Lopez Village

Water Supply Report and Recommendations

&

Abbreviated Coordinated Water System Plan

Lopez Village Water System Planning Committee

July 2003

Lopez Village Water System Planning Committee, July 2001 – July 2003

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Dedication

Gene Richey
April 12, 1917 – July 3, 2003

Since 1986, after retiring from teaching at the University of Washington's Department of Civil and Environmental Engineering, Gene Richey served on county committees addressing water quality and quantity issues. The Citizens' Water Advisory Committee, Watershed Ranking Committee, Watershed Management Committee, and Water Resources Management Committee all benefited from Gene's intellect, humor, and scientific approach to solving problems.

The Lopez Village Water System Planning Committee and its monitoring subcommittee brought water resource planning home to Gene's Island. His personal knowledge of the area, management of his own small community system, and a lifetime studying and teaching the science of water enabled a small volunteer group to produce a solid, verifiable study of the aquifer serving the village. He spent many hours in the field, in all weather. He constantly analyzed the growing body of information that was being collected from the monitoring wells, and proceeded to teach us the science of geohydrology as it related to the results. His curiosity and enthusiasm were inspiring. His honest evaluation of reports and early drafts of this plan kept us from getting caught by assumptions and goals that were unrealistic. He set high standards for our work on this plan, and at our meeting June 26, enthusiastically voted approval of the final document. His final report on the monitoring study was concluded on June 29. It has been a pleasure and honor to have worked with him.

Lopez Village Water Supply Report and Recommendations, and
Abbreviated Coordinated Water System Plan

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Executive Summary

The Lopez Village Water System Planning Committee spent two years working on the Lopez Village Water Supply Report and Recommendations and Abbreviated Coordinated Water System Plan. These planning documents are intended to direct the management and protection of water supplies for the Lopez Village Urban Growth Area through a series of steps that are tied to projected growth estimates.

The committee was charged with the task of developing an abbreviated coordinated water system plan in order to coordinate water system service in the designated urban growth area. This involved an assessment of the existing capacity of water systems in the UGA area and an evaluation of their ability to expand. The committee realized at the beginning that any evaluation of water system capacity to expand needed to address how much water was available. This was a critical element, since no studies of the island aquifers had been done, and although the area adjacent to Fisherman Bay seems to have an abundant supply of fresh water, many shoreline communities in other parts of the island have problems with seawater intrusion.

The committee spent two years meeting monthly. Meetings included education on water rights; water system management; alternative water sources, such as desalinization; regulations and ongoing changes to state water policies; fire flow requirements; water use patterns on Lopez compared to other parts of the county; and a growing picture of the aquifer characteristics as monitoring and analysis progressed. Much of the analysis was conducted by volunteers, who spent many additional hours monitoring, conducting surveys and developing reports. Gene Richey, Ron Meng, Ron Mayo, and others added their professional expertise to the project as engineers, hydrogeologists and water system managers. Altogether, the community contributed hundreds of hours of professional, technical and volunteer time worth an estimated $100,000.

The committee tackled many hard questions dealing with the demands created by the designation of an "urban" area in a rural community. The need for an urban level of service became clear, not just to serve a growing population efficiently, but to oversee the management of a limited water resource at the local level. The committee decided that the best way to address this need was to bring the existing water suppliers together to form an association that will either grow into a utility itself, or be the interim body to assist in establishing a utility. In the meantime, this association will fill the role of local agency for management.

<u>Water system capacity</u>

There are three Group A community water systems (non-profit, homeowners' associations) in the Lopez Village area serving residences and businesses, and one Group A, transient non-community water system serving a resort. At this time, only the Fisherman Bay Water Association has the capacity to meet projected growth demands, however their service area is limited to the Village

core. The Fisherman Bay system has adequate water rights and source capacity, but would need updated engineering plans for approval of additional connections. The system has the ability to obtain approval for additional connections without needing additional water rights. (see Section II, B., page 10)

Water supply availability

The results of a year of monitoring and a groundwater model indicate that pumping at estimated 2020 rates under normal withdrawal conditions is not expected to cause seawater intrusion in existing wells in the study area (See Figure 7), and is not expected to affect the availability of water from the aquifer. Because one year of monitoring and analysis of a limited area is just the start of type of aquifer study that is needed, the committee chose to take a conservative approach and recommends a five year interval for reassessing the aquifer capacity and growth projections.

The amount of water rights allocated in the aquifer serving Lopez Village exceeds the fresh-water resource (See Section II, C, page 13). This means that a re-allocation is needed and no new water rights are available. The plan recommends that this reallocation process involve a cooperative effort of water right holders in the area and Ecology.

Water use on Lopez is very conservative, although a greater efficiency can be obtained through metering, leak detection and policies to prevent waste. Conservation and efficient water use are essential to water management on Lopez.

Long-term goals

- Reallocate water rights through relinquishments, transfers and changes.
- Review options for development of a water public utility district.

Interim goals

1. Implement the Abbreviated Coordinated Water System Plan design guidelines for new water system development in the Lopez Village UGA in order to assure fire flow standards are met and that future interties between systems will be efficient.
2. Establish a local Water System/Users Association to take on management and decision-making in the Lopez Village area.
3. Establish an adaptive management program for the Lopez Village area that includes ongoing monitoring and analysis of the aquifer, tracking water use, and projecting water supply capacity on a five-year cycle.
4. Develop a comprehensive water system plan that defines the needs for infrastructure and funding to meet projected growth.

Strategy to implement goals

1. *Upon adoption of this plan, no new water supplies will be developed in the Lopez Village UGA until a comprehensive water system plan is developed.* This plan will map out how new development will fit into a larger water system structure and specifically identify components to meet future needs such as storage tank sites which will meet fire flow requirements for the entire area. This strategy is recommended for the following reasons:

   - Once the comprehensive water system plan is approved, development can proceed with a water system design that can grow into a municipal level of service, with shared fire flow. This will save developers money and prevent the hodge-podge of water system development that is a huge disincentive to future consolidation into a larger utility.
   - At this time there are over 100 connections available in existing or pending water systems in the UGA. There is currently a moratorium on new subdivision outside of the Village core.
   - The Lopez Village Groundwater Model Report indicates that wells in the Village core are most vulnerable to seawater intrusion.

2. *Upon adoption, an association of water systems and users will be established* to oversee monitoring, management, and future decision-making for water use and development. This organization will fill an essential role as the local responsible agency until the area grows to the point of needing an urban level of service.

- The plan defines an urban level of service, for the long-term, as a water utility district with adequate water rights, capacity and willingness to serve.
- The plan calls for review of the county growth projections for the area based on continuing evaluation of water system capacity.

3. *Upon adoption, an adaptive management program will be established* to evaluate ongoing monitoring and analysis of the aquifer capacity compared to growth projections. This evaluation will occur on a five-year basis.

Responsible parties

Implementation of the recommendations in this plan will involve a collaboration of local water users, water system purveyors, and the county. The committee recognized that each of these groups has a different role and responsibility in providing resource protection and addressing water needs for the urban growth area (UGA). For example, the water system purveyors and users are charged with establishing a local water system association to manage the water resources, with assistance from county staff. The association will be responsible for long-term monitoring, developing conservation programs, and on-going evaluation of water system capacities. In addition, the association will take the lead in making recommendations about reallocation of water rights and reviewing options for the expansion of existing water systems or the development of a public utility. Costs are estimated at $17,500 for start-up activities, $50,000 in facility improvements, and $5,000 per year in on-going

costs. These costs do not include volunteer labor. Potential funding sources for these activities includes grant sources, water association fees and user fees.

The plan identifies the county as the lead in developing the comprehensive water system plan for the UGA with assistance from the local water purveyors. Development of the comprehensive water system plan, including the capital facilities component, will set the framework for water system development in the UGA and allow logical consolidation in the future. In addition, the county has been charged with developing regulations to protect the aquifer as part of their critical areas ordinance (RCW 36.70A). Costs to perform these functions are estimated at $90,000 ($50,000 for the water system plan & $40,000 in staff time for ordinance development.

Section I. Background: Discussion of the issues that led to the declaration of the Lopez Village aquifer as a Critical Water Resource Area

A. Problem definition

The Lopez Village area was designated as an interim urban growth area by the Board of County Commissioners on October 3, 2000. Between 1990 to 2000, Lopez Island grew faster than any other ferry-served island in San Juan County. The population grew from 1483 in 1990 to 2176 in 2000, an increase of 47%, compared to 40% for the county as a whole

In the spring of 2001, with the adoption of the urban growth area for Lopez Village, a moratorium on new subdivisions was lifted and several developers submitted applications to the county for their projects. Because the primary water purveyor in the area, Fisherman Bay Water Users, was not able to provide service to these new developments and the state was not able to issue new water rights in the area, these new subdivisions were proposing new, small community water systems. These small water systems, with groundwater withdrawals of less than 5000 gallons per day, are exempt from the requirement to obtain a water right permit.

When these applications reached the county health department, which is responsible for reviewing new subdivisions for water adequacy, staff became concerned that these multiple withdrawals were creating an impact on the water resource without the benefit of an analysis of existing water users and resource capacity, which ordinarily would occur during the water right permit process.

Lopez Island is a sole source aquifer. That is to say, all water comes from local rainfall since there is no connection with mainland sources of water. Lopez is also entirely dependent on ground water, with no significant sources of surface water. In addition, although sea water intrusion has been documented on the island (USGS, 2000), as of June, 2001, no studies had been conducted to determine aquifer characteristics.

All of these factors led to Resolution 39-2001, declaring a Critical Water Resource Area for the Lopez Village UGA, May 15, 2001. A committee was formed to address water supply issues, and develop an abbreviated coordinated water system plan.

Responsible parties

Role of county agencies in the Lopez Village UGA relating to water:

San Juan County Health Department is responsible for determining water adequacy for new subdivision and assuring that community water systems supply safe, reliable water. Health is also responsible for water resource planning in the county and is in the process of evaluating water resources

county-wide. County health approves and regulates water systems serving less than 15 connections or less than 25 people (Group B water systems).

San Juan County Planning Department is responsible for determining whether there are adequate capital facilities for the designated urban growth area for Lopez Village, including the ability of water purveyors to supply adequate water for projected growth.

Role of state agencies:

Washington State Department of Health is responsible for approval and regulation of water systems that serve more than 25 people or more than 14 connections (Group A water systems) and gives the county authority to oversee Group B systems.

Washington State Department of Ecology is responsible for the management and protection for all water sources and issues water rights for groundwater withdrawals greater than 5000 gallons per day.

Other agencies involved:

The San Juan County Fire Marshal and Lopez Fire District 4 Fire Chief are responsible for seeing that adequate fire protection is provided by water systems for all new subdivision.

Lopez Village Water System Planning Committee:

The LVWSPC is responsible for developing an abbreviated coordinated water system plan and develop recommendations to the county and state for water system and water resource management in the Lopez Village area.

The following key issues were identified at the beginning of the planning process:

1. There is a substantial lack of analysis of water resource capacity for Lopez Village UGA.
2. Department of Ecology is not issuing new water rights in San Juan County.
3. Group A water systems in the UGA do not have additional service capacity due to the lack of: 1) water rights, 2) funds for new infrastructure, 3) management structure, 4) desire to provide service for new development.
4. New development in the UGA is limited to small water systems of less than 15 connections because of water rights.
5. Small water systems do not have the economic base to pay for an "urban level of service."

6. Without a comprehensive water system plan that identifies the location and timing of necessary water system components, water system development will be piecemeal and the cost of supplying fire flow capabilities for small systems will either prevent development or lead to substandard fire protection.
7. There is no municipal authority or utility district to take responsibility for funding, developing and implementing a comprehensive water system plan.

B. Discussion of issues

Water resource capacity

Fresh water on Lopez Island is supplied from local rainfall. Lopez consists primarily of glacial outwash gravels, sands and till with low hills and gentle terrain. There are many wetlands and man-made ponds, but no significant surface water sources. Weather is characterized by very low rainfall due to the proximity of the Olympic Mountains. In the 1970s and -80s the Department of Ecology began to look at the extent of sea water intrusion in coastal counties and drilled three test wells on the island. Preliminary reports, in conjunction with the US Geological Survey, indicated a potential for sea water intrusion. In 1997 USGS found chloride concentrations of 100 mg/L or more in 46 percent of the Island's 185 well study sites; 56 percent of wells completed in bedrock (28 wells) and 39 percent of the wells in glacial drift (42 wells). Chloride results ranged from 12 mg/L to 420 mg/L. The 1997 results were compared to a prior study in 1981 and subjected to two statistical tests. The results showed a statistically significant increase in concentrations[1].

At the time of the critical area designation, no studies had been conducted to evaluate the extent and capacity of the aquifers on the northern end of the island, where Lopez Village is located. Data from drilling logs indicate that the water table on the north end of the island is located just a few feet above sea level and is very flat. Since fresh water is lighter than sea water, it creates a fresh layer that sits on top of sea water, with a brackish interface between the two. The elevation of the well intake determines the level that water is withdrawn from the freshwater lens. Wells in the study area draw water from between 1.3-feet and 51.3-feet below mean sea level. See Appendix A, Summary of Ground Water Model results.

Water rights

Washington State Department of Ecology is responsible for the protection and management of all waters of the state. Ecology issues water rights for new and expanding uses of water through a process that looks at existing rights

[1] Chloride is a stable ion found in sea water that is used as an indicator of sea water intrusion. Chloride concentrations at 100 mg/L are considered an indicator of seawater intrusion; however, several conditions can cause an elevation chlorides, and intrusion can occur with chloride levels below 100 mg/L

(community water systems, individual wells, irrigation, etc.), the availability of water, and whether the water will be put to beneficial use. In the past, Ecology issued many water rights with little or no evaluation, which resulted in over-allocation (more rights than actual water available). In recent years, due to increasing litigation and instream flow requirements, Ecology's ability to administer water right law and manage the resource has been severely limited.

Because Ecology has not been issuing new water rights, development has followed the path of least resistance, which is to utilize the exemption that allows withdrawals up to 5000 gallons per day for single family and group domestic use. This has led to a remarkable increase in exempt well development. See Figure 3, Graph of water right allocations over time in San Juan County

Group A Water Systems in the Lopez Village area

There are three Group A community water systems in the Lopez Village area, Fisherman Bay Water Users Assoc., Normandy Heights, and Harbor on Fisherman Bay[2]. These systems serve residences and business with water rights issued prior to 1985. All of these systems are non-profit, homeowners' associations run by a board of members and focused on supplying water to existing connections. In addition, the Islander Lopez is served by a Group A, transient non-community water system. (For more information on the capacity of these water systems, see Section II, B, on page 10.)

