data including adjustment for high flow events attributable to system malfunctions plus an approximate 20% safety factor. It should be noted that the Calmar Cove ADD and MDD are significantly lower than that determined by Skagit PUD for the Alger Water System (ADD 164/MDD 328). This is most likely due to the small dwelling and lot size in the Calmar Cove community.

The existing water system is supplied by surface water from Lake Samish that is pumped through a submersible pump located approximately 500 feet off shore and north of the service area. A low “level” condition in the storage tank starts the supply pump and water is pumped through a pipe to the package filter plant at a rate of 15 gpm. The lake water is filtered, disinfected and then pumped into a 4,200 gallon contact chamber. From the contact chamber, water gravitates into a 1,100 gallon storage tank. A duplex booster system with bladder tanks is activated by low distribution pressure. The distribution system consists of 2 inch PVC and non-looped with limited valving providing the ability to isolate sections as required. A map of the distribution system is shown in Map 10.

Calmar Cove’s existing Key Tech conventional surface water treatment package utilizes Alum as the coagulant for flocculation, tube settlers, filtration, and ultimately disinfection to meet water quality standards. The existing plant was designed to treat 20 gpm of raw water which is consistent with Calmar Cove water rights of 19.74 gpm. The plant is currently operated at 15 gallons per minute for 20 hours per day, the plant can provide for the following number of ERU’s:

15 gpm x 1200 minutes per day / 250 gpd/ERU = 72 ERU’s

**Calmar Cove Water Treatment/Sanitary Surveys**

Sanitary Surveys by DOH on August 24, 2007 and January 7, 2011 indicated that the existing treatment plant is near the end of its life expectancy and further identified numerous operational challenges and deficiencies that need to be addressed. There were also signs of deteriorations in the walls of the plan due to corrosion that may eventually result in wall. For these reasons, replacement of the existing filter plant is a priority for continued safe operation of the water system. A copy of the Calmar Cove Sanitary Surveys are included in the Appendix as Exhibit 11a, 11b.

A “bag filtration” system was considered as an alternative to the existing package plant. Camp Lutherwood, located at the northwest end of the Lake Samish, is currently using a bag filtration system for treatment of lake water used by the camp. A local supplier proposed a similar system, however, due to concern regarding raw water quality variations between the two locations a brief pilot plan study was performed. Normally pilot studies for surface water sources are performed for one year to assure that all seasonal variations are experienced by the pilot plant. However, in an effort to expedite determining
preliminary feasibility of the system, it was decided to pilot the system in the early fall season when the lake historically experiences its worst water quality. Due to almost immediate fouling of the pilot filter system although no formal data was provided, the supplier immediately withdrew the proposed system as an alternative for water filtration for Calmor Cove. The results are consistent with the much poorer water summer water quality at the south end of Lake Samish.

The June 20, 2011 Water System Analysis by Wilson Engineering recommended replacement of the plant with a Key-Tech ACF (Adsorption Clarifier/Filtration) filter. Chemical injection followed by static mixing, then followed by coarse media roughing filter for floc development and removal, and followed by multimedia polishing filter. The course media roughing filter provides better clarification when subjected to multiple starts when compare to the existing filter tub settlers. An additional advantage of the ACF filter is a small foot print, making it a good candidate for replacement in the tight quarters of the existing building.

On September 8, 2011 DOH provided comments regarding the June 20, 2011 Water System Analysis and related Treatment Plan Options. A copy of the September 8, 2011 letter is included in the Appendix as Exhibit 12. Most significant is comment #9 that asks for further consideration for alternate systems of slow sand filtration and membrane filtration in addition to the current rapid sand filtration. Comment #9b notes that “two treatment trains must be provided”, comment #9d requires “pilot testing”, and comment #9e suggests “moving the WTP” all of which will likely result in significant increases over that reflected in the 2011 Water System Analysis.

As part of this study Wilson Engineer was asked to review the September 8, 2011 comments provided by DOH regarding the 2011 Water System Analysis and update the preliminary costs estimates accordingly. After further review by Wilson Engineering it was concluded that slow sand filtration and membrane filtration were not the most feasible options given the existing treatment plants’ long history of successful filtration.

The “two treatment train” and “moving the Water Treatment Plant” while desirable, are expected to at least double the construction and other associated costs reflected in the original estimate. If Calmor Cove continues to serve the same existing demand, it proposes to simply replace their existing treatment package plant in the same location, with an updated version of the same package plant from the same manufacture. Moving the treatment plant is not necessary or feasible for Calmor Cove existing demand.

The “two treatment train” design required to meet current design standards is desirable and should be included as part of the updated treatment plant design for long term implementation. However, the cost of the additional treatment train is not feasible for Calmor Cove in the short term, and given the priority to replace the existing treatment package plant as soon as possible, a phased approach to implementation of a long term treatment plan including a “two treatment train” is the most feasible approach.

The yearlong “pilot testing” requirement could add $20,000 to engineering and testing plus the cost of renting the equipment. Given the historical success of the current rapid sand filtration package plant, it is anticipated that pilot testing of an updated package plant of the same kind and manufacture can be minimized thereby significantly reducing the financial costs of the pilot test and still meeting DOH requirements.

Calmor Cove’s existing water treatment plant, storage, distribution system and water rights are not adequate to provide for any expansion beyond their current service area and connections. Therefore any plans for a larger community system will require constructing a larger treatment facility, storage, and booster system in another location.
Expanded Treatment Facilities

Based on the proposed service area and associated demand, Wilson Engineering was asked to provide scaled alternatives for a package treatment plant that meets current Water System and Water Treatment design standards including “two train treatment”.

