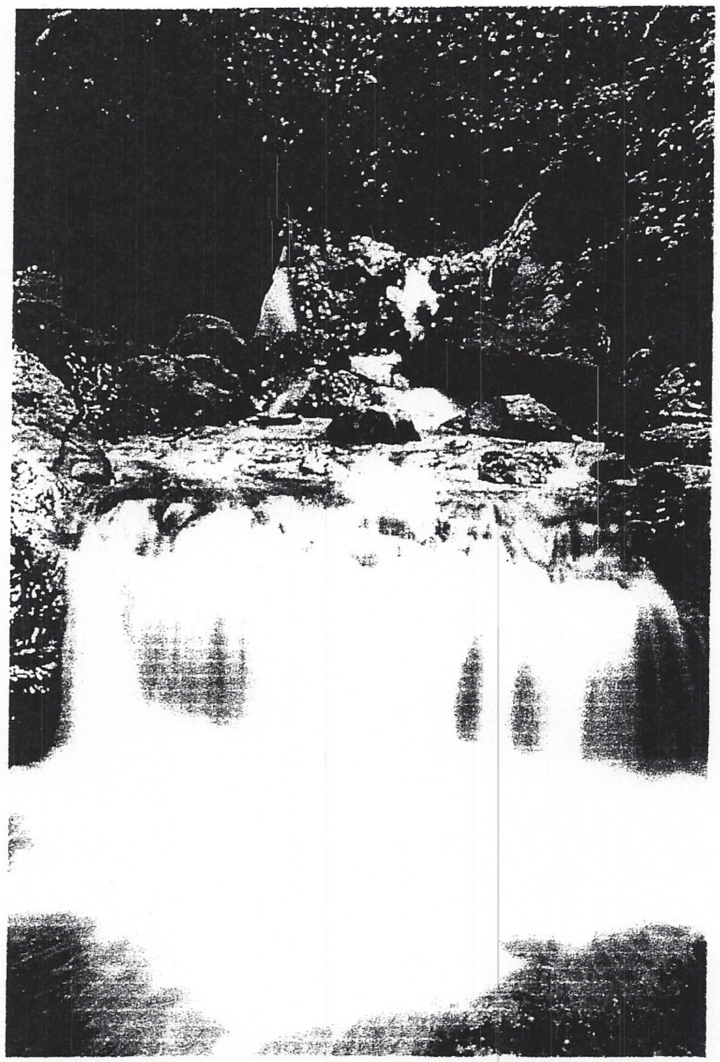
SALT SPRING ISLAND

POTABLE WATER SUPPLY AND DEMAND ANALYSIS



DRAFT REPORT

Prepared by SSI Water Council
Peter Lamb, Coordinator

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Acknowledgements

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The conclusions and recommendations are the solely those of the author.

Cover photograph: courtesy of David Denning

1. EXECUTIVE SUMMARY

"Critical to life in all its diversity, water is the lifeblood of society and a foundation of civilization. In addition to drinking water, freshwater ecosystems provide other fundamental "ecosystem services" such as irrigation water, habitat for wildlife, reserves for biodiversity, flood control and drought mitigation, mechanisms for environmental purification, and sites for recreation. All these functions are essential to the ongoing health and development of society".

Source: "At a Watershed", O.Brandes

No one would question the critical importance of a safe, sustainable and reliable supply of potable water for human use. It is also recognized now that the protection of the ecological values of our lakes and streams is a priority and irrevocably linked to human health. This, coupled with the current uncertainty in water supply capacity from both surface and groundwater sources, demands a precautionary approach to watershed management.

The purpose of this analysis is to consolidate all existing information on current and projected potable water supply and demand on Salt Spring Island in order to assist the Islands Trust and Capital Regional District (CRD) make more informed decisions, both with respect to future density and potable water delivery. In addition, a public workshop is proposed to discuss the results of this analysis, implications for future availability and quality of island water resources and potential impact on land use planning policies and decisions.

This analysis does not address water quality issues except to acknowledge that poor quality water clearly affects available supply and use by humans and animals.

The role of regulatory agencies in potable water supply is considered, noting the complex array of federal, provincial and local jurisdictions involved. The proposed modernization of the BC Water Act is underway and may resolve some of the jurisdictional and water management concerns.

Surface water sources account for 80% of total water supply and, of that amount, 75% is managed by the North Salt Spring Waterworks District, confirming its key role in the delivery of potable water on the island. Accordingly, the analysis is focused on the NSSWD current and future supply and demand situation. For planning purposes, a long-term forecast model was developed to project expected future water demands for the St. Mary and Maxwell Lakes delivery system under existing licence limits and different demand scenarios. A base case is included for discussion purposes, which indicates surplus capacity for at least the next 10 years barring any major disruptive events or major drought conditions. The implications of various drought events is considered in an update report by Bob Watson, NSSWD trustee

Updates are provided on current water supply and demand for all fifteen community water systems on Salt Spring and attention is drawn to the imprecise metering and limited end-use data on which to base a more complete analysis. Build-out forecasts for residential, commercial and institutional users provided earlier by the Islands Trust also need validation.

This draft report summarises the results of the analysis and provides conclusions and recommendations for further consideration.

2. INTRODUCTION

2.1 Water is life

No one would question the critical importance of a safe, sustainable and reliable supply of potable water for human use. It is also recognized now that the protection of the ecological values of our lakes and streams is a priority and irrevocably linked to human health. This, coupled with the current uncertainty in water supply capacity from both surface and groundwater sources, demands a precautionary approach to watershed management.

The current Official Community Plan (OCP) policy on Potable Water Quantity and Supply affirms this position:

- To apply the precautionary principle in ensuring that the density and intensity of land use is not increased in areas which are known to have concerns with the supply of potable water. (section C.3.1.1.1)
- To acknowledge that the surface water supply sources on the island are finite and remain under Provincial control and that more effective use, management and sharing of the resource should be encouraged to support present commitments and future desired land use decisions. (section C.3.1.1.2)

2.2 Purpose and Scope of the Analysis

The purpose of this analysis is to consolidate all existing information on current and projected potable water supply and demand on Salt Spring Island in order to assist the Islands Trust and Capital Regional District (CRD) make more informed decisions, both with respect to future density and potable water delivery.

During the current term of office, the Salt Spring Island Local Trust Committee and Trust staff is expecting to review and amend the Land Use Bylaw. This will involve important decisions about the future of development on the island. The LTC also will be considering measures that will be required for climate change mitigation and adaptation, for increasing food security (with a likely significant impact on water demand), and for potential additional densities to meet affordable housing needs. To do this effectively, the Local Trust Committee will benefit from a more thorough study of available water supply on the island, and of ways to conserve water.

At the same time, the Capital Regional District is expected to undertake a study of the ways that community water systems on Salt Spring Island provide potable water to their customers, and will be considering measures to assure efficiency and reliability of water delivery.

These activities point to the need for more understanding of current information on the available potable water supply on the island, projected water demands on those resources and potential sensitivity to likely impacts. This analysis will also provide useful information for addressing proposed changes to the provincial Water Act.

In addition, a public workshop is proposed to discuss the results of this analysis, implications for future availability and quality of island water resources and potential influence on land use planning policies and service delivery decisions.

This draft report summarises the results of the analysis and provides conclusions and recommendations for further consideration. Major reference sources are listed in Appendix 1.

2.3 Water quality considerations

Water quality in the island's natural lakes, streams and groundwater is a significant concern. This analysis does not address water quality but it is clear that if the quality is so poor as to render water unsuitable for use and expensive to treat, that is another factor affecting the available supply and use by humans and animals. Information on water quality, its causes, and remedies, can be seen in the watershed management plans for Cusheon Lake (2006) and St. Mary Lake (2008).

It is now accepted that human health is linked to ecosystem health and that protection of the ecological values of our wetlands, lakes and streams is vital to sustaining a healthy community and safe, reliable supplies of potable water on our island. A healthy ecosystem also offers economic benefits for the community; it has been estimated that a hectare of wetland has an economic value of $5,792 to $24,330 a year through water purification, flood control, animal refuge and more.(*Living Water Smart, Conserving and Restoring Watersheds, Feb..2010*)

3. REGULATORY CONSIDERATIONS

In view of its critical importance, regulation of potable water resources is an essential public service and one that involves a wide range of jurisdictions and authorities. Water governance is a broad and complex concept that includes the laws and regulations, the agencies and institutions that are responsible for decision-making and the policies and procedures that are used to make decisions and manage water resources. The following sections summarise the key elements and significance of water regulation in British Columbia.

3.1. Fisheries Act

The main federal legislation governing water resources is the Fisheries Act which was established to manage and protect Canada's fisheries resources. As federal legislation, the *Fisheries Act* supersedes provincial legislation when the two conflict. Consequently, approval under provincial legislation may not necessarily mean approval under the *Fisheries Act*.

While the Federal Government has the authority to manage fish habitat, it has essentially no control over the use of inland waters, beds of watercourses or shorelines which fall under provincial jurisdiction. Alternatively, the provinces cannot make regulatory decisions concerning fish habitat.

The prime focus of regulatory activity is Section 35 of the *Fisheries Act* which includes a general prohibition of harmful alteration, disruption or destruction (HADD) of fish habitat. However, all the habitat protection provisions must be considered when reviewing the negative effects of a project on fish habitat, including fish passage around obstructions and fishways, the provision of minimum flow below obstructions and a prohibition against the deposit of deleterious substances.

3.2 BC Water Act

The *Water Act* is the primary law in BC for managing our water resources and has a key role in ensuring the sustainability of BC's water resources.

Under the Water Act, the provincial government makes decisions on licences to:

- divert and use water in streams (water allocation);

- construct works or make other changes in and about a stream; and
- change or transfer water licences.

In this context, "stream" includes a natural watercourse or source of supply, whether usually containing water or not, and a lake, river, creek, spring, ravine, swamp and gulch. Water management planning, water allocation planning and drought management are also included in the *Water Act*. Note that "conservation" as a use under the *Water Act* is limited to conserving fish and wildlife.

To respond to new challenges that exist for managing our water, including dealing with population growth and climate change, the provincial Ministry of Environment is looking at ways to modernize the *Water Act*. A Discussion Paper has recently been released setting out four goals:

a. Protect stream health and aquatic environments
b. Improve water governance arrangements
c. Introduce more flexibility and efficiency in the water allocation system
d. Regulate groundwater extraction and use in priority areas and for large withdrawals.

The Gulf Islands have been designated as one of the "priority areas". Initial public feedback on the Paper is requested by April 30, 2010.