New development and exempt wells

Because the Department of Ecology has not been issuing new water rights in the county, and most existing community systems do not have available connections, new divisions of land are limited to using exempt wells to provide water. This means individual wells for each lot or a Group B community water system that uses less than 5000 gallons of water per day.

Development of exempt wells does not require the type of careful examination of existing water users and aquifer capacity that is required under the water right permit process. In addition, Group B water systems are not subject to the same level of design review and ongoing operation requirements as a Group A water system.

Small water system capacity

Group B water systems are water systems that fall below the standard for federal oversight. In the past, when water rights were available and new Group A systems were being developed, Group B systems filled the gap when a developer or group of homeowners wanted to create a simple water system. In 1997, the state department of health changed the standards for Group B systems to allow up to 14 connections and began to look at a design standard

[2] Harbor on Fisherman Bay is outside, just on the edge, of the UGA boundaries, but included here since it relates to the overall picture of water systems in the UGA.

of 350 gallons per day per connection. At this point, either using the old standard of 6 connections (and 800 g/d/c, referred to as a "six pack") or the 14 connection system, new development statewide began using Group B water systems and exempt wells when water rights for larger systems were unobtainable.

Small water systems work well when they are simple. When water systems require increased operation and maintenance or substantial capital improvements, the cost becomes prohibitive for a small group of users. For instance, in order to meet an urban level of service, as in an urban growth area, the biggest obstacle is supplying fire flow. The amount of water needed to fight a fire dwarfs the normal volume of water required daily for domestic use. Flow requirements jump from 20 gallons per minute to 500 gallons per minute.

Need for a comprehensive water system plan and implementation

If the Lopez Village UGA were being served by a single water purveyor, that purveyor would be required to develop a water system plan that includes a schedule for capital facility improvements to be phased in as demand for new connections occurs. These improvements would follow a master plan that identifies where mains, tanks, hydrants, and other components are needed. Grants, loans and bonds are available to larger water systems for this purpose, based on a documented ability for financial management and repayment.

The existing multiple small systems now serving the UGA can provide a high level of service under current conditions, but cannot afford to support urban levels of service. These systems may, over time, interconnect and share resources, if water rights are available. However, without a comprehensive plan that identifies the location and scheduling of needed improvements -- such as centralized storage for a common fire flow system -- these systems will be a hodge-podge of storage tanks and mains.

Section II. Water supply report and recommendations for Lopez Village

A. How the plan was developed

This Plan and Report are the result of 24 months of work by the Lopez Village Water System Planning Committee (LVWSPC) in conjunction with county staff and consultants. It is the outcome of months of discussion, learning, monitoring, analysis, reviewing information, and struggling with the complex and conflicting problems that control water supply development. This plan addresses water system capacity, water rights, and water availability in the Lopez Village study area and recommends strategies for a program of adaptive management that includes ongoing analysis and monitoring of aquifer conditions and phased development.

This planning effort was initiated as a Level 2 Assessment under the Watershed Planning Act (RCW 90.82 and WAC 2514) by the San Juan County Water Resources Management Committee. In addition to the criteria for a Level 2 Assessment, which addresses resource capacity, the WRMC recommended evaluating water system capacity by using the guidelines for developing an Abbreviated Coordinated Water System Plan (RCW 70.116)

This action was recommended due to the sudden development of multiple small water systems in the Village urban growth area. These small systems use exempt wells, which are allowed to withdraw up to 5000 gallons per day without applying for a water right permit. As a result, these new water supplies are not evaluated under the four standards for approval: 1) is the water available, 2) will it be put to beneficial use, 3) will the new right impair existing rights, and 4) is the use detrimental to the public interest.

The last two years of water system planning for the Lopez Village UGA has been a dynamic process. The declaration of a Critical Water Resource Area by the Board of County Commissioners May 15, 2001, created alarm and concerns for Lopez residents, many who were concerned about the designation as Critical Water Resource Area and felt that the County was going to impose a public utility on the Village, and confiscate individual wells and small water systems. Over 200 people attended the initial meeting of the LVWSPC, July 19, 2001.

In August, planning department staff began a series of meetings to discuss planning options for the Village UGA. A parallel process began, with the LVWSPC addressing water supply and water system capacity issues and the UGA planning committees discussing a wide range of planning issues. This has been something of a chicken and egg planning effort, with water supply being a critical aspect of the future determination of the UGA.

While water supply planning was taking place for the Lopez Village UGA, several significant milestones occurred at the state and county level that have a major impact on water supply planning for Lopez Village, listed below.

January. 2002	Western Washington Growth Management Hearings Board, Olympic Environmental Council vs. Jefferson County, SHB No. 01-2-0015 FDO	Found that Jefferson Co. was in violation of GMA because it had failed to: ✓ Adequately classify and designate Critical Aquifer Recharges Areas (CARAs), vulnerable to sea water intrusion ✓ Did not identify performance standards to protect CARAs; and ✓ Failed to implement a groundwater monitoring program for CARAs
March. 2002	Washington State Supreme Court Decision: DOE vs. Campbell & Gwinn	Determined a developer cannot claim multiple exemptions to provide water in a subdivision
April, 2002	USGS publication of Estimates of Ground-Water Recharge from Precipitation to Glacial-Deposit and bedrock aquifers on Lopez, San Juan, Orcas, and Shaw Islands, San Juan County Washington. WRIR 02-4114	Report estimates that recharge, a key element in assessing ground-water availability, is 2.49" for Lopez (during the study years '97-'98)
August, 2002	WRIA 2, Phase 2, Level 1 Basin Assessment	County-wide water balance assessment indicates water rights and water use in the Lopez Village area may be equal to or in excess of local recharge

Adaptive management: monitoring, analysis, planning

The LVWSPC has endorsed a program of adaptive management to address the impact of growth on a limited water supply. Adaptive management is a respected resource management process by which decisions are made based on best available science (BAS), and then ongoing study and analysis leads to revised management decisions. Management strategies evolve and adapt as more in-depth studies and the effectiveness of prior decisions are evaluated.

The LVWSPC's first decision was a commitment to find out the extent and capacity of the aquifer supplying the Lopez Village UGA. A year-long monitoring program began in March, 2002, to map the water table serving the Village area. A consultant was hired to develop a groundwater model (See appendix A for model results and summary). A volunteer committee selected 26 wells for a monitoring program to measure water levels monthly and chloride content quarterly. The results have been mapped and recorded in a spreadsheet and ongoing analysis of the results and discussions of aquifer characteristics have been provided. (Richey, Meng, 2003. See Appendix B, Monitoring report).

In addition to monthly reports from the monitoring group, the committee discussed water system capacity, fire flow requirements, water rights, desalinization, low impact development, and local water system associations.

An extra contribution to the process has been provided by Ron Mayo, a Lopez resident and retired engineer with 30 years of experience in water supply projects. He originally volunteered to compile information on alternative water supplies, but his work soon expanded to include an analysis of water use and resource availability for the UGA, as well as fire flow capacity for Lopez Island (Appendix C).

Outcomes

The LVWSPC decided to recommend a phased approach that would allow a limited amount of growth in the area with existing water supplies, and require feasibility studies and a comprehensive water system plan and capital improvement plan to determine capacity for additional density. Ongoing monitoring and aquifer analysis is needed to determine the capacity (volume balance) of the aquifer. In the long term, if growth is going to continue at the projected rate, new sources of water may have to be developed, or the land use plan amended. Recommended measures were adopted by the committee, July 2002, and are included in the goals and policies in Section E[3].

In the following sections, the committee recommends actions and programs that combine local management with support by county and state agencies. Most of the recommendations are not dependent on the outcome of planning for the UGA, but should form a foundation for water resource management and growth on Lopez Island. This plan is intended to provide a beginning framework for adaptive management. These recommendations are found in D. Conclusions and recommendations, and E. Goals and policies.

B. Water system capacity in the Lopez Village study area

There are three Group A community water systems in the Lopez Village study area, Fisherman Bay Water Users Assoc., Normandy Heights, and Harbor on Fisherman Bay. These systems serve residences and business with water rights issued prior to 1985, which may allow for additional connections. All of these systems are non-profit, homeowners' associations run by a board of members and focused on supplying water to existing connections. In addition, there are four transient, non-community Group A systems serving the public, including a resort and marina, a park, a restaurant, and commercial buildings. There are two Group B systems inside the interim UGA boundaries, and three additional

[3] The recommendations included: Moratorium on construction of new exempt wells in Lopez Village UGA; limit withdrawals from exempt wells; develop interim Group B's based on Design Standards; set up long term monitoring program; establish a water system cooperative association; develop a comprehensive water system plan; work with water right holders and Ecology to evaluate water rights in UGA; define requirements for an urban level of service as a utility district with adequate water rights, capacity and willingness to serve; set threshold for requiring an urban level of service: double existing density in UGA at the time of adoption of this plan (_____ dwelling units)

Group B systems adjacent to the UGA. (see Figure 1, 6/02, of UGA area with water systems).

The Fisherman Bay Water Association has the capacity to meet projected growth demands in their service area, which is the Village core. The system has adequate water rights and source capacity, but would need updated engineering plans for approval of additional connections. The system is committed for existing approved service connections, however, they have the ability to obtain approval for additional connections without obtaining additional water rights.

Existing Water Systems in and adjacent to the interim Lopez Village UGA:

	Active Connections	Total Connections Approved	Water Rights	Storage Capacity	Fire Flow	Certified Operator	Type of system	Willing/able to expand
Fisherman Bay	92	142	59 ac/ft	150,000	Yes	Yes	Community, homeowners association	Yes, to serve the Village core
Normandy Heights	4	0	6 ac/ft	26,500*	Yes	No	Community, homeowners association	Maybe, with approvals from DOH
Harbor on Fisherman Bay	49	71	35 ac/ft	20,000	No?	Yes	Community, homeowners association	?
Islander Resort	34	--	37.5 ac/ft	46,500	Yes	Yes	Transient, non-community	Yes, with approvals by DOH and DOE
Cormorant	3	0	Exempt	0	No	No	Transient, non-community	NA
Galley	1	0	Exempt	0	No	No	Transient, non-community	NA
Lopez Village Park	1	0	Exempt	0	No	No	Transient, non-community	NA
Erisman Plat	4	4	Exempt	1000 gal.	No	No	Group B	NA
Marine View Mesa	4	4	Exempt	0	No	No	Group B	NA
Richey-Freeman	9	9	Exempt	0	No	No	Group B	NA
Top of the World	0	7	Exempt	33,500	Yes	No	Group B	NA
Mariner Hill	2	14	Exempt	26,500*	Yes	No	Group B	NA

*shared

Pending water systems in the interim Lopez Village UGA

	Active Connections	Total Connections Pending	Storage Capacity	Fire Flow
Milagra 1	1	14	18,100*	Yes
Milagra 2	0	14	6,500	Yes
Island Camp	2	14	10,000	Yes
Montgomery	1	4	?	?
Blue Heron	0	14	22,000	Yes

*shared with Milagra 2 for fire flow

Private water systems vs. public water districts

Private community water systems include Group A and Group B systems that are owned and operated by homeowner associations (non-profit) or individual owners (for-profit). See Section I, page 4 and 5 for a discussion of these systems in the Village area.

Water utility districts are special taxing districts and are formed when a majority of the landowners within the proposed district's boundaries vote in favor of forming the new district. A district may consist of one large water system that expands to offer service within its boundary, or can include several Group A and/or Group B systems, with the district owning the systems outright, or acting as an umbrella organization to oversee financing and management. In terms of planning for growth, funding engineering studies, constructing needed facilities, and developing new sources of water, utility districts have several advantages not available to small, private systems.

Utility districts have greater authority and obligation for service than private water systems. With statute authority as a special purpose municipal corporation, a water district has broad power to provide a wide range of services and the ability to raise revenue to pay for such services. This authority includes the right of condemnation and the right to apply liens for non-payment of service charges. Districts have financing capability through the ability to issue tax exempt municipal bonds and assess fees to provide funds for the purchase, expansion and improvements of the water systems. This is an advantage to a homeowner in that it allows for payment for expensive improvements to be spread over a long period of time. Finally, districts are more highly regulated and accountable than private water systems. They must comply with report and auditing requirements, the open public meetings act, the open public records act, and they must prepare a comprehensive plan that includes how they will provide for current and future service needs in a timely and reasonable manner.

In addition to providing reliable service, utility districts play an important role in water resource management. Districts share responsibility with local and state government to fund studies and develop plans for resource protection.

There are several options for governance of water systems in the Lopez Village UGA. Some of the options include:

- ✓ A single public water district for the entire village UGA. This could start with a water district serving only part of the area that could then expand by annexation.
- ✓ The continued operation of individual homeowner associations.
- ✓ Some combination or multiple of the above.

The evaluation of governance options should be part of the comprehensive water system plan recommended in the following sections. These issues should be considered:

- ✓ Aquifer protection. The water systems in and near the village area are dependent on a single, finite aquifer. The best protection for the aquifer will come from a single effective governing body.
- ✓ Community views. In the long term, a single governing body will be best able to express the views of Lopez residents to state and county authorities regarding water system expansion or restrictions.
- ✓ Compliance with standards. At this time, few, or none, of the systems in the village area meet reasonable water utility standards. In the future these standards will become more demanding and a single organization would be more efficient in responding to change.
- ✓ Cost effectiveness. Scale of cost is more easily borne by a larger group.
- ✓ Future decisions. As the limits of the Lopez Village aquifer are reached, hard decisions must be made. What governing body is best prepared to make them?

In terms of managing the aquifer that supplies Lopez Village, future planning should include consideration of a district that includes all water systems that depend on the aquifer.