Research indicates that an upgraded version of the existing Key-Tech ACF (Adsorption Clarifier/Filtration) filter package plant is the best option and it is available at rates of flow for 20 gpm and 50 gpm. With a “two train treatment” design it is possible to operate a single treatment package plant 24 hours per day to meet Maximum Day Demand while allowing redundancy for filter backwash and maintenance.

Operating the Key-Tech ACF treatment plant with at design capacity of 20 and 50 gpm for 24 hours per day the plant can provide for the following number of ERU’s based on the Calmorn Cove MDD of 250 gpd/ERU. The cost of each treatment package only is shown below for comparison.

20 gpm x 1440 minutes per day / 250 gpd/ERU = 113 ERU’s ($234,000)
50 gpm x 1440 minutes per day / 250 gpd/ERU = 288 ERU’s ($264,000)

Operating the same plant with a capacity of 20 and 50 gpm for 24 hours per day can provide the following number of ERU’s based on the more conservative Alger Water System MDD of 328 gpd/ERU:

20 gpm x 1440 minutes per day / 328 gpd/ERU = 87 ERU’s ($234,000)
50 gpm x 1440 minutes per day / 328 gpd/ERU = 219 ERU’s ($264,000)

In the analysis above the 20 gpm package plant is capable of serving 38 – 64 additional ERU’s based on the corresponding Alger and Calmorn Cove MDD. Unfortunately, the due to limitations of the existing Calmorn Cove location, it is not possible to make the other improvements necessary to serve additional connections including additional storage and booster capacity, regardless of available water rights.

Due to the limitations of the existing Calmorn Cove site, another location will be required for the new treatment facility that will serve the proposed service area. In any location the 20 gpm treatment package is not adequate to serve the demand of the proposed service area. Therefore the 50 gpm Key-Tech ACF treatment plant is recommended in a new location to serve a minimum of 219 ERU’s.

It has been suggested that Calmorn Cove could simply replace its existing package plant with an updated 20 gpm package plant (same size as existing), and then later add a second one of the same size, together with the existing one, both in a new location if and when a larger community system develops. However, as you can see above from the analysis above, it is dramatically more cost efficient to update to the larger package plant right away if the goal is a treatment plant large enough to serve the proposed south Lake Samish Community service area. It is not cost effective to consider installing two 20 gpm “two treatment train” package plants (2 x $234,000 = $468,000) compared to one 50 gpm package plant ($264,000).

As part of this feasibility study Wilson Engineering was asked to provide a cost estimate for water system facility capable of service 200 ERU’s in a new location including: 50 gpm “two train treatment” package plant, storage, booster, building, and other as necessary. This did not include distribution improvement necessary to serve a South Lake Samish Water System which will be discussed later.
The Preliminary Water System Facility Estimate to replace the existing Calmor Cove 20 gpm “two train” Treatment Package plus additional storage required to meet current design standards is $458,505. The detailed planning estimate is also included in the Appendix as Exhibit 17.

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*Reflects no pilot study, budget $20,000 + pilot plant rental if piloting is required.
**Reflects private funding and minimal environmental study.
The Preliminary Water System Facility Estimate to replace the existing Calmor Cove 20 gpm Treatment Package with a new 50 gpm Treatment Package in a new location including a new building, storage, and booster system is $860,994. The planning estimate is also included in the Appendix as Exhibit 18.

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NOTES - 1) no land cost 2) reflects additional services associated with federal funding
Reflects no pilot study, budget $20,000 + pilot plant rental if piloting is required.
Reflects 160 ERU's or 112 ERU's at 400 gpd/ea + 48 @ Calmor at 250 gpd/ea or total MDD of 56,800 gpd (47.3 gpm at 20 hr day)
Service Area Delineation
The south end of Lake Samish is the focus of this study in large part due to a persistent grass roots effort by local residents to establish a community water system that can provide a safe reliable supply of quality water. The focus area for this study is also consistent with poor water quality at the south end of the lake and a general lack of support by the greater community for a public water system in the basin around Lake Samish.

Service Area
While it is not known which residential properties would participate in a South Lake Samish Water System, it was logical to start by including areas where there is already interest in a community water system or a water system already established. The service area was initially based on the area covered in a survey conducted by the grass roots effort regarding interest in a community water supply. The survey area is shown in Map 11. The survey results showed overwhelming support for a community water system and are included as Exhibit 13. We also included the service area of Group A Water System Calmoe Cove (Map 9) and each of the Group B Systems in the area: Samish Woods North, South, and East.

For planning purposes we then expanding the service area boundary’s taking into consideration the following natural boarders including but not limited to: geographic landmarks (lake Samish water front, Friday Creek), political boundary’s (Whatcom/Skagit County borders), existing and future infrastructure (roads, bridges, water distribution), and land use (zoning, density, development, public land). The resulting overall service area is shown below and also in the Appendix as Map 12.

Once the overall service area was established it was then broken down into several zones based on existing water system service areas and other logical boundaries. The Zones are also shown in Map 12.
Service Area Zones
Zones 1-4 are described below and also summarized in Service Area Demand: Table 1 on the following page.