3.3 Water Licencing

To use surface water in BC, a user must obtain a licence from the Ministry of Environment, Water Stewardship Division. Groundwater is not licenced at this time. Licences are held for a variety of purposes, including domestic, agricultural, industrial and conservation. Unrecorded water (water that is not allocated under a licence or special legislation, or reserved for other purposes such as fish habitat) may be used, without licence, for firefighting, domestic or mining purposes. However, since unrecorded water may be subject to a licence in the future, most water users obtain licences to secure use rights.

Licences establish a hierarchy for water use with the earliest licences taking precedence over users of unrecorded water and more recent licences when water shortages arise. (known as the "first-in-time, first-in-right" or FITFIR method of water allocation). Rights held under licences are not absolute. They are subject to the rules in the *Water Act* and its regulations, the terms set out in the licence, orders of the comptroller and engineers designated under the *Water Act*, and the rights bestowed on all licences that have precedence or seniority.

Several key concepts form the basis of the existing water management regime in British Columbia. These include:

Prior allocation:	determining the priority of a water licence based on the date of the water licence;
Appurtenance:	licences must be attached to a specific parcel of land or undertaking;
Purpose:	licences may be held for a variety of purposes, including conservation;
Associated works:	licences require the licence holder to undertake "works";
Use it or lose it:	if the water is not used for three years the licence holder may lose the licence; and
Pay for use:	the licensee must pay an annual water rent charge based on volume of the licence.

Source: "Water Licences and Conservation": Brandes and Curran

3.4 Water Allocation Plan for SSI

Water Allocation Plans are water supply and demand studies conducted on a watershed basis that determine the amount of water that is still available for allocation and the amount needed for conservation. The current Water Allocation Plan for Salt Spring Island was issued in November, 1993. At that time, the total licensed demand by purpose within the Salt Spring Island Water Allocation Plan area is summarized in Table 1 below.

Table 1: Total licensed demand by purpose (*SSI Water Allocation Plan, 1993*)

Purpose	**Licensed quantity**		**Percentage**
		Equivalent Flow &Volume	
Domestic	174,100 gpd	288,800 m3/yr	9.9%
Irrigation	437.1 ac.ft.	539,200 m3/yr	18.5%
Industrial Enterprise	38,700 gpd	64,200 m3/yr	2.2%
Conservation	58,557 gpd	97,100 m3/yr	3.3%
Waterworks	1,564 ac.ft.	1,929,200 m3/yr	66.1%
TOTAL	**2,366 ac.ft.**	**2,918,500 m3/yr**	**100.0%**
Storage	430.6 ac.ft.	531,100 m3	

At St. Mary Lake, the Plan states that "*the maximum recorded water level was 41.415 metres* [GSC or relative to sea level] *on February 9, 1992 and the minimum was 40.035 metres on October 25, 1987. The normal annual lake water level fluctuates between 40.0 to 41.0 metres GSC*" and the Plan proposed that "*a storage structure should be required to control lake water levels within this lake fluctuation range to mitigate the adverse effects on the fisheries resources of existing and future licenced water withdrawals.*"

It also noted that "*Lake Maxwell has been a source of licensed water supply for waterworks purpose since 1939*" and that an Order-in –Council *"reserves all the unrecorded water in the lake for waterworks purpose."*

At Cusheon Lake, the Plan notes that there is no control on the outflow from the lake and that *"further withdrawals from the Lake may extend the period of zero flow in Cusheon Creek and adversely affect the water available to support fish habitat and migration."*

Other lakes, including Weston Lake are identified and "*any significant withdrawals from these lakes may adversely affect the water available to support fish habitat and migration.*"

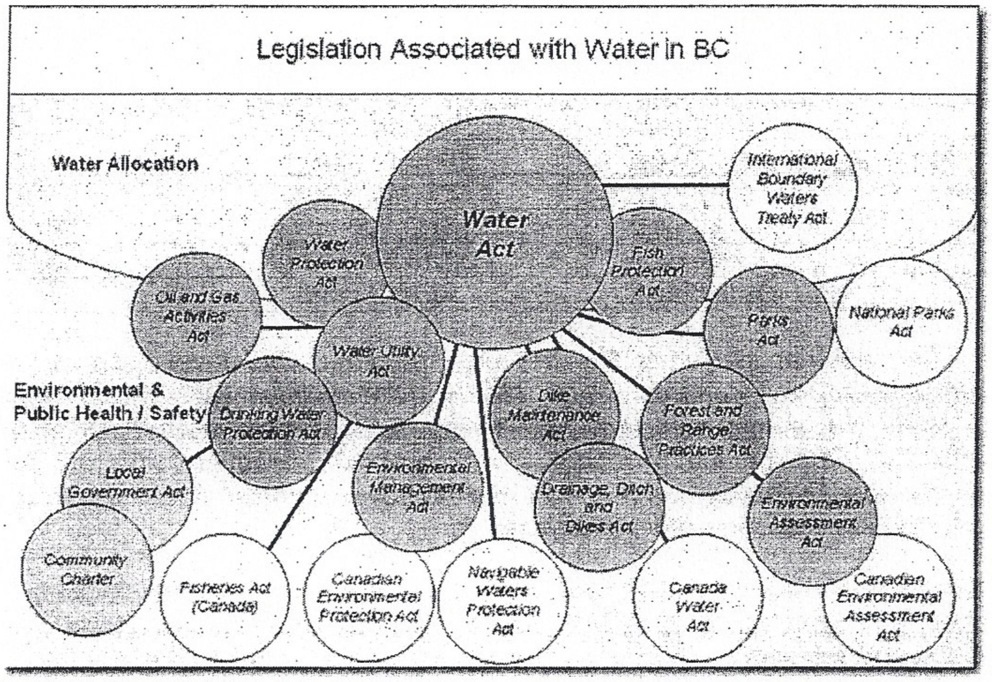
The Water Allocation Plan recommended "*that no further significant allocation of water be made unless all existing and proposed significant licenced demands are to be supported with storage.*"

3.5 Water governance

The Water Act Modernization Discussion Paper describes water governance as "the *process of decision making – who decides and is accountable for the decision, what the parameters of the decision are, and how decisions are made.*" In essence, the proposed goal of improving governance in the Water Act is to broaden participation in the decision-making process to include First Nations, citizens, professional associations, business, industry, and communities. This contrasts with traditional centralized approaches to water regulation in BC.

3.5.1 Federal/Provincial Jurisdiction

Underlying the concept of water governance in Canada is the recognition of Crown ownership of water resources which, "*will continue to be managed in the public trust for current and future generations*". (*WAM Discussion Paper*). Perhaps in view of this, there are multiple federal and provincial government departments and agencies currently involved in water management in BC, often with overlapping jurisdiction, which the proposed amendments to the BC Water Act will need to address. There are seven federal Acts and fourteen provincial Acts that apply to water.



Source: Living Water Smart, Ministry of Environment

3.5.2 Local Jurisdiction

On Salt Spring Island, drinking water is supplied and managed by fifteen community water systems and an undetermined number of individual wells and direct surface water licencees.

Land use activities clearly affect the health of our water resources. As the land use planning authority on the island, the Islands Trust establishes Official Community Plan objectives and policies, development permit area guidelines and zoning bylaws which regulate the permitted uses, lot coverage and subdivision potential. Section 5.5 of the Land Use Bylaw also establishes standards for potable water quantity and quality. (Appendix 2)

3.5.3 Community Water Systems

Of the fifteen community water systems, five are supplied from surface water sources and ten from groundwater sources. Currently six of the districts are owned and managed by the CRD and others are in the process of reviewing transfer of their service to CRD.

A complete list of the current Salt Spring Island community water systems is shown in Appendix 3 together with basic data on connections, licensed supplies or well capacities and water demand. A distinction is made, wherever data is available, between "bulk" water produced at the source and consumption by end-users – the difference being "non-revenue" uses such as distribution losses, flushing of mains and fire-fighting.

The North Salt Spring Waterworks District (NSSWD) is, by far, the largest water district on the island with approximately 75% of connections and current water demand of all water districts. NSSWD operates its own and six other community water systems, including three owned by the Capital Regional District (CRD).

For the CRD service systems, staff report that, "*in some cases growth is limited by water availability at the source and the CRD would recommend against land-use changes that may increase water demand*". Also that "*land-use policy would restrict growth within the capacity of available water supply for at least the next decade or two.*" For Fulford, it is noted that growth would be limited more by its capacity to manage sewage without a public sewage collection and treatment system.

4. SURFACE WATER SOURCES

4.1 Lake Characteristics

The physical characteristics of the nine larger freshwater lakes on Salt Spring Island are described in the revised November 2009 report by John Sprague, summarized below and in Appendix 4.

St Mary Lake dwarfs all the other lakes in size and amount of standing water, amounting to 16 million cubic metres (m3) of water while other lakes range from a little over 2 million m3 to only about 0.1 m3. The annual inflow into the lakes is greatest for the lakes with the biggest drainage basins. Cusheon, Ford, St. Mary and Blackburn Lakes have inflows of 3 to 4 million m3 per year, Stowel lake has an annual inflow of 2 million m3 while Bullocks, Maxwell, Weston and Roberts Lakes have annual inflows of only 1 million m3 or less. The problem is limited storage of water. Much of the heavy flow during the cool seasons moves right through the smaller lakes and down to the sea.

Annual rain and snowfall has historically averaged 959 millimetres (mm) across the whole island but variations for each region are shown in the report, ranging from 909 mm at Vesuvius to 1,037 mm at Cusheon Lake Road. The average annual surface runoff, directly from the land into creeks, is estimated at 48% of the amount of rain and snow that falls.

Salt Spring lakes are unusual in two respects compared to "typical" lakes elsewhere in Canada and the world. First, the major inflow of water comes as heavy winter runoff (rather than as springtime meltwater), followed by dry creeks in summer. Second, most of the lakes are of unusual size compared to their drainage basins. Blackburn, Ford and Stowel are small lakes set in relatively large basins. Weston, Maxwell and St. Mary are large lakes in small basins. Roberts, Cusheon and Bullocks Lakes are more typical in size, relative to their drainage areas.

Of these nine lakes, four are currently used to supply potable water for community water systems - Maxwell Lake, St. Mary Lake, Cusheon Lake and Weston Lake.

4.2 Licensed Water Withdrawals

Water withdrawals can affect lake levels, as well as flows in streams leaving the lakes, if licensed withdrawals are large relative to the volume of water in the system. Low summertime precipitation on Salt Spring Island, coupled with an almost doubling of the population due to the influx of tourists and off-island residents can result in significant stresses on the drinking water supply. Outflows into Cusheon Creek from Cusheon Lake and Duck Creek from St. Mary Lake typically diminish or cease in June or July and do not resume until October or November. Outflow measurements from Maxwell Lake and Weston Lake are not available, but they are also likely low to non-existent during the summer and early fall. In addition to affecting biota in streams draining the lakes, lake drawdown can impact plants and aquatic life along the edges of the lake when previously covered areas are exposed.