C. Water use and water rights in the Lopez Village study area

Water rights in the Lopez Village aquifer recharge area, 2002

Sections 10, 11, 15, 14, part of 22, 23, 26, and 27 (T35N, R02W) are in or overlap the aquifer study area (Figure 6, Estimated water balance, water rights by sections). These sections roughly coincide with the area covered by the monitoring study and Lopez Village Groundwater Model Report (appendix A and B). Water rights in these sections have been issued as certificates as shown below. In addition to these rights, approximately 189 exempt wells in the area may use up to 5000 gallons per day. There are a total of 96 water right claims filed in these sections, two applications, and no permits. See Appendix D. for an explanation of these categories.

Since water rights are only as good as the amount of water put to use, many of these rights, in part or entirely, are not valid. For instance, for exempt wells, Ecology will use 250-500 gallons per day per residence when evaluating water right allocations in an area. Priority is given to water right holders based on who came first (first in time is first in right). However, the legal process for sorting through the status of these rights is beyond the scope of state government at this time, and definitely beyond the scope of this report. Individual, exempt wells represent the majority of water rights in the area. With a potential right up to 5000 gallons a day, these wells tip the scale. Since rights in this area are over-allocated based on the amount of recharge available in these sections, a practical, local approach to sharing the resource is needed.

The following table represents some of the complexities of water rights. The information is based on certificates and documented wells, with an estimate of the amount of water that would be allocated for exempt well use if water rights were evaluated in the area. The water rights issued as certificates (and through the exemption) are only valid for the amount of water that is put to beneficial

use. Actual water use for exempt wells on Lopez may be lower than the standard used here. The percent of recharge that is available for withdrawal on an annual basis is not known. It is generally agreed that it is somewhere between 20-30%. The data for this table is from the WRIA 2 2000 Basin Assessment for San Juan County. The following table shows the percentage of recharge that is tied up by water right certificates, exempt rights at 5000 gallons per day, and exempt rights (use) as 400 gallons per day. See Figure 6 for a map of this information.

Table 1. Water rights by section in the Lopez Village study area.

Twn 35/ Range 2- Section	Recharge		Certificate Rights		Exempt Right (5000)		Exempt Use (400)	
	100%	20%	Ac/Ft/Yr	% of Recharge	Ac/Ft/Yr	% of Recharge	Ac/Ft/Yr	% of Recharge
15	185.49	37.10	6.50	4%	72.8	39%	5.824	3%
14	171.70	34.34	76.50	45%	207.2	121%	27.328	16%
11	141.56	28.31	0.00	0%	140	99%	20.608	15%
10	75.80	15.16	7.00	9%	112	148%	25.088	33%
23	140.96	28.19	10.50	7%	117.6	83%	19.712	14%
22	113.67	22.73	85.50	75%	179.2	158%	29.12	26%
26	195.88	39.18	8	4%	61.6	31%	13.888	7%
27	137.67	27.53	35	25%	168	122%	57.344	42%
Totals:	*1162.73*	*232.55*	*229.00*	***20%***	*1058.4*	***91%***	*198.912*	***17%***

Domestic and commercial water use

Water use numbers in the following table are based on meter information for the water systems in the UGA area and a sampling of meter information from other systems on the island (Mayo, 2003). The data indicates that water use tends to be higher on the larger UGA systems. This could be a reflection of the confidence customers have in the area about their water supply. The rural systems surveyed are systems that are metered because of a history of high chloride levels or failing wells. In general, metered water use on Lopez is very low. For a more detailed analysis, including monthly water use estimates based on meter information, see Appendix C. The following estimates are for an area (Water Use Study Area, or WUSA) that includes all the water systems adjacent to the interim urban growth area boundaries. These systems are Normandy Heights, Mariner Hill, Top of the World, and Harbor on Fisherman Bay (see Figure 1.)

Table 2. Estimates of 2020 water use in water use study area (WUSA)[4]

Year 2020 annual use in Water Use Study Area and UGA						
	2020 WUSA estimates of annual use			2020 UGA estimates of annual use		
	Connections	Use: MG	Use: ac/ft	Connections	Use: MG	Use: ac/ft
Totals: without UGA	348	29.42	90.27	226	20.04	61.49
Impact of "compact" UGA	139	10.15	31.14	139	10.15	31.14
Totals: with "compact" UGA	487	39.57	121.42	365	30.19	92.64

Table 3. Estimated water use on Lopez outside of the water use study area, gallons per day per residence

	2000	2020*
Houses on Community Wells		
Occupied (Full time) houses in rural area on wells	347	516
Vacant (Part time) houses in rural area on wells	258	383
Annual Water Use Full Time Houses in GPD/HU	188	188
Annual Water Use Part Time Houses in GPD/HU	63	63
Houses on Individual Wells		
Occupied (Full time) houses in rural area on wells	487	724
Vacant (Part time) houses in rural area on wells	363	539
Annual Water Use Full Time Houses in GPD/HU	263	263
Annual Water Use Part Time Houses in GPD/HU	86	86

*Assumes annual growth of 2%

Other water use

The complete picture of water use in the Village area must include the amount of water needed to keep a balance in the nearshore environment. This balance includes the amount of groundwater needed to maintain the gradient between the fresh and salt water interface in order to prevent seawater intrusion.

The determination of gradient adequate to prevent seawater intrusion is a daunting chore, one that is likely site-specific, requiring wells selected for that purpose and a lengthy monitoring period.

Fisherman Bay and its surrounding wetlands provide habitats that are important to forage fish spawning and rearing and to local and migratory shore and water birds. Forage fish are important to the life cycle of endangered Puget Sound salmon. While the role of the groundwater basin in maintaining the habitats of Fisherman Bay and its adjacent wetlands is not well understood, it

[4] The Water Use Study Area used for this analysis includes the interim UGA boundaries plus the area served by systems adjacent to the UGA. See Figure 1. This assumes that with the added impact of of the UGA will be to raise the number of UGA residents from 226 to 365 (487 in the WUSA). 365 is a number arrived at in cooperation with the planning department as being appropriate to the (UGA) Compact mixed density village. (Alt. 4). Several approaches were taken to how residences, commercial, and institutional customers were considered but in the end the results were similar

is important to consider the potential of adverse effects on these habitats as the human use of fresh groundwater nears sustainable limits.

Land use plans for the area should address impacts on the hydrologic cycle in terms of withdrawal of groundwater and stormwater management in order to protect groundwater and wetland resources. Stormwater management should recreate natural hydrologic conditions.

D. Aquifer characteristics and water availability for the Lopez Village study area

This report concludes two years of concentrated effort to understand the water supply for the Lopez Village study area. It is part of a statewide planning program to quantify water resources and develop management plans. This planning calls for a water budget, or balance, that shows how much water is taken out and how much water goes in to a groundwater (or surface water) system. The county conducted a Level 1 Assessment as part of this planning, using recharge as a measure of water in, and estimates of water use for water out. This is a static and overly simplified way of looking at a water budget, but a good first step in the planning process. (See Figure 5, Estimated water balance, water use by sections for Lopez Island)

A year of well monitoring and the groundwater model developed for the Lopez Village study area have added greatly to what we know about the aquifer and represent the most detailed groundwater study ever conducted in the county. Unfortunately, the question of how much water is available cannot be answered with an easy number. Timing and location is critical to evaluating the impact of withdrawal on the aquifer. At this time, what can be stated is that pumping at estimated 2020 rates under normal withdrawal conditions is not expected to cause seawater intrusion in existing wells in the study area, and is not expected to affect the availability of water from the aquifer.

There are limitations to what we have learned. The study area is small and does not represent the full extent of the aquifer. The model does not take into consideration seasonal changes. Recharge estimates are based, in part, on 1957 soil survey data, which is currently being revised. The model predicts the impact of development in the area to 2020. Predicting impact at build-out will require a comprehensive study of the island. The model used is a single-layer flow model; a more accurate three-dimensional model would take into account variations in aquifer characteristics, multiple aquifer levels and allow for an estimate of capacity.

The study area is bordered to the north and northeast by shoreline development that has a history of struggling with seawater intrusion (unlike the Village area, which is protected from seawater intrusion by a clay layer at the edge of Fisherman Bay). The aquifer serving the Village extends in this direction along a clay layer that slopes downward to the north. Results of the groundwater model indicate that the effects in this area from increased pumping as a result of the UGA will be minimal at 2020 projections. However, additional work is

needed to collect information about wells to the north/northeast and to run the model for this expanded area.

An essential task in establishing an adaptive management program will be to define the water quality or other threshold at which degradation of the aquifer is considered to occur. Although the groundwater model indicates that no monitoring wells are impacted by intrusion as pumping rates increase to 2020 projections, the seawater interface is moving landward, to some extent. At this time, state and county regulations do not address the mechanics of intrusion unless the water quality threatens to exceed a maximum contaminant level. Using chloride as an indicator of seawater intrusion, this approach does not respond until intrusion has already occurred. Better methods of predicting and preventing seawater intrusion are needed as Lopez grows beyond 2020.

Future management of water supply on Lopez

The committee has expressed strong support for forming a local organization to coordinate management of water systems, monitor aquifer conditions, and work with county and state agencies to oversee management of the groundwater resource. This group would lend local knowledge and expertise to decision-making and be a key element in the adaptive management program proposed in this plan.

E. Conclusions

- ✓ The aquifer serving Lopez Village study area has an over-allocation of water rights. The amount of water allocated in water rights exceeds the fresh-water resource (See Water Rights discussion on page 13). This means that no new water rights are available in the area, but that a re-allocation is needed. This could involve changes, transfers, and relinquishments. Ideally, this process would involve a cooperative effort of water right holders in the area and Ecology.
- ✓ Except for the area served by Fisherman Bay Water Association, there is no single water system purveyor, or group of purveyors with the capacity to meet the growth projections for the interim Village UGA. This may change in the future, but considerable commitment, planning, source development and funding is needed.
- ✓ Water use data collected as part of this plan shows low use by Lopez residents. It is important to reinforce this conservation ethic as growth occurs.
- ✓ The amount of additional water used by new development anticipated in the next five years is expected to have negligible impact in terms of seawater intrusion. This development can be allowed with a high degree of certainty that degradation of the aquifer will not occur, while additional data collection, modeling, and analysis will evaluate the impact of further development.

F. Goals and policies

The best approach to water resource management is an adaptive process, where decisions are made based on best available science. The county took this approach when it imposed stringent requirements on new water systems in the UGA and declared the area a Critical Water Resource Area and formed the Lopez Village Water System Planning Committee in July, 2001. Since that time a great deal more information about water resources for the UGA has been developed, and the following recommendations are based on this new information. In the future, a greater level of knowledge and experience will add to this decision-making process.

The committee's purpose in developing this plan was to look at the capacity of water systems in the interim Lopez Village UGA to provide an urban level of service for the projected growth in the area. At this time, the area is served by a combination of Group A, Group B, and individual water supplies.

The committee agreed that the *long-term* goal for an urban level of service is: a water district with adequate water rights, capacity and willingness to serve[5]. The committee recommends phasing of development based on water supply capacity. The first phase includes plans to coordinate water system management, establish an ongoing monitoring program, establish a conservation program, educate water users, and set up an adaptive management program, with a 5-year review period, that includes analysis of ongoing monitoring and water use trends.

The first phase will provide the needed organization, planning, and framework, the next phase will determine whether it is possible to provide an urban level of service for the Village UGA. This includes reallocating water rights and determining the feasibility or necessity of establishing a water district.

Policies:

Phase 1: to be implemented upon adoption:

1. Within six months of adoption of this plan, the County should develop a comprehensive water system plan and capital facilities plan for the Lopez Village UGA that includes, in addition to capital improvements, a feasibility study for providing fire protection and for developing additional water supplies, including impacts on existing water users and undeveloped property by additional groundwater withdrawals. This plan should be reviewed by Washington State Department of Health (Drinking Water Division) and Ecology (Water Resources).
2. No new individual or community water supplies should be developed in the current Lopez Village UGA until a comprehensive water system plan including a capital improvement plan is developed and feasible funding sources identified tied to potential development. Following adoption of the

[5] See discussion of water districts on pages 12 and 13. A water district for the Lopez Village area could include a variety of options.

plan, development shall only be permitted that is consistent with the water system plan, monitored through the County's concurrency program.

3. At this time, Fisherman Bay Water Users Association is the primary Group A water system in the Village UGA and the county should support its ability to grow into its water rights and offer service in its established service area. This support may include assistance with permitting and planning and assistance in obtaining grants and loans for infrastructure planning and development. This does not preclude expansion by other Group A water systems in the area.
4. The county should continue an ongoing well monitoring network and continued aquifer modeling and analysis. This is essential to determine the amount of groundwater that is available and to implement a program of adaptive management for Lopez Village and the entire island.
5. The county should implement an adaptive management program to protect the groundwater resource. This program should be established with a regular review cycle no longer than every five years.
6. Upon adoption of this plan, the county should initiate the formation of a cooperative association to manage water resources in the area, achieve greater efficiency and cost sharing, and to assist in developing options for a future water district. Upon adoption of the Abbreviated Coordinated Water System Plan for the Lopez Village Critical Water Resource Area, all water systems in the area should be required to participate. The following management elements are recommended:
   a. All participating water systems in the Village area should develop a comprehensive program of leak detection and repair that includes,
      - ✓ Metering and collection of meter data.
      - ✓ Technical assistance program for leak detection.
      - ✓ Funding through grants or revolving fund for repairs.
   b. All participating water systems in the Village area should develop a management program that includes tracking: 1) water use; 2) water levels; and 3) provide the association with the data on a regular basis.
   c. All participating water systems should develop water system plans that include, at a minimum, provisions for water use efficiency, sharing water use data, and contingency plans.
   d. All participating community water systems should develop appropriate fee structures that pays for ongoing monitoring and improvements that promote water use efficiency, and encourages conservation.

Phase 2:

7. Future growth projections for Lopez Village UGA should be revised when appropriate based on the results of ongoing monitoring and the demonstrated ability of existing systems to expand their service. Use of alternative water supplies (other than conservation and catchment) should

not be the basis for growth projections for development in the Lopez Village UGA.

8. As part of its final Plan for San Juan County, the Water Resources Management Committee for WRIA 2 should develop a memorandum of understanding with the Department of Ecology to evaluate water rights in the Lopez Village area. This MOU should include the provision that information and recommendations from the Lopez water system association (when formed) should be used as part of the review process.
9. An evaluation of actual water use should be used as the basis of future water right allocations for exempt wells.