- Zone 1 shown in Blue represents the 49 residents served by the Calmør Cove Water System drawing water from the lake, plus 14 additional residences on Fire Lane which draw water from the lake.
- Zone 2 shown in Yellow represents 63 residents along Shallow Shores Road primarily drawing water from the lake and bordered by Lake Samish and Friday Creek to the East, Nulle Road at the County Line to the south, and West Lake Samish Road to the west excluding about 4 parcels that do not have frontage along Shallow Shores Road.
- Zone 3 shown in Green represents 45 residents primarily drawing water from the lake along Friday Creek Road and bordered by Lake Samish and Friday Creek to the west, Whatcom County Public Park Land to the north, East Lake Samish Road and the I-5 Corridor to the east, plus 6 residents from three private Group B service areas to the south (Nulle Woods North, South, and East).
- Zone 4 shown in Brown represents the remaining 5 residents from three private Group B service areas to the south (Nulle Woods North, South, and East), plus 5 additional individual residents in the area east and west of Friday Creek.

It is understood that there may be interest from property owners outside the initial overall service area included in Zones 1-4. However, the number of potential connections beyond the service area, availability of water rights, and the relative cost of additional distribution system improvements to serve a small number of additional customers beyond the study area appears to make service beyond the propose service area unfeasible at this time.

Service Area Demand
In order to determine the total quantity of water that various system components must accommodate, the number of connections and population that will be served by the system must be known. If this population data is not available, and estimate must be made of the population of the area for various planning horizons.

Existing Land Use and Land Use Trends
It is anticipated that most of the water consumed or used within the Lake Samish drainage basin will be for domestic purposes; this should be particularly true given the residential zoning of the area. A zoning map is provided in Map 8. About fifty percent of the home owners around the Lake Samish are full-time residents; the other fifty percent comp only during the summer months and on the weekends.

For planning purposes, to estimate the number of potential residential connections in the service area we determined the number of platted lots in the proposed service area. Parcel Maps for the proposed service area are also included in the appendix as Map 13-1, 13-2. We then briefly reviewed land use zoning in the proposed service area and observed that very few if any existing lots are eligible for subdivision. The table below summarizes the number of existing platted lots in each zone of the study area. Each parcel represents one single family residential connection with the exception of Calmør Cove which is counted based on the total number of existing residential lots.
<table>
<thead>
<tr>
<th>Service Area</th>
<th>Lots</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Zone 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calmor Cove (CC)</td>
<td>49</td>
<td>Group A Surface Water Treatment Plant</td>
</tr>
<tr>
<td>Fire Lane (FL)</td>
<td>14</td>
<td>Individual Surface Water &amp; Wells (2)</td>
</tr>
<tr>
<td><strong>Zone 2</strong></td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>Shallow Shores East (SSE)</td>
<td>44</td>
<td>Individual Surface Water</td>
</tr>
<tr>
<td>Shallows Shores West (SSW)</td>
<td>19</td>
<td>Individual Surface Water &amp; Wells (4)</td>
</tr>
<tr>
<td><strong>Zone 3</strong></td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Friday Creek (FC)</td>
<td>39</td>
<td>Individual Surface Water &amp; Wells (5)</td>
</tr>
<tr>
<td>Samish Woods North (SWN)</td>
<td>2</td>
<td>Group B Well</td>
</tr>
<tr>
<td>Samish Woods South (SWS)</td>
<td>1</td>
<td>Group B Well</td>
</tr>
<tr>
<td>Samish Woods East (SWE)</td>
<td>3</td>
<td>Group B Well</td>
</tr>
<tr>
<td><strong>Zone 4</strong></td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Samish Woods North</td>
<td>2</td>
<td>Group B Well</td>
</tr>
<tr>
<td>Samish Woods South</td>
<td>1</td>
<td>Group B Well</td>
</tr>
<tr>
<td>Samish Woods East</td>
<td>2</td>
<td>Group B Well</td>
</tr>
<tr>
<td>East of Friday Creek</td>
<td>2</td>
<td>Individual Wells</td>
</tr>
<tr>
<td>West of Friday Creek</td>
<td>3</td>
<td>Individual Wells</td>
</tr>
<tr>
<td><strong>Service Area Total</strong></td>
<td><strong>181</strong></td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Service Area Connections

Water Consumption

A knowledge of the quantities of water required is essential to the evaluation and planning of water supply systems. Since such evaluation and planning is concerned with the water use at some future date, the quantities of water required must of necessity be approximated. However, through analysis of the various factors which influence water consumption, reasonable estimates of the requirements can be developed.

The physiological needs of people require less than a gallon of water daily. Yet demand for water for other purposes is such that average domestic consumption values between 60 and 100 gpcd are common and values in excess of 100 gpcd are not unusual. Most of the water delivered to homes is used in the kitchen, laundry, and bath, with lesser amounts used out-of-doors for lawn and garden irrigation and automobile washing. Other factors which particularly affect domestic consumption include weather and sewage disposal facilities. More water is used, both indoors and outdoors, when the weather is warm and dry.

Domestic Demand

Water consumption is usually expressed in terms of average daily consumption, based upon the total annual use. Actual rates of consumption change monthly, daily, and hourly. These variations are considered to be normal based on changes in weather conditions, community activities, and common habits of the population. Additionally there are large demands of water used in fighting fires. A knowledge of the extent of these variations from the average is necessary to the planning of a water supply system. Monthly and daily variations are a factor to be considered in planning adequate supply, storage, and transmission facilities. Hourly variations must be considered in designing distribution systems.
Calmor Cove’s ADD is 125 gallons per day and MDD is 250 gallons per day per connection. For comparison, Skagit PUD’s Alger Water System ADD and MDD is 164 and 328 respectively. The Alger Water System serves predominantly full time, residential dwellings on larger lots in comparison to the smaller lots and residents of the South Lake Samish community of which almost 50% are seasonal occupancy.

