

**Appendix B**  
**Water Use Plans**

**Souhegan River Water Management Plan**

**August 2013**

# **WATER USE PLAN**

## **Amherst Country Club (#20190) Ponemah Green Family Golf Center (#20624)**

### **Introduction**

The following Water Use Plan (WUP) has been prepared for Amherst Country Club and Ponemah Green Family Golf Center in Amherst, New Hampshire. This WUP was prepared using information provided by Amherst Country Club and Ponemah Green Family Golf Center (Ponemah Green) and from their water use records reported to the Department of Environmental Services (DES). These facilities are located along the Souhegan Designated River and use water withdrawn from the river to irrigate their respective golf courses. Since both golf courses and with respective irrigation systems are operated by Amherst Country Club, this WUP applies to the combined facilities.

Under the Instream Flow Rules (Chapter Env-Wq 1900), Amherst Country Club/Ponemah Green is considered an Affected Water User (AWU) because their shared registered water source is within 500 ft of the Souhegan Designated River and their registered water source is within the Souhegan River Water Management Planning Area, which is the watershed area of the Souhegan Designated River. Chapter Env-Wq 1900 requires the preparation of water use plans for each AWU located within the Planning Area, and must include:

- Water use data and information to define water use patterns and needs;,
- A description of the potential for water use modification, sharing or both to meet the protected instream flow requirements, including water use patterns and needs;
- An estimate of implementation costs of the plan; and
- An implementation schedule.

### **Water Source and Uses**

The Amherst Country Club/Ponemah Green withdraws water from the Souhegan Designated River using two 7.5 hp sump pumps, resting 8-10 inches off the bottom of the river. Water is withdrawn on an “as needed” basis to irrigate 105 acres of golf course fairways, greens and tees. The purpose of irrigating the courses is to ensure that the various grasses used at the courses remain healthy, adequately watered and meet user expectations.

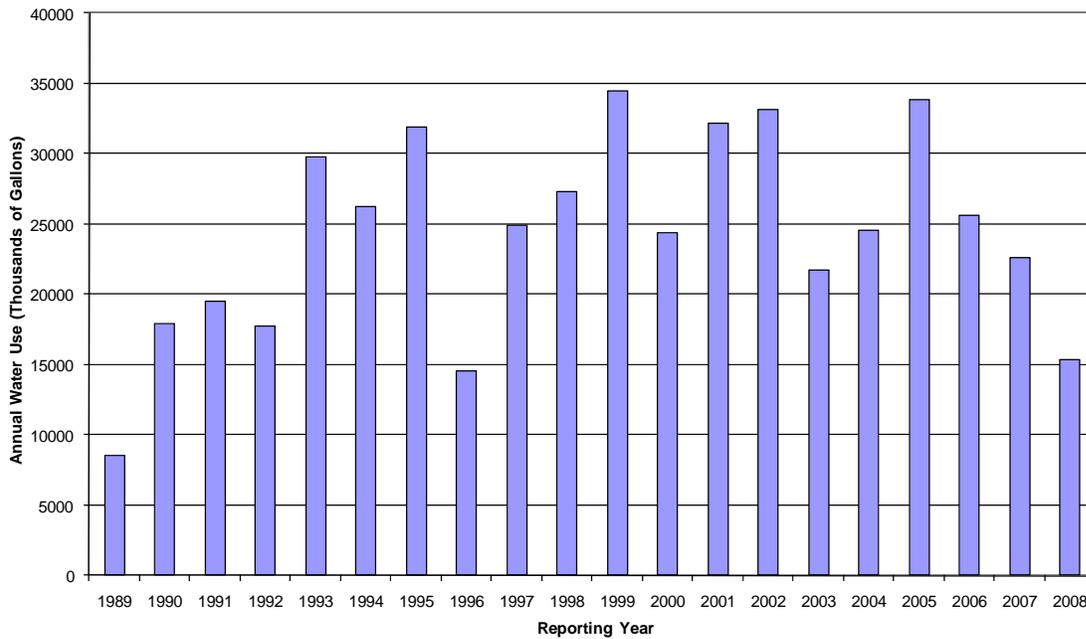
### **Water Use Patterns**

Water use is metered, recorded monthly and reported to DES annually. As noted, water is used on an as-needed basis, with the greatest use during the spring through the fall, depending on the weather. Weather conditions are monitored using information from local weather stations available via the internet. Irrigation is typically performed on a daily basis from early evening to early morning (10-12 hours), when necessary. This irrigation schedule can change depending on

the results of the soil moisture monitoring performed on the course and in response to any mechanical failures of the irrigation system.

Water use data for Amherst Country Club and Ponemah Green for the years of 1989 through 2008 were obtained from the DES and are summarized in Figures 1 and 2 and in Tables 1 and 2. The tables include the conversion of the water use from thousands of gallons to cubic feet per second (cfs) and cubic feet per second per square mile of the drainage area to allow for their comparison with streamflow values reported for the Souhegan Designated River.

Between 1989 and 2008, annual water use by Amherst County Club and Ponemah Green ranged from a high of 34.4 million gallons (1999) to a low of 8.52 million gallons (1989), and average use was 24.3 million gallons (Figure 1 and Table 1). During this period, annual water use increased by 6.86 million gallons or 81 percent. This represents an increase of 343,000 gallons a year or 4.1 percent per year.

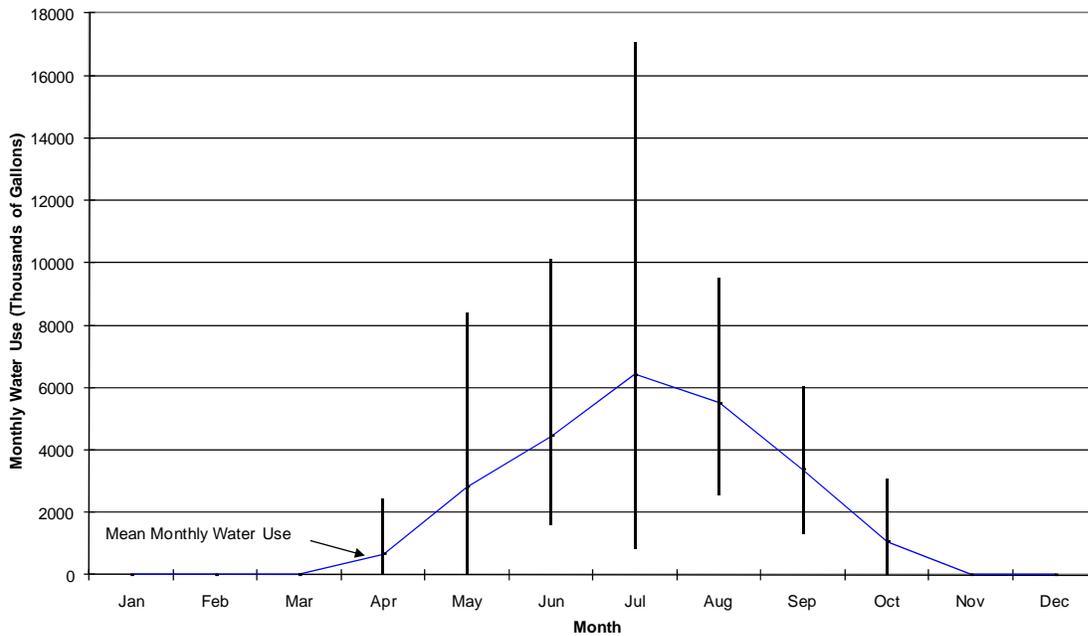


**Figure 1 - Amherst Country Club and Ponemah Green Family Golf Center Annual Water Use from 1989 through 2008**

**Table 1 – Amherst Country Club and Ponemah Green Family Golf Center Annual Water Use Statistics (1989 through 2008)**

	Low	High	Average
(1,000 gal)	8,520	34,400	24,300
(cfs)	0.0360	0.1460	0.1030
(cfsm at impact point)	0.0003	0.0010	0.0007
(cfsm at Merrimack Gage)	0.0002	0.0009	0.0006

Water withdrawals begin in April, increase to a maximum in July and then decline and end by November (Figure 2). The range in monthly water use reflects the weather conditions that affect the water demand by the golf course turf. The highest total monthly water use was 17.1 million gallons (July 2002, a time of drought), the lowest total monthly water use was 0 (multiple occurrences), with an average monthly use of 2.01 million gallons over a full year (Table 2). When averaged for only the April-October period, average monthly water use was 3.47 million gallons.



**Figure 2 - Amherst Country Club and Ponemah Green Family Golf Center Monthly Water Use from 1989 through 2008**

**Table 2 – Amherst Country Club and Ponemah Green Family Golf Center Monthly Water Use Statistics (1989 through 2008)**

	Low	High	Average	Apr - Oct avg
<b>(1,000 gal)</b>	0	17,100	2,010	3,470
<b>(cfs)</b>	0	0.8540	0.1020	0.1760
<b>(cfsm at impact point)</b>	0	0.0060	0.0007	0.0012
<b>(cfsm at Merrimack Gage)</b>	0	0.0050	0.0006	0.0010

The monthly water use data were converted from thousand gallons per month to cubic feet per second by dividing the monthly totals by days and then multiplying them by a flow unit conversion factor. These values were also divided by the drainage basin area (171 sq. miles) relative to the location of the United States Geological Survey gaging station (01094000) on the Souhegan Designated River in Merrimack, New Hampshire and they were also normalized to the drainage area (142 sq. miles) of the Designated Reach above the impact point of the withdrawals.

Based on these values, the water use of the Amherst Country Club and Ponemah Green has ranged from a minimum of 0 cfs (several months), to a maximum of 0.854 cfs (551,957 gallons per day, July 2002) with an average of 0.176 cfs (113,752 gallons per day) for the April through October period and 0.102 cfs (65,925 gallons per day) annually during the last 20 years (Table 2).

### **Potential for Water Use Management to Support Protected Instream Flows**

Presently, the Amherst Golf Course and Ponemah Green are solely dependent upon the direct withdrawal of water from the Souhegan Designated River as their source of irrigation water and, as a result, have limited potential to manage its water use to support the protected instream flows. During those infrequent periods when a reduction in water withdrawals is needed to support the protected instream flows, alternative off-stream sources of water may be needed. These may include:

- withdrawals from existing ponds on the golf course;
- the development of additional water hazard/storage ponds; and
- the development of a new groundwater supply

There are a total of six small ponds located within the Amherst Country Club and Ponemah Green properties. In the past, water was withdrawn from the ponds located on the Ponemah Green property and used for irrigation. This practice was discontinued with the construction of the withdrawal from the Souhegan Designated River, which represents a more reliable source of water. During periods when streamflow in the river falls below the Critical or Rare flow thresholds for a period greater than their catastrophic durations, Amherst Country Club and Ponemah Green could use the former pond withdrawal to temporarily reduce its direct withdrawal from the river.

The construction of additional water hazards or storage ponds on the Amherst Country Club and Ponemah Green properties would potentially impact existing golf course operations due to the lack of undeveloped land. Expansion of the existing ponds is possible, but would reduce the buffer area around these features and potentially impact existing operations.

Another potential alternative off-stream water supply source would be the development of a new groundwater supply. Based on information available from the United States Geological Survey (Toppin 1987), the Amherst Country Club and Ponemah Green properties are located on a stratified-drift aquifer. Production from a new well could be used during periods when streamflow in the river falls below the Critical or Rare flow thresholds for a period greater than their catastrophic durations, thereby replacing or reducing its direct withdrawal from the river.

Each of these alternatives would require additional evaluation to determine their feasibility. Important factors in determining their feasibility would include: the amount of water made available by the development of the alternative; the identification and evaluation of any hydrologic impact to the Souhegan Designated River as a result of the development of the alternative; and the cost of each alternative and their permitting requirements.

## Water Use Plan Activity

The highest mean and total monthly water use by Amherst Country Club and Ponemah Green occurs during June, July and August, which also coincides with the two bioperiods (GRAF Spawning and Rearing & Growth – June 15 to September 30) that have the lowest protected instream flow values (Critical flow of 26 cfs and Rare flow of 17 cfs, DES 2008). To support the protected instream flows, Amherst Country Club and Ponemah Green will be required to reduce its direct withdrawal of water from the Souhegan Designated River to the *de minimis* amount when mean daily discharge, as measured at the USGS gaging station (01094000) in Merrimack, falls below the Critical flow threshold of 26 cfs for a period exceeding its catastrophic duration of 20 days or when the mean daily discharge falls below the Rare flow threshold of 17 cfs. Mean daily discharge at the USGS gaging station and the protected instream flow conditions will be tracked by DES and will be available at its web page:

<http://www2.des.state.nh.us/OneStopPub/Watershed/souhegan-lower-pisf-track.xls>

Under Env-Wq 1900 Rules for the Protection of Instream Flow on Designated Rivers, the *de minimis* amount of water “shall always be available for use,” where the *de minimis* amount is defined as being “equal to 5 percent of 7Q10 at that location” (Env-Wq 1902.07). 7Q10 refers to the lowest average flow rate for a period of 7 consecutive days on an annual basis with an expected recurrence interval of once in every 10 years (Env-Wq 1902.01). Based on the discharge records for the USGS gaging station (01094000) in Merrimack, the 7Q10 for the Souhegan Designated River is 12.9 cfs, so the *de minimis* amount (5 percent) is equal to 0.65 cfs or 416,876 gallons per day. This *de minimis* amount of water is to be shared equally among those withdrawing water under this condition; the Amherst Country Club/Ponemah Green Family Golf Center, Souhegan Woods Golf Club, and Mr. de Bruyn Kops.

Since there are two other direct withdrawals on the Souhegan Designated River, the portion available to the Amherst Country Club and Ponemah Green facility is 0.22 cfs or 142,190 gallons per day. While this value is slightly higher than the historical average water use (in cfs) by Amherst Country Club and Ponemah Green Family Golf Center from April through October (Table 2) it is less than the average water use during the months of June, July and August. This suggests that more stringent water conservation measures would need to be implemented as a management action by Amherst Country Club and Ponemah Green Family Golf Center to reduce water demand, or that an alternative source(s) of water would need to be used to supplement the water withdrawal from the river.

The reduction in the direct withdrawal of water from the Souhegan Designated River would be rescinded when daily mean discharge, as measured at the USGS gaging station (01094000), exceeds 26 cfs, from a natural recharge event, for two consecutive days.

## Estimated Water Use Plan Implementation Costs

During periods of reduced withdrawals from the Souhegan Designated River, Amherst Country Club and Ponemah Green Family Golf Centers would need to either reduce their irrigation operations by taking additional conservation measures or supplement the withdrawal of water

from existing or new on-site storage ponds or from a new groundwater supply well. The development of a new groundwater supply well has several potential advantages over on-site storage ponds, the most important being that it would provide a larger and more continuous source of water for irrigation. The estimated cost for the exploration, permitting and development of a new well is dependent on the site specific conditions, but this cost could exceed \$100,000.

### **Water Use Plan Implementation Schedule**

By June 1, 2014, Amherst Country Club and Ponemah Green will implement its Water Use Plan and will institute the measures required to support the protected instream flows on the Souhegan Designated River during the GRAF Spawning and Rearing & Growth bioperiods from June 15 to September 30.

### **Water User Contact Information**

**Water User:** Amherst Golf Club/Ponemah Green Family Golf Center  
**Address:** 72 Ponemah Rd, Amherst, 03031  
**Contact:** Steve Wilson, Golf Course Superintendent  
**Phone:** 673-9908 ext. 20  
**Email:** [SWilson@AmherstCountryClub.com](mailto:SWilson@AmherstCountryClub.com)

### **Conversion Factors for Volume and Flow Units**

1	cubic foot =	7.481	gallons
1	gallon =	0.1337	cubic feet
1	acre-foot =	43,560	cubic feet
1	acre-foot =	325,872	gallons
1	cfs =	448.86	gpm
1	cfs =	646,358.4	gpd
1	cfs =	0.65	MGD
1	gpm =	0.002227866	cfs
1	gpd =	0.00000154713	cfs
1	MGD =	1.5471	cfs

### **Sources of Information**

Env-Wq 1900 Rules for the Protection of Instream Flow on Designated Rivers, effective 5/28/11.

Department of Environmental Services (DES) 2008. Final Souhegan River Protected Instream Flow Report. Prepared by University of New Hampshire, University of Massachusetts and Normandeau Associates, Inc.

Survey of Souhegan River Affected Water Users performed by Normandeau Associates, Inc. and completed by Steve Wilson, Amherst Country Club and Ponemah Green Family Golf Center.

Toppin, K.W. 1987. Hydrogeology of Stratified-Drift Aquifers and Water Quality in the Nashua Regional Planning Commission Area. South-Central New Hampshire. United States Geological Survey Water-Resources Investigations Report 86-4358. Prepared in cooperation with the Nashua Regional Planning Commission and the New Hampshire Water Resources Board.

Personal communication with Jamin Warren, Amherst Country Club and Ponemah Green Family Golf Center.

Personal communication with Steve Wilson, Amherst County Club.

Water use reports on file with the Department of Environmental Services (DES).

# **WATER USE PLAN**

## **Chamberlain Falls Dam (#20230)**

### **Introduction**

The following individual Water Use Plan (WUP) has been prepared for Chamberlain Falls Dam, which is located on the Souhegan River in Greenville, New Hampshire. This WUP was prepared using information provided by Alden Engineering and from their water use records reported to the Department of Environmental Services (DES). The dam is a privately owned hydropower facility that is licensed by the Federal Energy Regulatory Commission (FERC Project No. 7922) and registered with the DES Dam Bureau (#101.03).

Under the Instream Flow Rules (Chapter Env-Wq 1900), Chamberlain Falls Dam is considered an Affected Water User (AWU) because it is a registered water source within 500 ft of the designated segment of the Souhegan River. In addition, the dam is within the Souhegan River Water Management Planning Area (WMPA), which is the watershed area of the Souhegan Designated River. Chapter Env-Wq 1900 requires the preparation of water use plans for each AWU located within the Planning Area, and must include:

- Water use data and information to define water use patterns and needs;
- A description of the potential for water use modification, sharing or both to meet the protected instream flow requirements, including water use patterns and needs;
- An estimate of implementation costs of the plan; and
- An implementation schedule.