Implementation schedule:

Strategy	Start date	Basic Elements	Responsible parties (Lead agency)	Assisted by	Funding needed	Funding Sources
Organize water system/water users association	Upon adoption	✓ Coordinate water withdrawals ✓ Meter all users and share demand data ✓ Monitor well levels, chloride and conductivity ✓ Educate, offer technical assistance, share administrative and other costs, increase efficiency Prior to phase 2: ✓ Review options for expansion or development of utility ✓ Review water right reallocation ✓ Review options/need for new sources	Health (start-up), water purveyors, local water professionals	General public	$2,500 start-up	Assoc. fees, grants, County
Set up long-term monitoring program	Upon adoption	✓ Continuous water level reading in dedicated monitoring wells ✓ Monitoring for water level, conductivity, chloride in community wells ✓ Set up computer models to predict impact of seasonal and demand changes	Health (start-up), Water purveyors, local water professionals, county staff		10,000 startup, 5,000/ yr	Assoc. fees, grants, County
Comprehensive Water System Plans	6 months from adoption	✓ Comprehensive Water System Plan ✓ Capital Facilities Plan	Planning, Health, Public Works, Fire Marshal	Water system associati on	$50,000 – 150,000	County
Draft interim Aquifer Area ordinance for Lopez Isl.	12 months from adoption	✓ Regulations to protect resource area	Planning and Health		$50,000	County
Establish a conservation program	12 months from adoption	✓ Metering ✓ Education ✓ Leak detection ✓ Use of catchment ✓ Reuse of graywater and wastewater ✓ Incentives	Water system association, local volunteers	Health, state and local	5,000 startup, up to $50,000 for facilities	Assoc. fees, grants and loans, volunteer labor

Section III. Lopez Village Abbreviated Coordinated Water System Plan

A. Water System Design Guidelines

1. STANDARDS INCLUDED BY REFERENCE. Unless superseded by the provisions herein, all water system design, construction, and operation shall be in accordance with applicable federal, state, and local regulation. These include but are not limited to:

   a. Rules and Regulations of the State Board of Health Regarding Public Water Supplies, Chapter 246-290, WAC, and the current edition of the Department of Health "Group A Public Water System Waterworks Design Standards".

   b. General material specifications and construction standards – except as provided in these Minimum Standards, approved plans and specifications, or by waiver granted in writing by the County or State Departments of Health, selection of materials and construction of water system facilities in the Lopez Village Critical Water Supply Service Area shall conform to good engineering practices such as those set out in the following:

      i. Standards of the American Public Works Association (APWA).

      ii. Standards of the American Water Works Association (AWWA).

      iii. "Recommended Standards for Water Works" Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers, 1997 (Ten State Standards), or latest edition.

      iv. Recommendations of the individual manufacturer of materials or equipment.

   c. Well Construction and Maintenance, Chapter 173-160 WAC, "Minimum Standards for Construction and Maintenance of Water Wells", and Chapter 24-293 WAC.

   d. San Juan County Code 8.06, Rules and Regulations Regarding Water Systems and Water Wells.

2. APPLICABILITY

a. These standards apply to design and construction of new and expanding public water systems in the Lopez Village Critical Water Supply Service Area, as defined in Section 3.

b. As of the effective date of these standards, existing water systems are not required to utilize these minimum standards for repair or replacement of facilities, or addition of services within approved plans and specifications, so long as no expansion of service are is involved. If existing facilities must be replaced or upgraded to serve an expanded service area, the new construction shall meet these minimum standards. However, source and service meters and water conservation measures should be incorporated into all existing systems and adherence to these standards is encouraged in all cases to provide better public service throughout the LVCWSSA.

c. If water systems within the LVCWSSA extend service outside of the area, these design standards shall apply.

d. WAC 246-293 requires that water system plans be prepared by new or expanding Group A systems, and shall include a section addressing fire flow standards.

3. DEFINITIONS

a. Development classifications. (Chapter 246-293 WAC) Specific geographical areas within the existing and future service area of a public water system, identified for the purpose of determining the appropriate level of fire protection.

b. County fire marshal. The official responsible for administration of all federal, state and local fire codes.

c. Expanding water system. (Chapter 246-293 WAC) An existing water system which is undertaking new construction to provide water service to additional service connections outside its approved service area or beyond the number of connections in their original approval. Interconnection between two or more systems to provide better service and reliability to existing customers is not considered an expansion of either system.

d. Fire flow. The rate of water delivery needed for the purpose of fight fires in addition to the requirements for normal domestic maximum instantaneous demand and standby (or emergency) storage.

e. Franchise. A grant by the Board of County Commissioners, pursuant to Chapter 36.55 RCW, to purveyors, persons private or municipal corporations for the non-exclusive use of the right-of-way of the County roads for utility purposes.

f. Future service area. (WAC 246-293) A specific area for which water service is planned by a public water system, as determined by written agreement between purveyors.

g. Planning jurisdiction. (WAC 246-293) The responsible agency for preparation and adoption of land use plans, policies or standards affecting development (San Juan County).

h. Public water systems. As defined in WAC 246-290, any water supply system intended or used for human consumption or other domestic uses, including source, treatment, storage, transmission, and distribution facilities where water is being furnished to any community, collection, or number of individuals, but excluding a water supply system serving one single-family residence.

i. Purveyor. (WAC 245-54-015) Any agency or subdivision of the state or any municipal corporation, firm, company, mutual, or cooperative association, institution, partnership, or person, or any other entity that owns or operates a public water system. It also means the authorized agents of any such entities.

j. Service connection. (WAC 246-290) A connection to a public water system designed to serve a single family residence, dwelling unity or equivalent use (equivalent residential unit or ERU).

k. Service area. An area determined by the boundaries of parcels of land either provided with service connections or identified for service in approved plans and specifications of the water system.

l. State regional engineer. Department of Health Drinking Water Program engineer responsible for community water system operations in San Juan County.

m. Water main. Any transmission or distribution pipe which carries water supplied to a service connection.

4. APPROVAL AND CERTIFICATION REQUIRED

a. Source approval

i. Prior to developing a new source of ground water for a community system, the developer must submit an application for a water right permit to the Department of Ecology; or, submit a notice of intent to construct and develop an exempt well for multiple domestic or commercial use to the Department of Health and Community Services.

ii. Prior to construction, well site approval must be obtained from the Department of Health and Community Services and all protective covenants and easements recorded.

iii. All new sources of ground water for community water supplies must be tested, at a minimum, according to San Juan County pump test standards. Protocol for the pump test and a hydrogeologic report (SJCC 8.06 Appendix D) must be developed by a licensed engineer with expertise in groundwater hydrology or a licensed hydrogeologist and submitted to the Department of Health and Community Services for source approval.

iv. Water adequacy shall be determined as a sustainable production rate of no less than .7 gallons-per-minute per connection. A sustainable rate is one that does not negatively impact existing water users or degrade fresh groundwater quality and quantity.

v. Water quality shall meet the standards in WAC 246-290. Water quality standards for sea water intrusion parameters shall conform to SJCC 8.06, Appendix A.5.

vi. All wells will be equipped with a dedicated access tube or other approved device for measuring water levels.

b. Small water system plan and conservation measures. All new and expanding water systems in the LVCWSSA shall develop a Water System Plan (WAC 246-290-100) or small water system plan which shall include, at a minimum: a description of the ownership and management of the system, background of the development of the water system, location, and neighboring purveyors; description of facilities, service connections, and interties; relationship to other water system facilities and future interconnections; a map of the existing and future service area; service area agreements and policies; conditions of service; water

conservation program and implementation; financial plan and fire flow planning as described in 4.d, below.

c. For water system approval the following documents shall be submitted to the San Juan County Department of Health and Community Services

   i. Operation and maintenance manual that includes, in addition to standard water system management practices:

      1. Monthly meter readings at the source and each connection.

      2. Monthly static level readings from each well.

      3. Monthly chloride and conductivity testing, unless otherwise indicated at the time of approval.

      4. Coordination of withdrawals with adjacent water systems to minimize the impact of drawdown.

   ii. Contract with a licensed Satellite Management Agency that includes responsibilities detailed in the in the Operation and Maintenance Manual.

   iii. Water Rights evaluation, including:

      1. A water right certificate or a registered water right claim is required for all sources used by new and expanding public water systems; or, an approved hydrogeologic report for an exempt well.

      2. An evaluation of water rights adequacy for the proposed use based on current WS DOH/DOE policy.

   iv. Engineering report. A copy of any engineering reports, with letters of approval from the appropriate authorities.

   v. Construction documents. A copy of specifications, maps and drawings for the water system which shall contain the information required in WSDOH Group A Design Standards.

d. Fire flow planning.

   i. Water system plans prepared by new or expanding public water systems shall include a section in their plans addressing fire flow. In this case, the water system plan shall address hydrant and system reliability standards in

accordance with this chapter, current uniform fire code, and WAC 246-293. The plan shall include a map entitled "development classifications" which shall delineate the existing and future service area of the water system into the following categories (see SJCC 13.08.010):

1. Residential properties intended for occupancy by one family.
2. Commercial and industrial properties which includes commercial establishments and multi-family or high-density dwellings.

ii. Design capacities for fire flow facilities shall comply with Section 7.c. and construction scheduling shall comply with the adopted water system plan and Section 7.d. of these standards.

5. INSPECTION REQUIREMENT AND CONSTRUCTION CERTIFICATION. Inspection of constructed facilities is required prior to final water system approval. A construction report shall be submitted to the Department of Health and Community Services by the water system designer within 60 days of completion and prior to the use of any project. A construction report will include:

a. Certification by the project engineer or designer that all work was constructed in accordance with applicable standards and the approved plans.

b. Certification that flushing, disinfection, pressure testing and water quality tests has been completed.

c. An accurate "as built" drawing of the actual installation, including all modifications to the approved plans.

d. A detailed map and photographs of the actual installation, including all tees, elbows, valves, meters, pipe sizes, non-potable supply lines and labels, and depth.

6. MINIMUM DESIGN REQUIREMENTS FOR NEW CONSTRUCTION

a. All new and expanding water systems in the LVCWSSA shall be sized to minimize ground water withdrawals during peak use. Unless water use limits are included in the design, equalizing storage must be sized to meet a conservative peak demand of 800 gallons per connection for 150 minutes.

i. Water systems must be capable of supplying customer needs during extended drought conditions without affecting fire flow storage. This means that standby and fire flow storage must be separate.

ii. Actual water use goals must be established in the water system plan with measures to enforce limits, such as tiered rate structures.

iii. Design elements that limit ground water use are encouraged, such as, no outdoor water fixtures and dual plumbing.

1. Non-potable water supply lines shall comply with current uniform plumbing code.

2. All non-potable water lines and fixtures shall be labelled "non-potable".

b. Pressure. Water systems shall meet minimum pressure requirement of 20 psi during fire flow and 30 psi under non-fire flow conditions at the meter at all times. Maximum pressure shall not exceed 60 psi .

c. Pipe sizing. All new piping shall conform to sizes specified in WAC 246-293. Where water systems are providing fire flow, new water mains shall not be less than 6 inches in diameter, except in the following cases:

i. Branches to lines into cul-de-scs or other such locations where further expansion of the system is improbable. Such lines shall be of the size designated in approved plans and specifications by the certifying engineer, but shall not be less than 2 inches in diameter. If 2-inch line is used it is limited to a maximum length of 300 feet, unless certified by a professional engineer.

ii. In the Lopez Village core and along Fisherman Bay Road water mains shall be not less than 8-inches in diameter.

d. Minimum material specifications and construction standards.

i. All water mains shall be constructed of material meeting AWWA C900 standards.

ii. All valves, meters, hydrants and other appurtenances shall conform to the standards for the Fisherman Bay Water Users Association (Appendix A).

iii. Minimum construction standards for water mains shall conform to the standards for the Fisherman Bay Water Association (Appendix A).

e. Flow measurement. All new and expanding water systems must install master meters at each source and individual meters at each connection.

   i. Meter setter: locking copper meter setter –(such as? Ford Coppersetter)

   ii. Meter box: (such as: Fog Tite No. 1, or Intercontinental Plastics No. 520)

   iii. Care shall be taken so that surface water does not flood meter boxes.

   iv. A shut-off valve for each service shall be installed between the distribution main and service meter.

   v. Meter setters shall be bedded in gravel at a depth of 30".

f. Measurement of groundwater source. All new groundwater sources shall be equipped with access or a device to measure depth to water.

g. Isolation valving shall be installed to allow for isolation of lines. Such valves shall be installed at every junction or hydrant location.

h. Looping and dead ends. Looping of water mains shall be required whenever feasible. Any water main or branch line that terminates in a dead end shall have a standard fire hydrant and guard valve installed or an approved blow off valve.

i. Storage. Sizing of storage shall be adequate to provide for equalizing, standby and fire flow storage requirements. Fire flow and standby storage must be separate, i.e., not nested. Equalizing storage shall be oversized to lessen seasonal and peak demand impacts. Minimum fire flow shall be determined as set out in Section 7. Installation of storage facilities may be phased in certain cases. Siting of storage facilities should consider locations which provide potential interties for gravity fire flow.

j. Storage tank specifications

   i. All storage tanks will be designed and constructed to provide stability and durability and protect the quality of the stored water.