**Fire Demand**
Although the total water used for extinguishing fires usually is a negligible partition of the annual consumption, the rate at which it must be supplied is so great that, in all but the largest communities, fire flows are the largest variations imposed on water systems. Since fire protection is a primary importance, the planning and design of water works must include consideration of such demands. In this case minimum fire flow for a rural residential community is 500 gallons per minute for 60 minutes. However, as the size and composite material used in a residential structure change additional fire protection beyond that available may impose self-contained fire protection for each residence.

Chapter 246-290 of the Washington Administrative Code provides the requirements for Group A Public Water Systems. A Comprehensive Water System Plan (WAC 246-290-100) will be required for a South Lake Samish Water System including a complete water system analysis that will identify the facilities needed to meet demand in the community.
System Infrastructure

New Treatment Plant Locations
Representatives from the south Lake Samish community were asked to provide possible locations for the new water system facilities necessary to serve the proposed service area including: treatment, storage, booster pumps. Two possibilities were identified: a vacant lot on Fire Lane adjacent to the lake; and the south end of property owned by the Calmor Cove Club. Preliminary review of the two options indicates that the Calmor Cove property is preferred. The pros and cons for each are shown below:

Fire Lane
Pros
- Proximity to point of diversion
- Proximity to Calmor Cove existing distribution
- Proximity to Shallow Shores Road and related future distribution main
Cons
- Lot may not be available
- Lot size may be to small
- Historical, cultural, and environmental permitting very difficult and may not allow
- Land use may not allow treatment facility
- Location not favorable for construction including setbacks
- Limited Access to other utilities
- Increased traffic through community to facility
- Lot size may not be able to meet screening requirements to maintain residential character of the area that are expected as part of a conditional use permit.
- More difficult to serve area along West Lake Samish Road.

Calmor Cove
Pros
- Adequate space available
- Historical, cultural, and environmental permitting less difficult
- Conditional use permit likely to be approved for water system facilities
- Natural screening in place to protect community view
- Location favorable for construction including setbacks
- Property is likely available subject to negotiations with property owners
- Proximity to Calmor Cove existing distribution
- Proximity to Shallow Shores Road and future distribution
- Direct access from West Lake Samish Road
- Possible service available to immediate area along West Lake Samish Road.
- Closer for service from Skagit PUD if tank was required
Cons
- Proximity to point of diversion – further from the Lake
- Requires easement to connect to Shallow Shores Road distribution mains

Design of Facilities
The criteria for use in the planning level design of water supply, storage, and distribution facilities was based on the requirements or recommendations of the various regulatory agencies, DOH Design Standards, and to the specification of such authorities as the AWWA.

Source Capacity: The minimum production capability of the source and associated pumping system shall be 800 gallons per connection per day, plus capacity required to replenish standby storage except where records support a lower MDD.
**Pumps:** Source Pump Capacity for delivering to storage must be of such capacity as to be able to replenish standby storage within 72 hours after the termination of whatever emergency or other condition caused the drawdown of the standby volume and, while so doing, be able to continue to meet MDD established per connection.

**Surface water Sources:** The minimum treatment acceptable by DOH for surface water sources is 4 log removal achieved in addition to treatment that may include coagulation, sedimentation, filtration, disinfection, or combinations of these.

**Pipelines:** The capacity of pipelines should be so selected as to result in a system capacity sufficient to deliver water at the maximum daily rate of demand plus the required fire flow with residual pressure of not less than 20 psi. The pipe diameter will also need to provide for a minimum fire flow of 500 gpm.

The diameter of the pipe necessary to transport the required quantities of water will be established during hydraulic analysis as part of the design phase. However, for planning purposes 8” standard diameter pipe will be used to provide for both domestic and fire flow demand.

A map of the proposed distribution system is shown below and in the Appendix as Map 12.
Operations & Maintenance

Low quality water and high maintenance costs is a significant factor motivating local residents to consider an alternate source of water or a community treatment system. In home surface water point of use treatment systems commonly used for single family homes around the lake are fairly reliable when maintained properly. However during the summer months, especially during the algae bloom season at the south end of Lake Samish, point of use filters need to be monitored very carefully and filters changes as often as weekly to maintain quality water. Less sophisticated filters system without water quality monitoring alarms are prone to failure.

Group A Water Systems are required to have an operator certified by the Division of Drinking Water. The water system must also ensure that the personnel operating a system subject to Part 6 of WAC 246-290, Surface Water Treatment, also meet the requirements under RCW 70.119 and WAC 246-292. For a system with surface water treatment the operator must be certified as a Water Distribution Manager and a Water Treatment Plant Operator.

The operation of a public water system includes many duties and responsibilities that are necessary to protect public health. Daily operation of a water system include the following responsibilities:

- Ensure that all daily operation and maintenance activities of the water system are completed in accordance with acceptable public health practices and water industry standards.
- Perform water quality monitoring, maintain adequate records, and take follow-up action, if necessary, to comply with state and federal drinking water regulations.
- Implement preventative maintenance programs, inspect treatment and other systems components for malfunctions, make needed repairs, and keep adequate records.
- Analyze/ review record reading instrument readings and laboratory tests, determine sites and causes of any malfunctions, adjust various treatment processes or other components accordingly, and keep records of each action.
- Implement a cross-connection control program.
- Determine remedial actions in emergencies, and be available 24 hours a day.

When comparing maintenance and operations programs required for the two sources of supply being considered, Skagit PUD and Lake Samish, it is clear that maintenance of a basic distribution system is easier and less costly than that of a surface water treatment plant.

