

Sustainable Water Management Strategy



North Salt Spring Waterworks District

June 2015

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North Salt Spring Waterworks District Sustainable Water Management Strategy

Introduction

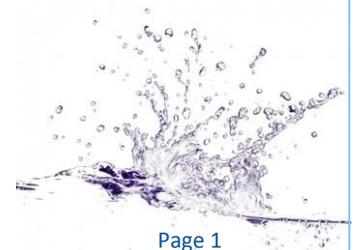
North Salt Spring Waterworks District (the District) is an Improvement District on Salt Spring Island (SSI), the largest of the southern Gulf Islands off the south-east coast of Vancouver Island. From St. Mary and Maxwell Lakes, the District provides potable water to the village of Ganges and much of the north end of SSI. The District has more than 1700 connections to residential, institutional, commercial and industrial customers including the hospital, schools, restaurants, hotels, and private homes. In 2013, the District sold more than 500,000 m³ of water which equates to the typical usage of approximately 2553 local single family homes or 5500 people.

In 2010, the BC Ministry of Environment released *Preparing for Climate Change: British Columbia's Adaptation Strategy* in which they revealed their vision for a resilient province and the strategic approach for realizing that vision. The strategy clearly states that adaptation will be integrated into all government policy, legislation and regulations and that the Province must work with other levels of government to achieve common goals.

As a local government organization, the District heard the message loud and clear. Over-allocation of our limited resources would place our community at risk and the District firmly believes that a precautionary approach is warranted.

In 2013, the District engaged the services of Kerr Wood Leidal Consulting Engineers to assess the water availability and demand of both St. Mary and Maxwell Lakes. For each source, the completed report contains a water budget under current and future climate conditions for both an average rainfall year and a 1

Water resources on SSI are already vulnerable to drought and climate change impacts could make the situation even more precarious.



in 10 year drought. Both reports contain a number of important conclusions and recommendations that the District plans to address. Moreover, both reports clearly define the current maximum licenced withdrawal limit as the maximum capacity of each source to supply water. This means neither lake has the capacity to support future withdrawals beyond the current licenced amounts. The District has developed the following management strategy to ensure a sustainable water supply for our community now and in the future.

Background

MAXWELL LAKE SUPPLY



The District is the sole water licensee on Maxwell Lake. When the lake level was raised in 2000, the District obtained licences to divert two seasonal creeks (Rippon Creek and Larmour Creek) from adjacent watersheds into Maxwell Lake because there was insufficient precipitation in the catchment area to refill the lake each year. Currently, the District does not withdraw the full licenced amount; however, there are undeveloped properties on the Maxwell system and the unused portion of the licence is reserved for those properties.

Drawdown of a lake beyond its typical seasonal low level can negatively impact both water quality and fish habitat.

Water rights on St. Mary Lake are fully allocated too, so there will be no further licenses issued to the District.



The Maxwell Lake hydrology report confirms that Maxwell Lake can support withdrawal of the District's full licence in both an



average year and a one in ten year drought. However, the report also identifies that after a one in ten year drought, it could take up to four years of greater than average precipitation to refill the lake. It is also important to note that a one in ten year drought does not

necessarily occur only every ten years. As the climate changes, the level of precipitation that constitutes a one in ten year drought may occur more frequently. It is critical that Maxwell Lake be prevented from excessive drawdown due to the risk of not refilling; therefore, the report recommends capping withdrawal at 72% of the total annual licence.

Water rights on St. Mary Lake are fully allocated so there will be no further licences issued to the District.

ST. MARY LAKE SUPPLY

Water rights on St. Mary Lake are fully allocated so there will be no further licences issued to the District. The District does not currently withdraw the full licenced amount, but there are undeveloped properties on the St. Mary system and the unused portion of the licence is reserved for those properties. This means that there may not be any water left to serve new development within the District in the future.



St. Mary Lake (Courtesy: Gulf Island Guide)

Drawdown of a lake beyond its typical seasonal low level can negatively impact both water quality and fish habitat, thus the Ministry of Forests, Lands, and Natural Resource Operations (MFLNRO) required the District to raise the lake level in order to



obtain an additional water licence in 2005. As a result, the Duck Creek weir was constructed to create more storage.