### **Water Source and Uses**

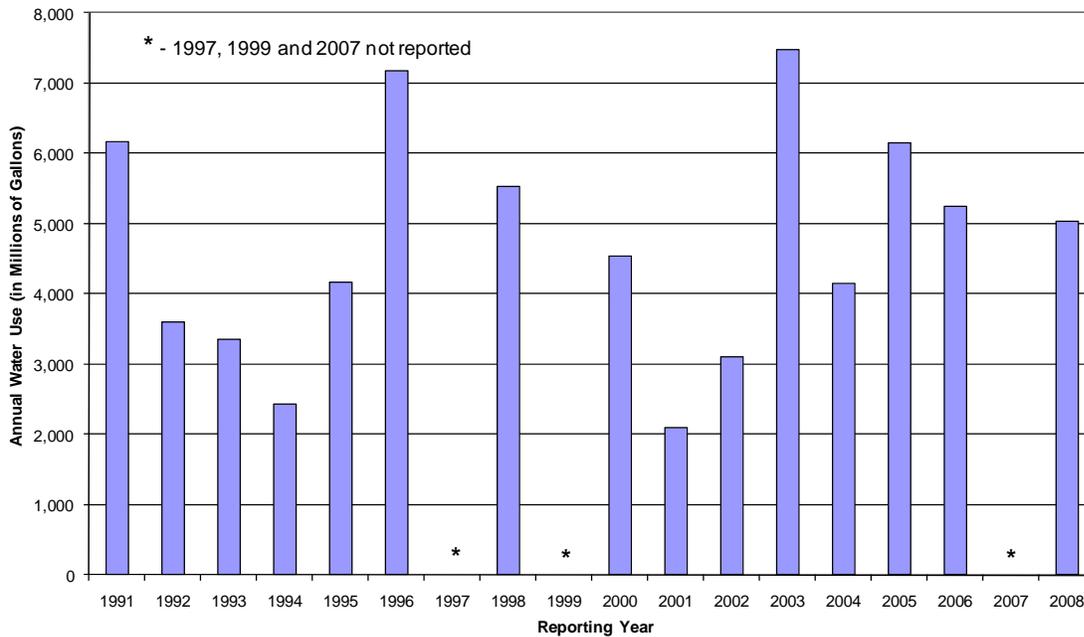
The source of water for the hydropower operations at Chamberlain Falls Dam is the main stem of the Souhegan River and the small impoundment immediately upstream of the dam. The dam is operated as run-of-river, meaning that the operation of the dam does not alter the flow of the river, and that all of the water diverted through the hydroelectric turbines is returned to the river.

If sufficient flow is available, the hydroelectric operations at Chamberlain Falls Dam can produce power 24 hours a day, seven days a week, 365 days a year. Under the terms of its license to operate, the facility must allow for a minimum outflow of 10 cubic feet per second (cfs) during the summer (June through September) and 15 cfs during the winter (October through May). When the hydropower facility is not operating (flows less than 20 cfs), all of the flow goes over the spillway of the dam.

### **Water Use Patterns**

Water use data for the Chamberlain Falls Dam, for the period of 1989 through 2008, were obtained from the DES and are summarized in Figures 1 and 2 and in Tables 1 and 2. Water use records for 1989 and 1990 were incomplete, and water use data for 1997, 1999 and 2007 were missing, so they are not included in the annual use summaries.

Water use by Chamberlain Falls Dam is dependent on river flow. Between 1991 and 2008, annual water use by Chamberlain Falls Dam ranged from a high of 7,470 million gallons (2003) to a low of 2,100 million gallons (2001), and average use was 4,680 million gallons for the 15 years that a complete record was available (Figure 1 and Table 1). Annual water use has not shown significant upward or downward trends and has mirrored the water usage at other Souhegan River dams.



**Figure 1 – Chamberlain Falls Dam Annual Water Use 1991 through 2008**

**Table 1 – Chamberlain Falls Dam Annual Water Use Statistics (1991 through 2008)**

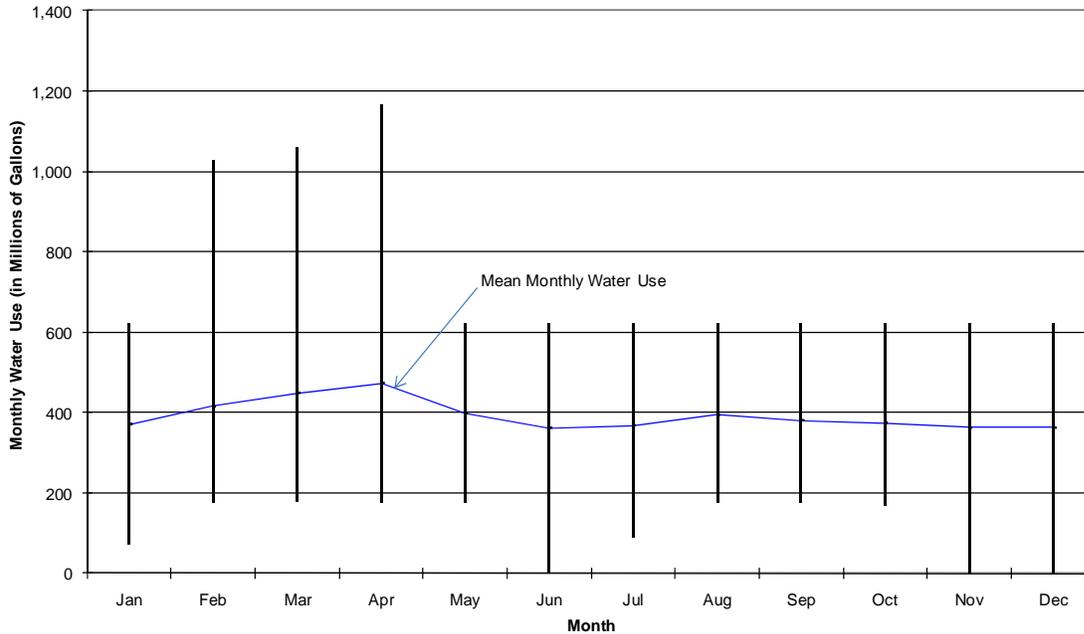
	Low	High	Average
(million gal)	2,100	7,470	4,680
(cfs)	8.93	31.70	19.90
(cfsm at impact point)	0.301	1.070	0.670
(cfsm at Merrimack Gage)	0.052	0.190	0.116

The highest total monthly water use by Chamberlain Falls Dam was 1,170 million gallons (April, 2008), the lowest total monthly water use was 0 gallons (June 2008), with an average monthly use of 393 million gallons (Figure 2 and Table 2). Generally, monthly water use is quite consistent, varying between 350 and 500 million gallons per month. Greatest monthly usage is usually during April, when river flows are highest, which is typical for a run-of-river dam in New Hampshire.

The monthly water use data were converted from thousand gallons per month to cubic feet per second (cfs) by dividing the monthly totals by days and then multiplying them by a flow unit conversion factor. These values were also divided by the drainage basin area (171 sq. miles)

relative to the location of the United States Geological Survey gaging station (01094000) on the Souhegan Designated River in Merrimack, New Hampshire and they were also normalized to the drainage area (29.6 sq. miles) of the Designated Reach above the impact point of the withdrawal.

Based on these values, the average daily water use for Chamberlain Falls Dam has ranged from a minimum of 0 cfs (June 2008) to a maximum of 60.2 cfs (38.9 million gallons per day, April 2008), and average use was 20.0 cfs (12.9 million gallons per day) for the period of 1988 to 2008 (Table 2).



**Figure 2 – Chamberlain Falls Dam Monthly Water Use 1991 through 2008**

**Table 2 – Chamberlain Falls Dam Monthly Water Use Statistics (1989 through 2008)**

	Low	High	Average
<b>(million gal)</b>	0	1,170	393
<b>(cfs)</b>	0	60.20	20.00
<b>(cfsm at impact point)</b>	0	2.030	0.676
<b>(cfsm at Merrimack Gage)</b>	0	0.352	0.117

### Potential for Water Use Management to Support Protected Instream Flows

Chamberlain Falls Dam has limited potential to manage its water use to support the Protected Instream Flows because it is operated on a run-of-river basis and is already required to support minimum flows in the Souhegan Designated River as a condition of its FERC operating license. The water use of the dam reflects the discharge of the river.

## **Water Use Plan Activity**

Since Chamberlain Falls Dam is operated on a run-of-river basis, and is required to maintain minimum flows in the Souhegan Designated River, the only water use management action to be taken to support the protected instream flows is to pass relief flows un-attenuated from the dams located upstream during a water management action event.

## **Estimated Water Use Plan Implementation Costs**

Since the water use management action for Chamberlain Falls Dam is to allow any relief flows to pass un-attenuated, there is no direct cost associated with the implementation of the plan.

## **Water Use Plan Implementation Schedule**

By June 1, 2014 Chamberlain Falls Dam will implement its Water Use Plan in order to institute the measures required to support the protected instream flows.

## **Water User Contact Information**

**Water User:** Alden Hydro LLC  
**Address:** 69 Spring Hill Road, Sharon, NH 03458  
**Contact:** Robert Greenwood  
**Phone:** 924-5777  
**Email:** greenwoodandson@aol.com

## **Conversion Factors for Volume and Flow Units**

1	cubic foot =	7.481	gallons
1	gallon =	0.1337	cubic feet
1	acre-foot =	43,560	cubic feet
1	acre-foot =	325,872	gallons
1	cfs =	448.86	gpm
1	cfs =	646,358.4	gpd
1	cfs =	0.65	MGD
1	gpm =	0.002227866	cfs
1	gpd =	0.00000154713	cfs
1	MGD =	1.5471	cfs

## **Sources of Information**

Env-Wq 1900 Rules for the Protection of Instream Flow on Designated Rivers, effective 5/28/11.

Department of Environmental Services (DES) Dam Bureau, NHDAMS Data Sheet for Chamberlain Falls Dam.

Survey of Souhegan River Affected Water Users performed by Normandeau Associates, Inc. and completed with input from Robert Greenwood, Alden Engineering.

Water use reports on file with the Department of Environmental Services (DES).

# **WATER USE PLAN**

## **Greenville Water Works (#20047)**

### **Introduction**

The following individual Water Use Plan (WUP) has been prepared for Greenville Water Works, which serves as the public water supplier for the Town of Greenville, New Hampshire and provides industrial process water to Pilgrim Foods (#20681). Greenville Water Works has one active water source, the Tobey Reservoir located in Temple, New Hampshire. This WUP was prepared using information provided by Greenville Water Works and from their water use records reported to the Department of Environmental Services (DES).

Under the Instream Flow Rules (Chapter Env-Wq 1900), Greenville Water Works is considered an Affected Water User (AWU) because its registered water source is within 500 ft of a tributary to the Souhegan Designated River and its registered water source is within the Souhegan River Water Management Planning Area (WMPA), which is the watershed area of the Souhegan Designated River. Chapter Env-Wq 1900 requires the preparation of water use plans for each AWU located within the Planning Area, and must include:

- Water use data and information to define water use patterns and needs;
- A description of the potential for water use modification, sharing or both to meet the protected instream flow requirements, including water use patterns and needs;
- An estimate of implementation costs of the plan; and
- An implementation schedule.

### **Water Source and Uses**

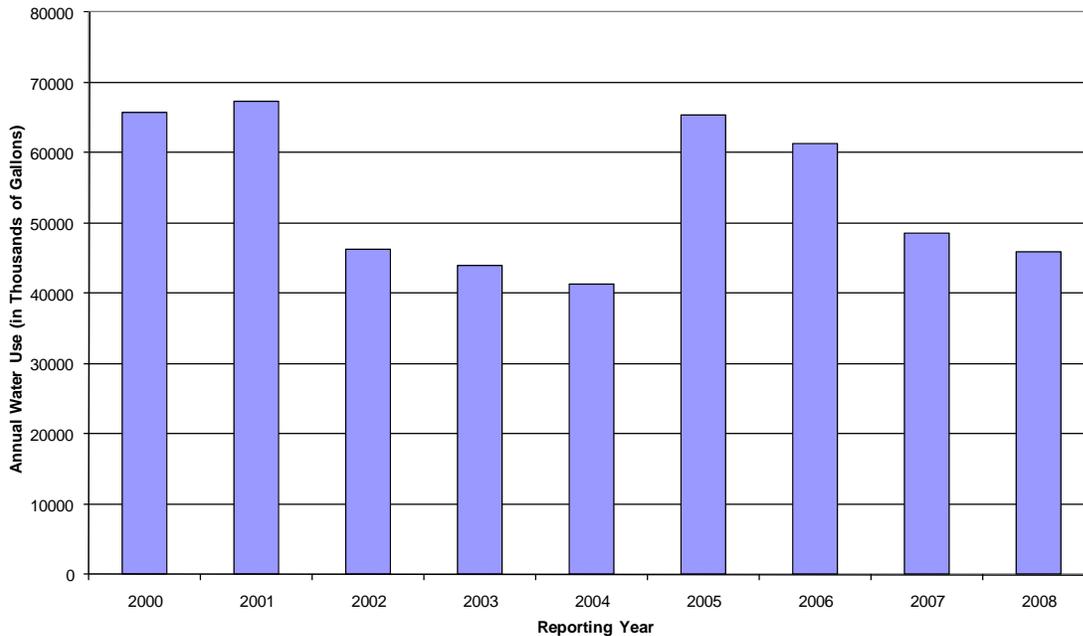
The Town of Greenville's water supply source is the Tobey Reservoir (20047-S01), which is located in Temple, New Hampshire east of Route 45. The Tobey Reservoir was created by two dams; one on an unnamed tributary of Temple Brook to the north and the other on an unnamed tributary of the Souhegan River to the south. Temple Brook flows into Blood Brook in Wilton, which discharges into the Souhegan River approximately 4 miles downstream of Greenville. A small drain pipe is located at the base of the north dam and water is not continuously released from this outlet structure. Water is continuously released to a small stream through an outlet structure at the south dam. This unnamed tributary then flows to the south and discharges into the Souhegan River approximately 1.3 miles downstream of Greenville. The major source of water for the reservoir is the two contributing watershed of the small unnamed tributaries.

Water withdrawn from the reservoir is pumped to a water treatment plant. The water treatment facility is capable of treating 0.25 million gallons of drinking water per day. Greenville recently completed a new 600,000 gallon storage tank, which brings their treated water storage capacity to 750,000 gallons. The treated water is distributed to residents and businesses located within the town.

## Water Use Patterns

Water use data for the Greenville Water Works for the period of 1999 through 2008 were obtained from the DES and are summarized in Figures 1 and 2 and as well as Tables 1 and 2. The water use records for the system were incomplete for 1999, so they are not included in the annual use summaries. The monthly summaries include both complete and incomplete records for the years 1999 through 2008.

Between 2000 and 2008, annual water use by Greenville Water Works ranged from a high of 67.4 million gallons (2001) to a low of 41.4 million gallons (2004) with an average annual use of 54.0 million gallons (Figure 1 and Table 1). During this period, annual water use declined by 19.86 million gallons or 30 percent. This represents an average decrease of 2.21 million gallons per year or 3.4 percent per year over this nine year period. The lack of any growth in water use is attributable to no significant new development in the town and also reflects the improvements made to the water distribution system to reduce leakage.



**Figure 1 – Town of Greenville Water Works Annual Water Use from 2000 through 2008**

**Table 1 – Town of Greenville Water Works Annual Water Use Statistics (2000 through 2008)**

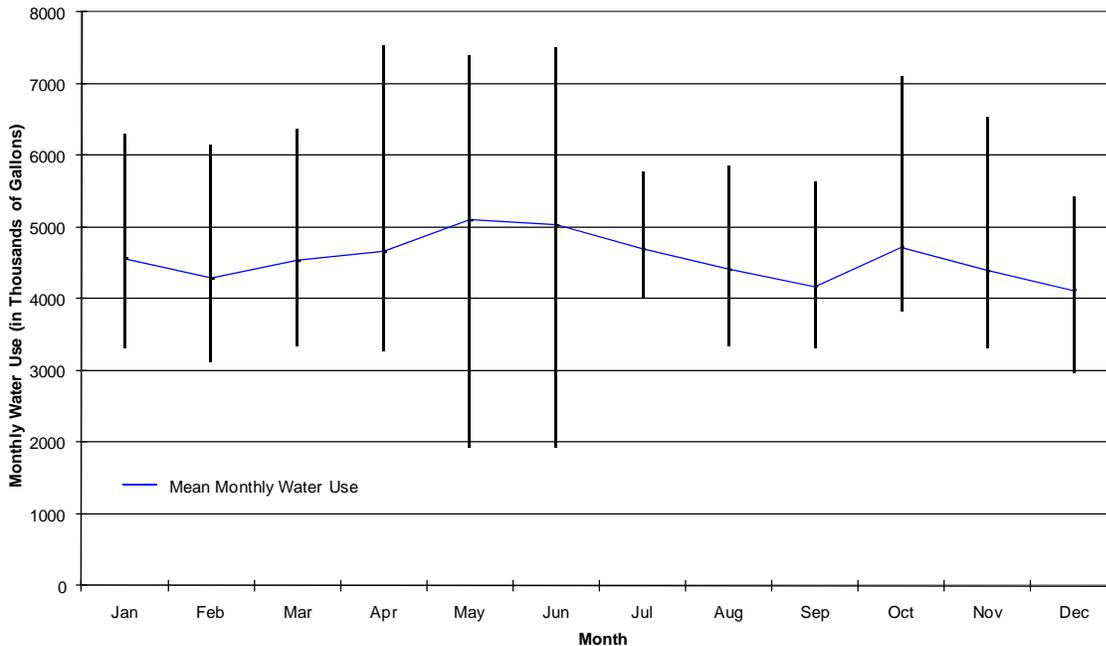
	Low	High	Average
(thousand gal)	41,400	67,400	54,000
(cfs)	0.1760	0.2860	0.2290
(cfsm at impact point)	0.0045	0.0074	0.0059
(cfsm at Merrimack Gage)	0.0010	0.0017	0.0013

The monthly water use records for the system begin in March 1999. Monthly water use varies in response to weather conditions and changes in seasonal demand. The total and average monthly water usage was highest during summer and lowest during winter (Figure 2). This seasonal pattern reflects increased outdoor water usage (lawn irrigation, garden watering, vehicle washing, etc.) during the summer months, which is a minimum during the winter months. The highest total monthly water use was 7.54 million gallons (April, 2005), the lowest total monthly water use was 1.92 million gallons (May and June, 2004), while the average monthly water use was 4.56 million gallons (Figure 2 and Table 2).

Approximately 12.0 million gallons of annual water use is by Pilgrim Foods (#20681), an industrial facility in the Town of Greenville. Pilgrim Foods' monthly water use varies in the range of 1.10 to 1.70 million gallons during the year.

The monthly water use data for Greenville Water Works were converted from thousand gallons per month to cubic feet per second by dividing the monthly totals by days and then multiplying them by a flow unit conversion factor. These values were also divided by the drainage basin area (171 sq. miles) relative to the location of the United States Geological Survey gaging station (01094000) on the Souhegan Designated River in Merrimack, New Hampshire and they were also normalized to the drainage area (38.8 sq. miles) of the Designated Reach above the impact point of the withdrawal.

Based on these values, the average daily water use by Greenville Water Works has ranged from a minimum of 0.099 cfs (63,986 gallons per day, June 2004) to a maximum of 0.389 cfs (251,419 gallons per day)(April 2005), and average use was 0.232 cfs (149,946 gallons per day) for the period of 1999 to 2008 (Table 2).



**Figure 2 – Town of Greenville Water Works Monthly Water Use from 1999 through 2008**

**Table 2 – Town of Greenville Water Works Monthly Water Use Statistics (1999 through 2008)**

	<b>Low</b>	<b>High</b>	<b>Average</b>
<b>(thousand gal)</b>	1,920	7,540	4,560
<b>(cfs)</b>	0.0990	0.3890	0.2320
<b>(cfsm at impact point)</b>	0.0026	0.0100	0.0060
<b>(cfsm at Merrimack Gage)</b>	0.0006	0.0023	0.0014

**Potential for Water Use Management to Support Protected Instream Flows**

The potential for the management of water use by Greenville Water Works to support the protected instream flows on the Souhegan Designated River is moderate to low. Greenville’s existing water supply, the Tobey Reservoir, is located in the headwaters of a tributary of Souhegan Designated River. The dam reportedly (DES Dam Bureau) has a maximum storage volume of 3,310 acre-feet (1,078 million gallons) with 652 acre-feet (212.5 million gallons) of storage reserved for water supply.