Operating a distribution system that would receive its supply of water directly from Skagit PUD, even with the possible addition of a local storage tank and booster pumps, is straightforward and requires minimal maintenance and operation. In most cases several routine visits each month, periodic annual maintenance, an alarm monitoring system, and a 24 hour on call certified operator is adequate.

However, operating and maintaining a surface water treatment plant is vastly more complicated. Daily site visits are required to monitor the treatment plant and collect water quality samples. Extensive maintenance and operational activities are time consuming and expensive. A higher level of operator certification is also required. Unfortunately, is often not feasible to hire a full time qualified treatment plant operator for a small system and this makes it difficult to find stable, competent staff.

Calmor Cove existing treatment plant maintenance and operations costs are difficult to determine because the onsite club maintenance person has broad duties including operation of the treatment facility. For the purpose of this study we have estimated that the routine hours required on a daily, weekly, and monthly basis. We then used the costs to hire an outside contract certified water treatment plant operator to perform the tasks required. It is important to recognize that Calmor Cove has been able to operate at a lower cost than those being projected. However, if their current operator were not available those costs are expected to increase dramatically if they were not able to find a maintenance person also qualified to operate the treatment system.
As a general observation, it is believed that the operation of an updated 20 gpm surface water treatment plant would be more efficient and cost effective than that currently being operated by for Calmor Cove. Furthermore, there is not expected to be any significant increase in operating cost for a 50 gpm treatment plant over a 20 gpm treatment plant other than an increase in chemicals. Certainly this is important to consider because the potential exists to spread the same operating costs over a much larger number of users thereby reducing the cost of water per customer.

**Financial Analysis**

Based on data gathered during this study the table below was prepared to summarize the planning level cost estimates for each source option including the estimated cost per connection assuming various levels of initial participation. The table below is based on funding provided by a Drinking Water State Revolving Fund Loan at 1.5% interest for 20 years. An alternate table was prepared based on funding from US Department of Agriculture (USDA) at 4% interest for 25 years. Both tables are included in Exhibit 19. The analysis also provides a long term cost comparison based on the useful life of each option. In particular, the anticipated useful life of a package treatment plan is 25 years where as the useful life of a distribution system can be up to 4 times that of the package treatment plan. This is significant when comparing the short term and long cost of each option. Safe, reliable, and sustainable delivery of drinking water is a priority for the department of health.

In the short term, 20-25 years, the table shows that the estimated monthly capital and operational cost per customer for treated water from Lake Samish drops significantly as the number connections increases primarily due to economies of scale.

During the same period, the capital and operational cost for water sourced from Skagit PUD is only considered for the full development of the South Lake Samish System (181 connections) because it is not remotely feasible for the smaller systems considered (49-63 connections). While the Skagit PUD option is more expensive in the short term it is a feasible options and much less complicated to operate.

In the long term (100 years), the package treatment plant would need to be replace 4 times during the life of the distribution system. Taking this into consideration the analysis shown at the bottom of the table clearly shows that sourcing water from Skagit PUD is far less expensive than treated water from Lake Samish in the long term.

While it appears to be less expensive to source water from Lake Samish in the short term, long term water sourced from Skagit PUD is by far the most feasible option financially and operationally long term.
CAPITAL COSTS

<table>
<thead>
<tr>
<th>Project Description (See Table 1 for abbreviations)</th>
<th>Lake Samish Treatment</th>
<th>Lake Samish Treatment</th>
<th>Lake Samish Treatment</th>
<th>Wholesale Skagit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Connections</td>
<td>CC</td>
<td>CC + FL</td>
<td>Zone 1 - 4</td>
<td>CC + FL + SS + FC</td>
</tr>
<tr>
<td></td>
<td>49</td>
<td>63</td>
<td>181</td>
<td>181</td>
</tr>
<tr>
<td>Source: Skagit/Treatment (25 Year Life Cycle)</td>
<td>$ 533,505</td>
<td>$ 535,505</td>
<td>$ 950,994</td>
<td>$ 4,500,000</td>
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<tr>
<td>Water Distribution System (100 Year Life Cycle)</td>
<td>$ -</td>
<td>$ 56,000</td>
<td>$ 637,000</td>
<td>$ 665,000</td>
</tr>
<tr>
<td>Project Total</td>
<td>$ 533,505</td>
<td>$ 591,505</td>
<td>$ 1,587,994</td>
<td>$ 5,165,000</td>
</tr>
<tr>
<td>Capital Cost Per Connection</td>
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<td>$ 9,389</td>
<td>$ 8,773</td>
<td>$ 28,536</td>
</tr>
<tr>
<td>Monthly Cost Per Connection @ Terms Below</td>
<td>$ 53</td>
<td>$ 45</td>
<td>$ 42</td>
<td>$ 138</td>
</tr>
<tr>
<td>Eligible for consolidation subsidy 50%*</td>
<td>N/A</td>
<td>Low</td>
<td>Moderate</td>
<td>High @ 50%</td>
</tr>
<tr>
<td>Net Impact</td>
<td>$ 53</td>
<td>$ 45</td>
<td>$ 42</td>
<td>$ 69</td>
</tr>
</tbody>
</table>

* Eligibility is based on current DWSRF guidelines and subject to change with each loan cycle and available funding.