In exchange for the additional withdrawal licence, the District was also required by the Department of Fisheries and Oceans to maintain minimum environmental flows in Duck Creek year-round. This was accomplished by constructing a fish ladder adjacent to the weir. The provision of year-round flow to Duck Creek has resulted in a substantial improvement in fish habitat.



Duck Creek Weir

In 2006, the weir was installed at an elevation of 40.7 m above sea level¹. However, prior to 2006, beaver dams kept the winter lake level at about 41.0 m even though the natural outlet is lower. Therefore, construction of the weir effectively lowered the peak lake level from

approximately 41.0 m to 40.7 m. This means that there is less water in St. Mary Lake now than before 2006, but the District is still committed to maintaining year-round fish flows in Duck Creek.



South end of St. Mary Lake with algal bloom

The District is not permitted to allow the lake level to fall below 40.0 m because minimum flows through the fish ladder cannot be maintained below that level. It is important to note that there are serious consequences

for failing to maintain fish flows or drawing the lake down below 40.0 m. Under the *Water Act*, the District's water licence can be

Even with the weir height at 41.0 m ASL, the additional storage will be sufficient to service the properties that are currently on the District tax roll but may not be able to support any additional development.

¹Elevations measured using the Geodetic Survey of Canada datum.

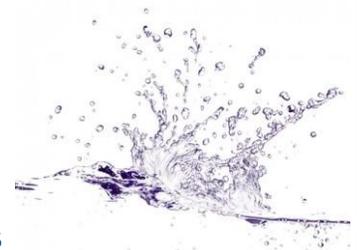


suspended or cancelled if the District does not comply with either condition.

During the summer drought of 2014, the District was able to maintain the lake level above 40.0 m due to voluntary conservation by ratepayers. The situation made it clear that St. Mary Lake cannot accommodate any additional demand until the weir is raised to 41.0 m. Furthermore, even with the weir height at 41.0 m, the additional storage will be sufficient to service the properties that are currently on the District tax roll but may not be able to support any additional development.

Objectives

Item #	Description	Complete	In Progress	Next Steps
Objective #1	Define the source capacity of St. Mary and Maxwell Lakes.			
Action:	The hydrology reports have defined the capacity and confirmed that neither lake can support withdrawals above the current licenced volumes.	√		
Objective #2	Compare the available supply to current demand and the maximum licenced withdrawal.			
Action:	The Maxwell Lake Hydrology Report determined that Maxwell Lake can meet current and licenced demand but may not be able to support any additional demand.	√		
Action:	The St. Mary Lake hydrology report determined that St. Mary Lake cannot support any additional demand until the weir is raised to 41.0 m. The report has also confirmed that St. Mary Lake can support the total licenced withdrawal once the weir height is 41.0 m but cannot support any additional demand.	√		
Objective #3	Limit new demand until storage in St. Mary Lake has been increased.			



Item #	Description	Complete	In Progress	Next Steps
Action:	A moratorium on new service has been implemented and will continue until the weir is raised to 41.0 m.	√		
Objective #4	Assess the potential impacts of climate change on both water sources.			
Action:	The hydrology reports determined that both water sources are at risk due to drought both now and under future climate change scenarios.	√		
Objective #5	Assess the potential impacts of drought on both water sources.			
Action:	The hydrology reports determined that both sources are extremely vulnerable to drought and that Maxwell may not refill for several years after a drought.	√		
Objective #6	Measure bulk water withdrawals and ratepayer consumption.			
Action:	The District is fully metered in both St. Mary and Maxwell water systems.	√		
Objective #7	Identify and address system trends and losses.			
Action:	The District conducts an annual water audit.	√		
Action:	The District has a proactive leak detection program.	√		
Objective #8	Adopt accounting procedures that enable detailed water demand analysis.			
Action:	A new accounting program has been implemented to allow detailed demand analysis by system and sector.	√		
Objective #9	Reduce system losses from reservoir overflows.			
Action:	Automated reservoir level control has been installed in Maxwell system.	√		