Studies were conducted in St. Mary Lake in 1997 (Westland Resource Group, 1998) and again in 2004 (Hatfield and Parks, 2004) to examine the potential effects of increased drawdown of the lake to meet the needs of a rapidly increasing population on Salt Spring Island. These reports conclude that there would likely be deleterious effects on spawning habitat for smallmouth bass and on rearing habitat for juvenile bass and salmonids. It was not thought that water quality would be significantly impacted.

In 2006, as part of the project, a low-head weir was built on St. Mary Lake with a fishway that should ensure a minimum flow (approximately 10% of the mean annual discharge) in Duck Creek year-round. As well, passage was provided for both adult and juvenile fish movement over the weir.
(Source: "*Water Quality Assessment and Objectives for Cusheon Lake, Maxwell Lake, St. Mary Lake and Weston Lake: Salt Spring Island, B.C*", Draft report by D.Epps, MOE, 2007)

4.3 St. Mary Lake and Maxwell Lake

St. Mary Lake provides drinking water to residences around the lake, as well as both the NSSWD and the CRD Waterworks. In 2006, a weir was constructed on Duck Creek, adjacent to St. Mary Lake, to increase the storage capacity thereby supplying sufficient volumes of water to meet existing licences.

Table 2: Licenced water withdrawals from St. Mary Lake (*MOE,2007*)

Use	No.of Licensed withdrawals	Total Volume m3/yr	%	Principal Licensee
Domestic	28	26,550	1.4%	Various
Enterprise	6	29,870	1.6%	Various
Fire Protection*	1	252,720	13.7%	SSI Fire Protection Dist.
Irrigation	10	102,200	5.5%	Various
Stockwatering	3	2,850	0.2%	Various
Waterworks Local Authority	9	1,432,290	77.6%	NSSWD, CRD
	57	1,846,480	100.0 %	

* The Fire Protection licence on St Mary Lake is likely a daily maximum; in any event, water must be removed by the truckload and the annual amounts would be insignificant.

Maxwell Lake supplies water to much of Ganges and the surrounding area through the NSSWD system which is essentially the only user of water from this lake. Construction of a 3.5m high earth-filled dam at the outlet of Maxwell Lake in 1994 increased its holding capacity, raising the water level one metre above existing levels during the winter months. This allows NSSWD to increase the storage capacity of the lake during the fall and winter months and lower the lake level during the dry summer months.

Table 3: Licenced water withdrawals from Maxwell Lake (*MOE, 2007*)

Use	No.of Licensed withdrawals	Total Volume m3/yr	%	Principal Licensee
Domestic	2	1,660	0.3%	Various
Waterworks Local Authority	4	663,730	99.7%	NSSWD
	6	665,390	100.0%	

Appendix 5 summarises the current supply and demand data from this combined lakes system. This information is provided by NSSWD and is subject to some uncertainty from errors in bulk supply and end-use metering. Accordingly, a conservative approach has been taken in the analysis of water supply.

In May,2007, the OCP Potable Water Focus Group submitted its report to the Islands Trust with a number of recommendations for changes to the OCP. A summary of those recommendations is given in Appendix 6. This report contained a study of NSSWD supply and demand by Denis Russell and Bob Watson (NSSWD trustees). Recently, Bob Watson has updated the "What-If?" part of that report, summarised in Appendix 7 and this section is based largely on his March 20 update together with comments received from Mike Larmour (former NSSWD manager).

4.3.1 Water Supply

NSSWD has five licences to use water from St. Mary Lake and eight licences for water from Maxwell Lake. Total licenced capacity from both lakes amounts to an estimated total annual volume of 1,198,000 m3/year (263.4 MG/yr) and a maximum daily withdrawal of 6,560 m3 /day (1.44 MG/day). Earlier licences only established maximum day volumes; the most recent licences establish both Maximum Day and Annual Quantity limits.

Further details on St. Mary and Maxwell Lakes as supply sources is contained in the Watson update report..

It should be noted that NSSWD's most recent licence on St. Mary Lake (C101050) also increased the maximum quantity of water to be stored by 300 acre feet within the lake elevation range of 40.0 m to 41.0m which could limit access to the maximum licensed volumes. (300 acre feet is 0.2 metres depth). Excessive drawdown of the lakes would also risk further stress on lake ecology and the potential for additional nutrient loading. The main limiting water supply factors, therefore, appear to be St Mary and Maxwell Lakes drawdown to protect fisheries and other ecological values, the relatively small watershed areas for major multi-year droughts and storage for major droughts. All of these factors demand a precautionary approach to determining a safe volume of water supply in the future.

NSSWD precipitation records for water years 1978-79 to 2006-07 show a mean annual precipitation of 967 mm at Lake Maxwell and 990 mm at St Mary Lake. NSSWD climate studies indicate that precipitation has been increasing since the 1890's at about 10mm/decade.

Supplemented to some extent by Maxwell Lake, there are no feasible alternatives to St. Mary Lake for water storage. Maxwell Lake and the surrounding creeks are not fish-bearing. St. Mary Lake is fish-bearing, requiring a mean annual discharge of 10% of outflow into Duck Creek and the shoreline is extensively developed. As noted earlier, St.Mary Lake drawdown below 40 metres lake level must be restricted to meet fisheries needs. Raising the peak winter lake level above 41.0 metres is likely not feasible because of lakeshore development. This range is also established in the 1993 Water Allocation Plan.

It is suggested in the Watson update that St. Mary Lake drawdown should not exceed 0.9 metres in an average year and 1.5 metres during severe drought years, although the latter would clearly require regulatory approvals and consideration of the ecological impact on the lakeshore and Duck Creek.

Aside from the NSSWD, there are two other community water systems (Highland and Fernwood, both now owned by the CRD) with licences to draw water from St. Mary Lake. Other licensed withdrawals from St. Mary Lake water are from direct residential and commercial users, properties with irrigation licences and allowance for minimum fisheries needs.

4.3.2 Potential supplementary supply sources

The Watson study describes four possible additional options to augment the existing supply capacity of St.Mary and Maxwell lakes **if required**. All involve regulatory approvals and significant capital expenditures and some would only be considered in the face of expected severe drought conditions. The options and estimated additional annual supply capacities are:

- o Diversion of Andrea and Gossett creeks into Maxwell Lake for up to 186,000 m3/yr (41 MG/yr)
- o Raising the dam at Maxwell Lake (to provide more storage)
- o Installing removable stoplogs on top of the St Mary Lake weir to allow increased storage of late winter and early spring precipitation and providing at least 364 m3/yr (80 MG/yr), and possibly 545,000 m3/yr (120 MG/yr)
- o Diverting water from Cusheon Creek to St.Mary Lake to provide 682,000 m3/yr (150 MG/yr)

The 2003 AQION report also considered:

- o New groundwater sources near the NSSWD system, based on a report by Potter, that identified an area near Maxwell Lake with an estimated potential of 200,000 m3/yr.
- o Inclusion of adjacent groundwater-based water systems that might provide net benefits to both systems.
- o The possibility of adding more storage reservoirs within the NSSWD system to the existing 2,200 m3 (0.48 MG) of storage reservoirs, which would alleviate short-term peak conditions but not provide a solution to long-term supply issues.

It should be emphasized that these supplementary sources are **not planned projects** but simply identified for further consideration should the need arise in the future.

4.3.3 Water Demand

The estimated current number and volume of water demands by all users from both lakes are summarised in Appendix 5.

Where there are commercial, industrial and institutional users on a water supply system, it is usual to express the total number of users in Single Family Equivalents (SFEs). For example, Fernwood School is assumed to be equivalent to 17 single-family units. And a duplex is equivalent to 2 SFEs. An engineering report prepared for NSSWD assumed that townhouses and other multi-unit housing use 83% of the water demand of a single-family home.

NSSWD does not maintain a breakdown of water consumption by type of user which would assist in establishing the SFE count each year and monitoring water use by sector.
Other, smaller community water systems are predominantly residential with the exception of the Fulford and Fernwood Water systems which supply schools and some commercial properties..

An attempt was made in the 2003 AQION report to determine such a breakdown for the NSSWD system based on consumption records between 1998 and 2001, summarized in the following table using the representative year of 2000. Residential use accounted for 71% of total consumption which likely still applies today.

Table 4: NSSWD Water Consumption by Land Use Category in 2000 (AQION)

Land Use	Total Water Consumption m3	Percentage %
Residential		
Single Family Dwellings	332,800	59.2%
Multi-Family Dwellings	67,300	12.0%
Sub-total	**400,100**	**71.2%**
Commercial		
Marine Commercial	9,100	1.6%
Tourist Accommodation	20,000	3.6%
Office and Retail	70,000	12.5%
Restaurant	7,700	1.4%
Sub-total	**106,800**	**19.0%**
Industrial		
Industry	900	0.2%
Sub-total	**900**	**0.2%**
Institutional		
Hospital/Care Homes	20,900	3.7%
Schools	20,000	3.6%
Churches	2,700	0.5%
Parks	7,300	1.3%
Other institutional	3,200	0.6%
Sub-total	**54,100**	**9.6%**
TOTAL	561,900	100.0%

Source: AQION Report, 2003

In 2009, NSSWD reported 1,732 connections representing an estimated 2,515 SFEs and an annual bulk water production of 732,000 m3 (161 MG/yr) compared to 780,000 m3 (171 MG/yr) in 2003, a dry year. Weather-adjusted demands on their system in recent years show a leveling off and even a slight decrease in water use attributed to slower economic activity (local businesses, tourism) and perhaps recent water rate increases. (Appendix 8). For planning purposes, NSSWD suggest using 2003 as the base year (780,000 m3) for projecting future demand, a realistic conservative approach which allows for likely drier weather patterns.

Build-out estimates provided by the Islands Trust in 2006 indicated a potential total number of connections under current zoning of 2,334 SFEs and an estimated 4,070 SFEs. This build-out number has not been updated for this report and should be validated. At this level, with "business as usual", water system demand by NSSWD from the lakes is estimated to rise to 1,260,000 m3/year (277 MG/yr) by 2050, a 62% increase.