MANAGEMENT & OPERATIONS

| Monthly Management & Operation                      | $ 70   | $ 54 | $ 26 | $ 4  |
| Monthly Base Rate Skagit                            | $ -    | $ -  | $ -  | $ -  |
| Monthly Cost of Water (200 gpd ADD/400 gpd MDD)     | $ 8    | $ 8  | $ 8  | $ 16 |
| Net Impact                                          | $ 78   | $ 62 | $ 34 | $ 24 |

Total Monthly Cost Per Customer (Initial 20 Years)    | $ 130  | $ 108 | $ 76 | $ 93 |

Long Term Analysis Based on 100 Year Distribution & 25 Year Treatment Plant Life Cycles

| Average Monthly Cost of Per Customer (100 Years)     | $ 107  | $ 86  | $ 48  | $ 38  |

Funding Options

The primary methods of funding water utility capital improvements are: savings, loans, and grants.

Savings or a sinking fund as it is often called is by far the least expensive financing option. However, this requires a great deal of time and commitment to plan and execute. In this case no significant savings are available for capital improvements of the magnitude proposed and even a dramatic rate increase will not accumulate funds fast enough to address the problem in a timely manner. The primary role of saving in this case will be to pay for preliminary engineering including cultural and historical reviews, and meeting other loan application requirements such as water system planning.

Generally speaking grants have become very scarce and eligibility is focused on the most serious problems in economically disadvantaged communities. If you are eligible for these limited resources it is still very competitive and difficult to justify expending resources to apply when the likelihood of success is so slim. There are some grants available that would be well suited for this type of project but they are only available to municipal entities such as a Public Utility District or a Water District. In order for this project to be eligible, the lead agency would need to become a water district, be taken by the PUD No. 1 of Whatcom County, or possibly have the PUD own a portion of the infrastructure.
Loans are the most common and likely financing option available for the proposed project. The two primary funding sources are the Drinking Water State Revolving Loan Program and the US Department of Agriculture Rural Development. Each loan program has its unique characteristics and challenges.

- **The Drinking Water State Revolving Loan Program** has a 1.5 percent basic interest rate on a 20-year loan and is well suited for this type of project. The State Revolving Fund Loan Program is ideal because it provides financing for preliminary engineering, construction documents, and retroactive financing funds expended for the required Water System Plan shortly after the loan is approved. However, an approved water system plan is required before loan can be approved in most cases and therefore the funds necessary to complete an approved Water System Plan must be spent in advance of the funds being available which can be many months or longer.

A copy of the 2011 Drinking Water State Revolving Fund Program is available on the DOH website. There are a variety of workshops available to assist with DWSRF loan applications. March 1, 2011 is the next application deadline at which time the Water System plan must also be submitted. While the 2011 deadline is not realistic, it is anticipated that March 2012 will be the following application deadline that should be considered.

During the feasibility study Part I, Meadowbrook Water Association submitted an application for $2.89M and was ranked number one in the first draft based on need. However, during the review process the loan committee determined that the project did not have adequate planning in place to proceed in a timely manner and more important the applicant was not able to demonstrate the ability to service the debt payments.

- **USDA Rural Development Loans** currently have a 4% interest rate for terms up to 40 years and are also well suited for this type of project and can be applied for at any time. The Rural Development loan application process is significantly more difficult and costly up front because the Water System Plan and all of the preliminary engineering must be in place including cultural and historical approval before the application will be approved. After the loan has been approved the first draw is not available until the first construction notice to proceed is issued and that can be three to six months or more after the loan is approved during which time the construction engineering and approvals need to be completed and approved by DOH and Rural Development for receiving the approval to begin construction.

In order to pursue a Rural Development loan it is very important to have adequate savings and bridge financing in place to cover interim planning, preliminary engineering, application costs, and project engineering through the first notice to proceed with construction. USDA Rural Development Water and Waste Program – Direct Loans and Grants information is readily available on the local USDA website or by calling the local USDA office.
Governance
This section presents a brief overview of governance options to be considered for developing a new south Lake Samish community water system.

The governing body would be responsible for executing a plan of action including: water rights development, obtaining easements and/or franchises, conforming with local ordinances, the Coordinate Water System Plan, and with WAC 246-290-100 and -230.

Ideally there would be a feasible governance structure already in place “that is willing” to represent the south Lake Samish community and continue immediately with an action plan following this feasibility study. However, presently there is no organization or governance in place to represent the residents of the proposed South Lake Samish service area. Addressing this governance issue will quickly become the single most important factor in taking the next steps towards the establishment of a community water system. Stakeholders will need to continue to be engaged at each new increment of requested commitment, especially concerning the raising of revenues.

There are a variety of governance structures to be considered including: private entities, cooperatives, associations, water districts, and a local utility district which is formed under the local public utility district. It is uncommon and not recommended for a community potable water system to be governed as a private entity or cooperative. The remaining three governance structures are considered briefly below.

Existing Water District: Samish Water District
Samish Water District (SWS) was formed in 1972 under RCW 57 and provides public sewer service to the residents around Lake Samish. RCW 57 provides broad enough statutory mandate for a Water District to initiate and maintain governance and funding authority for water potable water system management within its service area. The Samish Water District is governed by an elected body of commissioners who represent the community within its service area boundary.

Under RCW 57 Samish Water District has the powers necessary to:
- Construct, condemn and purchase, add to, maintain, and operate a public water systems
- Issue general obligation bonds, revenue bonds, local improvement district bonds, or utility local improvement bonds for the purpose of paying all or any part of the cost of developing infrastructure.

As discussed earlier in the study, Samish Water District has undertaken several comprehensive drinking water supply planning efforts to serve the residents around Lake Samish and each effort failed to garner sufficient public support for implementation. Samish Water District has reservations about supporting any further planning effort towards the development of a south Lake Samish community water system.