Item #	Description	Complete	In Progress	Next Steps
Objective #10	Encourage conservation through the use of a volumetric, increasing-block rate structure.	√		
Action:	The District has had a volumetric rate structure in place for many years and introduced conservation-oriented increasing block pricing in 2014.			
Objective #11	Reduce outdoor water use during the summer.			
Action:	Develop and implement a staged water restrictions bylaw by May 2015.	√		
Objective #12	Reduce demand from outside District boundaries.			
Action:	End bulk water sales by May 31, 2015.	√		
Objective #13	Prepare for dealing with the impacts of drought.			
Action:	Develop a Drought Response Plan with a draft to be completed by September 2015.		√	
Objective #14	Confirm and refine understanding of water balances at both sources.			
Action:	Install continuous, real-time lake level and climate monitoring at St. Mary and Maxwell Lakes by June 2015.	√		
Action:	Install continuous, real-time monitoring of St. Mary Lake outflow to Duck Creek by end of 2015.		√	
Objective #15	Increase storage in St. Mary Lake to allow withdrawal of full licenced amount.			
Action:	Raise the Duck Creek weir elevation to 41.0 m.		√	
Objective #16	Size infrastructure to match available supply.			



Item #	Description	Complete	In Progress	Next Steps
Action:	Design and construct the proposed St. Mary Lake treatment facility to supply the full licenced volume.		✓	
Objective #17	Clearly define undeveloped properties to which the District will provide service and the process for deciding which properties are eligible.			
Action:	Develop a list of undeveloped and under-developed properties on the District tax roll and a queue for those requesting service.		✓	
Objective #18	Improve understanding of potential demand at full build-out in Official Community Plan.			
Action:	Assist Islands Trust in conducting a demand-side analysis within District boundaries.			✓
Action:	Participate in community engagement regarding allocation of limited water resources.			✓
Objective #19	Improve security of the Maxwell Lake supply.			
Action:	Develop a comprehensive watershed management plan for the Maxwell Lake, Rippon Creek and Larmour Creek watersheds.			✓
Action:	Upgrade treatment at Maxwell Lake to meet surface water treatment objectives.			✓
Objective #20	Identify any options for increasing water supply.			
Action:	Explore the potential for new sources and augmentation of existing sources.			✓

Conclusion

The District’s resources are limited and must be very carefully managed to ensure a sustainable future. The objectives and actions outlined above will help ensure a sustainable future for our island community. However, while this new understanding of the limitations of our



freshwater resources may be concerning to many members of the community, be assured that the District recognizes the urgency of the situation. We understand that it requires a strategic and coordinated response by a number of government organizations. Adjusting to new limitations may be difficult but can be achieved. The District asks for your support as we embark on a new era of water management for Salt Spring Island.



Appendix A – 2014 NSSWD Water Audit & Demand Charts

North Salt Spring Waterworks District Annual Water Audit - 2014					
	Maxwell		St. Mary		Both Systems
Bulk Withdrawal	Shepherd Hills	58,720,800	Large Filter	40,084,511	
			Small Filter	45,989,800	
	Total	58,720,800		86,074,311	144,795,111
Metered Consumption	Ratepayers	45,440,603		64,307,923	109,748,526
	Bulk Water & Office			638,000	
	Total	45,440,603		64,945,923	110,386,526
Other Usage	Backwash Water	0		4,154,000	4,154,000
	Analyzer Water	69,870		55,020	124,890
	Tank and other autoflushes	103,000		71,710	174,710
	Distribution System flushing	456,000		480,000	936,000
	Tank Cleaning	72,000		702,000	774,000
	Fire Department	52,450		0	52,450
	Total	753,320		5,462,730	6,216,050
Losses¹	Unmetered Losses	12,526,877		15,665,658	28,192,535
	Unmetered Loss (%)	21%		18%	19%
Total Annual Licence		146,000,000		264,507,500	410,507,500
Total Annual Withdrawal		58,720,800		86,074,311	144,795,111
% Licence Used		40%		33%	35%
Peak Day Withdrawal	12/Sep/14	290,000	3/Aug/14	451,880	692,822
Peak Day Licence		500,000		943,500	on 3/July/14
% Licence Used		58%		48%	
Low Day Withdrawal	23/Dec/14	50,300	7/Apr/14	99,400	194,454
Peak Day Licence		500,000		943,500	on 23/Dec/14
% Licence Used		10%		11%	
Average Day Withdrawal		160,879		235,820	396,699
Peak to Low Day Withdrawal Ratio		5.8		4.5	3.6
NSSWD avg daily usage per SFD	118		BC avg daily usage per person		78
NSSWD avg daily usage per person²	59		Cdn avg daily usage per person		60
Year	2010	2011	2012	2013	2014
Tax Roll	2062	2067	2069	2070	2076
Average Total Connections³	1739	1746	1754	1708	1721
DUE⁴	2447	2452	1734	2555	2553

Notes:

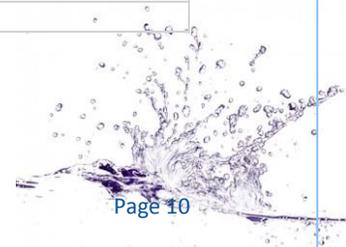
1. Losses include Ganges Hill Tanks overflows and leaks.