      1. Tanks shall comply with the standards in WSDOH, Group A Public Systems Waterworks Standards

2. In cases where phased fire flow is proposed, a temporary storage system may be proposed, with tanks that meet these minimum standards.

ii. All tanks shall be above ground or partially buried, with the top of the reservoir no less than two feet above normal ground surface.

iii. All tanks shall have the following appurtenances:

iv. Screened air vent

v. Separate drain line to daylight

vi. Overflow with discharge away from the base of the tank

vii. Inlets and outlets shall be designed to provide circulation

viii. Hatches and vents shall be watertight and insect proof and hatches provided with locks

ix. Storage tanks over 5000 gallons require a foundation permit from the San Juan County Permit Center

k. Water line placement.

i. For water mains placed within the County road right-of-way where existing topography, utilities, or storm drains are not in conflict, the preferred location for water lines parallel to the road is six (6) feet within the County right-of-way line. Water lines are to be located on the north and east side of the road. Otherwise, when it is demonstrated to the satisfaction of the county engineer that it is not reasonable to follow this location, the alternative is:

1. Along the county arterial and collector roads, 17 feet from the centerline of the road; and

2. Along county local access roads, no closer than 4 feet from the edge of the pavement.

ii. Water mains shall not be located in the shoulder without specific written approval of the county engineer.

iii. Where existing utilities or storm drains are in place, new utilities shall conform to these standards as nearly as practical and still be compatible with the existing installation.

iv. New utility easements must be a minimum of 15 feet in width, unless subject easement is contiguous to an access easement or public right-of-way. In such cases, the minimum easement width shall be 7.5 feet. Access shall be provided to all public water system lines and their appurtenances.

v. Fire hydrants shall be located no more than 10 feet from the road edge (SJCC 13.08.130).

vi. All water lines of non-magnetic material shall have a 2-inch magnetic sensitive detector tape with the words "Water Line Below," or equivalent, located 18 inches continuously above the water line for its entire length.

vii. Water line markers or posts will be installed at meter and valve locations, at a minimum.

l. Pipe cover.

i. The depth of trenching, installation of pipes and backfill shall be such as to give a minimum cover of 30 inches over the top of the pipe from finished grade. This standard shall apply to transmission, distribution, and service piping to the meter. If due to contact with bedrock a 30-inch depth of cover is not feasible, an alternative bedding and filling method may be used, if approved and inspected. Compaction on county road right-of-way shall adhere to county requirements. Materials capable of damaging the pipe or its coating shall be removed from the backfill.

ii. All water lines crossing a roadway shall be laid perpendicular to the centerline of the road, unless an alternative is approved by the county engineer. The top of pipe for such water lines shall be a minimum of 3 feet below the pavement surface. Conduits may be required by the county engineer where water lines are susceptible to damage by traffic loads. Pipe encasements may be installed under the roadbed for future utility pipe installations.

m. Separation distances.

i. Transmission and distribution water piping shall be laid at least 10 feet horizontally from any existing or proposed on-site waste disposal piping, drainfields, and/or wastewater gravity or force mains. The distance shall be measured edge to edge of the pipe.

ii. Where a 10 foot separation is not feasible or water lines must cross wastewater lines, installation shall conform to Ten State Standards, APWA and AWWA standards.

7. FIRE HYDRANTS

a. Design and installation of hydrants shall conform to the standards for the Fisherman Bay Water Association (Appendix A), and the provisions of San Juan County Code 13.08.

b. Spacing.

i. All hydrants in fire flow systems shall be spaced so as to ensure that all structures or building sites served by the system shall be reached by unobstructed hose lays of no greater than 400 feet to all parts of any structure.

ii. Hydrants shall be installed at the following maximum spacing intervals measure along improved roadways.

1. Residential: 800 feet maximum.

2. Commercial, industrial and multi-family: not to exceed 300 feet maximum.

3. Shorter intervals may be required by the fire marshal if necessary to meet the above 400 foot hose lay standard.

c. Fire hydrants shall be installed at all intersections in all areas except single-family residential, so that the distance between them shall not exceed 300 feet and if the distance between intersections is over 400 feet, then one hydrant shall be placed halfway between.

8. FIRE FLOW

a. New water systems and expansion of existing water systems shall be designed and constructed to provide for fire flows in a manner consistent with the standards outlined 7.C., below.

b. Nothing herein shall preclude the fire marshal's authority to establish, with cause, fire protection requirements for any building or structure on improved property utilizing Uniform Fire Code, NFPA Standards, ISO Standards or San Juan County Code, as appropriate.

c. Minimum fire flows to be provided by new or expanding public water systems shall be determined in accordance with WAC 246-293 and SJCC 13.08, based on Use Classifications of properties to be served, as follows. Minimum fire flows are in addition to requirements for domestic use.

Residential development (one family per residential structure)	500 gallons per minute for 20 minutes	10,000 gallons
High density residential, commercial and industrial	500 gallons per minute for 60 minutes	30,000 gallons

d. Construction schedule requirements. Prior to final plat or development permit approval, all required fire flow facilities must either be:

   i. Constructed in accordance with approved plans and specifications and certified "as built" as provided in these standards, or

   ii. Bonded for completion subject to release of bond after certification of inspection, or

   iii. Identified in a phased construction plan approved by the state regional engineer and county fire marshal in accordance with Section 7.e., below.

e. Phased construction.

   i. Provisions for fire flow service may be approved by the fire marshal based on a phased construction plan submitted in writing. The construction schedule shall include plans and specifications for all facilities. The plans and specifications shall be approved by the state regional engineer. A financing plan shall be provided showing improvements required, estimate costs, costs to each benefited property, and provision for an escrow account or other means approved by the county to accumulate funds required for completion. The approved phased construction plan shall be recorded with the title of all the properties affected, and declared on the face of any plat.

ii. The phased construction plan shall identify initial facilities to be constructed, including source, storage, pumps, hydrant location(s), and mains, and shall contain a certification by a registered engineer or initial fire flow service levels in gallons per minute at each hydrant or draft port. A schedule of completion of all remaining facilities shall be provided which is consistent with the schedule of site improvements. The schedule shall also indicate fire flows provided by each phase of construction.

iii. Location of planned fire flow facilities shall address possible interties with other purveyors to serve the pressure zone where the proposed water system is located.

Section III. Lopez Village Abbreviated Coordinated Water System Plan

B. Guidelines for timely and reasonable service

All new development either inside the boundary of a Group A system serving an urban growth area or inside an urban growth area adjacent to a Group A system shall be served by that water system. If the proposed development cannot obtain service from the Group A water system within 180 days, the applicant may develop an interim alternative source of water under the following requirements. The 180-day period begins the day that all required plans, documents, and fees have been submitted to the purveyor for connection to the water system.

Prior to developing a new source of water, a request for review of water availability for the project must be submitted to the health officer, which includes the following documents:

1. A copy of a letter requesting service submitted to the purveyor, describing the proposed development and providing all information needed to determine improvements and costs related to connecting to the water system.

2. A letter of response from the purveyor stating whether service is currently available, and if not, an estimate of improvements and costs required to make service available, and a timetable for when the improvements will be made.

3. If service is not available within a reasonable time and the applicant decides to proceed with approval of an interim water supply:

    a) the purveyor shall notify the applicant in writing that the proposed development has either been added to a current waiting list for service or will be included in plans for future additional service connections,
    b) the applicant shall sign a statement that the property shall be connected to the purveyor's water system upon availability of water service, and that the owner shall pay all costs of connection. In addition, this statement shall stipulate that the applicant and his grantees agree to participate in and not protest the formation of a utility local improvement district (ULID) or local improvement district (LID) or utility purveyor project that is designed to provide public water service to the property. This statement shall be recorded with the real property records of San Juan County and shall be a condition running with the land until such time as the costs for connection are fully paid to the purveyor and service is provided,
    c) the applicant shall submit a bond in the amount equal to the cost of connection to the Group A water system, based on estimated costs provided by the purveyor, and
    d) at the time of connection, the purveyor will reimburse the applicant for any or all parts of the interim water system that the purveyor may utilize, based on industry standards.

If the health officer determines that service is not available in a timely and reasonable manner from the purveyor, a letter will be sent to the applicant stating that the applicant may proceed to develop a new water supply meeting the requirements of SJCC 8.06.

- Any new water supply developed under this section shall be approved as an interim, alternative supply.

Lopez Village Water Supply Study Area: maps and figures

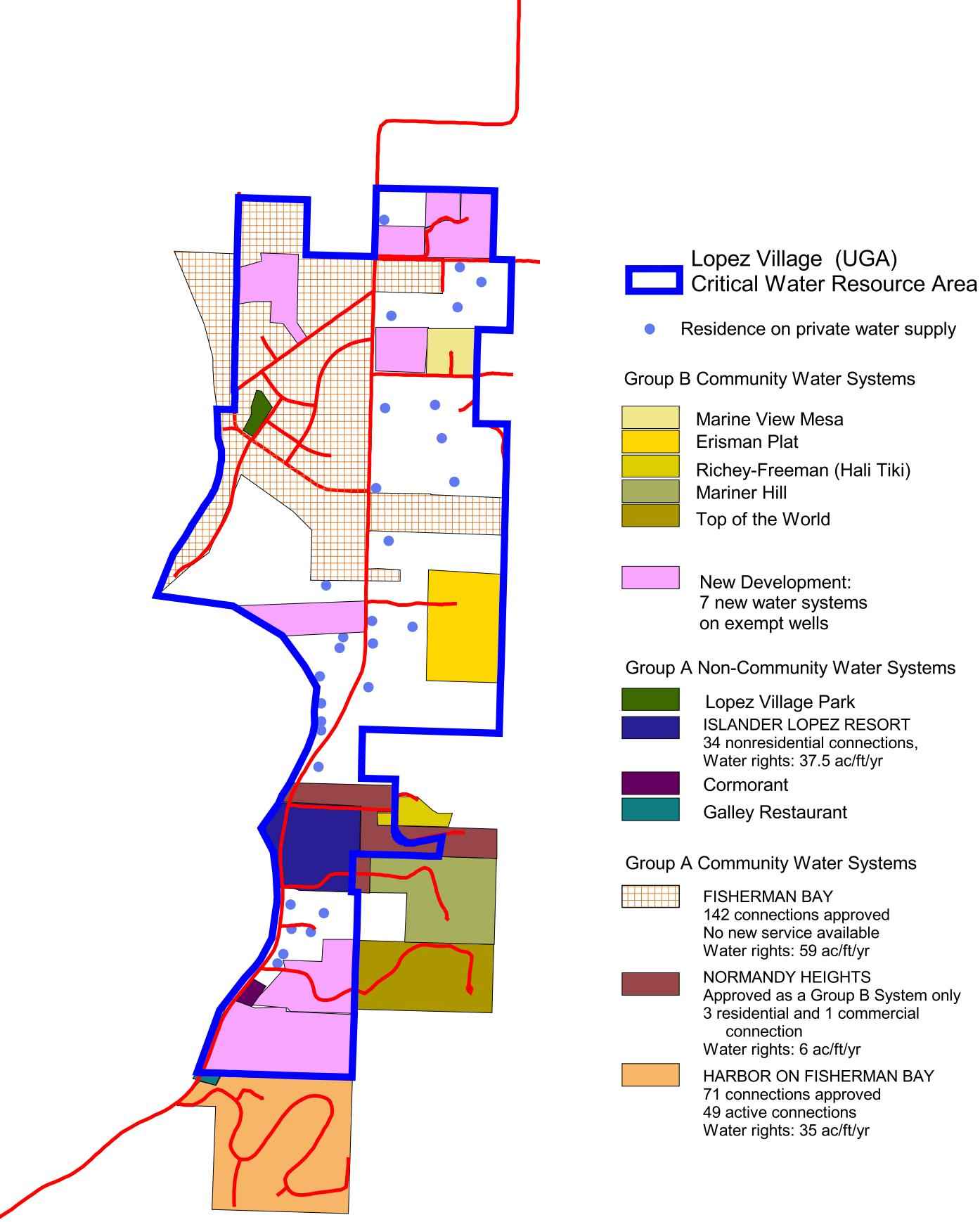
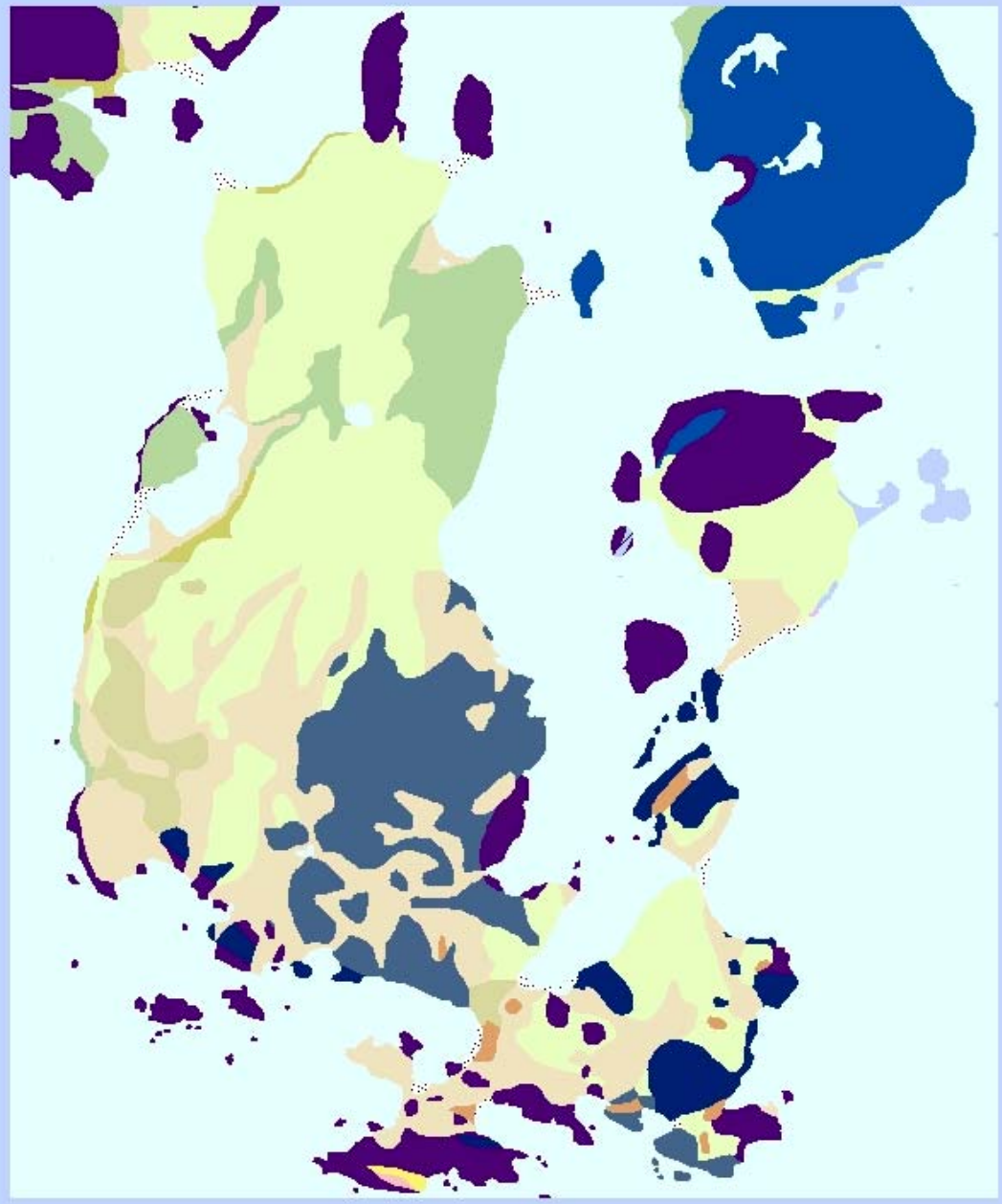