**Water Use Plan Activity**

Greenville’s water use could be managed to support the Protected Instream Flow to a very limited degree. Greenville’s water supply source is the Tobey Reservoir, which has a reserved capacity of 212.5 million gallons (652 acre-feet) for the Town’s water supply, which is three times greater than Greenville’s reported maximum annual water use of 67.4 million gallons (2001). Reduced water use will have little impact on river flow because the discharge from the Greenville waste water treatment plant is upstream from the discharge of the Tobey Reservoir. Given the low consumptive losses in the system, the Protected Instream Flow deficits are not substantially remedied by reduced use in the Greenville water system. As such, the Water Use Plan calls for actions such as outdoor use restrictions only when water supply capacity in Tobey Reservoir is low or other system infrastructure problems occur.

Greenville Water Works has an established Emergency Action Plan (Woodard & Curran Inc. 2009) with a multi-stage, outside water use reduction plan that applies during a water system emergency, which may include a drought.

Outside water use reduction will be accomplished by implementing the plans for outdoor water use reduction included in the Emergency Action Plan (Woodard & Curran 2009). Outdoor water use is heaviest during the summer and early fall. Under the Emergency Action Plan, outdoor water use will be reduced in three stages: an alert with voluntary water conservation, water use restrictions, and a water use ban.

The notification process for these actions is defined in the Town’s Emergency Plan (Woodard & Curran 2009). The Greenville Water Department Project Manager with the assistance of the water treatment plant operators will implement water conservation notification at the Greenville Water Department. Greenville Water Department staff will use telephone and cable channel notification procedures and post notices to implement and cancel water conservation measures.

Nothing in Water Use Plan precludes the Town from implementing more restrictive water use actions on its own initiative.

### **Estimated Water Use Plan Implementation Costs**

The water use management actions are the implementation of outside water use reductions or bans only when water supply capacity in Tobey Reservoir is low or other system infrastructure problems occur. There are no additional direct costs associated with the implementation of these water use management actions.

### **Water Use Plan Implementation Schedule**

By June 1, 2014, the Town of Greenville will implement its Water Use Plan by instituting the measures to support the protected instream flows on the Souhegan Designated River during the GRAF Spawning and Rearing & Growth bioperiods from June 15 to September 30.

### **Water User Contact Information**

**Water User:** Town of Greenville  
**Address:** P.O. Box 343, Greenville, NH 03048  
**Contact:** Carla Mary  
**Phone:** 878-1338  
**Email:** cmary@woodardcurran.com

### **Conversion Factors for Volume and Flow Units**

1	cubic foot =	7.481	gallons
1	gallon =	0.1337	cubic feet
1	acre-foot =	43,560	cubic feet
1	acre-foot =	325,872	gallons
1	cfs =	448.86	gpm
1	cfs =	646,358.4	gpd
1	cfs =	0.65	MGD
1	gpm =	0.002227866	cfs
1	gpd =	0.00000154713	cfs
1	MGD =	1.5471	cfs

## Sources of Information

Env-Wq 1900 Rules for the Protection of Instream Flow on Designated Rivers, effective 5/28/11.

Department of Environmental Services (DES) 2008. Final Souhegan River Protected Instream Flow Report. Prepared by University of New Hampshire, University of Massachusetts and Normandeau Associates, Inc. NHDES-R-WD-06-50.

Personal communication with Carla Mary, Woodard and Curran, contractor for Town of Greenville.

Survey of Souhegan River Affected Water Users performed by Normandeau Associates, Inc. and completed with input from Carla Mary, Woodard and Curran, contractor for the Town of Greenville.

Woodard & Curran, Inc. 2009. Town of Greenville Water Treatment Facility Emergency Action Plan.

Water use reports on file with the Department of Environmental Services (DES).

# **WATER USE PLAN**

## **Milford Fish Hatchery (#20218)**

### **Introduction**

The following individual Water Use Plan (WUP) has been prepared for the New Hampshire Fish and Game Department's Milford Fish Hatchery. This WUP was prepared using information provided by Milford Fish Hatchery and from their water use records reported to the Department of Environmental Services (DES). The Milford Fish Hatchery has two overburden water supply wells that are located north of the Souhegan Designated River, west of the hatchery facility just off North River Road in Milford, New Hampshire. The water pumped from these two wells is the source water for the fish hatchery operations. The hatchery raises trout for stocking in New Hampshire streams.

Under the Instream Flow Rules (Chapter Env-Wq 1900), Milford Fish Hatchery is considered an Affected Water User (AWU) because its registered water sources are within 500 ft of the Souhegan Designated River or its tributaries and its registered water sources are within the Souhegan River Water Management Planning Area (WMPA), which is the watershed area of the Souhegan Designated River. Chapter Env-Wq 1900 requires the preparation of water use plans for each AWU located within the Planning Area, and must include:

- Water use data and information to define water use patterns and needs;
- A description of the potential for water use modification, sharing or both to meet the protected instream flow requirements, including water use patterns and needs;
- An estimate of implementation costs of the plan; and
- An implementation schedule.

### **Water Source and Uses**

The Milford Fish Hatchery has two registered ground water wells, Well #4 (20218-S01, also known as the River Well) and Well #1 (20218-S02, also known as the Field Well). Much of the water used by the fish hatchery is returned to the Souhegan via an outfall above Purgatory Brook, a tributary to the Souhegan River (20218-D01).

Groundwater is withdrawn almost continuously since the wells are the water supply source for the fish hatchery and fish are cultivated year round. A separate water supply well is used to provide potable water to the hatchery facility. There is no water storage facility at the fish hatchery.

Although the water source is groundwater, due to the fact that these wells are located in a stratified drift formation that is connected to the Souhegan River, the wells intercept water that would be flowing in or just below the Souhegan River. An analysis of induced recharge by these wells was performed as part of the Instream Flow Study (DES 2005). The results of the analysis indicate that for the average pumping rates, the River Well induces 22 percent of its extraction from the river and the Field Well induces 35 percent of its extraction from the river.

The hydrologic conditions of the Souhegan River and other water use activities near the Milford Fish Hatchery wells are complex. Much of the water captured by these wells is likely returning to the Souhegan River thousands of feet downstream at or beyond where the fish hatchery return is occurring. The OK Tool Superfund Site returns water to the aquifer up-gradient of the fish hatchery wells. The Savage Superfund Site returns water to the aquifer and to the river just downstream of the fish hatchery wells, artificially augmenting both stream flow and the aquifer. The water returned from the fish hatchery enters Purgatory Brook which parallels and then re-enters the Souhegan River approximately one mile downstream from the wells. Because the complex hydrogeology does not match some of the assumptions used to generate the induced recharge estimates, there are some uncertainties regarding the impacts of pumping on stream flow.

### **Water Use Patterns**

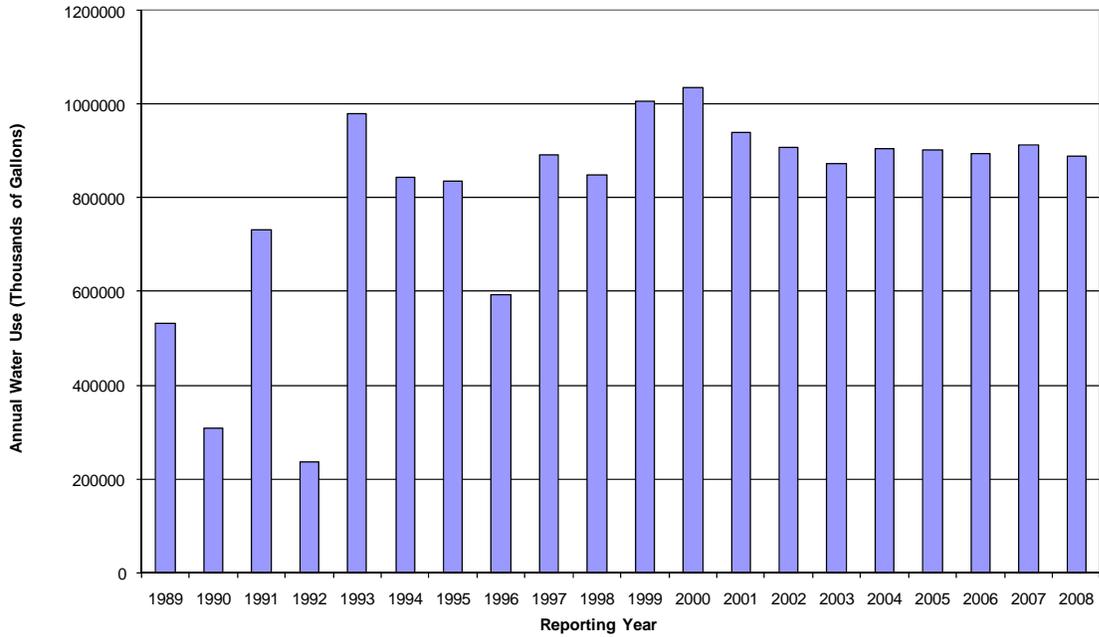
Water use is continuous and supports the needs of the aquiculture production at the fish hatchery. The groundwater pumped from the aquifer is free of fish pathogens, thereby limiting the potential for disease, and its nearly constant temperature provides cooling conditions for the fish in the summer and warmth during the winter.

The two wells pumps at different rates; the River Well (20218-S01) is pumped at a constant rate of 1,100 gallons per minute (or gpm), while the Field Well (20218-S02) has a more variable pumping rate between 400 and 800 gpm. Groundwater pumping is metered, recorded monthly and reported quarterly to the DES.

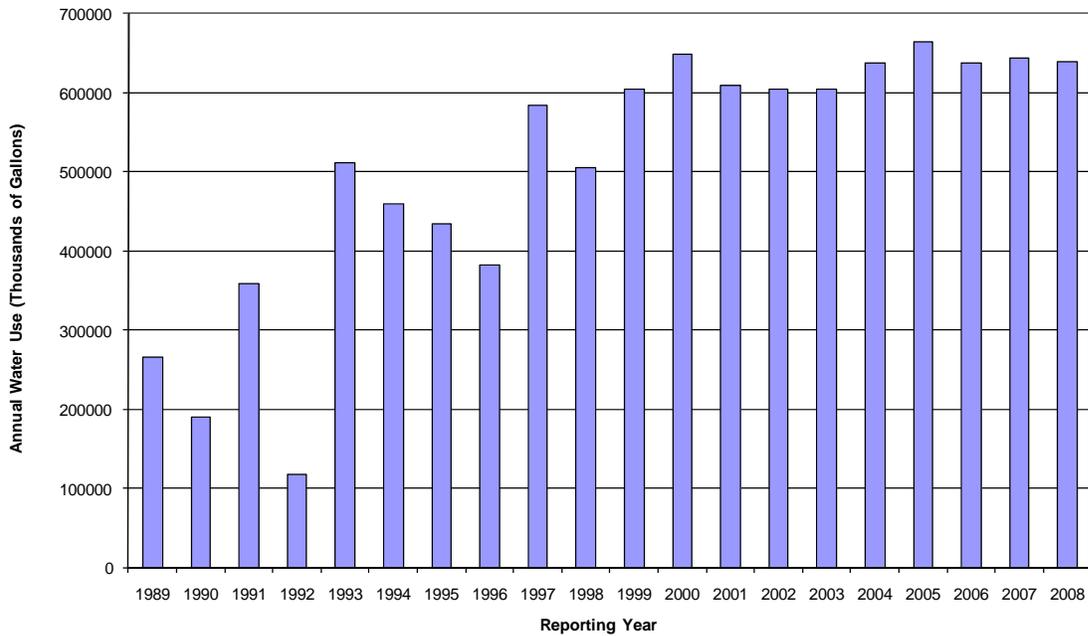
The Milford Fish Hatchery water use data for the years of 1988 through 2008 were obtained from the DES and are summarized in Figures 1, 2, and 3 as well as in Tables 1, 2, and 3. Water use records were incomplete for 1988, so they are not included in the annual use summaries. The first complete year of water use was reported for 1989.

Between 1989 and 2008 annual pumpage from the Milford Fish Hatchery wellfield ranged from a high of 1,030 million gallons (2000) to a low of 236 million gallons (1992), and average use was 803 million gallons (Figure 1 and Table 1). During this period, water use increased from 1989 to 1999, but has since stabilized and is typically on the order of 900 million gallons per year (Figure 1). From 1989 through 2008, water use increased by 357 million gallons or 67 percent. This represents an increase of 17.8 million gallons a year or 3.3 percent a year over the 20 year period.

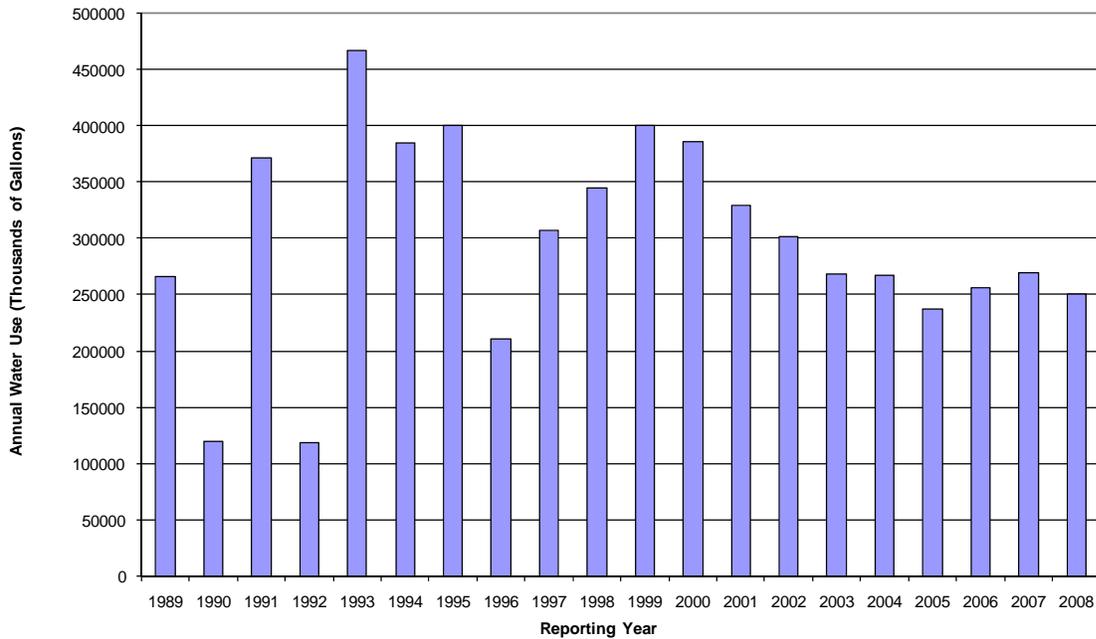
The flattening of annual water use beginning in the early 2000s is due to the implementation of a stable production target of trout for fisheries management of the Souhegan River and many other rivers in the southwestern part of the state. There are no plans to expand production for any reason at this time and annual water use is not expected to increase in the near future.



**Figure 1 – Milford Fish Hatchery Annual Water Use 1989 through 2008**



**Figure 2 – Milford Fish Hatchery River Well Annual Water Use 1989 through 2008**



**Figure 3 – Milford Fish Hatchery Field Well Annual Water Use 1989 through 2008**

**Table 1 – Milford Fish Hatchery Annual Water Use Statistics (Combined Wells 1989-2008)**

	Low	High	Average
(thousand gal)	236,000	1,030,000	803,000
(cfs)	1.000	4.390	3.410
(cfsm at impact point)	0.009	0.037	0.029
(cfsm at Merrimack Gage)	0.006	0.026	0.020

**Table 2 – Milford Fish Hatchery River Well Annual Water Use Statistics (1989-2008)**

	Low	High	Average
(thousand gal)	118,000	663,000	505,000
(cfs)	0.500	2.820	2.140
(cfsm at impact point)	0.004	0.024	0.018
(cfsm at Merrimack Gage)	0.003	0.016	0.013

**Table 3 – Milford Fish Hatchery Field Well Annual Water Use Statistics (1989-2008)**

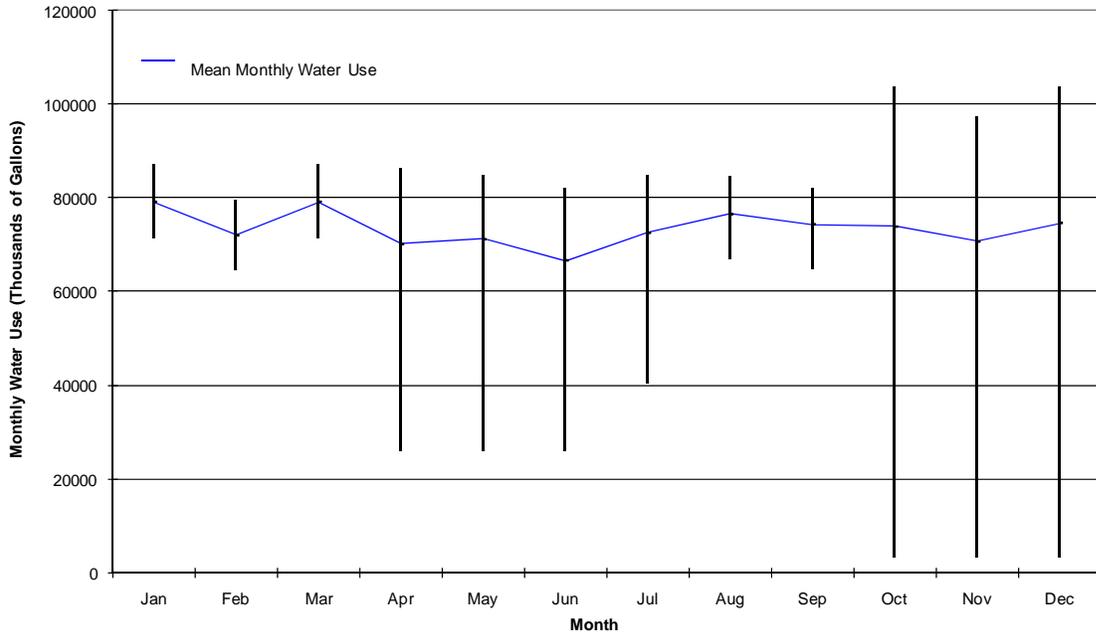
	Low	High	Average
(thousand gal)	118,000	663,000	505,000
(cfs)	0.500	2.820	2.140
(cfsm at impact point)	0.004	0.024	0.018
(cfsm at Merrimack Gage)	0.003	0.016	0.013

The monthly water use records for the Milford Fish Hatchery begin in October 1988. Average monthly water use varies in a narrow range (Figures 5, 6, and 7), but follows seasonal trends. This seasonal variation reflects the growing season pattern and fish biomass and the water needs for loading capacity. The higher water use during the late winter (March) is due to the timing of the fish biomass reaching its peak. Fish are then distributed out of the facility from April through June, resulting in a lower biomass and lower water use. The next generation (year-class of trout) grows up in July to September, so biomass increases during this period along with a corresponding increase in water use.