2. Assumption: 2 people per household within NSSWD

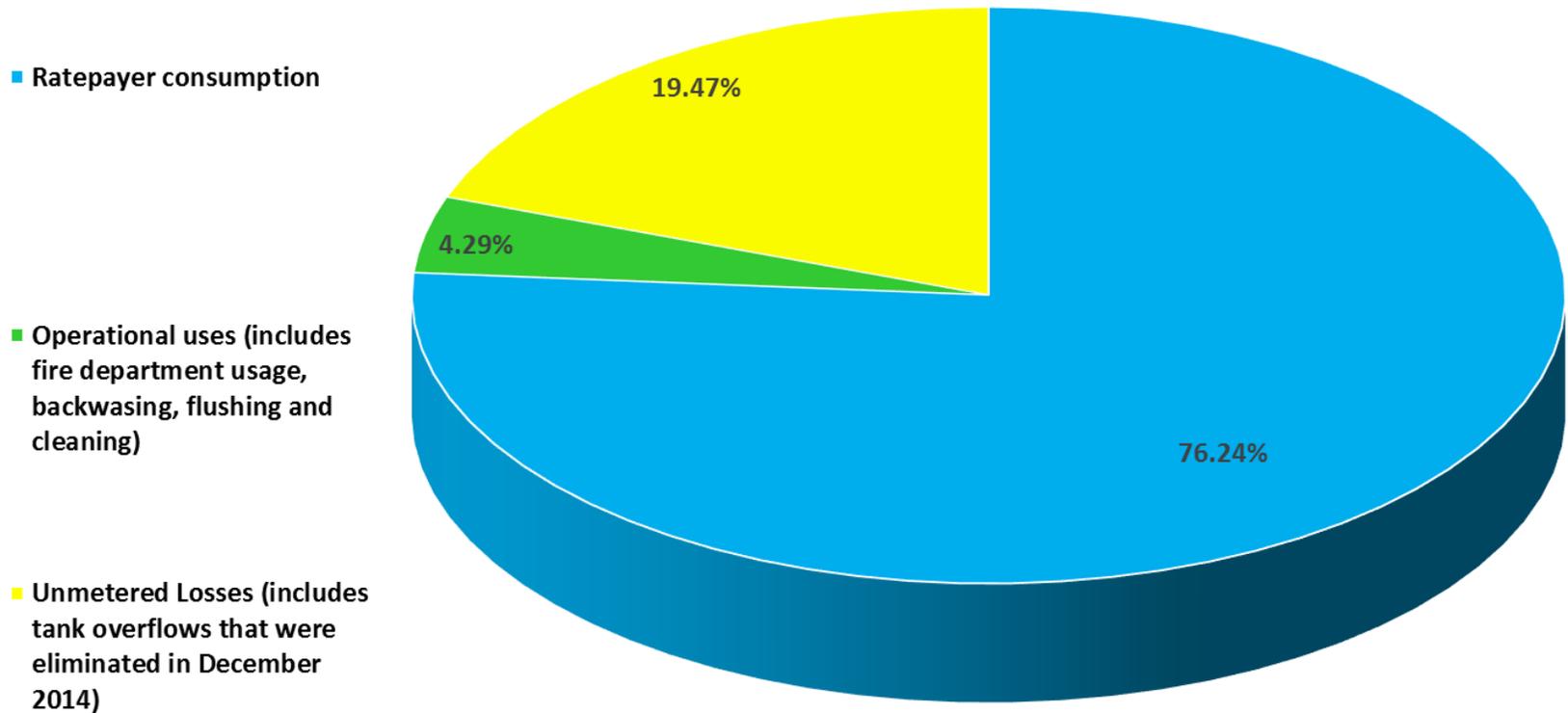
3. Prior to 2013, average total connections figures are higher due to addresses being counted twice when changes of occupancy or ownership occur within a billing period.