Figure 1. Map of water system boundaries in the Lopez Village water use study area

SJCHCS 6/03



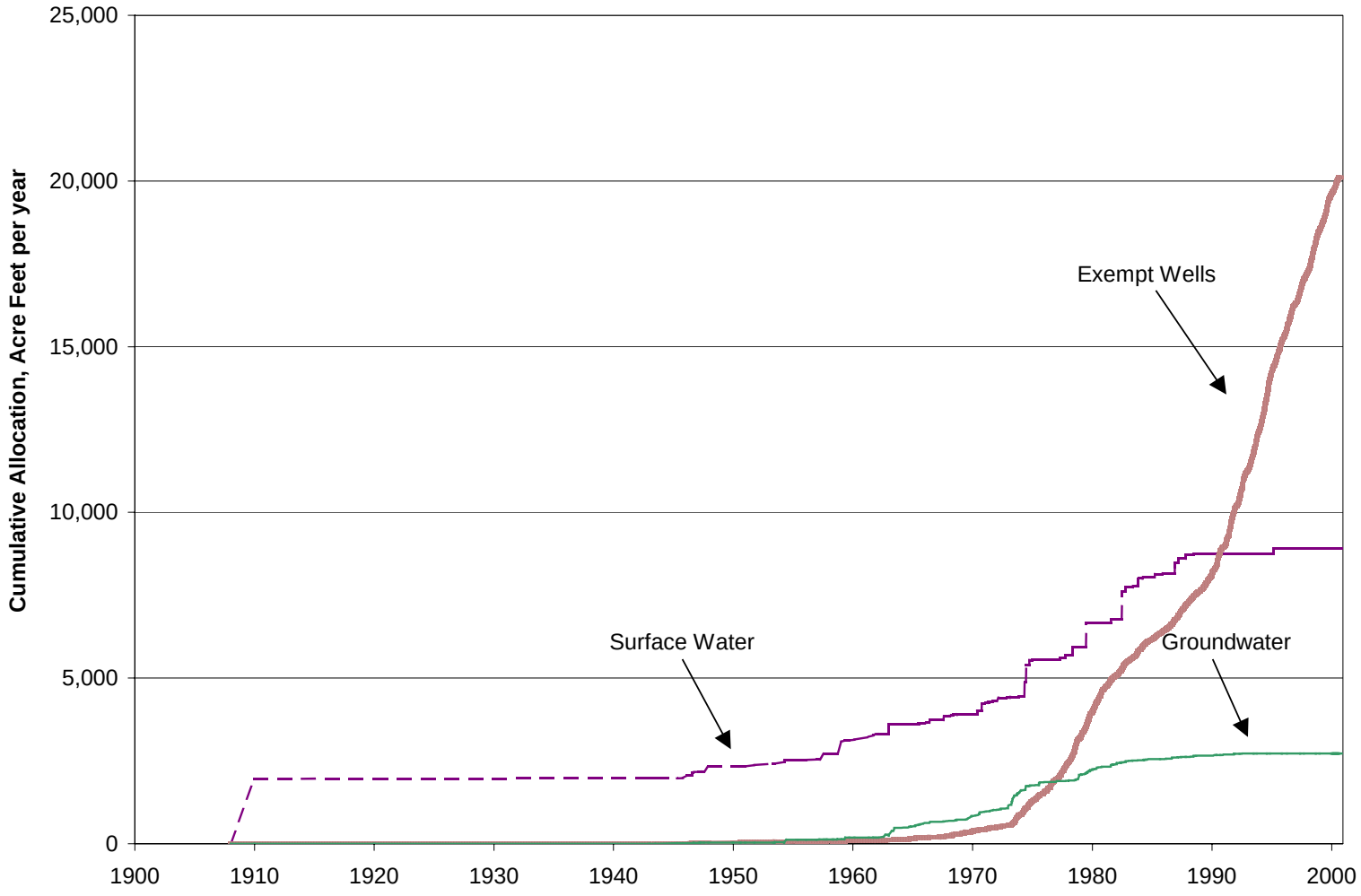
GLACIAL DEPOSITS

- glaciomarine drift
- advance continental glacial outwash
- continental glacial drift
- continental glacial outwash
- continental glacial till
- peat deposits
- beach deposits

BEDROCK

- intrusive rocks
- metavolcanic rocks
- basalt flows
- marine sedimentary rocks

Figure 2. Lopez Island geology.
Source: DNR Division of Geology and Earth Resources, draft 2003



Legend

- Surface Water
- Exempt
- Groundwater

Figure 3. Distribution of Water Rights Allocations Over Time for San Juan County

San Juan County
WRIA 2 Basin Assessment

Pacific Groundwater Group

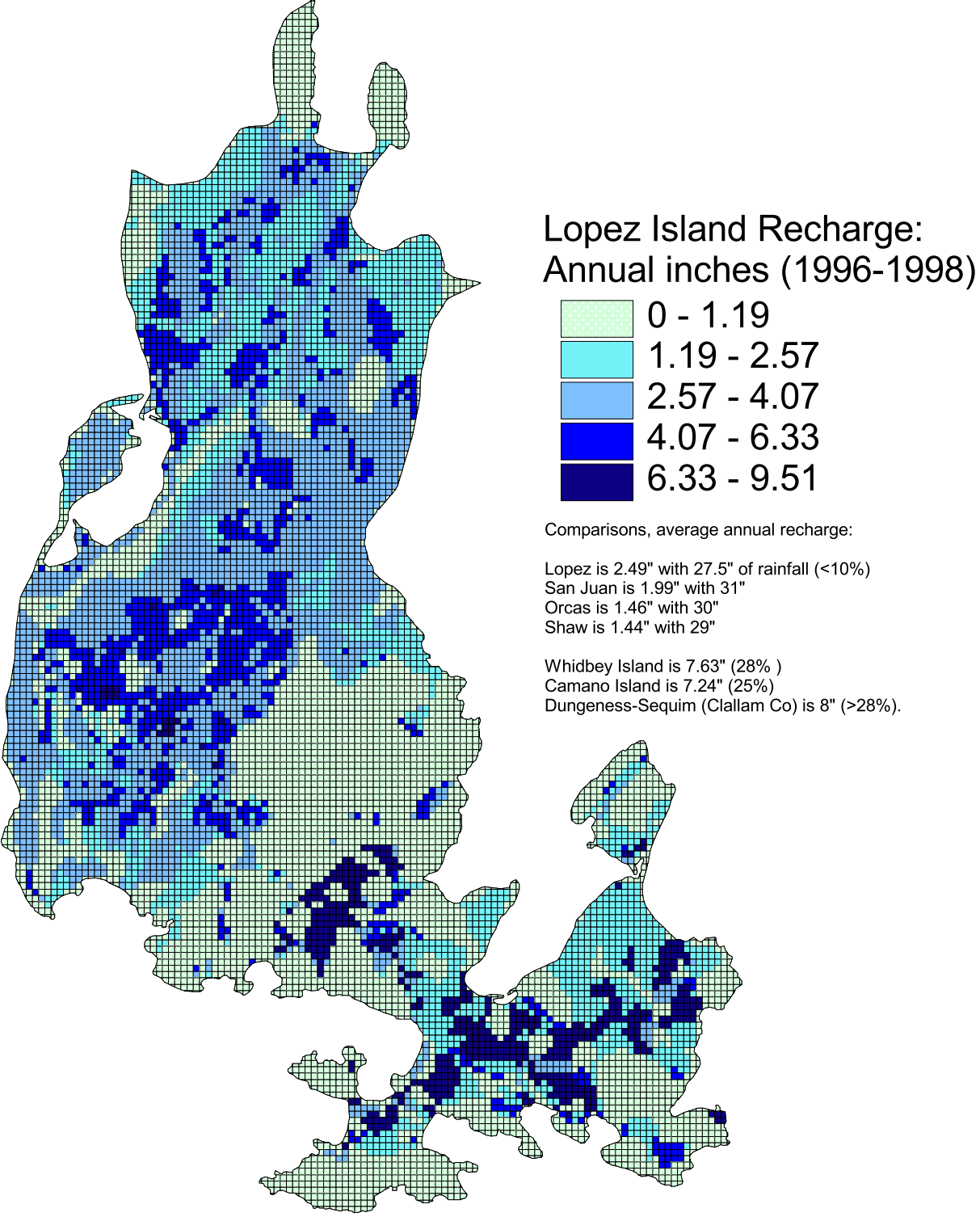


FIGURE 4. Estimated recharge for Lopez

Source: USGS, fall 2001

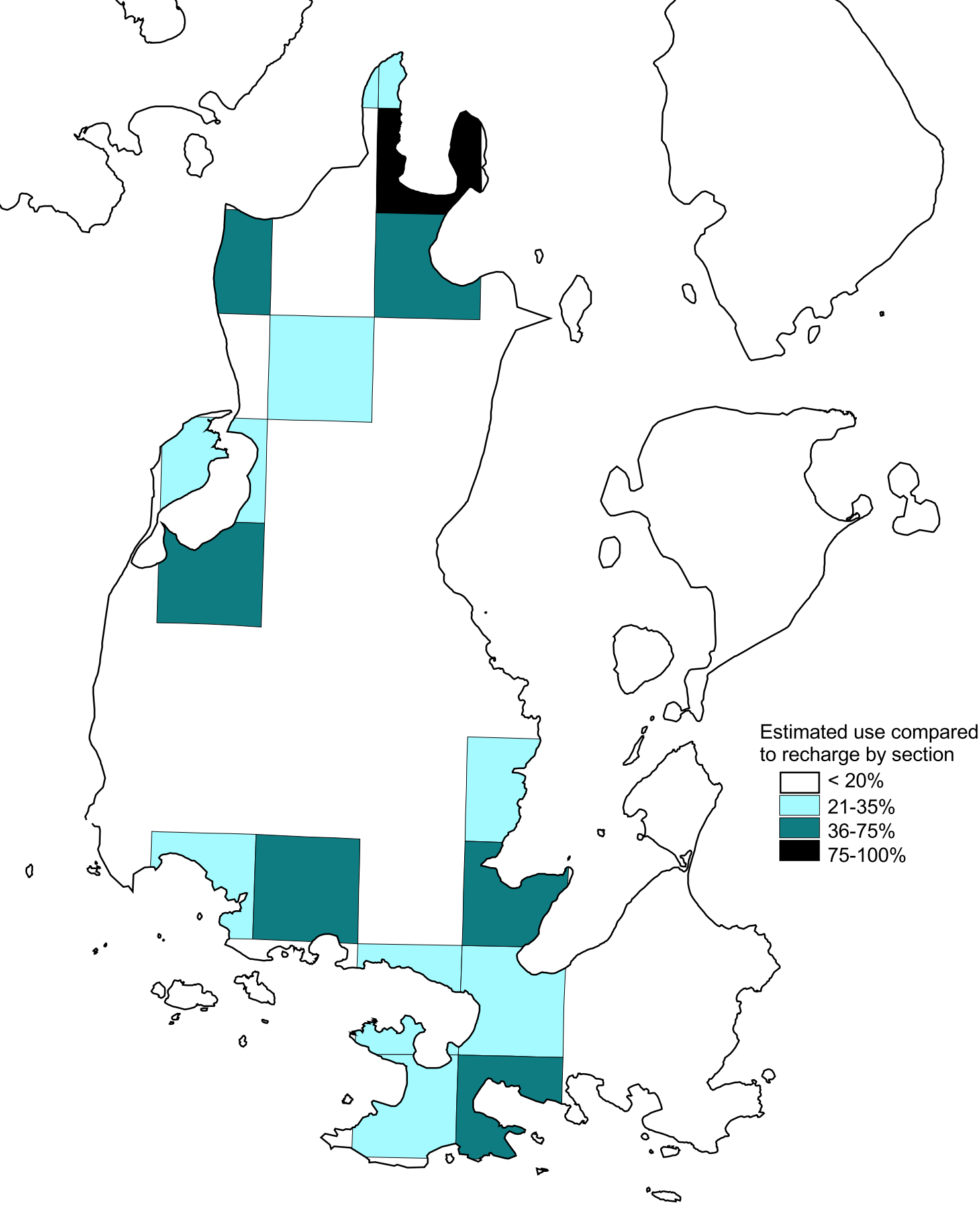


FIGURE 5. Estimated water balance, water use by section for Lopez.