The Highland Water System has 257 connections (all residential) and Fernwood Water System has 75 connections (100 SFEs), including Fernwood School and limited commercial users near North Beach Road for a total of SFEs of 357 SFEs). The combined systems report a current water demand of 104,000 m3/year (23 MG/yr) and full build-out of 400 SFEs with a projected water demand of 116,000 m3/year (25MG/yr). Other users are estimated to add about 412,000 m3 /year (91 MG/yr) in 2009, (direct lake and irrigation licencees plus fisheries discharge needs) which is the maximum licenced volumes and is forecast not to change.

A long-term housing growth of about 1% per year was assumed, based on estimates contained in an Islands Trust housing report which forecast future population and housing projections in the region derived from BC Statistics data.

Channel Ridge is a special case since the NSSWD is committed to supplying this development with water under a 1986 covenant which also protected the important St. Mary Lake watershed on the west side of the lake. As a base case, it is assumed that building in Channel Ridge village will commence in 2010 and add about 50 units per year until full build-out of 577 homes in the whole development by 2018.

In summary, the estimated current water supply and current /build-out demands from St. Mary and Maxwell Lakes are shown in the following table.

Table 5: St. Mary Lake and Maxwell Lake supply and demand summary

User	**Annual Demand**		**Licenced Supply**	
	2009	**Build-Out**	**Annual**	**Peak Day**
	m3/yr	**m3/yr**	**m3/yr**	**m3/day**
NSSWD	780,000	1,260,000	1,198,000	6,560
CRD Fernwood/Highlands	104,000	116,000	229,000*	860
SML direct licencees	29,000	29,000	29,000	160
Agricultural (irrigation)	102,000	102,000	102,000	560
Fisheries use	280,000	280,000	281,000	770
Total	**1,215,000**	**1,787,000**	**1,839,000**	**9,000**

* Annual licenced supply effectively limited to 157,000 m3/yr by peak day volume

4.3.4 Potential increases and decreases in demand

While current demand is well within the licenced capacity of both lakes, even discounting the uncertainty in available supply quantities, it is important to consider potential future changes in water demands relative to existing licenced capacity. Long-term projections were therefore made for water demand from St. Mary and Maxwell Lakes assuming no changes in current water use patterns and existing supply limits with no new licences (business as usual). For planning purposes, it is also useful consider the implications of expected or potential future increases and decreases in demands. Details are given in the updated Watson report together with estimates of future water supply and lake drawdowns under various drought conditions.

The results are summarized in a spreadsheet in Appendix 9, based on normal supply conditions and other assumptions set out in the model. Other outcomes can obviously be examined under a range of different assumptions to test the sensitivity of the model.

The following factors were considered in the analysis of potential **increases** in demand on the NSSWD water system:

- OCP-Affordable housing units: a potential increase of up to 200 units over 20 years.
- OCP-Density Transfer: a potential addition of 20 housing units over 20 years.
- OCP-Amenity zoning: a potential addition of 20 units over 10 years (current limit is 40).
- Legalising secondary suites and cottages: assumed no net change in water use from existing unauthorized rentals.

4.5 Weston Lake

Weston Lake provides drinking water to the community of Fulford Harbour and the surrounding farms and houses primarily through the Fulford Water System which was transferred to the CRD in 2004. It includes the Fulford Elementary school and the commercial users in Fulford Harbour village

The system currently serves an estimated 109 SFEs with a water demand from the lake of almost 35,000 m3/yr (7.7 MG/yr). Figures for build-out are not confirmed at this time but are likely to be within the licensed annual withdrawal capacity of 58,000 m3/yr.(*MOE*)

5. GROUNDWATER SOURCES

5.1 Introduction

British Columbia is the only province in Canada and one of the last jurisdictions in the world that allocates water but does not regulate groundwater resources. Specifically, section 1.1 of the *Water Act* directs that the sections of the Act dealing with licensing, diversion and use of water do not apply to groundwater unless the provincial government enacts a regulation to that effect. There are no regulations enacted under that section.

Because groundwater is unregulated, there is no integration of decisions about surface water allocations under water licences and their implications for groundwater. Likewise, the impact of groundwater extractions on streams is not understood - there is little monitoring of groundwater extraction or understanding of the cumulative effects of groundwater use on surface water hydrology. This lack of integration is particularly important where streams are recharged primarily from groundwater in the summer. As groundwater is drawn down, streams dry up because there is no longer an adequate water table to support both the extractive use and the natural hydrology.

So, if the Ministry refuses to grant a water licence to a landowner due to lack of water in a stream, the applicant landowner can drill a well 5 metres away from the stream and extract groundwater with essentially no regulation of the location of the well or amount of water used.

The Groundwater Protection Regulation being developed under the Water Act is being implemented in three phases. Phase 1 came into effect on November 1, 2005 and focuses on registration of well drillers, pump installers and well construction. Phase 2 will include standards for well construction and testing, controlling artesian flow and reporting of information. Phase 3 will likely include development and implementation of specific regulations in Water Management Plan areas and regulation of well operation. Note that Implementation of groundwater regulation is a major goal in the Water Act Modernization program.

5.2 Groundwater Supply and Demand

The most recent and comprehensive review of groundwater supply and demand on Salt Spring was provided in March, 2007 by Hugh Greenwood and Rick Gilleland for the OCP Potable Water Focus Group. This section is based largely on their report on groundwater supply and demand. In 2009, a comprehensive geological map of Salt Spring was completed by Hugh Greenwood and a projected drainage and runoff map prepared by Tom Wright, both of which provide a better understanding of the underlying structures and likely flows of groundwater on Salt Spring Island.

Groundwater on Salt Spring Island is contained mainly in fractures both in the sedimentary rocks of the Nanaimo Group and the metamorphic igneous rocks of the Sicker Group at the south end. In the sediments the main storage capacity is in the fractures but there may be some available pores as the net effective fracture porosity is very low, approaching 0.01% of the rock volume. The Sicker rocks are generally massive and fractured and have limited primary porosity. The principal storage capacity is in the fractures.

There is no single, large aquifer under our island (Tom Wright refers to it as an "aquaclude"). Within the fracture network is a lens of fresh water derived from rainfall but accessible only where fracture porosity exists.

Also, there is no firm count of the number of active, producing wells on the island. In 1995, Potter estimated 1,535 wells serving about 30% of the population. In 2007, Greenwood and Gilleland suggested a possible number of 2,257 existing wells and reported a Ministry of Environment estimate of between 2,000 and 2,200 wells, but not all in use. A better determination of active, producing wells and the potential number at build-out needs to be carried out.

Assuming 2,100 to 2,200 wells and that a typical demand of about 200 litres per capita/day in the smaller community water districts would apply to an individual well owner, then an estimate of total water demand from wells is between 305,000 m3/yr and 320,000 m3/yr. Including the water demands from groundwater-based community systems would indicate that about 20% of total water demand on Salt Spring Island is supplied from groundwater and 80% from surface water.

5.3 Precipitation, Runoff, Evapotranspiration and Groundwater Recharge

All the fresh water on the island arrives in the form of precipitation, most of which either runs off into the sea or evaporates. The average annual precipitation on Salt Spring used by Greenwood and Gilleland is 900 mm but has been estimated more recently at 959 mm (Sprague). The water that eventually enters the groundwater system represents only between 150 mm and 25 mm and this is enough to annually recharge the groundwater system in some places but not in others.

Runoff factor is the proportion of the rainfall that runs off to the sea. Several estimates have been made by measuring flow rates at streams and using the rainfall measured in the capture area of the stream. Losses due to evapotranspiration depend on the relative areas of lakes, land, vegetation, the kinds of vegetation, average humidity, amount of wind, and hours of sunshine.

Based on data from a number of studies, an attempt was made by Greenwood and Gilleland to evaluate how much water may be taken up by groundwater across the island, considering precipitation, runoff, evapotranspiration, and storage capacity. In summary, the following ranges of the critical values were noted.

Table 6: Salt Spring Island precipitation, runoff, evapotranspiration, and storage capacity

	Average	Maximum	Minimum
Precipitation mm/yr	900	1050	566
Runoff factor	0.38	0.52	0.30
Evapotranspiration mm/yr	550	700	400
Storativity	0.0001	0.04	0.0000002

Source: Greenwood and Gilleland, 2007

Based on these results, and using the most representative values for precipitation, runoff, and evapotranspiration, Greenwood and Gilleland estimated that the average annual groundwater recharge is likely on the order of 140 mm/year or 16% of the annual precipitation. Of course, depending on a number of factors, the amount will vary considerably in different parts of the island. (Sprague has estimated the range of precipitation across the island). Some areas may be prone to more runoff due to soil type and vegetation. Likewise, areas underlain by fracture zones are expected to have higher annual recharge.

Note that their estimated average precipitation of 900 mm and average runoff factor of 38% differ from more recent estimates derived by Sprague (Nine Lakes study, 2009) of 959 mm precipitation and 48% runoff which appear to have considerable validity for future use; they are however, within the range shown in the above table.

Summarising the above estimates, it is clear that calculating the amount of precipitation that is able to enter the groundwater system is rather uncertain and critically dependent on the values chosen for porosity, evapotranspiration and runoff, the latter two of which will depend on the incident rainfall. Especially critical is the fact that the figures are for a complete year but the process of evapotranspiration occurs in the dry months and runoff in the wet months, and once the aquifer is full the runoff becomes much larger. Further, as withdrawal will continue while recharge is taking place, the aquifer will have a larger effective capacity than indicated by a simple calculation.

5.4 Implications

Estimates of the amount of water that recharges the groundwater reserve annually are uncertain, but the amount is generally small, probably not more than 140 mm/yr. Estimates of storage capacity are likewise uncertain but it seems clear that if the best estimate of storage potential (0.0001) is used then about a kilometre of depth is needed to accommodate the annual precipitation that reaches the water table. If the storage potential is as low as 0.0001, the aquifer will fill quickly and the balance of the available precipitation will probably leave as runoff.

To evaluate our groundwater supply, a widespread monitoring scheme similar to that in-use for the Mount Belcher system (monitoring of well withdrawals and static water levels in the system wells) and several other systems would go a long way toward an understanding of the net effects of our use of the groundwater resource. This can be accomplished by monitoring a representative sample of existing wells on a regular basis.

The possibility of a water well encountering salty water is greater in near-shore regions than in inland regions. Continued extraction of salty water by a well owner can exacerbate the problem, posing a threat to nearby well owners. Areas that have low topography are more at risk for saltwater intrusion and the number of wells in such areas should be limited.

The amount of rainfall that can annually reach the water table is not great and consequently the area from which each well draws must be large enough to capture the required amount of water. This implies that either a minimum average lot size should be established where the water is derived from wells or a maximum number of wells be permitted in a designated catchbasin.

6. CLIMATE CHANGE

6.1 Patterns of Water Supply

The "Living Water Smart" website includes the following description of the effects of climate change on water supply.