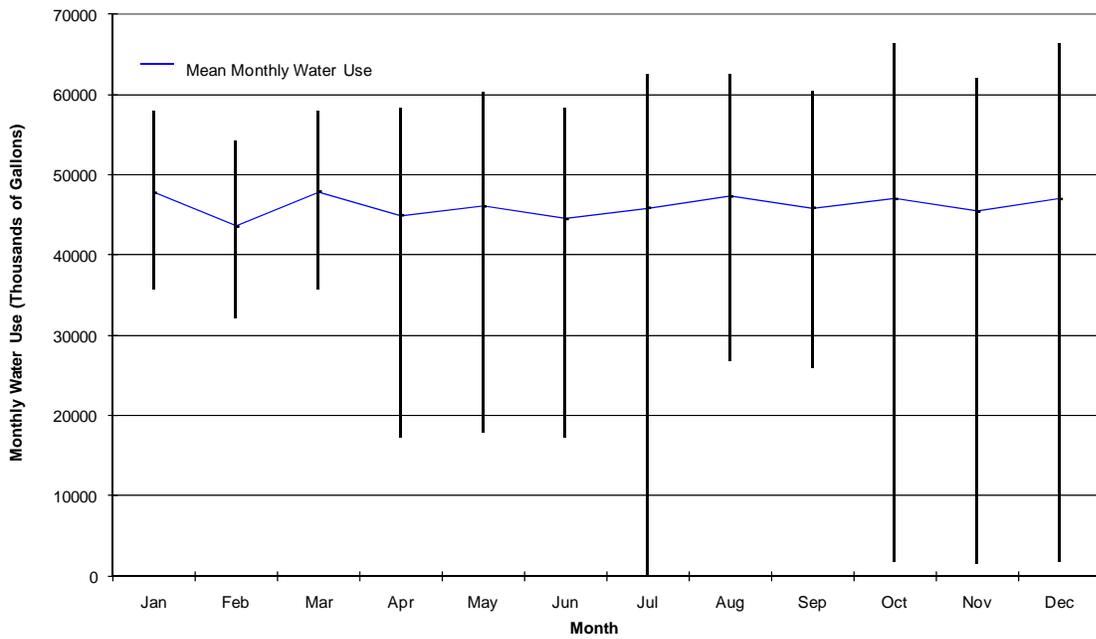
The very high variability (maximum versus minimum) in monthly water use shown in Figures 4, 5, and 6 is related to the period of increasing use from 1988 to 1999. Since 1999, the variability in annual water use along with monthly water use has lessened considerably due to a more stable production target of trout. Monthly water use statistics are shown in Tables 4, 5, and 6. The highest total monthly water use by the fish hatchery wells was 1,104 million gallons (December 2000), the lowest total monthly use was 3.24 million gallons (November 1991), with an average monthly use of 73.4 million gallons (Figure 4 and Table 4).

The monthly water use data for the Milford Fish Hatchery were converted from thousand gallons per month to cubic feet per second by dividing the monthly totals by days and then multiplying them by a flow unit conversion factor. These values were also divided by the drainage basin area (171 sq. miles) relative to the location of the United States Geological Survey gaging station (01094000) on the Souhegan Designated River in Merrimack, New Hampshire and they were also normalized to the drainage area (117 sq. miles) of the Designated Reach above the impact point of the withdrawals.

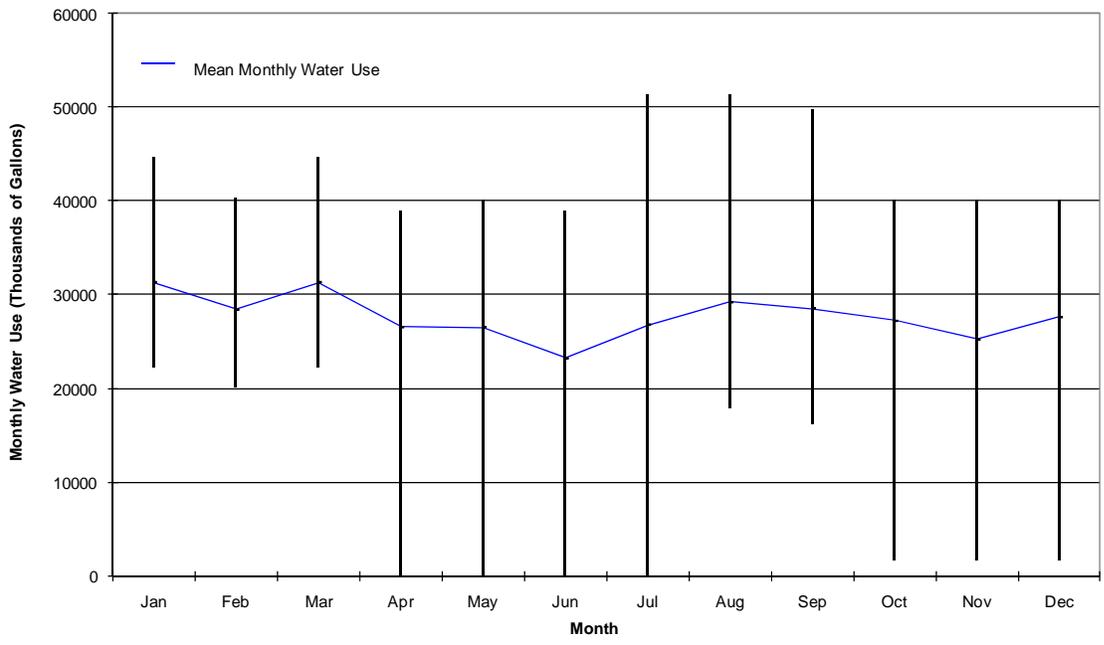
Based on these values, the average daily water use for the fish hatchery wells has ranged from a minimum of 0.167 cfs (107,935 gallons per day, November 1991) to a maximum of 5.19 cfs (3.35 million gallons per day, December 2000), and average use was 3.74 cfs (2.42 million gallons per day) for the period of 1988 to 2008 (Table 2).



**Figure 4 – Milford Fish Hatchery Monthly Water Use 1988 through 2008**



**Figure 5 – Milford Fish Hatchery River Well Monthly Water Use 1988 through 2008**



**Figure 6 – Milford Fish Hatchery Field Well Monthly Water Use 1988 through 2008**

**Table 4 – Milford Fish Hatchery Monthly Water Use Statistics (Combined Wells 1988-2008)**

	Low	High	Average
(thousand gal)	3,240	104,000	73,400
(cfs)	0.167	5.190	3.740
(cfsm at impact point)	0.001	0.044	0.032
(cfsm at Merrimack Gage)	0.001	0.030	0.022

**Table 5 – Milford Fish Hatchery River Well Monthly Water Use Statistics (1988-2008)**

	Low	High	Average
(thousand gal)	0	66,300	46,000
(cfs)	0	3.310	2.340
(cfsm at impact point)	0	0.028	0.020
(cfsm at Merrimack Gage)	0	0.019	0.014

**Table 6 – Milford Fish Hatchery Field Well Monthly Water Use Statistics (1988-2008)**

	Low	High	Average
(thousand gal)	0	51,300	27,600
(cfs)	0	2.560	1.410
(cfsm at impact point)	0	0.028	0.020
(cfsm at Merrimack Gage)	0	0.015	0.008

## **Potential for Water Use Management to Meet Protected Instream Flows**

The potential for the management of water use by Milford Fish Hatchery to support the protected instream flows on the Souhegan Designated River is low. Its water supply consists of two production wells, which are the sole source of water to the hatchery. The operation of the wells has been shown to induce infiltration from the river (DES 2005) under average pumping rates. However, as noted above, there are uncertainties in the calculation of induced flows for this location. Options to reduce the impact of ground water withdrawals on the river to support the protected instream flows include: reduced pumping rate of the wells; supplementing the existing ground water supply with an additional water supply source; pumping return water to the affected part of the river; or, some combination of these options. Due to the operational requirements of the hatchery, reduction in water use is not a viable option. A new water supply source at this scale would have to be ground water and to limit its effect on flows in the Souhegan Designated River, it would have to be located and operated so that pumping from the new well would not induce recharge from the river.

### **Water Use Plan Activity**

One option to reduce the effects of pumping by reducing the pumping from wells inducing recharge from the Souhegan River. Under average pumping rates the two production wells at the Milford Fish Hatchery extract between 22 and 35 percent of their water from the Souhegan Designated River via induced infiltration. Based on the results of an analysis of the effects of the well withdrawals on the river (DES 2005), to eliminate induced infiltration pumpage of the Field and the River wells would have to be reduced by between 30 and 50 percent, under average conditions. These reductions would be required during the summer and early fall at times when stream flows on the river fall below the protected instream flow levels. If additional water is required to support the hatchery operations, the reduction in pumping from the existing wells could be offset by pumping from a new well(s) that is located at a sufficient distance from the river to minimize induced infiltration.

Under this option, reductions in pumping from the existing water supply wells will occur when daily mean discharge in the Souhegan Designated River falls below the Rare protected flow level of 17 cfs during the period of June 15 to September 30 for longer than the 10 day, catastrophic duration (DES 2008). The lowest flows in the Souhegan River typically occur during this period and lowering these flows by pumping would further increase stress on aquatic organisms in the river. The need for reduction in production from these two wells may be offset by pumping from a new well(s) as long as it does not induce infiltration from the Souhegan Designated River. The reduction in pumping from the Field and River wells is rescinded when daily mean discharge caused by natural recharge exceeds 17 cfs for two consecutive days.

The prompt for this water use action will be determined from daily flow measurements at the United States Geological Survey gaging station (01094000) on the Souhegan Designated River in Merrimack, New Hampshire. The Milford Fish Hatchery will act on its Water Use Plan based on mean daily flow conditions at this gage or based on conditions defined the DES web page: <http://www2.des.state.nh.us/OneStopPub/Watershed/souhegan-lower-pisf-track.xls>.

Alternatively, during low flow conditions, sufficient water to offset the induced recharge effecting stream flow could be discharged in the vicinity of the existing pumping wells. This option would require another discharge permit for this location.

Both alternatives of finding an alternate water source and returning water to the vicinity of where it was induced from stream flow are costly. Funding is currently unavailable from the State to support these activities. Further, the quantification of the flow needs for these alternatives is uncertain and affects the costs.

Therefore, the recommended activity prior to determining the course of further management is to determine the effects of fish hatchery pumping and other water uses in the vicinity on stream flow by conducting groundwater modeling. The model will be required to quantify effects of water use on the natural stream flow and determine the volume and location of corrective actions needed over the range of conditions occurring throughout the year. Such a model could expand on the one created for the Milford-Souhegan aquifer including where the fish hatchery wells and the Souhegan River exist.

### **Estimated Water Use Plan Implementation Costs**

If additional water is required to maintain the operation of the fish hatchery during periods of reduced production from the existing wells, a new ground water supply source will have to be investigated, permitted and installed. The estimated cost for the completion of these tasks is dependent upon the number of wells that would need to be developed, the level of effort required to find a new ground water source, to evaluate its potential for development, to address any site specific permitting issues and the cost of its installation. These costs could range from several hundred thousand dollars to over a half a million dollars.

Costs for modeling the effects of pumping withdrawals on the Souhegan River between the fish hatchery wells and the return flow at Purgatory Brook are estimated to at \$50,000 to \$125,000. Any changes in water withdrawal or return necessary after these steps are taken must also be included. The cost for these changes may be none to the cost for a developing and permitting a new groundwater source identified above. Regardless, the model would be required at this level of detail as part of the state's groundwater permit process if a new source is required as the alternative.

### **Water Use Plan Implementation Schedule**

By June 1, 2014, the Milford Fish Hatchery will implement its Water Use Plan and will institute the measures required to support the protected instream flows on the Souhegan Designated River during the GRAF Spawning and Rearing & Growth bioperiods from June 15 to September 30.

### **Water User Contact Information**

**Water User:** New Hampshire Fish and Game Department  
**Address:** 408 North River Road, Milford, NH 03055  
**Contact:** Jason Smith

**Phone:** 271-2501  
**Email:** Jason.Smith@Wildlife.nh.gov

### **Conversion Factors for Volume and Flow Units**

1	cubic foot =	7.481	gallons
1	gallon =	0.1337	cubic feet
1	acre-foot =	43,560	cubic feet
1	acre-foot =	325,872	gallons
1	cfs =	448.86	gpm
1	cfs =	646,358.4	gpd
1	cfs =	0.65	MGD
1	gpm =	0.002227866	cfs
1	gpd =	0.00000154713	cfs
1	MGD =	1.5471	cfs

### **Sources of Information**

Env-Wq 1900 Rules for the Protection of Instream Flow on Designated Rivers, effective 5/28/11.

Department of Environmental Services (DES) 2005. Souhegan River Instream Flow Task 2 Report. Prepared by Dr. Tom Ballesterro, University of New Hampshire.

Department of Environmental Services (DES) 2008. Final Souhegan River Protected Instream Flow Report. Prepared by University of New Hampshire, University of Massachusetts and Normandeau Associates, Inc. NHDES-R-WD-06-50.

Survey of Souhegan River Affected Water Users performed by Normandeau Associates, Inc.

Water use reports on file with the Department of Environmental Services (DES).

# **WATER USE PLAN**

## **Milford Water Works (#20100)**

### **Introduction**

The following individual Water Use Plan (WUP) has been prepared for Milford Water Works, which serves as the public water supplier for the Town of Milford, New Hampshire. This WUP was prepared using information provided by Milford Water Works and from their water use records reported to the Department of Environmental Services (DES). Milford Water Works has two registered water sources that are located off Merrimack Road and north of the Souhegan Designated River in Amherst, New Hampshire.

Under the Instream Flow Rules (Chapter Env-Wq 1900), Milford Water Works is considered an Affected Water User (AWU) because its registered water source is within 500 ft of the Souhegan Designated River and its registered water source is within the Souhegan River Water Management Planning Area (WMPA), which is the watershed area of the Souhegan Designated River. Chapter Env-Wq 1900 requires the preparation of water use plans for each AWU located within the Planning Area, and must include:

- Water use data and information to define water use patterns and needs,;
- A description of the potential for water use modification, sharing or both to meet the protected instream flow requirements, including water use patterns and needs;
- An estimate of implementation costs of the plan; and
- An implementation schedule.

### **Water Source and Uses**

The Milford Water Works supply source consists of three wells, Curtis Wells #1, #2, and #2A as a wellfield under one registration (20100-S01). Groundwater is withdrawn continuously since the water is the principal water supply for the Town of Milford. When demand exceeds supply from the wellfield, the town purchases additional water from the Pennichuck Water distribution system. In 2008, the Curtis Wells supplied 88.6 percent of the water needed and the remaining 11.4 percent was purchased from Pennichuck Water. The Town water system also includes 1.25 million gallons of storage.

The Town of Milford recently applied to DES for the approval of a new drinking water supply well for their system. The new well (Curtis Well #2A) was developed as source to serve as a backup to existing Well # 2 at the Curtis Wellfield. Well # 2 has declined in specific capacity in recent years and this backup well will allow for full utilization of the wellfield production.

Although the water source is groundwater, due to the fact that these wells are located in a stratified drift formation that is connected to the Souhegan River, the wells intercept water that would be flowing in or just below the Souhegan River. An analysis of induced recharge by these wells was performed as part of the Instream Flow Study (DES 2005). The results of the analysis indicated that Curtis Well #1 does not induce Souhegan River water recharge at its average or

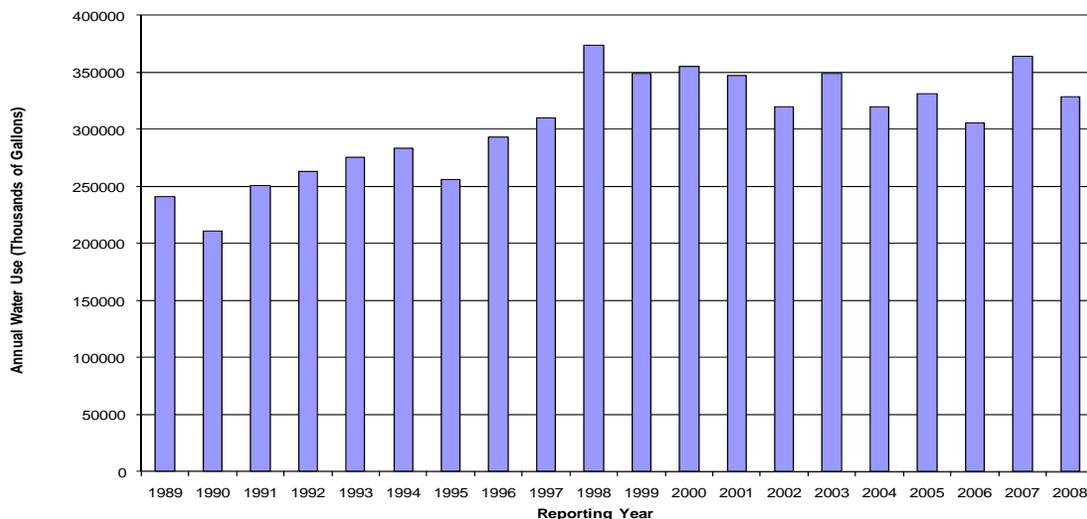
maximum reported extraction rates. About 60 percent of the Curtis Well #2 extraction is induced recharge for its long-term average pumping rate.

### Water Use Patterns

Water use in the town is continuous and the Curtis Wells provide sufficient water to supply most of the community water supply needs. The primary wells are pumped at a fairly uniform rate, 700 gallons per minute (or gpm). When pumping exceeds demand, excess water fills storage, and when pumping is less than demand, stored water makes-up the difference. Groundwater pumping is metered, recorded monthly, and reported to the DES quarterly.

Water use data for the Milford Water Works for the years of 1989 through 2008 were obtained from the DES and are summarized in Figures 1 and 2 and Tables 1 and 2. Unfortunately, each well does not have its own meter and therefore the withdrawal data include the combined well pumping.

Between 1989 and 2008 annual pumpage from the Curtis Wellfield ranged from a high of 374 million gallons (1998) to a low of 211 million gallons (1990), and average use was 307 million gallons (Figure 1 and Table 1). During this period, annual water use from the Curtis Wellfield increased by 87.6 million gallons or 36.2 percent. This represents an increase of 4.4 million gallons a year or 1.8 percent per year over the 20 year period. As shown in Figure 1, water use increased from 1989 to its maximum in 1998 and since then has ranged from 305.9 million gallons (2006) to 364.4 million gallons (2007). The plateau in water use reflects the supply limitation of the Curtis Wellfield and a contracted cap on the water available from Pennichuck Water. As a result, the Town of Milford is in the process of permitting an additional water supply well for the system.