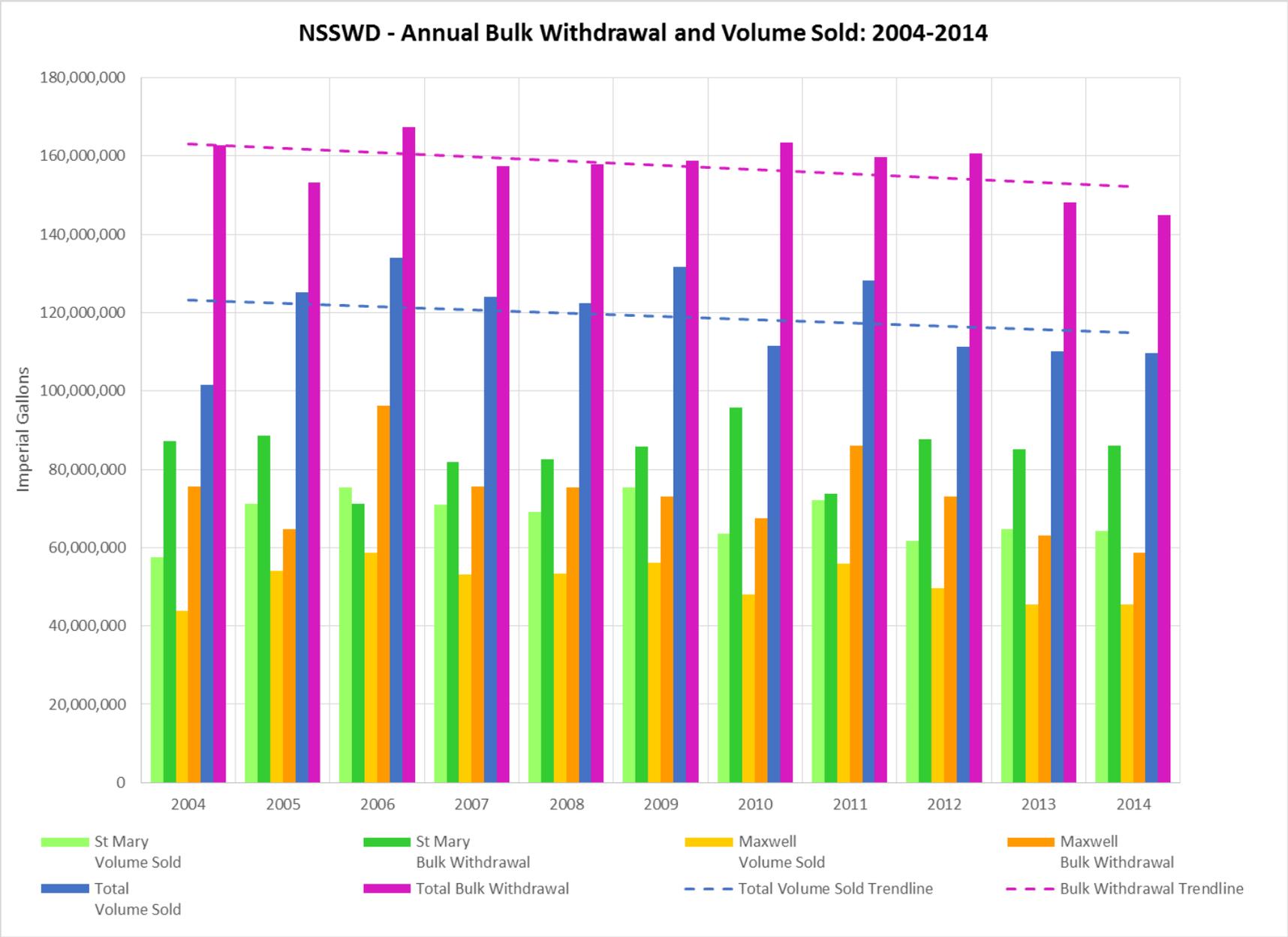
4. 2012 DUEs were not calculated properly because SFDs with zero consumption were erroneously included in the calculation for average consumption by SFDs.