Evidence shows that our climate has changed over the past 50 to 100 years. The average annual temperatures have warmed in different regions of the province and B.C. has lost up to 50% of its snow pack. Total annual precipitation has increased by about 20%. These observed changes have affected our natural resources and many people's livelihood:

- Faster melts and increased precipitation have resulted in floods in the Fraser Valley, Interior and throughout British Columbia;
- Communities have been experiencing longer summer droughts as weather patterns grow increasingly erratic.

Current projections indicate that B.C. could experience a further warming by 2050. Predicted average temperatures will be warmer in the summer and winter for most of the province, while average rainfall will be higher in the winter and much less in the summer for the southern part of the province. As a result, stream flow patterns will be affected. The rain that replenishes our streams, lakes and reservoirs in the winter and spring may fall within a short period in the winter and not later in the year when we need this water to irrigate crops and for other important uses.

Predicted effects are listed below:

- While agriculture may enjoy longer, warmer growing seasons, more frequent and prolonged droughts as well as increased pest infestations are expected;
- Many areas will experience growing water shortages and increased competition among water uses, including municipalities, irrigation, industry, power generation, fisheries, recreation and aquatic ecosystems;
- The greater frequency and intensity of extreme weather events and related hazards, such as flooding and forest fires, will threaten key infrastructure (e.g., roads, ports) affecting B.C. communities and people's health and well-being;
- Sea levels are expected to rise on the coast of British Columbia;
- Already-stressed fisheries will face further challenges, in particular the highly important Pacific salmon species, which are sensitive to stream and ocean surface warming aswell as summer flows

(Source: Living Water Smart website)

6.2 Local impacts

Global climate change presents a challenge to water-planners in that precipitation and drought events must be considered. The annual precipitation may well increase but it will occur mainly during the winter, and as groundwater appears to be already recharged by existing rainfall, any excess will only add to runoff. Further, extreme weather events such as droughts are likely to become twice as frequent with the result that drought events that are now considered to occur only once every 50 years could recur as often as every 25 years. Any planning for future water management must adopt a stance that will deal with this 'worst scenario' which is ever more likely to occur.

7. WATER CONSERVATION

Water suppliers are becoming increasingly aware of the importance of improving the efficiency of water uses on the island. Indeed, many individual well owners and groundwater-based community water districts are facing more frequent occurrences of failing wells or reduced flows during the summer months and are managing demands accordingly. The smaller community water systems are also vulnerable to increased land development in nearby areas and the real risks of additional wells reducing their water supply. Conserving water demand is, therefore, an appropriate response to limited supply capacity and should become the first step in the effective management of available water resources.

In their Living Water Smart program, the provincial water efficiency goals are that, by 2020, water use will be 33% more efficient and that 50% of new demand will be met by conservation through:

- Implementation of a Canada-wide water efficiency labeling program for household appliances,
- Ultra low-flow toilets (6 L) and other water-saving fixtures and fittings which are now mandatory in new construction and renovations under the new Green Building Code since September 2008. Further work on requiring dual flush toilets is underway.
- Bill 27 (Green Communities) which provides tools to local government to conserve water.
- Guidance to encourage water reclamation and reuse across the province.

In 2007, Water Council supported a review of Salt Spring's water supply and demand by the University of Victoria's POLIS Project on Ecological Governance, using their "soft path" approach. In their view, this approach "*moves away from 'forecasting' the future by simply extrapolating from the past and relies on 'backcasting' - a planning approach based on a future scenario that integrates human needs within ecological limits. After determining what water might be available (ecologically), planners then work backwards to find feasible paths to meet long-term social and economic needs.... At the core of this process are structural changes that embed conservation, complemented by technologies and practices that increase efficiency.*"

The report considered water demands by community water systems over a 20 year time-frame from 2006 to 2026 with a "business as usual" base case and two alternative scenarios. First, no new water until 2026, a 25% reduction in average demand from the base case. Second, a 20% reduction of 2006 water demand by 2026, a 41% reduction in average demand from the base case. Strategies to achieve these two goals are then described in detail. The results of this approach are set out in the report, the recommendations from which are summarized in Appendix 10.

In essence, it allows water suppliers to set a future limiting target for water demand and determine the specific actions that would be required to achieve that target. The project also provided a model for individual water systems to consider water-saving scenarios with their "POLIS WaterSmart Scenario Builder". With this spreadsheet tool, water systems can "*refine water demand and conservation estimates over time by conducting indoor and outdoor water audits and/or population surveys.*"

Another conservation initiative has been taken by Ron Bain of the Cedars of Tuam Water System with preparation of a draft manual for owners and residents, including background and strategies for reducing water consumption in the system. It provides their community with an analysis of water consumption history and a survey of existing fixtures and appliances with the goal of reducing water demands on their limited groundwater supply. When completed and approved, the manual is intended to be made available to other small water systems.

8. FINANCIAL CONSIDERATIONS

This report does not consider the financial implications of any of the potential supply options or demand management tools. Clearly, ongoing maintenance and repair of all existing water delivery infrastructure (much of it aging) is a priority and will need to be reflected in capital borrowing and water rates. Nor have the consequences of rising rates on water demand been assessed. This may become an issue as water suppliers become concerned about maintaining revenues to meet their base operating expenses.

However, as new capital projects are contemplated to augment current supply structures, it is important that water managers carry out an assessment of the economics of lowering future demands by water conservation and recycling/reusing existing supplies. Indeed, it has been said that water conservation is the simplest and lowest-cost form of additional supply.

9. PROPOSED WORKSHOP

This is a draft report prepared for further input and review by Water Council members and by others involved, in varying degrees, with potable water management on Salt Spring Island and by the broader community. Accordingly, it is proposed that this report be used to stimulate discussion of current drinking water supply and demand issues in a public workshop. The workshop participants would consider the implications for future security and quality of island water resources and the potential impact on land use planning policies and decisions.

Specific workshop goals would be:

- to provide Water Council and the public with a better understanding of the drinking water situation on the island,
- to help people understand the importance of stewardship and water conservation,
- to better inform the Islands Trust local trustees and assist them in decisions about re-zoning, the Development Permit review process and updates to the LUB,
- to better inform the CRD Director about the broader potable water supply and demand issues on Salt Spring and assist in securing support for specific projects as needed,
- to help shape the final report to Water Council and assist in submissions to the provincial government over potential legislative changes.

The workshop would be a free, full-day event with invited "experts" to speak in morning sessions on government policies and legislative plans, potable water supply considerations and demand management options. The afternoon sessions would afford an opportunity for participants to focus on key topics and actions that could be taken by individuals, community groups, water system owners and operators and all levels of government. The outcome would provide input into the final report to Water Council, the Islands Trust and CRD.

10. CONCLUSIONS

a. The analysis of potable water supply and demand confirms the significance of surface water sources (80%) on the island and the key role that NSSWD plays in management of these resources (75% of users and water consumption). Protection of our drinking water lakes is critical in maintaining a safe, sustainable supply.

b. For NSSWD, current annual demands appear to be within existing licence capacity for the next decade (barring any major disruptive events such as extended drought conditions) but will be stressing acceptable supply limits in the longer term. Much more work needs to be done to assess the potential impacts of climate change on water supply and demand, ecological constraints, water conservation measures and the implications for maintaining water supply in more frequent drought years.

c. The key issue for NSSWD is to determine, in collaboration with the provincial Ministry of Environment and the federal Department of Fisheries and Oceans, the safe and acceptable drawdown of St. Mary Lake which will ultimately define the long-term capacity of the NSSWD system.

d. More confidence is needed in the estimates of future build-out under current zoning bylaws; a more detailed assessment is also needed of potential housing growth in the NSSWD service area from current Islands Trust policies for affordable housing, density transfers and amenity zoning.

e. All of the smaller water systems are at, or close to, build-out of connections in their specified service areas and no extensions of areas are expected. Those relying on groundwater are conscious of the need to conserve water and protect its quality.

f. Continued efforts are needed to mandate more water efficient appliances and equipment as well as provide incentives and education to encourage more voluntary water conservation practices. NSSWD should develop stronger water conservation policies.

g. There is a need for a more detailed breakdown of the island's water demand by sectors. What we don't measure, we can't monitor. Metering of individual end-users and improved reliability (calibration) of meters would be helpful.

h. Specific studies are needed to fill data gaps that now exist for:
   - A comprehensive hydrology study of the island
   - Well monitoring for water table changes
   - The link between surface water and groundwater
   - Price elasticity of water demand
   - The extent and scale of rainwater harvesting in use and its potential on SSI.

i. Given the limited data now available, the uncertain impacts of long-term and seasonal climate change on water supply patterns and use, it is prudent to take a precautionary approach to potable water management. Long-term forecasts should consider a range of possible scenarios.

j. It should be recognized that proposed new land developments generally result in permanent additions to water demand and should only be approved if there is assurance that the long-term demand can be met without prejudicing existing users or water supplies to current and projected essential services.

k. The proposal to recycle water from the Ganges Waste Water Treatment Plant is a significant option for relieving Ganges Village irrigation demands on the NSSWD system.

l. Cost/benefit studies should be included in the consideration of all new water supply proposals and assessed against investments in water conservation programs.

m. Groundwater is a community resource and must be shared and conserved; it needs to be carefully managed and access not allowed without applying constraints to development, subdivision and rates of water withdrawal.

n. Revisions to the BC Water Act and increased groundwater regulation could provide the necessary data on which to craft new land-use policies.

11. RECOMMENDATIONS

It is recommended that:

a. Water Council support the comprehensive studies carried out by NSSWD to determine its reliable water supply capacity with existing licences to meet long-term annual and peak day demands under a range of possible drought conditions and that these studies be reviewed and updated at least every two years.

b. The Islands Trust and/or the CRD retain an independent hydrologist or other qualified consultant to provide independent advice on the use of the NSSWD supply studies for land-use policy planning and bylaw development, taking into account the likely effects of climate change and predicted more frequent drought conditions.

c. The Islands Trust review and clarify its projections for build-out on Salt Spring Island.

d. Promoting improved efficiency of water use (conservation) be a key objective of regulatory agencies and all water suppliers. All community water systems should be encouraged to meter individual end-users and establish a stepped rate structure with appropriate rates to promote water conservation.

e. A public workshop be organized to review water supply and demand issues and discuss possible actions to ensure long-term security of a safe, sustainable supply of drinking water on Salt Spring Island.

f. Water Council continue to participate in the Water Act Modernization process with particular focus on proposed measures to improve groundwater regulation.

g. Water Council seek funding and support to undertake studies into:
    - A comprehensive hydrological study of the island to improve estimates of the future potential of surface water and groundwater sources
    - Well monitoring for water table changes
    - The link between surface water and groundwater
    - Price elasticity of water demand
    - The extent and scale of rainwater harvesting in use and its potential

h. Water Council assess the recommendations contained in the POLIS "Soft Path Strategy for SSI" and initiate follow-up actions where appropriate.