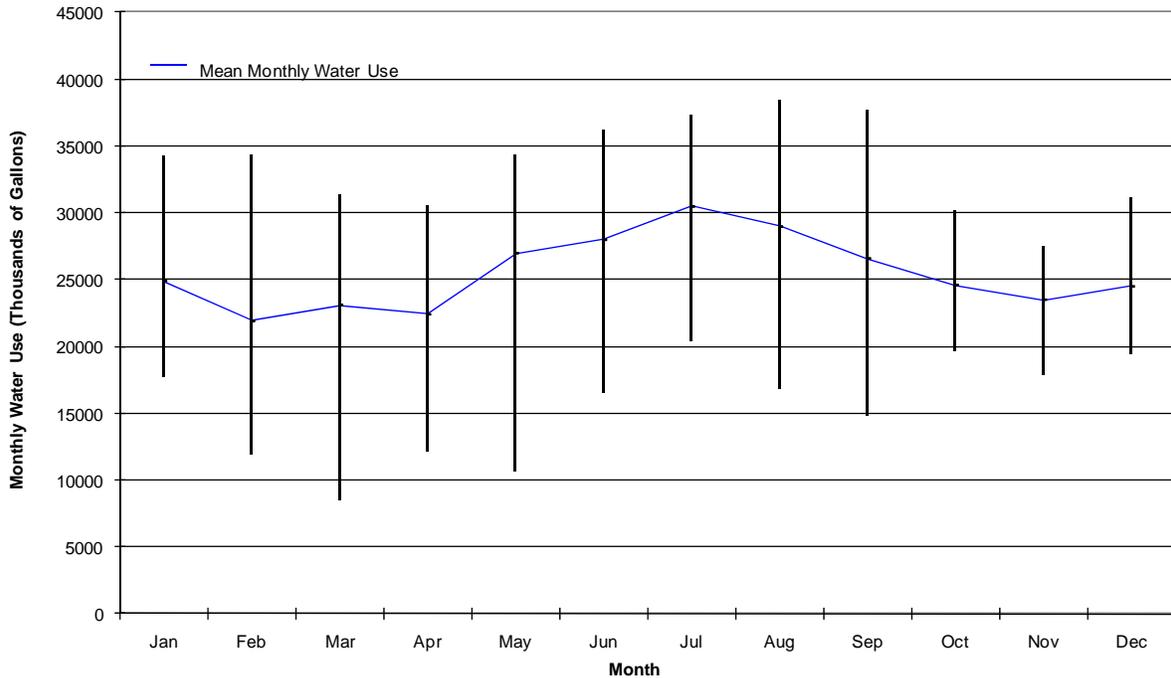


**Figure 1 – Milford Water Works Annual Water Use 1989 through 2008**

**Table 1 – Milford Water Works Annual Water Use Statistics (1989 through 2008)**

	Low	High	Average
(thousand gal)	211,000	374,000	307,000
(cfs)	0.894	1.590	1.300
(cfsm at impact point)	0.006	0.011	0.009
(cfsm at Merrimack Gage)	0.005	0.009	0.008

The monthly water use records for the Curtis Wellfield begin in October 1988. Monthly water use varies in response to weather conditions and changes in seasonal demand. The total and average monthly water usage was highest during summer and lowest during winter. This seasonal pattern reflects increased outdoor water usage (lawn irrigation, garden watering, vehicle washing, etc.) during the summer months, which then declines during the fall; remains low during the winter and begins to increase again in the spring. The highest total monthly use for the Curtis Wellfield was 38.4 million gallons (August 2006), the lowest total monthly use was 8.41 million gallons (March 2002), with an average monthly use of 25.5 million gallons (Figure 2 and Table 2).



**Figure 2 – Milford Water Works Monthly Water Use 1989 through 2008**

**Table 2 – Milford Water Works Monthly Water Use Statistics (1988 through 2008)**

	Low	High	Average
(thousand gal)	8,410	38,400	25,500
(cfs)	0.420	1.920	1.300
(cfsm at impact point)	0.003	0.014	0.009
(cfsm at Merrimack Gage)	0.002	0.011	0.008

The monthly water use data for the Curtis Wellfield were converted from thousand gallons per month to cubic feet per second by dividing the monthly totals by days and then multiplying them by a flow unit conversion factor. These values were also divided by the drainage basin area (171 sq. miles) relative to the location of the United States Geological Survey gaging station (01094000) on the Souhegan Designated River in Merrimack, New Hampshire and they were also normalized to the drainage area (139 sq. miles) of the Designated Reach above the impact point of the withdrawals.

Based on these values, the average daily water use for the Curtis Wellfield has ranged from a minimum of 0.42 cfs (271,454 gallons per day, March 2002) to a maximum of 1.92 cfs (1.24 million gallons per day, August 2006), and average use was 1.30 cfs (840,216 gallons per day) for the period of 1988 to 2008 (Table 2).

### **Potential for Water Use Management to Support Protected Instream Flows**

The potential for the management of water use by Milford Water Works to support the protected instream flows on the Souhegan Designated River is high. Milford's water supply consists of three production wells, only one of which (Curtis Well #2) has been shown to induce flow from the Souhegan Designated River. Use of this well could be reduced during the summer and early fall when flows on the Souhegan Designated River fall below the Critical or Rare protected instream flow levels by reducing water demand through the implementation of outdoor water use restrictions.

### **Water Use Plan Activity**

Milford Water Works has an established Emergency Plan Guide (Milford Water Utilities Department 2009) that includes water conservation measures that can be implemented during an emergency or drought. Discussions with public water suppliers indicated an interest and willingness to coordinate reductions in outside water use that is linked with stream flow conditions in order to reduce system demand to support the protected flows.

Milford's Emergency Plan Guide (Milford Water Utilities Department 2009) includes only limited water conservation measures (odd/even day lawn watering program) that can be implemented during an emergency or drought. Outdoor water use reductions will be accomplished by implementing a multi-stage approach when outdoor water use is heaviest during the summer and early fall. The outdoor water use reduction plan will apply to the two bioperiods that correspond with the highest levels of water use, occurring from June 15 to September 30, and when flows in the Souhegan Designated River fall below the Critical and Rate protected instream flow levels (DES 2008). Under this Water Use Plan, outdoor water use will be reduced in three stages: an alert with voluntary water conservation, water use restrictions, and a water use ban.

The prompts for these water use actions are defined by the lower Souhegan Protected Instream flows (DES 2008) as determined from daily flow measurements at the United States Geological Survey gaging station (01094000) on the Souhegan Designated River in Merrimack, New Hampshire. The Town will act on the Water Use Plan based on mean daily flow conditions at

this gage or based on conditions defined on the DES web page at:  
<http://www2.des.state.nh.us/OneStopPub/Watershed/souhegan-lower-pisf-track.xls>.

The first action is an alert to its customers and town-wide that voluntary water conservation measures should be taken and that further actions may begin soon. The alert will be enacted by the Town on the day after daily mean discharge at the gage falls below 26 cfs during the GRAF Spawning and Rearing and Growth bioperiods (June 15-September 30). The Town will inform its water users through its notification process to implement voluntary water conservation measures and prepare for further actions. An alert may be rescinded when daily mean discharge from a natural recharge event exceeds 26 cfs for two consecutive days.

If daily mean discharge in the Souhegan Designated River continues to decline and fall below the Critical protected flow level of 26 cfs during the GRAF Spawning and Rearing and Growth bioperiods (June 15-September 30) for longer than the 20 day Catastrophic duration, then the Town will implement outside water use restrictions on the watering gardens, lawns, and other landscaped areas; the washing of cars, trucks, RV's, driveways, sidewalks, patios and decks along with the filling of swimming pools from the water system. These restrictions may be rescinded when daily mean discharge from a natural recharge event exceeds 26 cfs for two consecutive days.

If the daily mean discharge in the Souhegan Designated River falls below the Rare protected flow level of 17 cfs during the GRAF Spawning and Rearing and Growth bioperiods (DES 2008) for longer than the 10 day, Catastrophic duration, then a ban on outside water use will be imposed. The ban on outside water use may be rescinded or reduced to an earlier restriction level when daily mean discharge from a natural recharge event exceeds 17 cfs for two consecutive days.

Nothing in this Plan precludes the Town from implementing more restrictive water use actions on its own initiative.

Whenever operational considerations of the water system allow during periods when outdoor water use restrictions are recommended or during a ban on outdoor water use, the Town will manage pumping from its water supply wells to further minimize potential impacts to the Souhegan Designated River. This includes: 1) minimizing the withdrawal of groundwater from the well located closest to the river; 2) balancing this reduction with increased pumping from the well farthest from the river; and 3) operating the withdrawal at lower withdrawal rates over longer periods of time in preference to higher withdrawal rates for shorter periods.

### **Estimated Water Use Plan Implementation Costs**

The water use management actions are the implementation of outside water use reductions or bans when flows on the Souhegan Designated River fall below the Critical or Rare protected instream flow levels during summer and early fall during periods exceeding the Catastrophic duration. There are no additional direct costs associated with the implementation of these water use management actions.

## Water Use Plan Implementation Schedule

By June 1, 2014, the Town of Milford will implement its Water Use Plan and will institute the measures required to support the protected instream flows on the Souhegan Designated River during the GRAF Spawning and Rearing & Growth bioperiods from June 15 to September 30.

## Water User Contact Information

**Water User:** Milford Water Works  
**Address:** Town Hall, 1 Union Square, Milford, NH 03055-4240  
**Contact:** Dave Boucher, Superintendent  
**Phone:** 249-0660  
**Email:** dboucher@milford.nh.gov

## Conversion Factors for Volume and Flow Units

1	cubic foot =	7.481	gallons
1	gallon =	0.1337	cubic feet
1	acre-foot =	43,560	cubic feet
1	acre-foot =	325,872	gallons
1	cfs =	448.86	gpm
1	cfs =	646,358.4	gpd
1	cfs =	0.65	MGD
1	gpm =	0.002227866	cfs
1	gpd =	0.00000154713	cfs
1	MGD =	1.5471	cfs

## Sources of Information

Env-Wq 1900 Rules for the Protection of Instream Flow on Designated Rivers, effective 5/28/11.

Department of Environmental Services (DES) 2005. Souhegan River Instream Flow Task 2 Report. Prepared by Dr. Tom Ballestero, University of New Hampshire.

Department of Environmental Services (DES) 2008. Final Souhegan River Protected Instream Flow Report. Prepared by University of New Hampshire, University of Massachusetts and Normandeau Associates, Inc. NHDES-R-WD-06-50.

Milford Water Utilities Department 2009. Emergency Plan Guide, Community Public Water System, Town of Milford, New Hampshire.

Personal communication with Dave Boucher, Milford Water Works.

Survey of Souhegan River Affected Water Users performed by Normandeau Associates, Inc. and completed by Mr. Larry Anderson, superintendent of the Town of Milford Water Utilities Department.

Water use reports on file with the Department of Environmental Services (DES).

## **WATER USE PLAN**

### **Monadnock Mountain Spring Water, Inc. (#20621)**

#### **Introduction**

The following individual Water Use Plan (WUP) has been prepared for Monadnock Mountain Spring Water, Inc. which is a water bottling company. This WUP was prepared using information provided by Monadnock Mountain Spring Water, Inc. and from their water use records reported to the Department of Environmental Services (DES). Monadnock Mountain Spring Water, Inc. has two overburden water supply wells located near the water bottling plant in Wilton, New Hampshire. One is located off Intervale Road and the other is near Mansur Road. The water pumped from these wells is either bottled on site or shipped by truck to another bottling facility located in Massachusetts.

Under the Instream Flow Rules (Chapter Env-Wq 1900), Monadnock Mountain Spring Water, Inc. is considered an Affected Water User (AWU) because one of its registered water sources is within 500 ft of the Souhegan Designated River. In addition, its registered water sources are within the Souhegan River Water Management Planning Area (WMPA), which is the watershed area of the Souhegan Designated River. Chapter Env-Wq 1900 requires the preparation of water use plans for each AWU located within the Planning Area, and must include:

- Water use data and information to define water use patterns and needs;
- A description of the potential for water use modification, sharing or both to meet the protected instream flow requirements, including water use patterns and needs;
- An estimate of implementation costs of the plan; and
- An implementation schedule.

#### **Water Source and Uses**

Monadnock Mountain Spring Water, Inc. has two registered ground water wells, the Mansur Road (20621-S01) and the Intervale Road (20621-S02) wells. Groundwater is withdrawn primarily during business hours (9 AM – 6 PM). Monadnock Mountain Spring Water, Inc. has 40,000 gallons of storage at the bottling facility, 30,000 gallons for spring water and 10,000 gallons for distilled water. Water is pumped from the wells to storage and from there to the bottling operations. Once a week 8,000 gallons of water are shipped via truck to another bottling operation located in Massachusetts, otherwise the spring water produced on site is used on site.

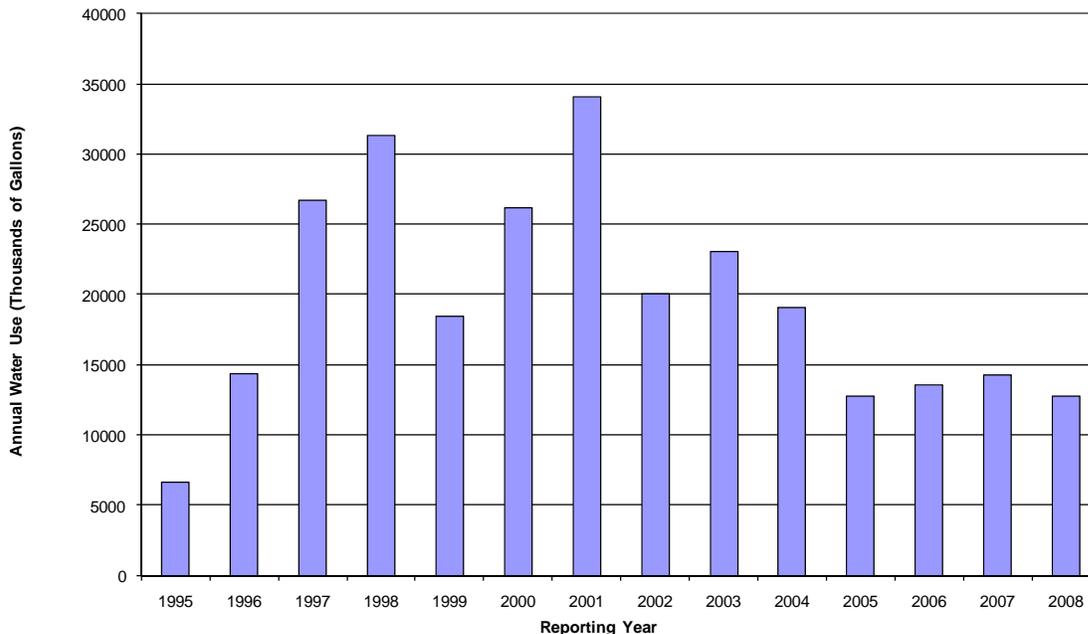
Although the water source is groundwater, due to the fact that these wells are located in a stratified drift formation that is connected to the Souhegan River, the wells intercept water that would be flowing in or just below the Souhegan River. An analysis of induced recharge by these wells was performed as part of the Instream Flow Study (DES 2005). The results of the analysis indicated that the wells do not induce river recharge at normal or maximum pumping rates.

## Water Use Patterns

Although water use has been reported for each well, over 90 percent of the reported data from 1995 – 2008 is identical for each well. That is because prior to the fall of 2008 the water use was estimated based on bottling production and the total water use was divided by half and reported for each well. In the fall of 2008, Monadnock Mountain Spring Water installed recording water use meters on each of the wells and reports this information to the DES quarterly.

Water withdrawal is near continuous during normal business hours. The wells are generally pumped at a uniform rate with recent meter based water use data showing that the Intervale Well provides 2/3rds of the total production, while the Mansur Road provides the remainder. When pumping exceeds demand, excess water fills storage, and when pumping is less than demand, stored water makes-up the difference for the bottling operations.

Water use data for Monadnock Mountain Spring Water, Inc. for the years of 1995 through 2008 were obtained from the DES and are summarized in Figures 1 and 2 as well as in Tables 1 and 2.



**Figure 1 – Monadnock Mountain Spring Water, Inc. Annual Water Use 1995-2008**

Between 1995 and 2008 annual water use by Monadnock Mountain Spring Water, Inc. ranged from a high of 34.1 million gallons (2001) to a low of 6.63 million gallons (1995), and average use was 19.5 million gallons (Figure 1 and Table 1). During this period, annual water use by Monadnock Mountain Spring Water, Inc. increased by 6.16 million gallons or 93 percent (Figure 1). This represents an increase of 440,000 gallons a year or 6.6 percent per year over the 14 year period. Annual water use reached a maximum of 34.1 million gallons in 2001, but since then it has dropped to within the range of 12.7 million gallons (2005) to 14.3 million gallons (2007), a decline of roughly 63 percent.

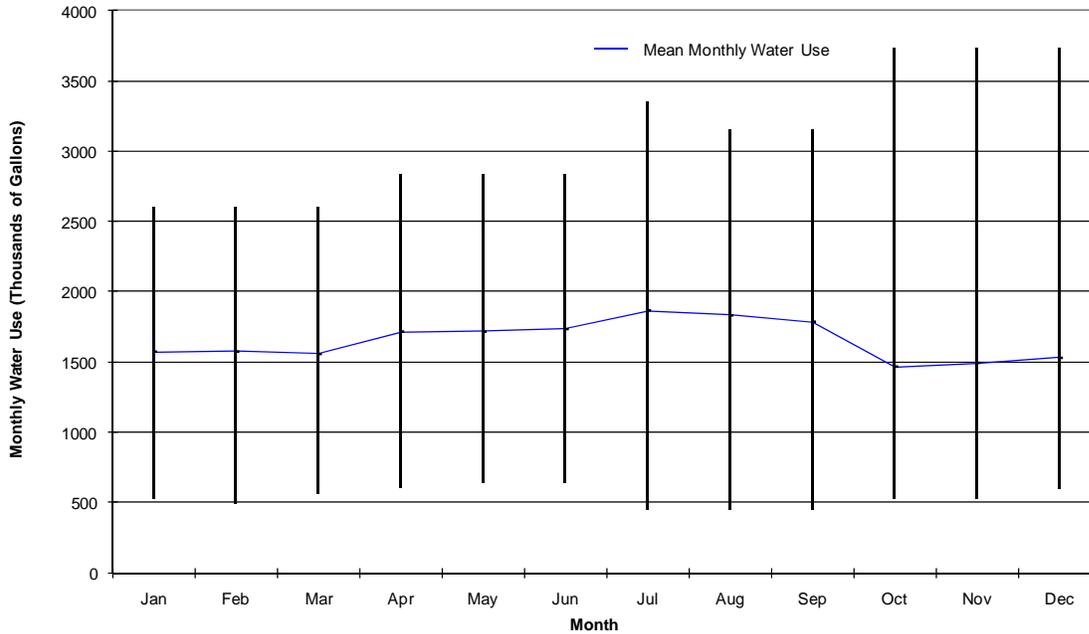
**Table 1 – Monadnock Mountain Spring Water, Inc. Annual Water Use Statistics (1995 through 2008)**

	<b>Low</b>	<b>High</b>	<b>Average</b>
<b>(thousand gal)</b>	6,629	34,107	19,515
<b>(cfs)</b>	0.0281	0.1447	0.0828
<b>(cfsm at impact point)</b>	0.0004	0.0023	0.0013
<b>(cfsm at Merrimack Gage)</b>	0.0002	0.0009	0.0005

Over the period of record, total monthly reported water use was highly variable, however, from month to month; the average water use varies in a narrow range (Figure 2). The highest mean monthly water use is in the summer (July), reflecting the increase in demand for bottled water, while the minimum mean monthly water use is during the fall/winter (Figure 2). The highest total monthly use was 3.73 million gallons (October, November and December 2001), the lowest total monthly use was 442,000 gallons (July, August and September 1995), and the average monthly use was 1.65 million gallons (Table 2).