Conclusion: Samish Water District is an existing feasible governance structure that is well suited to support the development of a south Lake Samish Water System. However, at this time the District is unwilling to lead in the planning effort.
New Water District
It would be possible to form a new water district under RCW 57 provided that Samish Water District was not willing to serve potable water to the proposed service area. However forming a water district is complicated and requires a well-organized, dedicated group, with overwhelming community support to be successful. Forming a Water District also requires a significant financial investment over a period of months and possibly years.

Conclusion: Given the findings and recommendations of this study the formation of a new Water District is not recommended at this time due primarily to the complexity and cost compared to other short term options. At some time in the future forming a water district may become feasible.

Existing: PUD No. 1 of Whatcom County
PUD No. 1 of Whatcom County was formed under RCW 54 “Public Utility Districts” and is authorized to provide public water service in Whatcom County. Currently PUD No. 1 of Whatcom County only serves one potable water system. However, under RCW 54.16.120

“The district may, by resolution, establish and define the boundaries of local assessment districts to be known as Local Utility District No. . . . , for distribution, under the general supervision and control of the commission, of water for all purposes, public and private, including domestic use, . . . , and in like manner provide for the purchasing, or otherwise acquiring, or constructing and equipping and maintaining and operating distribution systems for such purposes, and for extensions and betterments thereof, and may levy and collect in accordance with the special benefits conferred thereon, special assessments and reassessments on property specially benefited thereby, for paying the cost and expense thereof, or any portions thereof, as herein provided, and issue local improvement bonds or warrants or both to be repaid wholly or in part by collection of local improvement assessments. A district also may form local utility districts located entirely or in part outside its limits or the limits of the county in which the district is located to provide water, or sewer facilities if otherwise authorized under this title.”

Conclusion: Whatcom PUD No. 1 is an existing feasible governance structure that is cable of supporting the development of a South Lake Samish Water System. However, given the findings and recommendations of this study the formation of a new “Local Utility District” by Whatcom PUD No. 1 is not recommended at this time due primarily to the complexity and cost compared to other short term options. In the future, if Samish Water District elects not to participate in the formation of a South Lake Samish Water System, a “Local Utility District” is a viable option.

Water Association:
An Association is a very common form of governing structure that is successfully used by community water systems across the State of Washington. Associations are generally registered with the secretary of state as a Washington State Non-Profit Corporation. Forming a Non-Profit Water Association is a fairly straightforward and inexpensive process. An example of Non-profit Water Association Articles of Incorporation are included as Exhibit 20.

As a non-profit organization, it is not anticipated that there will be any surplus funds or net income to the Association at the end of the fiscal year after provisions are made for the payment of the expenses of operation and maintenance and the funding of the various reserves for depreciation, debt retirement, and other purposes, including those required by the terms of any borrowing transaction. The occurrence in subsequent fiscal years of surplus funds or net income above the requirements of the Association as above mentioned, including, if any, a reserve for improvements and extension of the facilities, shall be taken into consideration by the board of directors in determining the water rates to be charged the members.
Membership in the Association is governed by the Bylaws of the Association and generally Membership is limited to one per property within the service area of the water system. Membership is generally open to those within the service area provided that adequate water is available and the issuance of new memberships will not negatively impact the supply of water to existing members.

An Association does not have capital stock. Membership in the Association is represented by membership certificates which represent the right to use and enjoy the benefits of the Association's water supply system upon the payment of necessary assessments, if any, and reasonable charges based upon such use.

An Association is governed by a board of directors elected by the membership at the annual meeting of the membership from among the members. The directors meet as needed to conduct the business of the Association, subject to restrictions of law, the Articles of Incorporation, and adopted by-laws.

A variety of funding options are available for Associations and discussed later in the study.

**Conclusion:** If Samish Water District and PUD No. 1 of Whatcom County are not prepared to take a lead role in the development of a South Lake Samish Water System, the formation of a new “Water Association” is recommended due to the flexibility, simplicity, and relatively low cost. A Water Association will work well to facilitate the next development steps required and provide an organizational structure that can engage in formal negotiations and agreements on behalf of its members. As the plans for a water system develop, there may be some time in the future that forming a new Water District or being taken over a Municipal entity becomes feasible.

**Summary**
Developing a new public water system under an existing organization is desirable provided there is adequate support by its governing body and the community. However, there are some aspects of operating as a Public Entity, such as a Water District or PUD, that can prove to be more cumbersome and restrictive, specifically with regards to complying with the open public meetings act, financial management through the county treasurer, and financial accounting audits required by the state auditor. In general, a public entity is also subject to pay state prevailing wage rates for construction and capital improvements. On the other hand, Public Entities are typically eligible to receive funding from more sources, and have the authority to levy assessments, and issue bonds to pay for capital improvements.

The use of Private Non-Profit Association for governing a community water system is more flexible, accountable only to its members, and is not subject the open public meetings requirements. Financial management can be done internally and audits conducted as prescribed by the Bylaw and the Board of Directors. Funding resources may be more limited compared to those of a Public Entity.
CONCLUSIONS

Effective communication of the study results to the south Lake Samish Community and the general public will be important to the future success of developing a south Lake Samish Water System. If sufficient support is generated, consolidation becomes feasible, and the appropriate source development can be implemented.

Based on preliminary information gathered for this study it was concluded that:

- Wheeling water from Skagit PUD at Bow Hill Road to Alger, and then to the South Lake Samish Area is not feasible based on the short term (25 years) analysis, however long term Skagit PUD is the most feasible option;
- Sourcing water from Skagit PUD Alger Water System is not available utilizing the existing well and associated water rights;
- Lake Samish is a feasible source for a South Lake Samish Water System in the short term provided that a sufficient number of property owners participate.