Source: SJC WRIA 2 Basin Assessment, 2002

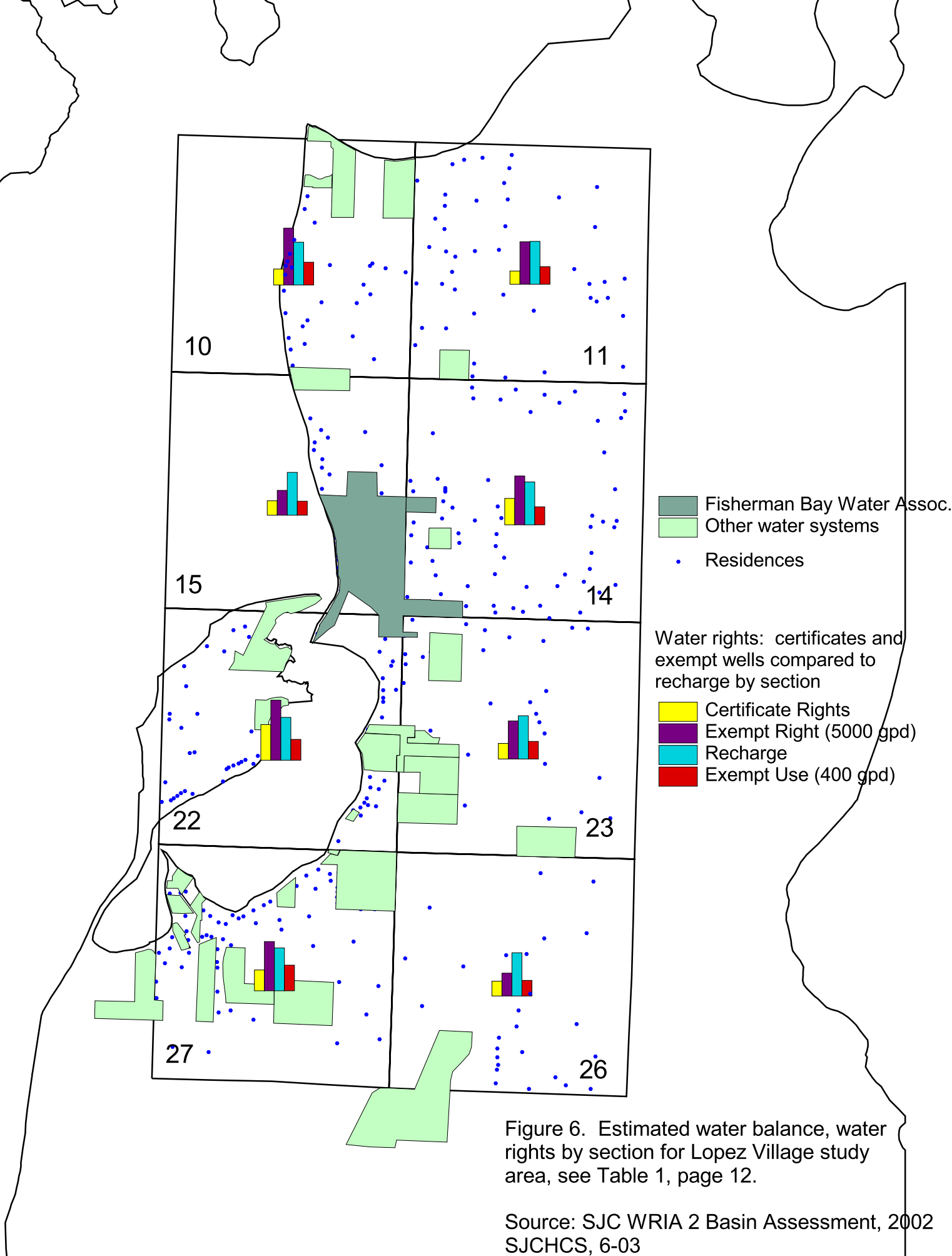


Figure 6. Estimated water balance, water rights by section for Lopez Village study area, see Table 1, page 12.

Source: SJC WRIA 2 Basin Assessment, 2002
SJCHCS, 6-03

Figure 7. Lopez Village Monitoring Sites, 2002-2003

Appendix C to
The Lopez Village Water Supply Report

A Summary Report on Water
Issues on Lopez Island, Washington

A. Introduction

This document is published as an Appendix to the Lopez Village Water Supply Report produced by the Lopez Village Water System Planning Committee. (LVWSPC)

This is a summary of information about water issues on Lopez Island, WA with emphasis on Lopez Village. The purpose of this report is to parallel and supplement the work of the LVWSPC and whenever possible expand the public's understanding of their choices when it comes to water supplies on Lopez. The information presented here is based on a series of more detailed working paper and surveys. These documents are available for review.

B. Issues and Studies

There are a number of issues and studies that impact this summary: We'll start with a discussion of the several of special significance.

1. UGA Issue - The availability of potable freshwater is of increasing concern to the people of the San Juan Islands of Washington. This concern has recently received extra attention on Lopez Island with a proposal by the Board of County Commissioners to designate a particular area incorporating Lopez Village as an Urban Growth Area (UGA). This designation[1] is the outgrowth of a determination by the state Growth Management Hearings Board that the boundaries and densities of the proposed rural activity center for Lopez Village in the 1998 plan did not meet the requirements of the Growth Management Act.

Planning Department and their consultants evaluated the boundaries and densities of the area under the requirements of the act, and found that those proposed in the 1998 plan could only be approved if the area was established as a UGA. The designation of Lopez Village as a UGA was done in order to make it possible to proceed with the plan for Lopez Village that was already in existence "as opposed to some new proposal that fundamentally changed the nature of the 1998 village plan".

[1] The Planning Department provided much of this discussion of the UGA and we are grateful for their effort. However, we aren't in a position to validate their views relative to the process.

With the boundaries and densities thus established, the planning department made growth projections and allocated growth to the Village in response to historic growth projections and countywide needs for affordable housing. Their analysis included two alternate estimates for the village based on 20% or 50% of residential growth on Lopez and Shaw islands being assigned to Lopez Village. The 50% allocation is the one they have been using as a working assumption for the 20-year growth of the UGA in capital facilities planning for the Village. The total number of residential units estimated in the Village in the year 2020 under these assumptions is 546 when an additional allowance for affordable housing is added to these percentage allocations.

This would be accomplished by changes in land use densities and other measures that focus much of the Lopez's growth into the UGA.

This proposal is not universally admired on Lopez and a number of alternatives are being considered. A primary issue in these discussions is: "Is water available to support the growth proposed for the UGA?"

2. Other Issues - The UGA is not the only water-related issue on Lopez. Most of the water used in both the UGA and the rest of Lopez is from wells. In some areas wells are already failing either from a lack of water or contamination by seawater. There are community water systems that have traditionally supplied water to all comers that must now refuse to supply water to new customers. There is an increasing use on Lopez of alternatives to wells such as rainwater catchment, desalinization (reverse osmosis, RO), hauling from off island, and the development of surface water sources. Another water related issue is the availability of water for fire protection. While some parts of the village are protected, other areas in the village and on other parts of the island aren't.

3. Other Studies - Recently studies have been undertaken by the county and the USGS that have direct implications to the study of water sources on Lopez. The county has been modifying its codes and regulations to clarify questions pertaining to water supply alternatives. An advisory committee (LVWSPC) is now undertaking an investigation of well water supplies serving the Lopez Village UGA. They are also considering other issues such as water rights and the coordination of existing water systems.

C. Study Areas

In this planning effort we are concerned with three areas related to the UGA (See the LVWSPC study report and the attached Figure B Lopez Village - Water Use Study Area (WUSA) at the end of this text.) They are:

1. The Lopez Village UGA Area - As now defined by the county the UGA has 369 acres and as defined by the separate water utilities the UGA currently has 253 nominal connections.

2. WUSA - Water Use Study Area - This is illustrated on "Figure B". Specifically it is the Lopez Village Urban Growth Area (UGA) plus about 156 adjacent acres that contain several water systems that are immediately adjacent to the UGA. The total area of the WUSA is (369 + 156) 525 acres.

3. Lopez Island as a whole.

D - 1. Water Systems and Water Consumption - Current and Projected - In Lopez Village

1. Summary - These are the major systems in the WUSA and the projections of water consumption for each. We have grouped together the smaller systems ("O(ther) WUSA Water Systems). In addition we have assumed the "Added UGA Housing" required to bring the total number of houses within the UGA up to 546.

	Conn. Current	Conn. Estim. 2020	Current Annual Use-MG	2020 Annual Use-MG	Current Peak M. Use-MG	2020 Peak M. Use-MG
Fisherman Bay	113	158	9.3	13.0	1.34	1.86
Galley Restaurant	1	1	0.4	0.6	0.04	0.06
Harbor	49	65	3.3	4.4	0.45	0.60
Islander Lopez Marina	1	1	1.7	2.0	0.19	0.24
Lopez Concrete	1	1	0.2	0.2	0.02	0.03
Lopez Village Park	1	1	0.1	0.1	0.02	0.03
Mariner/IMC/Norm.Hts	10	26	1.1	2.1	0.13	0.27
O. WUSA Water Systems	53	113	4.9	8.6	0.70	1.22
Total Above in WUSA	253	388	20.9	31.0	2.9	4.3
Added UGA housing	0	261	0	16.7	0	2.36
Totals	253	649*	20.9	47.7	2.89	6.67

* Of which 546 are within the UGA.

2. WUSA Water Consumption - The Impact of Meters - Both Harbor system and Fisherman Bay system are metered but the meters aren't used to establish water charges. We would expect, based on the above data, that were the individual meters used the consumption would drop in the range of 20% with no other action. Based on the above, water consumption in the WUSA is estimated to be: (Other values for comparison.):

Current -WUSA	21	MGY
Year 2020 -WUSA - No special conservation	48	
Year 2020 -WUSA - Full meter use	39	
Current - Friday Harbor	105	
Current - Eastsound	36	

3. Comparison of Systems (Consumption and Costs) This compares the single family residential (SFR's) units of several systems in terms of size and consumption. It also illustrates the impact of water costs on consumption and the impact of meters.

Water System	Eastsound	Frid. Har.	Harbor	Fish Bay	Cattle Pt	Potlatch
Island	Orcas	San Juan	Lopez	Lopez	San Juan	Guemes
Type of Units	SFR	SFR	SFR	SFR eq.	SFR	SFR
Source of Water	Surface	Surface	Well	Wells	RO	RO
Timeframe	Yr 2000	Yr 2000	Current	Current	Current	Current
Annual Total-MG	35.57	40.17	3.13	9.30	0.96	0.62
Peak Month-MG	4.74	5.36	0.45	1.33	0.13	0.06
Average Month-Gal/Conn	5,156	4,133	5,325	6,858	2,424	1,845
Nominal Connections	575	810	49	113	33	28
Peak Month-GPD/Conn	266	213	296	381	125	69
Ave.Month-GPD/Conn	172	136	175	225	81	62
Metered?	Yes	Yes	Yes	Yes	Yes	Yes
Charges Based on Meters?	Yes	Yes	No	No	Yes	Yes
Monthly Ch-@Ave Use	$ 31	$ 44	NA	NA	$ 81	$ 75
Monthly Ch-@4,000 GPM	$ 28	$ 37	NA	NA	$ 120	$ 130

*SFR=Single Family Res.

D – 2 Water Systems and Water Consumption - Current and Projected - In Rural Areas of Lopez Outside of Lopez Village

This information was derived primarily for modeling purposes and to provide a basis for future island-wide planning. Some of the data presented here varies slightly from earlier data as this information has been refined with time.

Well Water Use on Island outside of the WUSA - Current and 2020.

	Year	**2000**	**2020** 2.0%/yr
Houses on Community Wells			
Occupied (Full time) houses in rural area on wells		347	516
Vacant (Part time) houses in rural area on wells		258	383
Annual Water Use Full Time Houses in GPD/HU		188	188
Annual Water Use Part Time Houses in GPD/HU		63	63
Houses on Individual Wells			
Occupied (Full time) houses in rural area on wells		487	724
Vacant (Part time) houses in rural area on wells		363	539
Annual Water Use Full Time Houses in GPD/HU		263	263
Annual Water Use Part Time Houses in GPD/HU		86	86

Water Use in MG/Year		
Houses on Community Wells	30	44
Houses on Individual Wells	58	86
Agriculture-Veg. & Flowers-MGY	-	-
Agriculture-Winery-MGY	0.008	0.024
Agriculture-Cattle Ranching-MGY	1.75	1.75
Agriculture-Large Private Gardens-MGY	1.1	1.1
Undefined Points of Well Water Consumption-MGD	2.0	3.0
Annual Water Use in Rural Lopez in MG	92.7	136.5
Average Daily Consuption - Cubic feet	33,970	49,986

Sumarized Data for Model Use - Entire Island		
Year	2000	2020
	CFt/day	CFt/day
Consumption in WUSA	7,020	14,492
Consumption in Remainer of Island	33,970	49,986
Total Island Consumption-CF/day	40,990	64,477
	MG/Year	MG/Year
Consumption in WUSA	19.2	39.6
Consumption in Remainer of Island	92.7	136.5
Total Island Consumption-MG/yr	111.9	176.0

E. Groundwater

Groundwater estimates are developed elsewhere in the Lopez Village Water Supply Report produced by the Lopez Village Water System Planning Committee. (LVWSPC)

F. Alternative Sources of Water - Catchments

1. Current Status - Today there are probably more than 100 potable water catchment systems in use in San Juan County. They are typically permitted by the county if they meet established standards of design and construction. Many are for summer homes but systems for full-time residents are not uncommon. Some systems provide all of the required water while others supplement well water supplies.

At this time, the county is in conflict with state law by permitting residential catchment systems without requiring that individual obtain water rights (to the rain) from the

Department of Ecology. However, the current expectation is that a state rule, now being written, will allow rooftop catchments for residential units. In any case, the county continues to issue permits for residential catchment systems.

In the San Juans residential catchment systems are approved primarily where existing wells are failing due to diminishing water availability or quality issues such as seawater intrusion. In some instances, approval is given where a property owner can demonstrate that a new well will not produce a satisfactory water supply and where no other sources exist.

2. Rainfall - The starting point for planning a catchment system is in the rainfall patterns. We have developed what we feel is an appropriate design pattern for Central Lopez Island. It is based on records at 10 different Lopez locations over a six-year period of time. (See Working Paper - Rainfall Patterns On Lopez Island.) These are values in inches for a six year period.

Year	1	2	3	4	5	6
Jan	4.81	4.65	3.27	4.62	2.24	2.55
Feb	2.24	3.23	0.83	3.53	1.65	1.50
Mar	2.47	2.94	2.79	1.93	1.52	2.35
April	1.72	1.89	0.36	1.09	1.61	1.43
May	1.39	2.63	2.17	2.21	2.74	0.78
June	0.43	1.63	1.27	1.80	0.97	1.75
July	0.31	0.96	1.18	0.88	0.56	0.56
Aug	0.32	0.53	0.08	1.79	0.96	0.93
Sept	2.22	1.84	0.21	0.23	1.41	0.66
Oct	3.71	4.05	1.14	2.78	1.86	4.49
Nov	4.68	2.25	7.03	3.68	2.02	3.37
Dec	5.38	2.58	6.14	4.37	2.41	4.69
Annual	29.68	29.18	26.47	28.91	19.95	25.06

3. Basic Components of a Residential Rainwater Catchment System - Catchment systems used in the US are designed to meet appropriate public health standards. Typically such a catchment system constructed to provide potable water has six basic components.