The monthly water use data for the Monadnock Mountain Spring Water, Inc. wells were converted from thousand gallons per month to cubic feet per second by dividing the monthly totals by days and then multiplying them by a flow unit conversion factor. These values were also divided by the drainage basin area (171 sq. miles) relative to the location of the United States Geological Survey gaging station (01094000) on the Souhegan Designated River in Merrimack, New Hampshire and they were also normalized to the drainage area (64 sq. miles) of the Designated Reach above the impact point of the withdrawals.

Based on these values, the average daily water use by Monadnock Mountain Spring Water, Inc. has ranged from a minimum of 0.023 cfs (14,736 gallons per day in July, August and September 1995) to a maximum of 1.92 cfs (1.24 million gallons per day in October, November and December 2001), and average use was 0.09 cfs (53,515 gallons per day) for the period of 1995 to 2008 (Table 2).



**Figure 2 – Monadnock Mountain Spring Water, Inc. Monthly Water Use 1995 through 2008**

**Table 2 – Monadnock Mountain Spring Water, Inc. Monthly Water Use Statistics (1995 through 2008)**

	<b>Low</b>	<b>High</b>	<b>Average</b>
<b>(thousand gal)</b>	442	3,733	1,653
<b>(cfs)</b>	0.0228	0.3250	0.0888
<b>(cfsm at impact point)</b>	0.0004	0.0051	0.0014
<b>(cfsm at Merrimack Gage)</b>	0.0001	0.0019	0.0005

**Potential for Water Use Management to Support Protected Instream Flows**

Monadnock Mountain Spring Water, Inc. has limited potential to support the Protected Instream Flows on the Souhegan Designated River. Although its use of groundwater for on-site bottling and bulk shipments of water offsite for bottling are consumptive, the pumping of the source wells at their normal or maximum rates does not induce recharge from the river.

**Water Use Plan Activity**

Since groundwater pumping at the Monadnock Mountain Spring Water, Inc. site does not induce recharge from the Souhegan Designated River, no water use management actions are required at this time.

**Estimated Water Use Plan Implementation Costs**

Since no water use management actions are currently required for Monadnock Mountain Spring Water, Inc., there are no costs associated with the implementation of the plan.

## Water Use Plan Implementation Schedule

Since no Water Use Plan actions are currently required for Monadnock Mountain Spring Water, Inc., there is no implementation schedule.

## Water User Contact Information

**Water User:** Monadnock Mountain Spring Water, Inc.  
**Address:** P.O. Box 518, 8 Mansur Road, Wilton, NH 03086  
**Contact:** Gary Boot  
**Phone:** 654-2728  
**Email:** monadnock3@tellink.net

## Conversion Factors for Volume and Flow Units

1	cubic foot =	7.481	gallons
1	gallon =	0.1337	cubic feet
1	acre-foot =	43,560	cubic feet
1	acre-foot =	325,872	gallons
1	cfs =	448.86	gpm
1	cfs =	646,358.4	gpd
1	cfs =	0.65	MGD
1	gpm =	0.002227866	cfs
1	gpd =	0.00000154713	cfs
1	MGD =	1.5471	cfs

## Sources of Information

Env-Wq 1900 Rules for the Protection of Instream Flow on Designated Rivers, effective 5/28/11.

Department of Environmental Services (DES) 2005. Souhegan River Instream Flow Task 2 Report. Prepared by Dr. Tom Ballestero, University of New Hampshire.

Survey of Souhegan River Affected Water Users performed by Normandeau Associates, Inc.

Personal communication with Gary Boot, Monadnock Mountain Spring Water, Inc.

Water use reports on file with the New Hampshire Department of Environmental Services (DES).

# **WATER USE PLAN**

## **OK Tool Source Area (#20832)**

### **Introduction**

The following individual Water Use Plan (WUP) has been prepared for the OK Tool Source Area (also referred to as Operable Unit 1 or OU1) of the Savage Municipal Water Supply Well Superfund Site (Site ID #0101145). This WUP was prepared using information from the OK Tool site water use registration and water use data reported to the Department of Environmental Services (DES). There is an active groundwater pumping and treatment system at the site and treated groundwater is re-infiltrated to the aquifer via underground injection.

Under the Instream Flow Rules (Chapter Env-Wq 1900), the OK Tool site is considered an Affected Water User (AWU) because its registered water sources are within 500 ft of the Souhegan Designated River. In addition, its registered water sources are within the Souhegan River Water Management Planning Area (WMPA), which is the watershed area of the Souhegan Designated River. Chapter Env-Wq 1900 requires the preparation of water use plans for each AWU located within the Planning Area, and must include:

- Water use data and information to define water use patterns and needs;
- A description of the potential for water use modification, sharing or both to meet the protected instream flow requirements, including water use patterns and needs;
- An estimate of implementation costs of the plan; and
- An implementation schedule.

### **Water Source and Uses**

The OK Tool site is the source area of a groundwater contamination plume in the Souhegan River aquifer. The source is now contained by a vertical, circular, subsurface, low permeability slurry wall. Groundwater is extracted from two six inch wells (20832-S01 and 20832-S02) within the containment area. The water is then treated for volatile organic compounds (VOCs) via air stripping and returned to the subsurface through a recharge trench (20832-D01) outside the slurry wall.

### **Water Use Patterns**

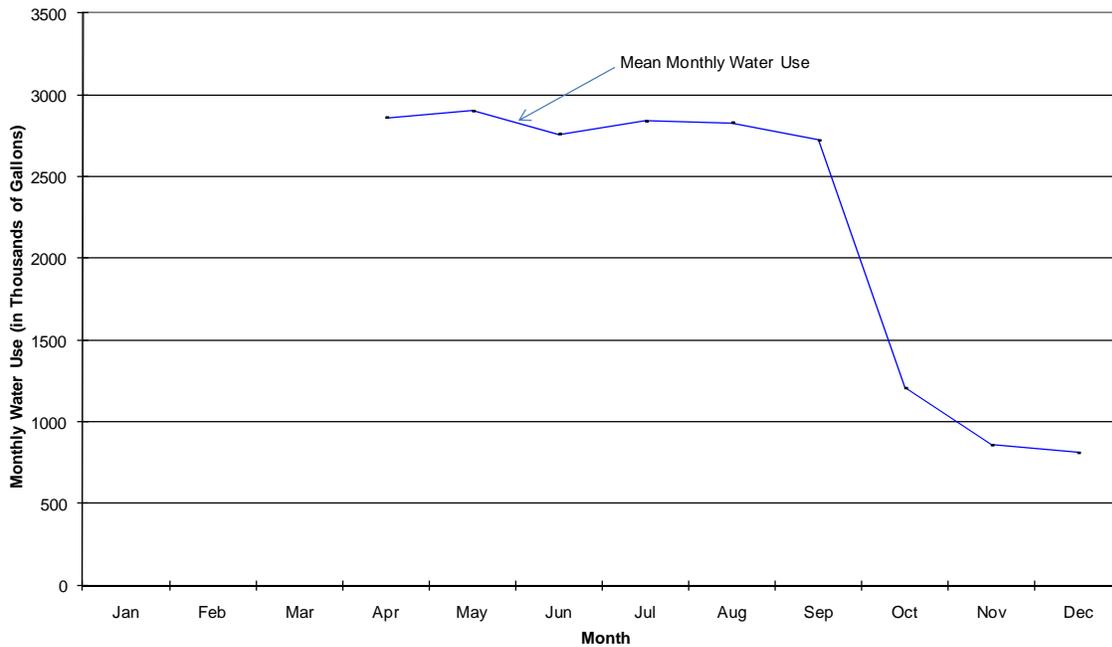
Water use is near continuous during normal treatment operations and the wells are generally pumped at a uniform rate (17 to 20 gallons per minute or gpm). Groundwater pumping is metered and is recorded monthly, as well as reported to the DES. Groundwater use data used for this report covered only part of 2008.

According to the water use registration forms on file with the DES, the OK Tool site wells are pumped at an average rate of 99,500 gallons per day (gpd) with a maximum rate of 178,560 gpd and an average annual use of 36,317,500 gallons. The water pumped from the extraction wells is

returned to the aquifer through a recharge trench down-gradient of the extraction wells, thus, there is no net water consumption at this site.

Water use data for the combined well pumping at the OK Tool site for 2008 were obtained from the DES and are summarized in Figure 1 and Table 1. Since only a partial record of water use is available, only monthly data are presented. From April to December 2008 the highest total monthly water use was 2.9 million gallons (May), the lowest total monthly water use was 811,000 gallons (December), with an average monthly use of 2.2 million gallons.

The monthly water use data were converted from thousand gallons per month to cubic feet per second by dividing the monthly totals by days and then multiplying them by a flow unit conversion factor. These values were also divided by the drainage basin area (171 sq. miles) relative to the location of the United States Geological Survey gaging station (01094000) on the Souhegan Designated River in Merrimack, New Hampshire and they were also normalized to the drainage area (103 sq. miles) of the Designated Reach above the impact point of the withdrawal.



**Figure 1 – OK Tool Site Monthly Water Use for 2008**

Based on these values, the average daily water use for OK Tool has ranged from a minimum of 0.04 cfs (25,853 gallons per day in November and December) to a maximum of 0.15 cfs (96,948 gallons per day, April), and average use was 0.11 cfs (71,095 gallons per day) for 2008 (Table 1).

**Table 1 – OK Tool Site Monthly Water Use Statistics for 2008**

	<b>Low</b>	<b>High</b>	<b>Average</b>
<b>(thousand gal)</b>	811	2,900	2,190
<b>(cfs)</b>	0.0405	0.1450	0.1110
<b>(cfsm at impact point)</b>	0.0004	0.0014	0.0011
<b>(cfsm at Merrimack Gage)</b>	0.0002	0.0008	0.0007

**Potential for Water Use Management to Meet Protected Instream Flows**

The OK Tool site has limited potential to support the Protected Instream flows since the water pumped from the extraction wells is returned to the Souhegan River aquifer on site through a recharge trench down-gradient of the extraction wells.

**Water Use Plan Activity**

Since the groundwater withdrawn from the extraction wells at the OK Tool site is effectively recycled, no water use management actions are currently required for the site.

**Estimated Water Use Plan Implementation Costs**

Since no water use management actions are currently required for the OK Tool site, there are no costs associated with the implementation of the plan.

**Water Use Plan Implementation Schedule**

Since no Water Use Plan actions are currently required for the OK Tool site, there is no implementation schedule.

**Water User Contact Information**

**Water User:** State of New Hampshire  
**Address:** P.O. Box 95, 29 Hazen Drive, Concord, NH 03302-0095  
**Contact:** Robin Mongeon  
**Phone:** 271-7378  
**Email:** Robin.Mongeon@des.nh.gov

### Conversion Factors for Volume and Flow Units

1	cubic foot =	7.481	gallons
1	gallon =	0.1337	cubic feet
1	acre-foot =	43,560	cubic feet
1	acre-foot =	325,872	gallons
1	cfs =	448.86	gpm
1	cfs =	646,358.4	gpd
1	cfs =	0.65	MGD
1	gpm =	0.002227866	cfs
1	gpd =	0.00000154713	cfs
1	MGD =	1.5471	cfs

### Sources of Information

Env-Wq 1900 Rules for the Protection of Instream Flow on Designated Rivers, effective 5/28/11.

Water use registration forms on file with the Department of Environmental Services (DES).

Waste Site Cleanup & Reuse in New England – Savage Municipal Water Supply, United States Environmental Protection Agency, website:  
[http://yosemite.epa.gov/r1/npl\\_pad.nsf/701b6886f189ceae85256bd20014e93d/83c7d221bb30028c8525691f0063f6f4!OpenDocument](http://yosemite.epa.gov/r1/npl_pad.nsf/701b6886f189ceae85256bd20014e93d/83c7d221bb30028c8525691f0063f6f4!OpenDocument)

# **WATER USE PLAN**

## **Otis Falls Dam (#20229)**

### **Introduction**

The following individual Water Use Plan (WUP) has been prepared for Otis Falls Dam, which is located on the Souhegan River in Greenville, New Hampshire. This WUP was prepared using information provided by Alden Engineering and from their water use records reported to the Department of Environmental Services (DES). The dam is a privately owned hydropower facility that is licensed by the Federal Energy Regulatory Commission (FERC Project No. 7921) and registered with the DES Dam Bureau (#101.01).

Under the Instream Flow Rules (Chapter Env-Wq 1900), Otis Falls Dam is considered an Affected Water User (AWU) because it is a registered water source within 500 ft of the designated segment of the Souhegan River. In addition, the dam is within the Souhegan River Water Management Planning Area (WMPA), which is the watershed area of the Souhegan Designated River. Chapter Env-Wq 1900 requires the preparation of water use plans for each AWU located within the Planning Area, and must include:

- Water use data and information to define water use patterns and needs;,
- A description of the potential for water use modification, sharing or both to meet the protected instream flow requirements, including water use patterns and needs;
- An estimate of implementation costs of the plan; and
- An implementation schedule.

### **Water Source and Uses**

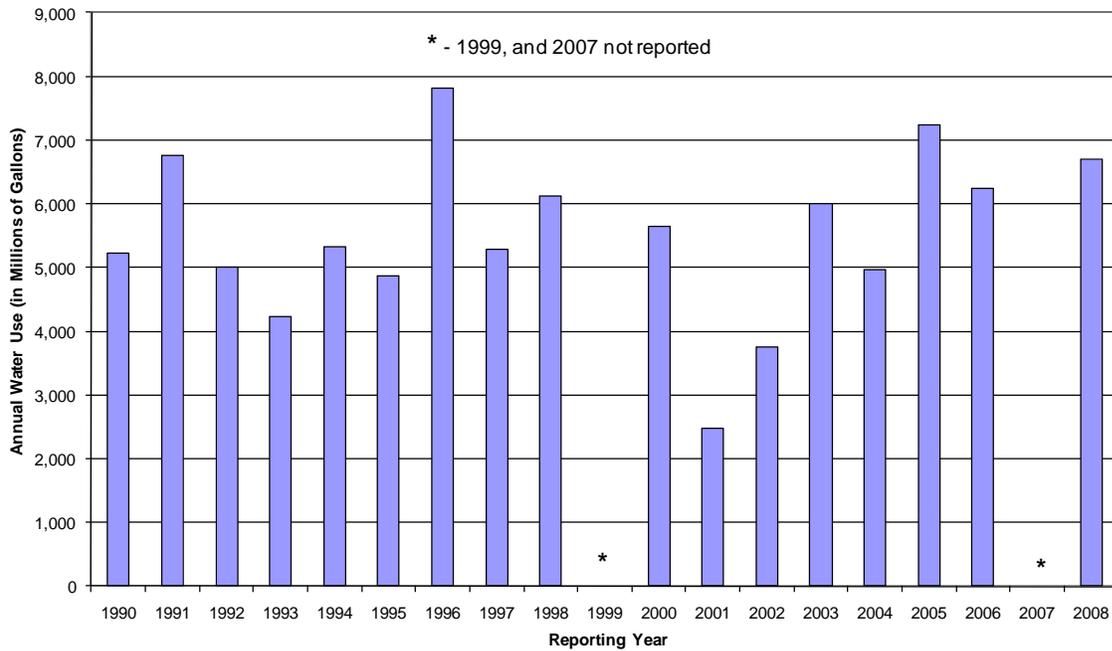
The source of water for the hydropower operations at Otis Falls Dam is the main stem of the Souhegan River and Mill Pond, the impoundment formed upstream of the dam. The dam is operated as run-of-river, meaning that the operation of the dam does not alter the flow of the river and that all of the water diverted through the hydroelectric operations is returned to the river.

If sufficient flow is available, the hydroelectric operations at Otis Falls Dam can produce power 24 hours a day, seven days a week, 365 days a year. Under the terms of its FERC license to operate the facility must allow for a minimum outflow of 10 cubic feet per second (cfs) during the summer (June through September) and 15 cfs during the winter (October through May). When the hydropower facility is not operating all of the flow goes over the top of the dam.

### **Water Use Patterns**

Water use data for the Otis Falls Dam for the period of 1988 through 2008 were obtained from the DES and are summarized in Figures 1 and 2 as well as in Tables 1 and 2. Water use records for 1988 and 1989 were incomplete and water use data for 1999 and 2007 were missing so they are not included in the annual use summaries.

Water use by Otis Falls Dam is dependent on river flow. Between 1990 and 2008 annual water use by Otis Falls Dam ranged from a high of 7,820 million gallons (2006) to a low of 2,480 million gallons (2001), and average use was 5,380 million gallons for the 17 years that a complete annual record was available (Figure 1 and Table 1). Annual water use has not shown significant upward or downward trends and has mirrored water usage at other Souhegan River dams.



**Figure 1 – Otis Falls Dam Annual Water Use 1990 through 2008**

**Table 1 – Otis Falls Dam Annual Water Use Statistics (1990 through 2008)**

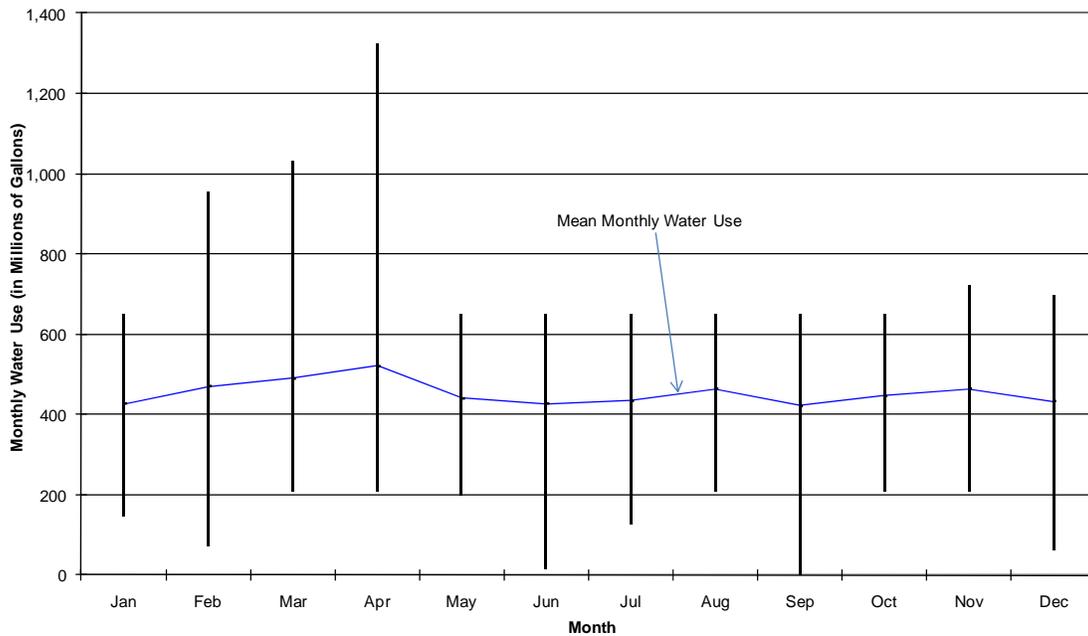
	Low	High	Average
(million gal)	2,480	7,820	5,500
(cfs)	10.50	33.20	23.40
(cfsm at impact point)	0.3560	1.1200	0.7940
(cfsm at Merrimack Gage)	0.0616	0.1940	0.1370

The monthly water use records for Otis Falls Dam begin in December 1988. The highest total monthly water use was 1,320 million gallons (April, 2008), the lowest total monthly water use was 192,000 gallons (September, 1989) with an average monthly use of 454 million gallons (Figure 2 and Table 2). Greatest monthly usage is usually during April, when river flows are highest and is typical for a run-of-river dam in New Hampshire.