APPENDIX 1

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(in date order)

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Appendix 1: *NSSWD Supply-Demand Graph & Explanatory Notes*: M.Larmour

Appendix 2: *NSSWD Supply & Demand Report:* D.Russell & B.Watson

Appendix 3: *Review of NSSWD Supply & Demand Report*: M.Larmour

Appendix 4: *Groundwater*: H.J.Greenwood & R.J.Gilleland

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Salt Spring Island Land Use Bylaw 355, December, 2009

5.5 POTABLE WATER

5.5.1 Each *lot* in a proposed *subdivision* must be supplied with *potable* water in accordance with the *service* levels specified in Part 9 of this Bylaw.

5.5.2 Each *lot* in a proposed *subdivision* must be supplied with sufficient water to supply all *uses*, *buildings* and *structures* permitted on the *lot* by this Bylaw according to the standards set out in Table 1. Where more than one *use* is permitted on a *lot*, the amount of water to be supplied is the sum of the amounts required for each permitted *use*, calculated separately.

Information Note: If two or more lots are connected to the same source of water,the water system is subject to the Safe Drinking Water Regulations, administered by the Capital Health Region.

5.5.3 Where water is to be supplied by a *community water system*, the *community water system* must provide written confirmation of the amount of water it is able to supply to each *lot*.

5.5.4 Where water is to be supplied from a surface *water body*, the applicant for *subdivision* must provide proof of a water license issued after November 30, 1994, that permits the withdrawal of the required amount of water.

Information Note. The provincial Water Management Branch completed a study of surface water availability in November of 1994. Water licenses issued before this time may not be a reliable indication that water is actually available in the necessary quantity.

5.5.5 Where water is to be supplied by groundwater, the applicant for *subdivision* must provide written certification under seal of an *engineer* with experience in groundwater hydrology that there is sufficient available groundwater to provide the required amount of *potable* water on a continuous basis, and that the extraction from the groundwater table of that amount of water is not reasonably expected to adversely affect the quantity or quality of water obtainable from any existing well or surface water that is used as a source of *potable* water.

TABLE 1
POTABLE WATER SUPPLY STANDARDS FOR SUBDIVISION

USE	VOLUME (litres per day per lot)
Dwelling unit	1600
Seasonal cottage	680
Bed and breakfast home-based business	225/bedroom
Commercial or Industrial use	900
Community hall or church	1590
School	50/classroom
Commercial guest accommodation units	450/unit
Campgrounds	225/campsite

5.5.6 If the required amount of water cannot be supplied or if the certification, water license or confirmation referred to in Subsections 5.5.3, 5.5.4 or 5.5.5 cannot be made, the *Approving Officer* may nonetheless approve the *subdivision* if the applicant grants a covenant under the Land Title Act to the Salt Spring Island Local Trust Committee that restricts the development of the *subdivision* to the *buildings*, *structures* and *uses* for which the required amount of water can be supplied, licensed or certified under Subsections 5.5.3, 5.5.4 or 5.5.5.

5.5.7 For the purposes of the certification referred to in Subsection 5.5.5, the *engineer* must supply supporting documentation of a pump test conducted by the *engineer* which must indicate that the test was of sufficient duration to establish the long term reliability of the water supply in accordance with generally acceptable hydrological engineering practices.

5.5.8 Where the water supply is provided through a groundwater well or through a private surface water license, an *engineer* must also provide a water quality analysis that demonstrates that the surface water or the groundwater from each proposed water supply source or well is *potable* or can be made *potable* with a treatment system that is customarily used in a *single-family dwelling*. The certificate must include a plan of the proposed *subdivision* indicating each well location where a water sample was taken, and a statement that the water samples upon which the water quality analysis was performed were unadulterated samples taken from the locations indicated on the plan. If the water to be supplied is not *potable*, but can be made *potable* with a treatment system that is customarily used in a *single-family dwelling*, then the *Approving Officer* may nonetheless approve the *subdivision* if the applicant grants a covenant under the Land Title Act to the Salt Spring Island Local Trust Committee that requires on-going treatment of the water to ensure that it is *potable* before it is used as drinking water.

SALT SPRING ISLAND: COMMUNITY WATER SYSTEMS DATA

Mar.21, 2010

System	Source	Connections (SFEs) Current	Connections (SFEs) Build-out	Current Production	Current Use	Average use/ capita (@2/hsld)	Peak Day Demand	Build-Out Production	Peak Day* Maximum Withdrawal	Annual* Maximum Withdrawal
		#	#	m3/yr	m3/yr	lcd	m3/day	m3/yr	m3/day	m3/yr
Surface Water										
NSSWD	St. Mary Lake/ Maxwell Lake	2515	4070	777,366 (dry year)	660,761 (dry year)	360		1,258,004	6,560	1,198,000
Beddis (CRD)	Cusheon Lake	127	138	33,327	24,839	268	144	36,214	282	54,400
Fernwood(CRD)**	St. Mary Lake	*100*	*120*	23,724	15,605	214	382	28,469	341	62,223
Fulford Harbour(CRD)	Weston Lake	109	*130*	34,884	24,419	307		41,605	318	58,200
Highlands(CRD)**	St. Mary Lake	257	*280*	103,370	47,768	255		112,621	518	94,580
Sub-total		3108	4738	972,671	773,392	281 (Average)		1,476,912	8,019	1,467,403
Groundwater										
Cedar Lane(CRD)	2 wells (meters)	44	46	n/a	4,616	144	n/a	4,865	n/a	n/a
Cedars of Tuam(CRD)	1 well (meters)	16	16	n/a	1,643	141	n/a	2,864	1,293	2,387
Erskine Heights	2 wells (meters)	31	40	*3,873*	3,873	171	n/a	*4,997*	n/a	25,719
Harbour View	3 wells (meters)	21	22	2,270	2,270	*148*	n/a	2,500	n/a	n/a
High Hill (2007)	3 wells (meters)	7	9	1,560	1,283	251	n/a	2,273	n/a	n/a
Maracaibo Estates	4/7 wells(meters)	73	91	10,719	10,719	201	97	78,028	n/a	59,232
Mount Belcher	7 wells (meters)	45	55	8,174	8,174	249	105	11,353	n/a	10,910
Reginald Hill		20	24	3,273	3,273	224	n/a	3,864	n/a	n/a
Scott Point	3 wells (meters)	60	62	5,110	5,110	117	n/a	7,274	n/a	n/a
Swan Point	1 well (meters)	4	5	*436*	*436*	*149*	n/a	*727*	n/a	n/a
Sub-total		321	370	35,415	41,397	179 (Average)		111,017		
TOTAL		3,429	5,108	1,008,086	814,789			1,587,929		

* Licenced amounts for surface water sources; actual/estimated well capacity for groundwater sources

** Annual withdrawal limited to 157,000 m3 by peak day licence.

Figures in italics not confirmed

APPENDIX 3

APPENDIX 4

Table 1. Physical characteristics of the larger lakes on Salt Spring Island. Lakes are in order of drainage basin size. Information is from surveys and reports in the footnote***.

1. Lake	2. Depth (metres)		3. Surface area (hectares)	4. Volume (thousands of m^3)	5. Drainage basin, lakes included (hectares)	6. Yearly inflow* (thousands of m^3)	7. Time to fill if empty (years)	8. Time for 95% replacement of water	
	Mean	Max.						Years	Months
Cusheon	4.5	9.1	26.9	1,214	839**	4,100	0.30	0.89	11
Ford	3.0	3.5	4.25	127	780	3,915	0.032	0.097	1.2
St. Mary	8.8	16.7	182	15,960	690	3,269	4.9	14.6	176
Blackburn	3.0	5.0	3.08	92.4	619**	2,943	0.031	0.094	1.1
Stowell	4.6	7.5	4.57	210	389	1,806	0.12	0.35	4.2
Bullocks	3.9	7.0	9.40	370	212	1,005	0.37	1.1	13
Weston	5.9	12.2	18.5	1,090	170	789	1.4	4.1	50
Roberts	4.1	8.2	3.44	140	120**	586	0.24	0.72	8.6
Maxwell Original Modified	 6.5 7.7	 17.0 19.2	 27.7 29.9	 1,810 2,310	 115 217	 533 910	 3.4 2.5	 10 7.6	 122 91

* Inflow is estimated from size of the drainage basin, using annual precipitation in that region, and an average (island) value for proportion that runs off the land. Inflows for the three lakes of the Cusheon system are estimated from a more detailed model shown in Table 5 of the Appendix.

** Areas of the three drainage basins in the Cusheon system were estimated by Islands Trust (Korteling 2006); areas shown here include basins of upstream lake(s). Definitive areas of the total Cusheon and St. Mary basins were measured by Grange (2008a, b) and are incorporated into this table.

*** Maps and data from government lake surveys are provided on a web site of B.C. Environment, at time of writing http://a100.gov.bc.ca/pub/fidq/bathyMapSelect.do. (Cusheon 1972, Ford 1978, St. Mary 1978, Blackburn 1972, Stowell 1960, Bullocks 1981, Weston 1960, Roberts 1972, Maxwell 1981). Precipitation for areas of Salt Spring Island were provided by Aston (2006), Barnett et al. (1993), Hamilton (1995), Environment Canada (2006) and Watson (2006b). Other information on lakes and flows was given by Barnett et al. (1993), Hamilton (1998), Holms (1996), McKean (1981), Nordin (1986), Nordin et al. (1983), Sprague (2007b), and Watson (2006a,b).