5. Units for all volumes are Imperial gallons.

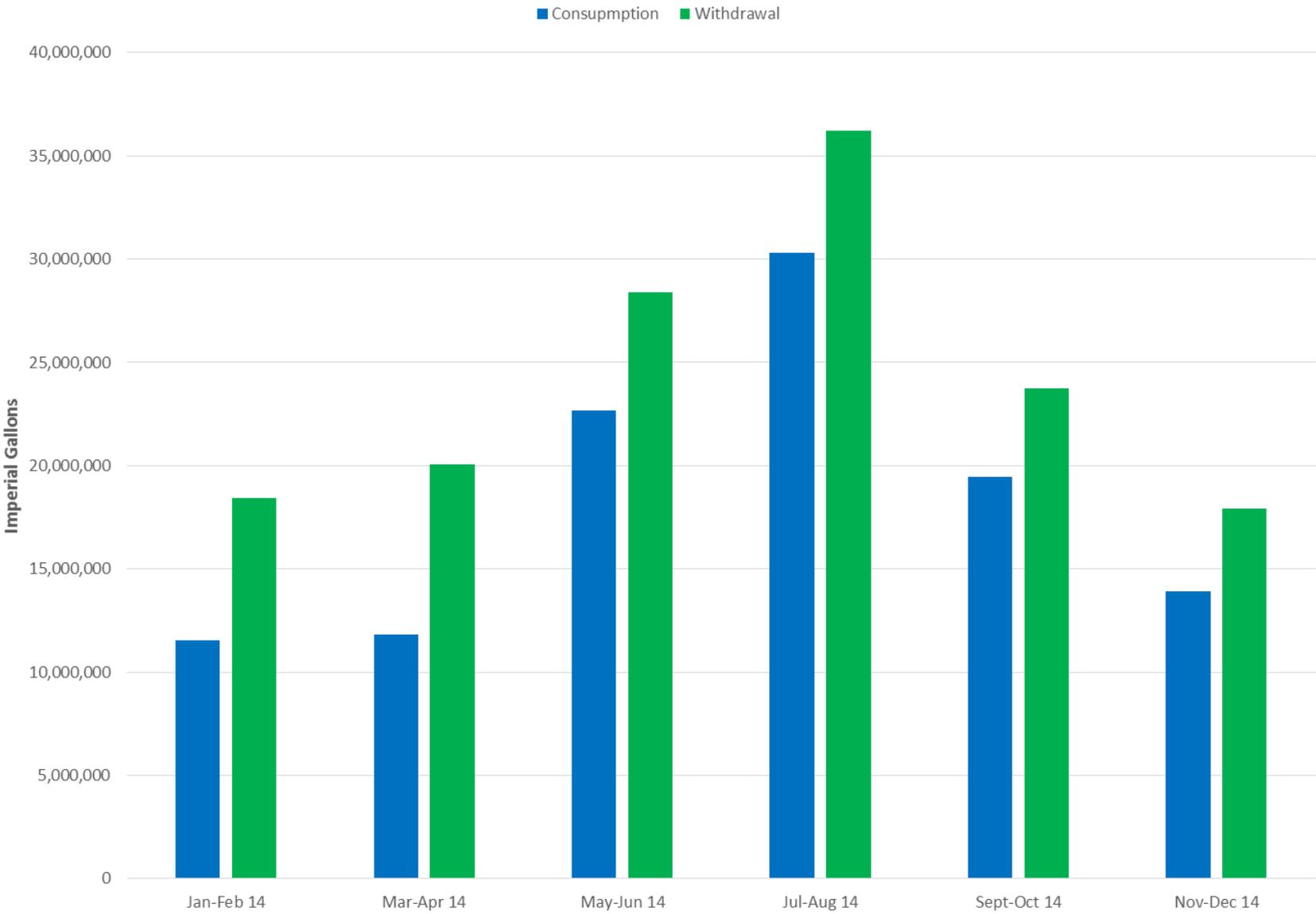


NSSWD Water Usage Breakdown - 2014

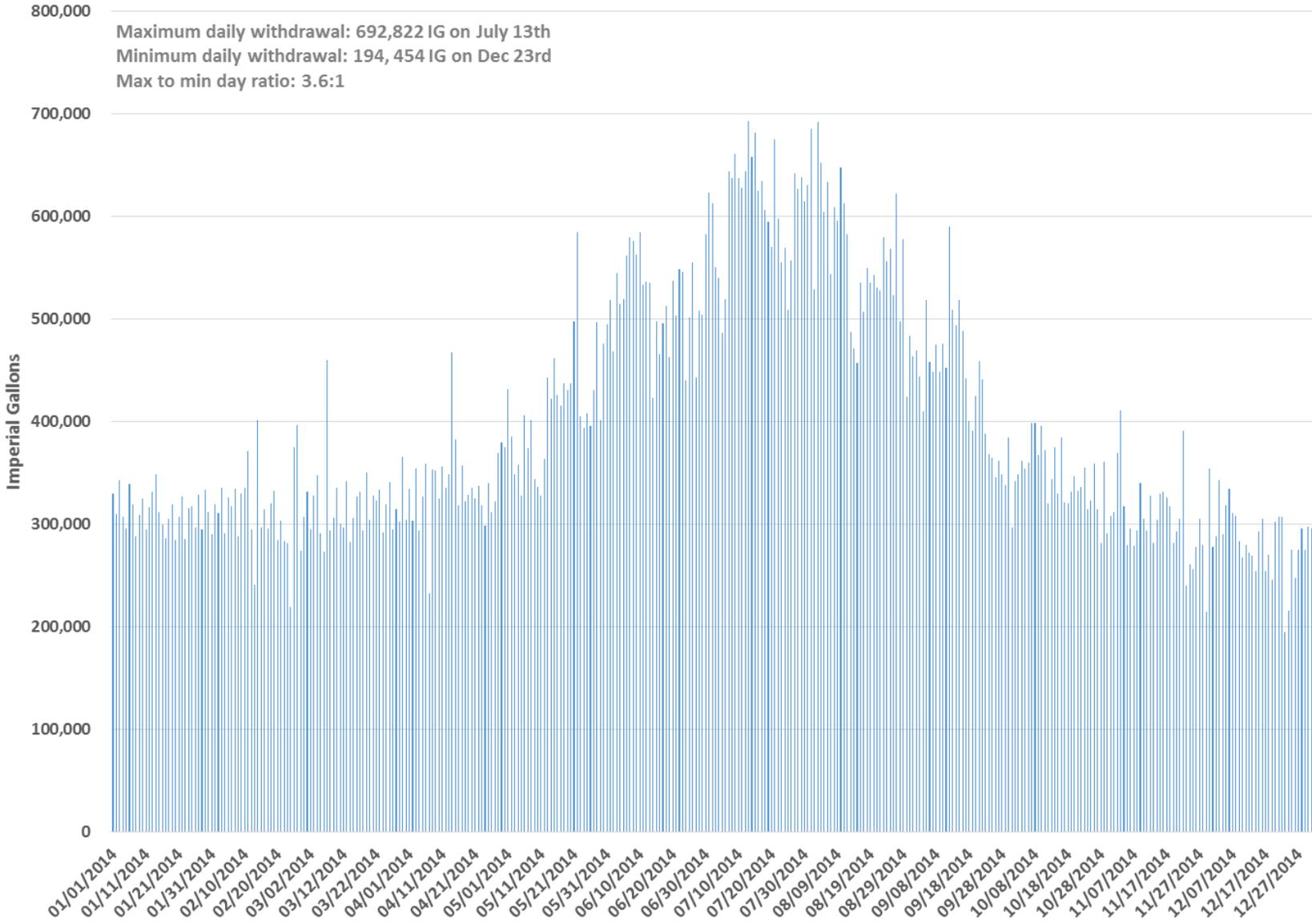




NSSWD -2014 Withdrawal and Consumption by Billing Period



NSSWD - 2014 Total Daily Withdrawals from St. Mary and Maxwell Lakes



References

1. BC Ministry of Environment. (2010). *Preparing for Climate Change: BC's Adaptation Strategy*. Retrieved from http://www.livesmartbc.ca/attachments/Adaptation_Strategy.pdf
2. Sutherland, C. and Yao, W. (2015). *St. Mary Lake Watershed Water Availability and Demand – Climate Change Assessment*. Kerr Wood Leidal Consulting Engineers. Prepared for North Salt Spring Waterworks District.
3. Sutherland, C. and Yao, W. (2015). *Maxwell Lake, Rippon Creek and Larmour Creek Watersheds Water Availability – Climate Change Assessment*. Kerr Wood Leidal Consulting Engineers. Prepared for North Salt Spring Waterworks District.