The monthly water use data were converted from thousand gallons per month to cubic feet per second (cfs) by dividing the monthly totals by days and then multiplying them by a flow unit

conversion factor. These values were also divided by the drainage basin area (171 sq. miles) relative to the location of the United States Geological Survey gaging station (01094000) on the Souhegan Designated River in Merrimack, New Hampshire and they were also normalized to the drainage area (29.5 sq. miles) of the Designated Reach above the impact point of the withdrawal.

Based on these values, the average daily water use for Otis Falls Dam has ranged from a minimum of 0.01 cfs (5,817 gallons per day, September 1989) to a maximum of 68.3 cfs (44,144 million gallons per day, April 2008), and average use was 23.1 cfs (14,930 million gallons per day) for the period of 1988 to 2008 (Table 2).



**Figure 2 – Otis Falls Dam Monthly Water Use 1988 through 2008**

**Table 2 – Otis Falls Dam Monthly Water Use Statistics (1988 through 2008)**

	Low	High	Average
<b>(million gal)</b>	0.192	1,320	454
<b>(cfs)</b>	0.01	68.30	23.10
<b>(cfsm at impact point)</b>	0.0003	2.3200	0.7840
<b>(cfsm at Merrimack Gage)</b>	0.0001	0.4000	0.1350

**Potential for Water Use Management to Support Protected Instream Flows**

Otis Falls Dam has limited potential to manage its water use to support the Protected Instream Flows because it is operated on a run-of-river basis and is required to support minimum flows in the Souhegan Designated River as a condition of its FERC operating license. By virtue of its management, the water use of the dam reflects the discharge of the river.

## Water Use Plan Activity

Since Otis Falls Dam is operated on a run-of-river basis, and is required to maintain minimum flows in the Souhegan Designated River, the only water use management action to be taken to support the protected instream flows is to pass relief flows un-attenuated from the dams located upstream during a water management action event.

## Estimated Water Use Plan Implementation Costs

Since the water use management action for Otis Falls Dam is to allow any relief flows to pass un-attenuated, there is no direct cost associated with the implementation of the plan.

## Water Use Plan Implementation Schedule

By June 1, 2014, Otis Falls Dam will implement its Water Use Plan and will institute the measures required to support the protected instream flows.

## Water User Contact Information

**Water User:** Alden Hydro LLC  
**Address:** 69 Spring Hill Road, Sharon, NH 03458  
**Contact:** Robert Greenwood  
**Phone:** 603-924-5777  
**Email:** greenwoodandson@aol.com

## Conversion Factors for Volume and Flow Units

1	cubic foot =	7.481	gallons
1	gallon =	0.1337	cubic feet
1	acre-foot =	43,560	cubic feet
1	acre-foot =	325,872	gallons
1	cfs =	448.86	gpm
1	cfs =	646,358.4	gpd
1	cfs =	0.65	MGD
1	gpm =	0.002227866	cfs
1	gpd =	0.00000154713	cfs
1	MGD =	1.5471	cfs

## **Sources of Information**

Env-Wq 1900 Rules for the Protection of Instream Flow on Designated Rivers, effective 5/28/11.

Department of Environmental Services (DES) Dam Bureau, NHDAMS Data Sheet for Otis Falls Dam.

Survey of Souhegan River Affected Water Users performed by Normandeau Associates, Inc. and completed with input from Robert Greenwood of Alden Engineering.

Water use reports on file with the Department of Environmental Services (DES).

# WATER USE PLAN

**Peter de Bruyn Kops (#20383)**

## **Introduction**

The following individual Water Use Plan (WUP) has been prepared for Peter de Bruyn Kops, who operates a commercial farm located in Amherst, New Hampshire. This WUP was prepared using information provided by Mr. de Bruyn Kops and from the water use records reported to the Department of Environmental Services (DES). The farm produces various crops based on market demand. The farm borders the Souhegan Designated River and has historically withdrawn water from it for crop irrigation and occasionally for frost prevention.

Under the Instream Flow Rules (Chapter Env-Wq 1900), Peter de Bruyn Kops is considered an Affected Water User (AWU) because his registered water source is within 500 ft of the Souhegan Designated River and his registered water source is within the Souhegan River Water Management Planning Area (WMPA), which is the watershed area of the Souhegan Designated River. Although, his water sources are currently inactive, because his water use has been less than the threshold requiring reporting, Mr. de Bruyn Kops requested that he continue to be considered an AWU. Chapter Env-Wq 1900 requires the preparation of water use plans for each AWU located within the Planning Area, and must include:

- Water use data and information to define water use patterns and needs;
- A description of the potential for water use modification, sharing or both to meet the protected instream flow requirements, including water use patterns and needs;
- An estimate of implementation costs of the plan; and
- An implementation schedule.

## **Water Source and Uses**

Mr. Peter de Bruyn Kops registered with the DES in 1993 and reported water withdrawals from the Souhegan River (#20383) from 1994 through 2003. During this period though, water use only occurred in 1997, 1998 and 1999. The facility has been officially inactive as a water user since 2003 and has not reported water uses since that time. At the request of Mr. de Bruyn Kops, his farm operations are being included in the development of the Souhegan River Water Management Plan.

Since the early 2000s, the crops produced at the farm (hay, clover, canola, vegetables and flowers) have not required reportable levels of water use for irrigation. Records for surface water use by Mr. de Bruyn Kops are available from DES for the period of 1994 through 2003.

Water was withdrawn from the Souhegan Designated River via a removable pipe that is connected to an eight inch irrigation pipe. Water was withdrawn on an “as-needed” basis and used to irrigate a mixture of crops. After 1999, irrigation withdrawals from the river ceased since the majority of the farm is used for the production of hay (alfalfa, alfalfa-grass, clover-grass and grass), sweet clover and honeybee forage. Up to 1999, approximately six to ten acres

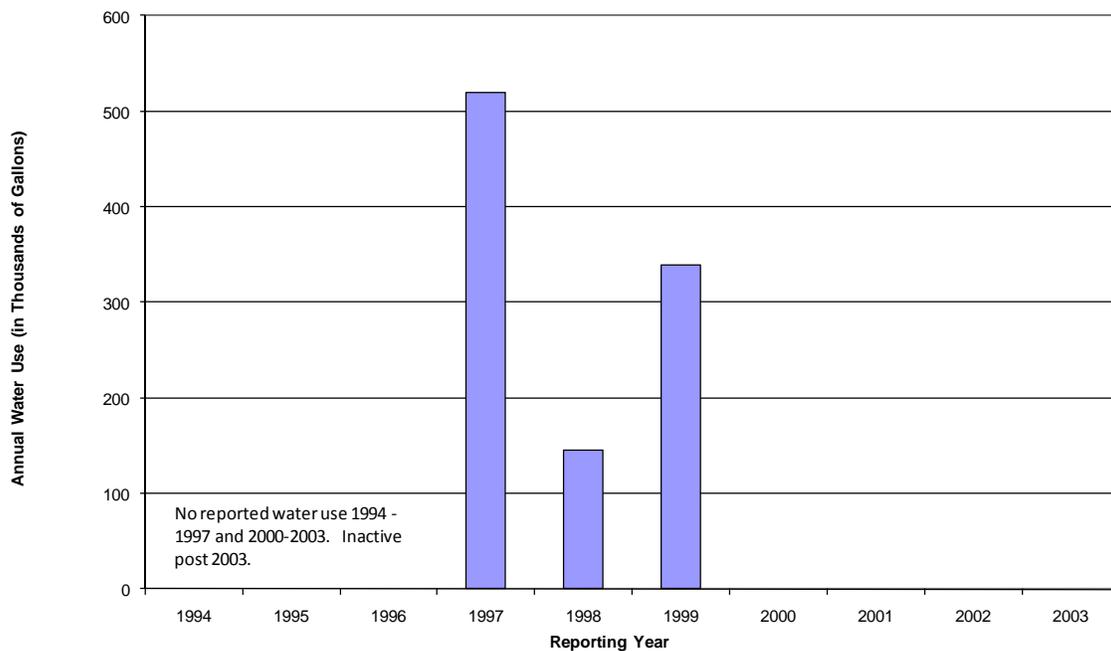
were irrigated for the production of pumpkins and winter squash. Currently, less than an acre is used for the production of general vegetables and these have required some irrigation, but below the reporting threshold. Drip irrigation has been used on some vegetables during the past few years. The sources of water for this irrigation include both a domestic well and a withdrawal from an oxbow pond.

### Water Use Patterns

Water use was on an as-needed basis, potentially 7 days per week and is weather dependent. On a daily basis water is used anytime it is needed. If less than one inch of water is provided by rainfall during a week, the remaining fraction of water is provided by irrigation, with irrigation generally done during daylight hours. Water use is not metered, but is estimated from the sprinkler flow rates.

Water use data for Peter de Bruyn Kops for the years of 1994 through 2003 were obtained from the DES and are summarized in Figures 1 and 2 and Tables 1 and 2. After 1999, Mr. de Bruyn Kops did not use river water for crop irrigation and, therefore, he stopped reporting withdrawals to the DES after 2003. Although his registration as a water user is now considered inactive, he may withdraw water from the Souhegan Designated River for irrigation again in the future, depending on which crops are grown and water availability (rainfall).

Water use varied from year to year and month to month, depending primarily on rainfall, weather conditions and the growing season. Annually, usage has ranged from a low of 0 gallons (multiple years) to a high of 520,000 gallons (1997) and has averaged 100,000 gallons for the reporting period (Figure 1 and Table 1). During this 10 year period (1994 through 2003), water was only withdrawn from the Souhegan Designated River in 1997, 1998 and 1999.

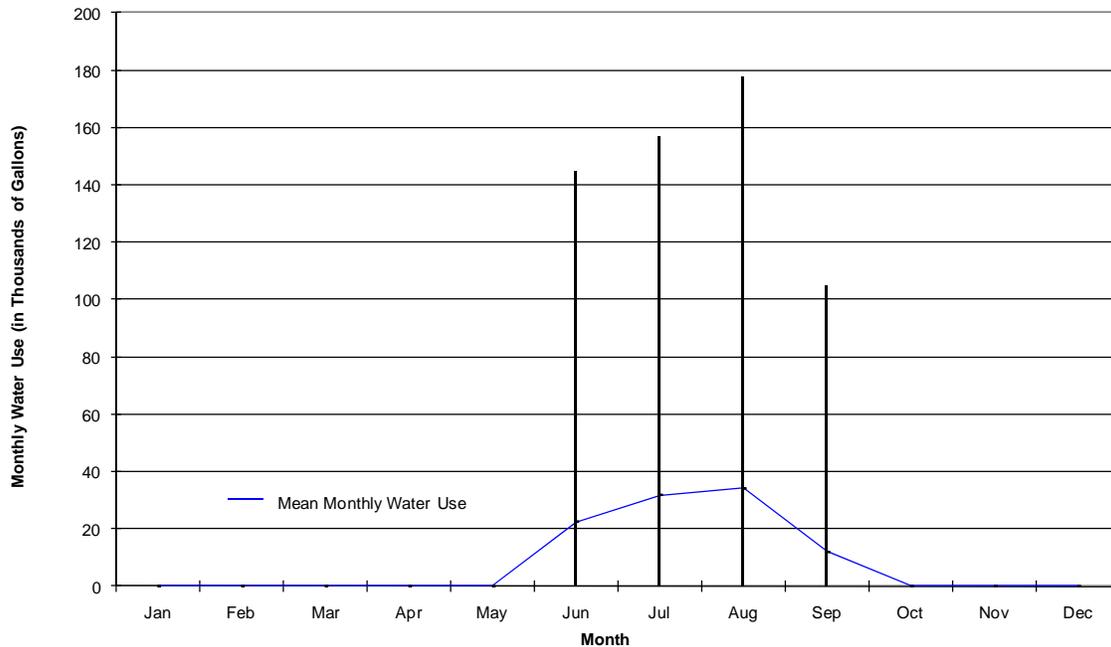


**Figure 1 – Peter de Bruyn Kops Annual Water Use 1994 through 2003**

**Table 1 – Peter de Bruyn Kops Annual Water Use Statistics (1994 through 2003)**

	Low	High	Average
<b>(1,000 gal)</b>	0	520	100
<b>(cfs)</b>	0	0.0022	0.0004
<b>(cfsm at impact point)</b>	0	0.00001	0.000003
<b>(cfsm at Merrimack Gage)</b>	0	0.00001	0.000003

Monthly water use changes seasonally with crop irrigation demand and rainfall. There has been no reported water use during the months of October through May due to plant dormancy conditions (Figure 2). The total and average monthly water usage was highest during the summer, specifically during August. The highest reported total monthly use of 178,000 gallons occurred in 1997. The average monthly use was 8,000 gallons, while the average monthly water use for the growing season months of April through October was 14,000 gallons (Table 2).



**Figure 2 – Peter de Bruyn Kops Monthly Water Use 1994 through 2003**

**Table 2 – Peter de Bruyn Kops Monthly Water Use Statistics (1994 through 2003)**

	Low	High	Average	Apr - Oct avg
<b>(1,000 gal)</b>	0	178	8	14
<b>(cfs)</b>	0	0.009	0.0004	0.007
<b>(cfsm at impact point)</b>	0	0.00006	0.0000003	0.00004
<b>(cfsm at Merrimack Gage)</b>	0	0.00005	0.0000003	0.00004

The monthly water use data were converted from thousand gallons per month to cubic feet per second by dividing the monthly totals by days and then multiplying them by a flow unit

conversion factor. These values were also divided by the drainage area (171 sq. miles) relative to the location of the United States Geological Survey gaging station (01094000) on the Souhegan Designated River in Merrimack, New Hampshire and they were also normalized to the drainage area (156 sq. miles) of the Designated Reach above the impact point of the withdrawal.

Based on these values, the average daily water use by Peter de Bruyn Kops has ranged from a minimum of 0 cfs (October through May in all years, all of 1994-1996, and all of 2000 through 2003) to a maximum of 0.009 cfs (5,817 gallons per day, August 1997) with an average of 0.007 cfs (4,524 gallons per day) for the April – October period and 0.0004 cfs (259 gallons per day) annually from 1994 through 2003.

### **Potential for Water Use Management to Support Protected Instream Flows**

Management of Peter de Bruyn Kops' farm operations has limited potential to support the Protected Instream Flows on the Souhegan Designated River. Historical water use has been of low volume and since 2003; no water use has been reported to DES because the farm operations have been below the reporting thresholds.

### **Water Use Plan Activity**

Management of Peter de Bruyn Kops' farm operations has limited potential to support the protected instream flows on the Souhegan Designated River unless water use changes from its current below reporting-threshold level. If water use by Peter de Bruyn Kops' farm operations meets the water use reporting threshold, Mr. de Bruyn Kops will be required to reduce his direct withdrawal from the Souhegan Designated River to the *de minimis* amount (Env-Wq 1902.07) when the daily mean discharge falls below the Critical protected flow for a period exceeding its Catastrophic duration, or when the daily mean discharge falls below the Rare threshold.

The *de minimis* amount for Mr. de Bruyn Kops, the Amherst Country Club/Ponemah Green Family Golf Center and Souhegan Woods Golf Club combined is 0.65 cfs (416,876 gallons per day), to be shared equally among those withdrawing water under this condition. The provisions of the Water Use Plan will not go into effect until Mr. Peter de Bruyn Kops re-activates his registration as a water user.

Alternatively, Mr. de Bruyn Kops may develop an alternative water supply that does not directly impact river flows, such a farm pond or well. Ideally, these water supplies would be hydrologically separated from the river by distance or intervening low permeability soils or both. As a rule of thumb, withdrawals located 500 feet or more from a tributary to the Souhegan River are considered hydrologically separate.

### **Estimated Water Use Plan Implementation Costs**

The low water use by Peter de Bruyn Kops' farm operations means that there are no costs under current management. If water use increases above the reporting threshold, this water use plan would apply. Costs to implant this plan will depend on the level of increased use. Existing available alternative supply sources (*de minimis* or existing farm ponds) are available under low levels of use, and there are no direct costs associated with the implementation of these water use management options. If water use is greater than *de minimis*, and greater than the onsite sources

can supply without affecting stream flow, then an additional cost of developing and permitting an alternate water supply would apply.

### **Water Use Plan Implementation Schedule**

This Water Use Plan will go into effect upon Mr. Peter de Bruyn Kops re-activation of his registration as a water user and he will institute the measures for the management of irrigation water use during the summer and early fall when flows on the Souhegan Designated River fall below the Critical or Rare protected instream flow levels.

### **Water User Contact Information**

**Water User:** Mr. Peter de Bruyn Kops  
**Address:** 379 Amherst Street, #222, Nashua, 03063  
**Contact:** Same as user  
**Phone:** 603-673-8392  
**Email:** dkb@acugen.com

### **Conversion Factors for Volume and Flow Units**

1	cubic foot =	7.481	gallons
1	gallon =	0.1337	cubic feet
1	acre-foot	43,560	cubic feet
1	acre-foot	325,872	gallons
1	cfs =	448.86	gpm
1	cfs =	646,358.4	gpd
1	cfs =	0.65	MGD
1	gpm =	0.002227866	cfs
1	gpd =	0.00000154713	cfs
1	MGD =	1.5471	cfs

### **Sources of Information**

Env-Wq 1900 Rules for the Protection of Instream Flow on Designated Rivers, effective 5/28/11.

Department of Environmental Services (DES) 2008. Final Souhegan River Protected Instream Flow Report. Prepared by University of New Hampshire, University of Massachusetts and Normandeau Associates, Inc.

Personal communication with Mr. Peter de Bruyn Kops.

Survey of Souhegan River Affected Water Users performed by Normandeau Associates, Inc.  
and completed by Peter de Bruyn Kops.

Water use reports on file with the Department of Environmental Services (DES).

# **WATER USE PLAN**

## **Pennichuck Water/Souhegan Woods (#20659)**

### **Introduction**

The following individual Water Use Plan (WUP) has been prepared for Pennichuck Water's Souhegan Woods Community Water System (CWS). This WUP was prepared using information provided by Pennichuck Water and from their water use records reported to the Department of Environmental Services (DES). Pennichuck Water's registered water source, a well, is located along the Souhegan Designated River. This CWS also has an interconnection with the Merrimack Village District as a supplemental water supply.