- Catchment area, typically a roof. The favored roof material for new systems is enameled metal, but other less efficient materials are used. The theoretical maximum rate of rainwater collection is 0.623 gallons per inch of rain per square foot of horizontal roof area. However based on the materials it seems prudent to base preliminary planning on catchment rates of between 0.45 to 0.60 gallons per inch of rain per square foot
- Gutters and downspouts
- Leaf screens and roof-washers
- Storage tanks
- Conveyance, the pipes that carry the stored water to the "point of use".
- Water treatment

Where the rainwater is being collected for non-potable use such as garden watering, the water treatment element is generally not included.

4. Initial Costs - Each situation differs but after questioning several installers and owners we have defined a basic system for consideration near Friday Harbor. It would already have available about 2,000 SF of roof area; it would have three to six water tanks, each with an effective storage volume of 2,100 gallons; and it would have all necessary treatment. The home would be for two people living full-time; they'd have a full compliment of fixtures, all "water savers"; outside water use would be minimal in dry months and they would be conscious of the nature of the water supply. Most people questioned said that an estimate of the initial costs in the range of $10,000 to $15,000 seems appropriate.

5. Planning Examples - We have developed a planning model for catchment systems on Lopez Island. The primary assumptions used in this planning example are:

1. Design rainfall per the Working Paper-Rainfall Patterns.
2. Water use for a single-family residence and for Domestic or Irrigation use.
3. Efficiency of Water catchment = 98%, assuming a metal roof material.
4. In the six years of the model life the storage tank will never go empty.

The requirements of two systems are:

Location	Mud Bay	Lopez Village
House Use	Domestic	Irrigation
Roof size-SF	1,700	1,700
Catchment Volume-Gal.	12,000	12,000
Average GPD	66	120

Conclusions – If we were to construct a domestic system with 12,000 gallons of storage and a 1,700 SF roof we could rely on 66 gpd (87 gpd summer, 55 gpd winter). Increasing the storage would increase the flow by no more than 10%. Systems using desalinization are in the same range of use. Municipal systems provide twice that flow. Whether this system would meet the needs of an individual home is a function of personal lifestyle. It is doable but it is not for everyone.

Clearly, when one is relying on domestic catchment systems, household conservation is important; low flush toilets, low use fixtures, and so on. Perhaps the best conservation measure can be found in the homeowner's attitude.

The annual amount of water from the irrigation system is roughly 18,000 gallons or 30" of water over 1,000 SF. 30" of water is a typical irrigation amount. Thus this system could provide water to a decent sized "victory garden".

G. Alternative Sources of Water - Hauling Water

1. Current Practice - As an alternative to wells, desalinization, surface water, or catchments it is possible to purchase water from water purveyors on the mainland and within the county. The state and county have strict requirements for haulers, their equipment, and their water sources. In summary, a hauler and his equipment must be certified and the water must come from Class A water sources.

While some users have purchased water for a period of time, it is most common that water is purchased to fill catchment tanks at start-up or to overcome well problems for the short term. There are certified haulers on Shaw, Orcas, San Juan and in Anacortes. There does not appear to be a certified hauler on Lopez, though several individuals do haul water for non-potable uses. It may be that the impediment to water hauling from Lopez is that the Class A water systems do not have an excess of water

It would appear that water for hauling could be available from Anacortes in the long term. Sources in the county may be a little more problematic.

2. Costs - Water can be hauled to Lopez users, but at this time it is only available from off-island sources. It is available in loads up to 4,500 gallons. The price of water in full loads is in the range of $0.11 to $0.15/gallon. Were a hauler to be certified on Lopez with a source on island, the costs would be reduced somewhat.

H. Alternative Sources of Water - The Anacortes Pipeline

Anacortes gets its water from the Skagit River at a site near Burlington. The water is drawn into a treatment plant and then pumped through a large pipe to Anacortes. Along the way, water is served to La Conner, Oak Harbor, the March Point oil refinery and finally, Anacortes. Currently the water treatment plant is supplying 17.5 million gallons per day (mgd) on an average day and 26.9 mgd on a peak day. The plant is rated at 30 mgd. It is evolving plans to increase the capacity to 50 mgd in the next few years and to about 85 mgd before the year 2040. The March Point oil refineries currently use about 65% of that available.

Based on 2.2% annual growth the San Juan County population in 2050 will be about 42,000. Today about 14,000 are served water "internally." If we assumed that the limits of water supplied in 2050 would be 21,000 people, then there is a need to import water for 21,000. At 400 gpd/connection and 3 people per connection, the import need would be 2.8 mgd.

As to costs, preliminary calculations suggest that a piped transmission system could carry that much water in a 12-inch line or two 8-inch lines. It would be premature to suggest the feasibility of such an undertaking, but it should not be rejected out of hand. In 1994 an estimate was made for a smaller Anacortes/San Juan pipeline of $5,100,000.

I. Water for Fire Protection

1. Fire Protection on Lopez - Like for many rural areas, fire protection is a community activity, typically a fire district, combined with individual common sense. The fire district is the most visible. In the year 2001 the District answered 201 aid unit calls and 51 fire calls. The fire calls in 2001 were:

Structures	8	
Wildland	8	
Vehicle	3	
Hazardous Materials	2	
Missing Persons	1	
Smoke	17	
Other	12	
Total		51

2. Water for Fire Protection - Like many rural areas, Lopez is not covered by a network of pipes to transmit water to hydrants for direct fire fighting. Basically, fire protection on much of Lopez depends on hauling water quickly. It is not enough to have water stored in useful locations it must also be easily available and in large quantities (500 gpm and more). This means convenient, well marked, high capacity hydrants with ample related storage.

There is another critical issue to consider. There is a need for cooperative agreements between the water systems and the fire district that define the conditions of use BEFORE the event.

3. Fire Protection in the Village - System reservoirs in the Village that can provide significant protection capabilities are:

	Reservoirs Over 8,000 Gallons Volume-Gals	Hydrants Suited to High Capy Fire Protection
Fisherman Bay	150,000	Y
Harbor	20,000	N
Island Camp	48,000	Y
Islander Marine Resort	46,500	Y
Mariner Hill/IMC/Normandy Heights	26,500	Y
Milagra #1 & #2	18,000	Don't Know
Top of the World	23,500	Y

4. Reservoirs Outside of the Village - In addition are the 17 systems outside of the village with reservoirs in excess of 8,000 gallons (excluding individual catchment tanks). At least 8 are equipped with hydrants suited to high-capacity fire protection. The others probably need replumbing to be of particular value for fire protection.

	Reservoirs Over 2,000 Gallons Volume-Gals	Hydrants Suited to High Capy Fire Protection
Aleck Bay Park	32,000	N
Cape St Mary Association A & B	30,000	Y
Cedars Water System	9,600	Don't Know
Davis Head	90,000	Y
Flat Point	27,000	N
Hodgson Place Short Plat	8,000	Don't Know
Humphrey's Head	30,000	Y
Islandale Fire Station-Non-Potable	10,000	Y?
LGH Water System	10,000	Y
Lopez Sch. Fire Protection-Non-Potable	40,000	Y
Lopez School Potable Water	30,000	N
MacKaye Harbor Water Co./Salmon Pt	30,000	N
Richwood Maintenance Corp	10,800	Don't Know
Shoal and Swift Bay	40,000	Y
Snug Harbor	32,000	N
Spencer Spit State Park	32,400	Don't Know
Sperry Peninsula	50,000	Y

5. Summary-Fire Protection

- While the availability of "hauled" water for fire protection in Lopez Village is good, it can be improved.

- The rest of the island is not well covered, though things can be improved by adding high-capacity hydrants to four or more existing reservoirs. It may also be worthwhile to add "Draft sites[2]" for fire protection water at six or more sites on the island.

- Perhaps as important as water, is reaching agreements with the water companies defining conditions of use of their hydrants and reservoirs.

- The issue of providing for hauled water throughout the rural areas of Lopez does not appear to have been of high priority over the last eight years.

The new fire chief has undertaken the initial gathering of information to make it possible to focus more on water supply issues. This working paper is part of that effort.

J. Alternative Sources of Water - Desalinization (Reverse Osmosis - RO)

[2] Draft site is one of several used for reservoirs that as established specifically to provide water to fire trucks. The 40,000 gallon tank at the school and the 10,000 gallon unit are examples.

1. Systems Surveyed - A major aspect of this study was to locate RO systems nearby and determine if they provided precedence for Lopez Village or other parts of Lopez. A number of RO based systems were contacted and these nine were surveyed in more detail.

System Name	RO System Function	Service Date	Approved Conn.	Current Capy-gpd	Capacity/ Connection
Cattle Point	Primary	1999	60	21,600	360
Center Island	Primary	1991	135	4,000	30
Eliza Island	Primary	1993	62	16,000	258
Guemes Island	Primary	1998	33	30,000	909
Hat Island	Primary	2002	236	40,000	169
Mineral Point	Summer	1998	19	7,600	400
Mitchell Point	Summer	1996	44	12,000	273
Sperry Peninsula*	Primary	2002	50	12,500	250
Spring Point	Back-up	2001	60	7,000	117
Totals			699	150,700	216

*Connections shown is an equivalent value based on peak month's use of 250 gpd per connection.

2. Costs - Information on capital and operating costs are included as are consumption comparisons to other non-RO systems. Capital costs for systems in the 40 to 160 connection range are projected to be between $6,750 and $4,875. Unit charges for operating RO systems are typically in the range of $0.03 to $0.04/gallon as compared to less than a cent for Friday Harbor and Eastsound. However, as RO system connections tend to more conscious of water use, the monthly spread in charges is closer to 2 to 1.

3. Regulations and Policies Impacting the Use of Desalinization (RO) Systems in San Juan County - There are a number of state and county regulations and policies that impact the use of desalinization systems in San Juan County. That such systems are permitted by the regulations is demonstrated by the existence of at least six such systems in the county. (See Working Paper - Regulations and Policies Impacting the Use of Desalinization Systems in San Juan County.)

4. **Summary** - That there are nine RO systems within a short distance suggests that RO systems can be feasible in some situations. This county, other counties, the state and the federal governments have allowed RO systems to be constructed for community systems with appropriate limits and safeguards. Permitting is an issue in every system constructed but that too is getting, marginally, easier.

The two greatest impediments in planning an RO system are costs and organizational obstacles. Even these have been resolved where no cheaper alternative can be found and where the water associations have the will.

5. RO System Surveys - In preparing this working paper we contacted operators of a number of systems and gathered information from using a standard survey format. Of the systems contacted, nine had adequate information to make completing the survey

worthwhile for our purposes. The survey identified the persons interviewed, a history of the system, the number of customers, the nature of the present system and costs. The consultants are identified and a brief comment on what they anticipate the future of the system will be. Each survey was sent to the system operator for review and each survey was modified to reflect their comments. The surveys are attached to the RO working paper.

K. Alternative Sources of Water - Elsewhere on Lopez

1. Hummel Lake - We do not believe that Hummel Lake has either the volume or the quality to serve as a viable source to a UGA Village.

2. Wells in other areas - Water from wells in areas other than the village offer promise. For instance, the L2 Study Area (Recharge study) has a recharge value of 2.78 inches and a relatively light population. The basin area is 1.63 square miles or 1040 acres. Assuming an available fraction of 20% (as we did in the UGA drainage area) the area could, in theory, produce about 15 million gallons per year. This is more than the well shortfall that was predicted above thus it should be of interest.

There are several impediments to this program including costs. However, the most significant is certainly the problem of cooperation. That is getting the water users in the village to agree; and then getting the landowners in Basin L2 to agree; and then getting the two groups agree; and then getting the permits.

L. Responses

This document has been under review for several months and we have responded to questions and comments from a number of people. This summarizes my personal responses to the more significant issues that have been raised.

1 .Water Use - We have taken some care in projecting water use in the village and the surrounding basin. The numbers for the current village situation (20± MGY[3]) are probably very reliable. Our estimates for 2020 suggest use in the range of 25 to 48 MGY. These estimates are probably as reliable as any of similar nature.

2. Conservation - This could reduce water use 15% - 20% simply by beginning to read meters and charging for the water. More can be accomplished by continuing emphasis on other forms of conservation. However, until the water purveyors and their customers perceive that there is a serious justification for doing so, conservation won't happen. Simply to "free up" water so that other people can move into the village is not generally accepted as sufficient justification.

3. Alternatives Water Sources - Water hauling or pipelines to Anacortes don't have much to commend them as water sources. There are alternative sources that can make up

[3] MGY is million gallons per year.

the shortfall such as remote well field development and reverse osmosis. They involve significant cost but may be within reach if the community is determined to meet the UGA growth objective. I've seen little sign of this.

Catchments are flexible and reliable water sources for individual homes well separated from water systems. That they are being constructed right now in more densely settled areas might suggest the failure of our rag-tag collection of Village water systems to serve public needs.

4. Fire Protection - In the village things aren't too bad. In the countryside, things aren't too good. In either case, improvement is within reach. The primary problem is that in the past the rules of the day allowed some developers to build systems too small and too cheap. For the most part current rules work much better but we still have some inherited problems to solve.

5. Adequacy and Governance

This is what I have come to believe relative to water supplies in the village:

- The lack of effective water supply system governance may well be the most serious water supply issue to be dealt with.

- The aquifer serving the village is adequate in the short term. However, it does not have an unlimited capacity.

- It can't be determined at this time if there is enough water in the aquifer for the UGA or the WUSA through 2020. In the first place the UGA is a moving target and in the second place, there is more technical analysis to do. However, my inclination is to say that, with care, it's OK.

- All of the village systems are drawing water from either a single aquifer or several that are closely linked hydraulically.

- The first step in improving the long-term ability of the aquifer to serve the village is the continued monitoring of its condition and the use of water by the major suppliers. This will require the active, effective participation of all of the major water systems.

- At such time as monitoring demonstrates a need, conservation measures should be undertaken in all of the systems drawing water from common aquifers.

- One measure likely to be effective will be metering, first to detect leaks and then to apply an economic incentive for conservation.

- Initially, the water systems should join into some form of water association. It can be informal but it needs to be effective.

- In the longer term, the water association may become more formal even to the point of physically joining systems and operation. This should be a local choice. If the water systems continue their separate ways the possibility of serious water problems and costly solutions is very real.

6. Where do we go from here? - In my opinion the most important immediate water issue on Lopez, especially in the village, is the effective long-term public monitoring of the aquifer(s). The work needs to be done by the water associations working together and reported periodically to the public.