POTABLE WATER SUPPLY and DEMAND: St. Mary Lake & Maxwell Lake				(March 21,2010)	
	Maximum Day	**Annual Supply**	**2009**	**Build-Out**	
	m3/day	m3/yr			
Licensed Supply					
NSSWD - St.Mary Lake	4,289	783,000			
NSSWD - Maxwell Lake	2,273	415,000			
	6,562	1,198,000			
CRD (Fernwood/Highland)*	859	157,000			
SML direct users (licences)	159	29,000			
Agricultural (irrigation licences)**	680	102,000			
Fisheries use (Minimum flow)	770	281,000			
Total supply	9,030	1,767,000			
* Annual supply limited by maximum day volume					
** Assumes 150 day period for maximum day					
Connections					
NSSWD					
Connections			1,732		
Tax Roll			2,058		
CRD Fernwood/Highland			338		
Single Family Equivalents					
NSSWD			2,515	4,070	
CRD (Fernwood/Highland)			357	400	
Demand (m3)					
NSSWD (Dry Year)			780,000	1,262,000	
CRD (Fernwood/Highland)			127,000	142,000	
SML direct users (licences)			29,000	29,000	(At max.)
Agricultural (irrigation licences)			102,000	102,000	(At max.)
Fisheries use (Minimum flow)			281,000	281,000	(At max.)
Total Demand			1,319,000	1,816,000	
Average demand (m3/yr/SFE)					
NSSWD			310		
CRD (Fernwood/Highland)			356		
Average demand (litres/capita/day)					
NSSWD*			340		
CRD (Fernwood/Highland)**			292		
* Assumes 2/SFE and 20% system losses					
** Assumes 2/SFE and 40% system losses					

SALT SPRING ISLAND OFFICIAL COMMUNITY PLAN REVIEW 2007 – 2008
Focus Group: Potable Water

3.0 Summary of Recommendations

3.1 Apply the *Precautionary Principle* to the Planning, Utilization and Protection of Potable Water Resources on Salt Spring Island

The *precautionary* principle should be applied with regard to potable water supplies. Where the risk to the quality or quantity of potable water is considerable and long lasting, decision makers should act with caution, taking a highly conservative approach that comfortably offsets uncertainty of the impact of proposed actions that may impact on water supplies.

3.2 Coordinate Governance of Water Management Issues

As the governing body most affecting water demand by its actions and the only government body with protocol agreements with all other bodies concerned, the Islands Trust should include water management issues in existing protocol agreements with the CRD and all other bodies concerned.

3.3 Undertake a Comprehensive Water Management Plan for Salt Spring Island

Assess the potential magnitude of demand under present zoning and projections. Combine this information with other relevant information on supply, quality, conservation methods and costs to develop a comprehensive water management plan. Review the entire zoning framework of the island and make the changes necessary to secure reliable water resources for the future.

3.4 Control Growth in Areas Supplied by Surface water to Ensure Supply/Demand Balance.

The capacity to provide potable water from surface water sources is limited by hydrologic, economic, regulatory and environmental constraints. One water district will reach its legal limit to supply water before the build out projection in the current OCP is reached. Others are at or close to their licensed capacities. Revise planned development and settlement patterns in accord with the licensed and known capacities to provide high quality potable water at a reasonable cost.

3.5 Improve the Method of Proving the Adequacy of Groundwater Supplies

With the advice of a competent hydrologist, with local knowledge, the Trust should develop tests for proof of groundwater quantity and quality that are strict, well defined and cover conditions likely to apply through the year. Concerns of well interference, reliability under severe drought conditions, and overall sustainability at the permitted density and intensity of land use should be covered. The protocols thus established should serve as criteria guiding hydrologists acting for developers and for Approving Officers acting for the citizens of Salt Spring.

3.6 Place Every Community Watershed for Surface Water within a Development Permit Area

Place each watershed serving a community drinking water supply lake within a Development Permit Area. Define measures specific to each watershed with the objective of reducing sedimentation and nutrient loading in the lake it serves. Implement the Cusheon Watershed Management Plan. Prepare individual watershed management plans for other community drinking water lakes.

3.7 Require Minimum Lot Size in Areas Served by Groundwater
Establish minimum lot sizes to ensure sustainability of groundwater supply. This will require an area-by area approach to the hydrology in order to establish reasonable local limits.

3.8 Require a Permit and a Development Plan for All Construction
All construction, whether a new subdivision, a house on an existing lot, or a renovation to an existing dwelling shall, in addition to a building permit, require the developer or owner to submit and have approved by the Islands Trust, a plan indicating how all water-related issues will be addressed.

3.9 Establish a Water Conservation Policy
Develop an island-wide water conservation policy. In addition to education, a conservation policy should encourage imaginative development of demand management measures, incentives and disincentives including user pricing priorities and progressive rate structures.

Future North Island Water Supply & Demand
A "What If" Scenario

Prepared by Bob Watson, NSSWD Trustee; March 20, 2010

What if the community wished to make some changes to island settlement patterns, accommodate affordable housing, and provide an alternative for north island areas with groundwater problems – would it be feasible?

A well thought out water supply and infrastructure plan would minimise costs and allow costs to be shared fairly between present and new development. It would include the environmental, fisheries, recreational, water quality and aesthetic aspects of using our lakes for water supply. It would need to be acceptable to the community and to regulatory authorities.

The following describes one possible scenario of future water demand and supply infrastructure for the northern portion of the island, just to start the thinking. All estimates are "ball-park".

1.0 Summary

Current development within NSSWD totals about 2,515 SFEs (single family dwelling unit equivalents. With growth allowed within present zoning, NSSWD is expected to increase to about 4,070 SFEs by build-out.

In addition to allowed growth, irrigation needs are expected to increase with future drier, warmer summers, and more intensive island agriculture and home food gardening. Watermains may need to be extended to replace supply for areas with failing groundwater. Affordable housing may increase home occupancy, thus water demand within the areas being served. Increased emphasis on density transfer to within the serviced area may increase demand. The water demand estimate was adjusted for each of these and other items, including a 1,600 SFE (single-family equivalents) allowance for groundwater supply replacement, affordable housing, and density transfer combined. With the above 1,600 SFE allowance included, NSSWD plus CRD's Fernwood/Highland waterworks will need to serve about 6,100 SFEs by build-out.

If the community wishes to proceed as outlined in this scenario, it appears feasible to provide sufficient water supply, subject to confirmation by independent hydrology and fisheries specialists, and subject to licensing, as follows:

- Water filtration plants would be constructed to treat all water supplied to current Vancouver Island Health Authority standards. NSSWD's plan includes a initial 0.5 mgd WTP at Lake Maxwell and a 1.0 mgd WTP at St Mary Lake.

- All feasible conservation measures would be undertaken, reducing annual, summer storage season, and peak day demand.

Reclaimed water from the Ganges WPCP would be utilised, mainly for irrigation in the Ganges core area. A low water use fixtures and appliances incentive program would be established. Planned pressure control and water treatment improvements, and planned watermain replacement will reduce water used for waterworks operations and water quality maintenance and will reduce losses from leaks. Watermain leak detection surveys could be undertaken if needed. Increasing costs of water consumption in combination with conservation methods education is expected to result in improved water conservation.

- Adjustable stoplogs would be added to the St Mary Lake weir to provide at least 0.9m of live storage, to improve fisheries protection during major droughts.

- "Andrea" and "Gossett" creeks would be diverted to Lake Maxwell to increase the watershed area (before NSSWD reaches 3,000 SFEs).

- The Lake Maxwell dam would be raised to increase storage and thus reduce St Mary Lake drawdown by providing most of NSSWD's supply during severe single-year droughts (before NSSWD reaches 3,300 SFEs). Lake Maxwell aeration would be installed if needed to prevent phosphorus resolubilisation from summer oxygen depletion in the lake bottom water.

- The Maxwell WTP would be expanded to 1.0 mgd (before NSSWD reaches 3,900 SFEs).

- A pumping station would be built at Cusheon Lake and a connecting supply main to St Mary Lake installed (before NSSWD reaches 4,400 SFEs). Part of the overflow from Cusheon Lake each winter would be transferred to St Mary Lake until St Mary Lake had refilled.

- The St Mary WTP would be expanded to 1.5 mgd (before NSSWD reaches 5,000 SFEs). The expanded WTP would serve both NSSWD and CRD service areas plus most areas where service had been extended to replace groundwater supplies.

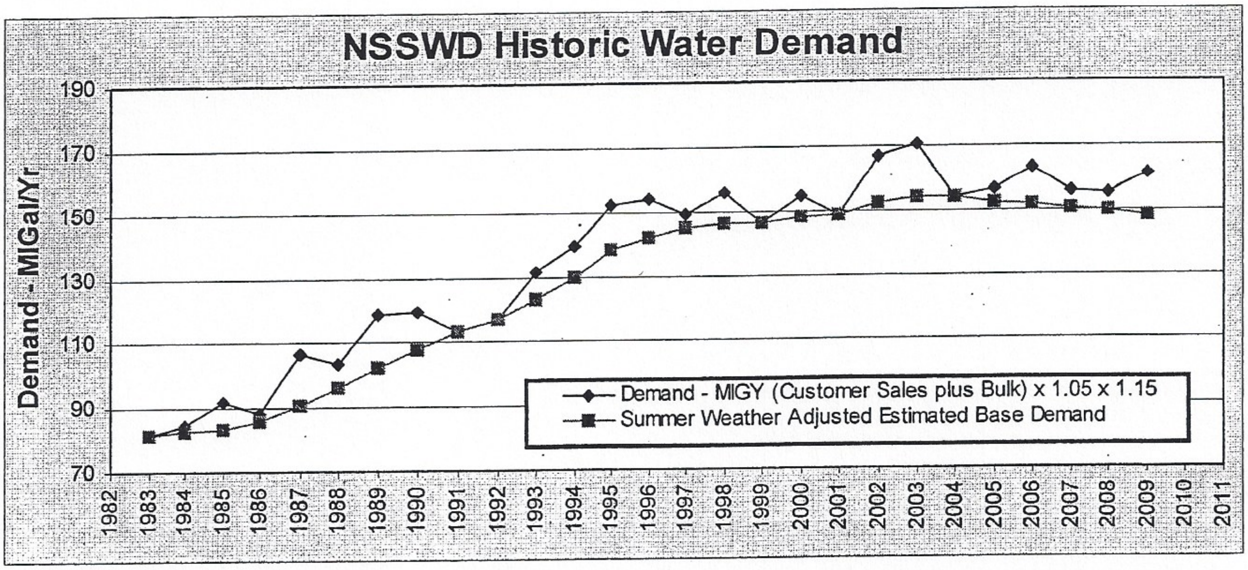
- The NSSWD/CRD combined Maxwell/St Mary waterworks would serve about 6,100 SFEs. The net waterworks demand would be about 350 MGY. The overall demand on the Maxwell plus St Mary watersheds would be about 480 MGY.

- The Beddis waterworks would be expanded to serve Scott Point and adjacent areas to replace inadequate groundwater supplies.

- The Ford watershed would be held as a major climate reserve to supplement Cusheon diversion to St Mary Lake if needed in the future.

The main limiting water supply factors appear to be St Mary Lake drawdown to protect fisheries, watershed area for major multi-year droughts, and storage for major single year droughts.

St Mary Lake drawdown should not exceed 0.9m during an average year, and should not exceed 1.5m during severe drought years, to protect fisheries.