The key objective of this feasibility study was to provide planning level information to: evaluate regional source and treatment options; identify associated water utility ownership and governance options; develop an initial service area; identify existing and new facilities and pipelines needed for various options; and discuss water right needs including steps to secure and consolidate them.

Action Plan
Based on the information available and analysis completed during this feasibility study the following action list was established for the further development of a South Lake Samish Water System.

1. Verify Skagit PUD Source - It is essential to have a written commitment from Skagit PUD in order for Samish Water District, PUD No. 1 of Whatcom County, and the community to properly evaluate the source options and subsequent Governance options being considered.

2. Landowner Commitment – Following confirmation one way or the other of Skagit PUD source availability and based upon the findings of this study, it is critical to determine the current level of commitment from residents in the proposed service areas to determine the feasibility moving forward with a community system. This can be done in the form of a survey similar to the one completed in 2010.

3. Establish Governance Structure – Upon completion of the survey, a governance structure is needed to represent the south Lake Samish Community. Initially this can be done with representatives from each Zone in the proposed service area. However, if Samish Water District and PUD No. 1 of Whatcom County are not willing or able to take the lead role, the community will need to establish a more formal structure such as a Non-profit Water Association.

4. Samish Water District Service or Denial – The proposed new service area is within the Samish Water District service area. Samish Water District has the right and associated duty to serve in the proposed service area and therefore, in order to move forward the south Lake Samish community must secure from Samish Water District a commitment to serve or a denial of service in order to move forward with other water system options.
5. If a Non-Profit Water Association is formed, Articles of Incorporation will need to be filed with the Washington Secretary of State Corporations Division. Bylaws will also need to be developed for governance of the Association. A critical part of this process is to establish how membership will be handled during each milestone in the development of the Association including election of a board of directors to formally represent the community.

6. Once the process for membership and leadership are established, it will be necessary to secure a commitment from existing and prospective members. This is typically done in the form of an initial membership fee followed by additional contributions at various stages of system development through completion. Incentives are typically provided for early membership.

7. When the minimum number of membership commitments are secured, the following outline represents the planning effort necessary to develop a new regional Group A water system.

   a. Memorandum of understanding with Ecology for the process of Water Rights consolidation and eventual submittal of an application for water rights.
   b. Prepare a Hydraulic Analysis, Recommended Improvements, and Cost Estimates.
   c. Prepare a Comprehensive Water System Plan (Business Plan) – This is required for a new Group A public water system in accordance with the WADOH’s Water System Design Manual and WSDOH Water System Planning Handbook. Important components of the water system plan include:
      i. Agreements and Governance
      ii. Service Area and Consistency with Local Planning and WRRA
      iii. System Demand
      iv. System Design including Capital Improvements
      v. Management and Operations
      vi. Policy and Design Standards
      vii. Financial Planning including Rates
   d. Preliminary System Design Engineering,
   e. Apply for and Secure Funding
   f. Design Engineering and Construction Documents
   g. Permits – SEPA/Environmental, Section 106/Historical & Cultural, Construction
   h. Project Construction
   i. Project Completion and System Startup
References

Water System Analysis prepared by Wilson Engineering, LLC for Calmor Cove Club
June 20, 2011 - Project No. 2009-098

Lake Samish Basin Comprehensive Stormwater Plan prepared by Wilson Engineering for Whatcom
County, June 1, 2012

Domestic Water Withdrawals from Lake Samish prepared by Arthur G. Larson, October 1988 – Project
No. OFTR 88-2

Lake Samish Comprehensive Water Plan prepared by URS/Hill, Ingman, Chase & Co., March 14, 1975


the Hydrology of Samish Lake and Upper Friday Creek, prepared by Arthur G Larson, December 1990

Washington State Department of Health, Office of Drinking Water, Sentry Data Base

Revised Code of Washington (RCW) Title 54 “Public Utility Districts”

Revised Code of Washington (RCW) Title 57 “Water-Sewer Districts”

Washington Administrative Code Chapters 249-290ff “Group A public water systems”

College of the Environment, Western Washington University, September 20, 2008
Appendix

Maps:  
Map 1: Regional Vicinity Map  
Map 1a: Lake Samish Water Systems  
Map 2: Samish Water District Service Area/Land Use  
Map 3: Lake Samish Basin  
Map 4: WRJA 3: Lower Nooksack  
Map 5: South Lake Samish Study/Survey Area  
Map 6: Skagit PUD No. 1 Source Infrastructure  
Map 7: South Lake Samish Wells & Diversions  
Map 8: South Lake Samish Zoning  
Map 9: Calmor Cove Service Area  
Map 10: Calmor Cove Distribution System  
Map 11: South Lake Samish Survey Area  
Map 12: Proposed South Lake Samish Service Area, Zones, Distribution  
Map 13: South Lake Samish Parcel Maps (5)
**RURAL RESIDENTIAL**

- **RR3**: Rural Residential 3 Units/Acre
- **RR2**: Rural Residential 2 Units/Acre
- **RR1**: Rural Residential 1 Unit/Acre
- **RRI**: Rural Residential Island
- **RR5A**: Rural Residential 1 Unit/5 Acres
- **RR10A**: Rural Residential 1 Unit/10 Acres
- **TZ**: Transition - R5A/RR1

**RURAL**

- **R2A**: Rural 1 Unit/2 Acres
- **R5A**: Rural 1 Unit/5 Acres
- **R10A**: Rural 1 Unit/10 Acres