NSSWD Historic Water Demand
Demand - MIGal/Yr
190
170
150
130
110
90
70
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Demand - MIGY (Customer Sales plus Bulk) x 1.05 x 1.15
Summer Weather Adjusted Estimated Base Demand

WATER SUPPLY and DEMAND on St. Mary Lake & Maxwell Lake																	APPENDIX 9	
		Build-Out		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2030	2040	2050
Estimated SSI Population						10,030					10,500				10,900	12,000	13,200	14,500
Estimated SSI Households						4,860	4,980	5,100	5,230	5,360	5,500	5,590	5,680	5,770	5,860	6,400	7,000	7,640
NSSWD SFEs		4070		2,515	2,555	2,626	2,689	2,753	2,822	2,891	2,965	3,013	3,060	3,058	3,106	3,392	3,710	4,049
Fernwood/Highlands SFEs		400		357	362	367	372	377	382	387	392	397	400	400	400	400	400	400
Total SFEs		4470		2872	2,917	2,993	3,061	3,130	3,204	3,278	3,357	3,410	3,460	3,458	3,506	3,792	4,110	4,449
LICENSED SUPPLY (thous.m3)																		
NSSWD				1,198	1,198	1,198	1,198	1,198	1,198	1,198	1,198	1,198	1,198	1,198	1,198	1,198	1,198	1,198
Fernwood/Highlands SFEs				157	157	157	157	157	157	157	157	157	157	157	157	157	157	157
SML direct users (licences)				29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Agricultural (irrigation licences)				102	102	102	102	102	102	102	102	102	102	102	102	102	102	102
Fisheries use				280	280	280	280	280	280	280	280	280	280	280	280	280	280	280
Total annual supply				1,766	1,766	1,766	1,766	1,766	1,766	1,766	1,766	1,766	1,766	1,766	1,766	1,766	1,766	1,766
Peak day licence capacity (th.m3)				*9.00*	*9.00*	*9.00*	*9.00*	*9.00*	*9.00*	*9.00*	*9.00*	*9.00*	*9.00*	*9.00*	*9.00*	*9.00*	*9.00*	*9.00*
PROJECTED DEMAND (thous.m3)	*Aver.hshld*																	
NSSWD	*310*			780	792	814	834	853	875	896	919	934	949	948	963	1,052	1,150	1,255
CRD Fernwood/Highland (SFEs)	*356*			127	129	131	132	134	136	138	140	141	142	142	142	142	142	142
Other licencees				412	412	412	412	412	412	412	412	412	412	412	412	412	412	412
Total annual water demand				1,319	1,333	1,357	1,378	1,400	1,423	1,446	1,471	1,487	1,503	1,502	1,517	1,606	1,704	1,810
Estimated peak day demand (th.m3)	*Ratio 2:1*			*7.23*	*7.30*	*7.43*	*7.55*	*7.67*	*7.80*	*7.92*	*8.06*	*8.15*	*8.24*	*8.23*	*8.31*	*8.80*	*9.34*	*9.92*
Projected **Annual** Surplus (Deficit)				448	433	410	388	367	344	320	296	279	263	264	249	160	62	-43
Projected **Peak Day** Surplus(Deficit)				1.77	1.70	1.57	1.45	1.33	1.20	1.08	0.94	0.85	0.76	0.77	0.69	0.20	-0.34	-0.92
Potential increases in demand	*Aver.hshld*	*Number*	*Period(yrs)*															
Affordable housing units (SFEs)	*260*	*200*	*30*			1.7	3.5	5.2	6.9	8.7	10.4	12.1	13.9	15.6	17.3	34.7	52.0	52.0
Density Transfer units (SFEs)	*260*	*20*	*20*			0.3	0.5	0.8	1.0	1.3	1.6	1.8	2.1	2.3	2.6	2.9	2.9	2.9
Amenity Zoning units (SFEs)	*260*	*20*	*10*			0.5	1.0	1.6	2.1	2.6	3.1	3.6	4.2	4.7	5.2	5.2	5.2	5.2
Legalised suites & cottages (net)		*0*																
Groundwater replacement (SFEs)	*310*	*600*	*50*		4	7	11	15	19	22	26	30	33	37	41	45	48	52
Increased food production		*77 th.m3/yr*			20	25	30	35	40	45	50	55	60	65	70	77	77	77
Climate change (irrigation)		*268 th.m3/yr*			50	60	70	80	90	100	110	120	130	140	150	268	268	268
Sub-total				0	74	95	116	137	159	180	201	222	244	265	286	432	453	457
Projected **Annual** Surplus (Deficit) with potential increased demand				448	360	315	272	229	185	141	95	57	20	-1	-37	-272	-392	-500
Projected **Peak Day** Surplus (Deficit) with potential increased demand				1.77	1.29	1.05	0.81	0.58	0.34	0.09	-0.16	-0.37	-0.57	-0.68	-0.88	-2.17	-2.82	-3.42
Potential decreases in demand		*Thous.m3/yr*																
Waterworks improvements		*80*			53	54	55	56	58	59	60	61	62	62	63	68	74	80
Ganges recycled water		*130*	*5*		26	52	78	104	130	130	130	130	130	130	130	130	130	130
Increased water rates/structure		*0*																
Rainwater harvesting		*0*																
Appliance efficiency savings	*20%*	*in-house use*				151	155	158	162	165	169	172	175	174	177	191	207	224
Sub-total				0	79	257	288	318	349	354	360	363	367	367	370	389	411	434
Projected **Annual** Surplus (Deficit) with potential decreased demand				**448**	**438**	**572**	**560**	**548**	**534**	**495**	**454**	**420**	**387**	**366**	**333**	**117**	**19**	**-67**
Projected **Peak Day** Surplus (Deficit) with potential decreased demand				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

POLIS "A Soft Path Strategy for Salt Spring Island (Extract only)

Section 4 – Getting from Here to There: Action Items for Implementing a Soft Path Strategy

All too often, contemporary water efficiency efforts are viewed as ad hoc measures aimed at buying time until new supplies can be secured and developed. The soft path differs fundamentally from these efforts by directing planners to look beyond programs aimed at simply using water in more efficient ways or asking in some cases, why use water at all? This shifts the objective of water management from expanding and maintaining water supply infrastructure to providing water-related services, such as new forms of sanitation, drought-resistant landscapes, rain-fed ways to grow certain crops, or even influencing what crops are grown in the first place.

The following action items and associated recommendations represent the immediate (and likely most effective) opportunities to begin creating a more sustainable approach to water management for Salt Spring Island regardless of which scenario is adopted.

4.1 Screening Measures for Action Items

Potential water conservation and efficiency measures were subjected to an informal screening process based on the following criteria: Technical Feasibility, Applicability, Social Acceptability and Cost-effectiveness

4.2 Action Items - All Sectors

4.2.1 Set an Overall Water Use Goal of "Preserving Water Supplies for the Next Generation"

An overarching water conservation target sends a clear signal to islanders that water conservation and efficiency are essential to continued economic and ecological health.

4.2.2 Create a Water Demand Management Coordinator Position

Hiring a permanent staff person (either full-time or part-time) with technical skills and understanding in fields such as ecology, social marketing, economics, and education is a critical first step in developing and implementing any long-term water conservation strategy.

4.2.3 Implement Full-Cost and Volume-Based Pricing

Canadians paying flat rates use 74% more water than those under volume-based structures. Full cost water rates should extend to protecting the source, replacing aging infrastructure at a reasonable rate, water conservation planning and programming, education, research, and treatment of wastewater as opposed to a narrow focus on water treatment infrastructure.

4.2.4 Plan for Sustainability Through "Wet Growth"

Land use decisions determine water use and watershed health now and in the future, and many patterns of development are problematic. SSI should explore implementing water and land use policies that require all new developments to either offset new water demands with conserved water or purchase water rights.

4.3 Residential Use

4.3.1 Efficient Indoor Residential Water Use

Mandating best available efficient fixtures in all new construction that meet or exceed existing international standards through bylaws and by updating specifications regularly is much more cost effective than conducting retrofits later, and ensures all new demands for water are the most efficient possible.

4.3.2 "Go Golden" Campaign to Reduce Outdoor Water Use
Outdoor water use is a primary factor contributing to peak demands in Canadian communities. For this reason, outdoor summer demands should be one of the primary targets of Salt Spring's water conservation programme.

4.4 ICI Sector
Increase efficiency and conservation across the ICI sector.

4.5 Agricultural Sector
4.5.1 Data Collection
In order to make informed decisions about water use, the SSI Water Council should make a concerted effort in close cooperation with farmers to gather more data about agricultural water use on Salt Spring.
4.5.2 Improve Water Efficiency for Irrigation
Irrigation represents the biggest opportunity for improving efficiency in agriculture

4.6 Looking to the Future
4.6.1 Rainwater and Waste(d) Water as the Source
In 2010 the BC Ministry of Housing and Social Development is looking to update the Building Code to include rainwater harvesting in response to government's commitment to "mandate purple pipes in new construction for water collection and reuse by 2010" outlined in the Living Water Smart strategy.

4.7 Five Year Implementation Overview
1. Hire a co-ordinator, funded through NSSWD, the CRD, who will make use of existing resources in the CRD and adapt for use on SSI.
2. Launch toilet rebate program and offer rebates ONLY for high efficiency/dual flush toilets that meet MaP testing specifications to maximize effectiveness.
3. Co-ordinator to develop and deliver an educational campaign consisting of (at a minimum) water bill inserts, education for commercial facilities on the hot water cost benefits of pre-rinse spray valves.
4. Education/liase with hardware stores that sell water efficient fixtures to ensure they stock the best models, train employees and have signage to guide purchases.
5. Co-ordinator to hold rainwater harvesting workshop including pitfalls to avoid, regulatory constraints and approvals, tank sizing and connections, etc.
6. Revisit targets, successes, failures and adapt and adjust strategy for next 5 years to meet targets.

4.8 Implement for Success
The observed rate of water savings will depend on the aggressiveness, available funding and effectiveness of the program; the residential, industrial, commercial and agricultural growth rates; and natural replacement frequencies of water use fixtures..

4.9 Cost Comparison
The case for the cost-effectiveness of water conservation programs has been made in many communities across Canada. In addition to the direct one-time capital cost savings for upgrading supply, additional operating savings and environmental benefits could potentially be realized.

CONVERSION TABLE

1 Imperial gallon = 4.546 litres

1 cubic metre (m3) = 1,000 litres

1 cubic metre (m3) = 220.2 imperial gallons

1 million imperial gallons (MG) = 4546 cubic metres (m3)

1 acre = 0.4047 hectare

1 hectare = 2.471 acres