Under the Instream Flow Rules (Chapter Env-Wq 1900), Pennichuck Water/Souhegan Woods is considered an Affected Water User (AWU) because its registered water source is within 500 ft of the Souhegan Designated River. In addition, its registered water source is within the Souhegan River Water Management Planning Area (WMPA), which is the watershed area of the Souhegan Designated River. Chapter Env-Wq 1900 requires the preparation of water use plans for each AWU located within the Planning Area, and must include:

- Water use data and information to define water use patterns and needs;
- A description of the potential for water use modification, sharing or both to meet the protected instream flow requirements, including water use patterns and needs;
- An estimate of implementation costs of the plan; and
- An implementation schedule.

### **Water Source and Uses**

Pennichuck Water provides water to the Souhegan Woods CWS from one overburden groundwater supply well (20659-S01). Groundwater is withdrawn from the well on a daily basis to provide drinking water and fire protection to the 115-home, Souhegan Woods subdivision. The system is interconnected with the Merrimack Village District (MVD) water supply which can be utilized as a supplemental water source.

Although the water source is groundwater, due to the fact that the pumped well is located in a stratified drift formation that is connected to the Souhegan River, the well intercepts water that supports stream flow in the Souhegan River. An analysis of induced recharge by this well was performed as part of the Instream Flow Study (DES 2005). The results of the analysis indicated that it does not induce Souhegan River water recharge at its average or maximum reported extraction rates.

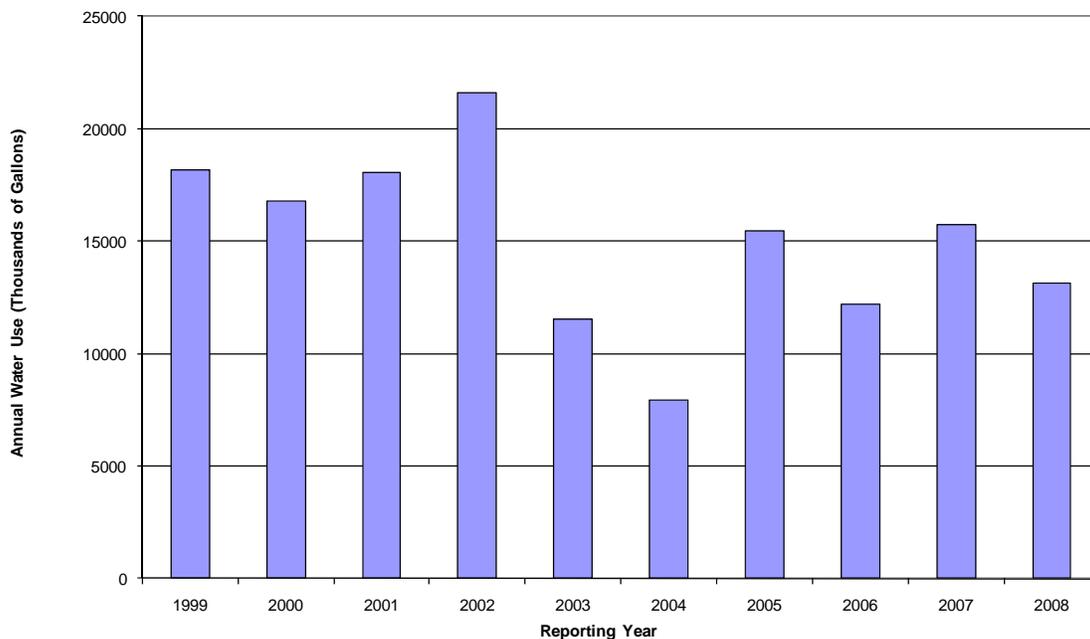
### **Water Use Patterns**

Water use is daily and represents common community water supply needs moderated by system storage. Daily water demand follows a diurnal pattern, with the greatest water demand during

the day (morning through evening) and lowest overnight. The well pump runs about five hours per day during the low water use season (winter), and about 17 hours per day during the high water use season (summer), with most of the increased water demand for lawn irrigation. The system includes 40,000 gallons of storage in two atmospheric tanks and 11,000 gallons in a hydropneumatic tank. When pumping, the well is pumped at a uniform rate (~61 gallons per minute); when pumping exceeds demand, excess water fills storage, and when pumping is less than demand, stored water makes up the difference. Groundwater pumping is metered and water use is recorded monthly and reported to DES quarterly.

Water use data for the Souhegan Woods CWS well for the years of 1998 through 2008 were obtained from DES and are summarized in Figures 1 and 2 as well as in Tables 1 and 2. Water use records were incomplete for 1998, so 1998 was not included in the annual use summaries. The monthly summaries include both data from the years 1998 through 2008.

From 1999 through 2008, annual water use by the Souhegan Woods CWS well ranged from a high of 21.6 million gallons (2002) to a low of 7.94 million gallons (2004), and average use was 15.1 million gallons (Figure 1 and Table 1). During this period, annual water use by Souhegan Woods CWS well has decreased by 5 million gallons or 27.5 percent. This represents a decrease of 500,000 gallons a year or 2.8 percent per year averaged over the 10 year period. Pennichuck Water credits the overall decline in water use to the increased use of water saving fixtures by residents and changing demographics within the community.



**Figure 1 - Pennichuck Water’s Souhegan Well Annual Water Use 1999 through 2008**

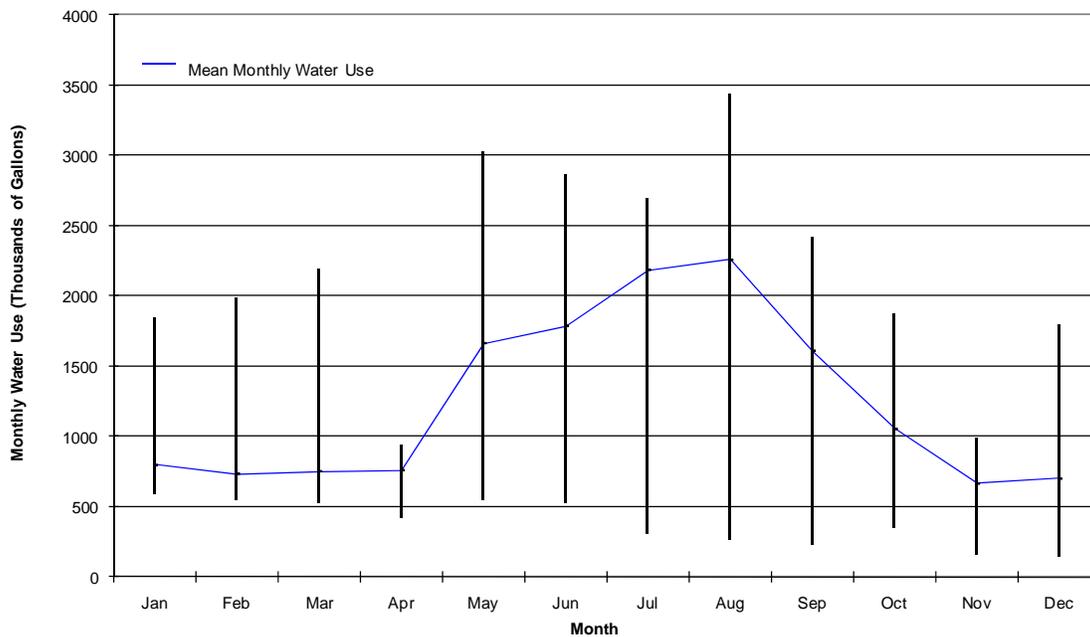
**Table 1 – Pennichuck Water’s Annual Water Use Statistics (1999 through 2008)**

	Low	High	Average
<b>(thousand gal)</b>	7,940	21,600	15,100
<b>(cfs)</b>	0.0337	0.0916	0.0639
<b>(cfsm at impact point)</b>	0.0002	0.0006	0.0004
<b>(cfsm at Merrimack Gage)</b>	0.0002	0.0005	0.0004

The monthly water use records for the system begin in July 1998. Monthly water use varies in response to weather conditions and changes in seasonal demand. For the system, the total and average monthly water usage was highest during the summer and lowest during the winter. This seasonal pattern reflects increased outdoor water usage (lawn irrigation, garden watering, vehicle washing, etc.) during the summer months, which then declines during the fall; remains low during the winter and begins to increase again in the spring. The highest total monthly use was 3.44 million gallons (August 2001), the lowest total monthly use was 145,000 gallons (December 2003), while the average monthly use was 1.24 million gallons (Figure 2 and Table 2).

The monthly water use data were converted from thousand gallons per month to cubic feet per second by dividing the monthly total by days and then multiplying them by a flow unit conversion factor. These values were also divided by the drainage basin area (171 sq. miles) relative to the location of the United States Geological Survey gaging station (01094000) on the Souhegan Designated River in Merrimack, New Hampshire and they were also normalized to the drainage area (161 sq. miles) of the Designated Reach above the impact point of the withdrawals.

Based on these values, the average daily water use by the Souhegan Woods CWS well has ranged from a minimum of 0.007 cfs (4,718 gallons per day, December 2003) to a maximum of 0.17 cfs (111,167 gallons per day, August 2001), and average use was 0.06 cfs (40,847 gallons per day) for the period of 1998 to 2008 (Table 2).



**Figure 2 - Pennichuck Water’s Souhegan Well Monthly Water Use 1999 through 2008**

**Table 2 – Pennichuck Water’s Monthly Water Use Statistics (1998 through 2008)**

	<b>Low</b>	<b>High</b>	<b>Average</b>
<b>(thousand gal)</b>	145	3,440	1,240
<b>(cfs)</b>	0.0073	0.1720	0.0632
<b>(cfsm at impact point)</b>	0.0001	0.0011	0.0004
<b>(cfsm at Merrimack Gage)</b>	0.00005	0.0010	0.0004

### **Potential for Water Use Management to Support Protected Instream Flows**

The potential for the management of water use by Pennichuck Water’s Souhegan Woods well to support the protected instream flows on the Souhegan Designated River is low. The Souhegan Woods CWS is supported by one well, which is supplemented by water provided by the Merrimack Village District (MVD) with water supply sources located outside the Planning Area. The on-site source well for the Souhegan Woods CWS was evaluated for its potential to induce recharge from the Souhegan Designated River. The results of this analysis indicate that the well does not induce recharge from the river either at its average or maximum reported withdrawal rates.

In addition, since only one well provides water to the community system, Pennichuck Water already manages water demand during the summer using an odd/even lawn watering restriction. This well is shut off automatically if pumping levels get low and the system then runs exclusively off of the MVD water system. The system can run and supply odd/even water demands solely from the MVD supply, so if the well needs to be shut off, according to Pennichuck Water, they do not need to implement more stringent watering restrictions. Additional reductions in water use by the Souhegan Woods community system can be imposed by MVD, when it provides water to Souhegan Woods, through restrictions or bans depending on its system production and storage.

### **Water Use Plan Activity**

Pennichuck Water manages outdoor water use by the Souhegan Woods CWS during the summer using an odd/even lawn watering restriction. During periods of reduced groundwater availability, the on-site well is shut off and water is supplied by the MVD. The MVD can impose additional outdoor water use reductions on the Souhegan Woods CWS through restrictions or bans, depending on its system capacity.

Since the on-site water source has been shown to not directly impact the Souhegan River and the MVD located outside of the Planning Area, the existing water use management activities are accepted as part of this Water Use Plan and are to be continued. No other actions are required as part of this plan.

### **Estimated Water Use Plan Implementation Costs**

Since there is no change in activity in the Water Use Plan for Pennichuck Water’s Souhegan Woods CWS, there are no costs.

## Water Use Plan Implementation Schedule

Since there is no change in activity in the Water Use Plan for Pennichuck Water's Souhegan Woods CWS, implementation is continued as current practice.

## Water User Contact Information

**Water User:** Pennichuck Water Works  
**Address:** P.O. Box 1947, 25 Manchester Street, Merrimack, NH 03054-1947  
**Contact:** Donald Ware  
**Phone:** 913-2330  
**Email:** donald.ware@pennichuck.com

## Conversion Factors for Volume and Flow Units

1	cubic foot =	7.481	gallons
1	gallon =	0.1337	cubic feet
1	acre-foot =	43,560	cubic feet
1	acre-foot =	325,872	gallons
1	cfs =	448.86	gpm
1	cfs =	646,358.4	gpd
1	cfs =	0.65	MGD
1	gpm =	0.002227866	cfs
1	gpd =	0.00000154713	cfs
1	MGD =	1.5471	cfs

## Sources of Information

Env-Wq 1900 Rules for the Protection of Instream Flow on Designated Rivers, effective 5/28/11.

Department of Environmental Services (DES) 2005. Souhegan River Instream Flow Task 2 Report. Prepared by Dr. Tom Ballestero, University of New Hampshire.

Personnel communication with Don Ware, Pennichuck Water.

Survey of Souhegan River Affected Water Users performed by Normandeau Associates, Inc.

Water use reports on file with the Department of Environmental Services (DES).

# WATER USE PLAN

## Pilgrim Foods, Inc. (#20681)

### Introduction

The following individual Water Use Plan (WUP) has been prepared for Pilgrim Foods, Inc., (Pilgrim Foods), which is a food production facility and is located off of Old Wilton Road in Greenville, New Hampshire. This WUP was prepared using information provided by Pilgrim Foods and from their water use records reported to the Department of Environmental Services (DES). Pilgrim Foods has used water from several sources as part of its operations. These sources include; the Town of Greenville water supply system, a well leased from the Town (Souhegan River Well) and two on-site ground water supply wells.

Under the Instream Flow Rules (Chapter Env-Wq 1900), Pilgrim Foods is considered an Affected Water User (AWU) because two of its active registered water sources are within 500 ft of the Souhegan Designated River (20681-S03, the Davis Well) and a tributary to it (20681-S04, the Dube Well). In addition, its registered water sources are within the Souhegan River Water Management Planning Area (WMPA), which is the watershed area of the Souhegan Designated River. Chapter Env-Wq 1900 requires the preparation of water use plans for each AWU located within the Planning Area, and must include:

- Water use data and information to define water use patterns and needs;
- A description of the potential for water use modification, sharing or both to meet the protected instream flow requirements, including water use patterns and needs;
- An estimate of implementation costs of the plan; and
- An implementation schedule.

### Water Source and Uses

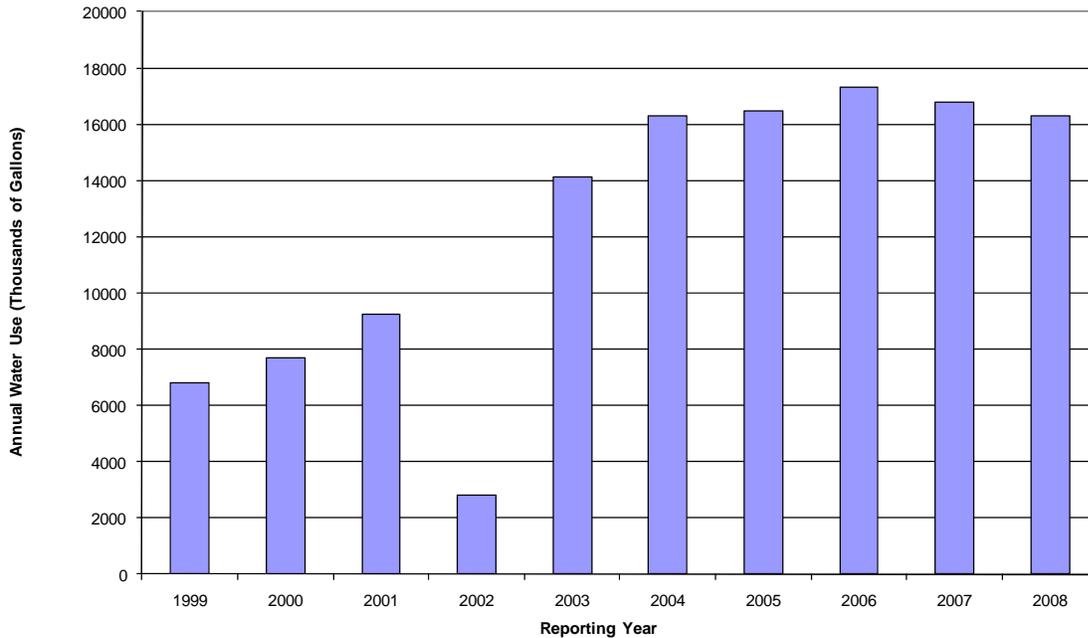
Pilgrim Foods has four registered water sources; the Town of Greenville water supply system (20681-S01), the Souhegan River Well (20681-S02) and two on-site wells (20681-S03 and 20681-S04). The Town of Greenville water system has been used by Pilgrim Foods since it started reporting its water use in 1999 and remains its principal source of water. The Souhegan River Well was used along with the water purchased from the Town of Greenville water system until the end of 2006, when the lease that Pilgrim Foods had with the Town for use of the well expired. The two on-site wells were inactive from 1999 through 2008, but Pilgrim Foods started using these wells in 2009 so they could reduce the amount of water they purchase from the Town of Greenville. The production of these wells range from 4 - 8 gallons per minute (gpm) for the Dube Well (20681-S04) to 12 - 15 gpm for the Davis Well (20681-S03). Pilgrim Foods can also store 20,000 gallons of water in on-site storage tanks.

Water use by Pilgrim Foods is daily, Monday through Friday during normal operating hours (7 am to 4 pm). Water use is metered by each source and is checked weekly. The total monthly water use is reported to the Department of Environmental Services (DES) quarterly.

## Water Use Patterns

Water use data for Pilgrim Foods for the years of 1999 through 2008 were obtained from DES and are presented in Figures 1 and 2 and are summarized in Tables 1 and 2. Water use data were available for the period of 1999 through 2008 for the Greenville water supply source and the Souhegan River Well (now inactive); while no water use was reported for the two on-site wells. The monthly water use records are incomplete for 1999 through 2001, with complete monthly records beginning in 2002.

Between 1999 and 2008 annual water use by Pilgrim Foods ranged from a high of 17.2 million gallons (2006) to a low of 2.80 million gallons (2002) and has averaged 12.39 million gallons (Figure 1 and Table 1). During this period, annual water use by Pilgrim Foods has increased by 9.50 million gallons or 140 percent (Figure 1). This represents an increase of 951,200 gallons a year or 14 percent over the ten year period. The increase in water use by Pilgrim Foods directly reflects the increased production at the facility over this time.



**Figure 1 – Pilgrim Foods, Inc. Annual Water Use 1999 through 2008**

**Table 1 - Annual Water Use Statistics (Combined Sources 1999 through 2008)**

	Low	High	Average
(thousand gal)	2,800	17,300	12,390
(cfs)	0.012	0.073	0.053
(cfsm at impact point)	0.0004	0.0023	0.0017
(cfsm at Merrimack Gage)	0.0001	0.0004	0.0003

Between 1999 and 2008 annual water use by Pilgrim Foods ranged from a high of 17.2 million gallons (2006) to a low of 2.80 million gallons (2002) and has averaged 12.39 million gallons (Figure 1 and Table 1). During this period, annual water use by Pilgrim Foods has increased by

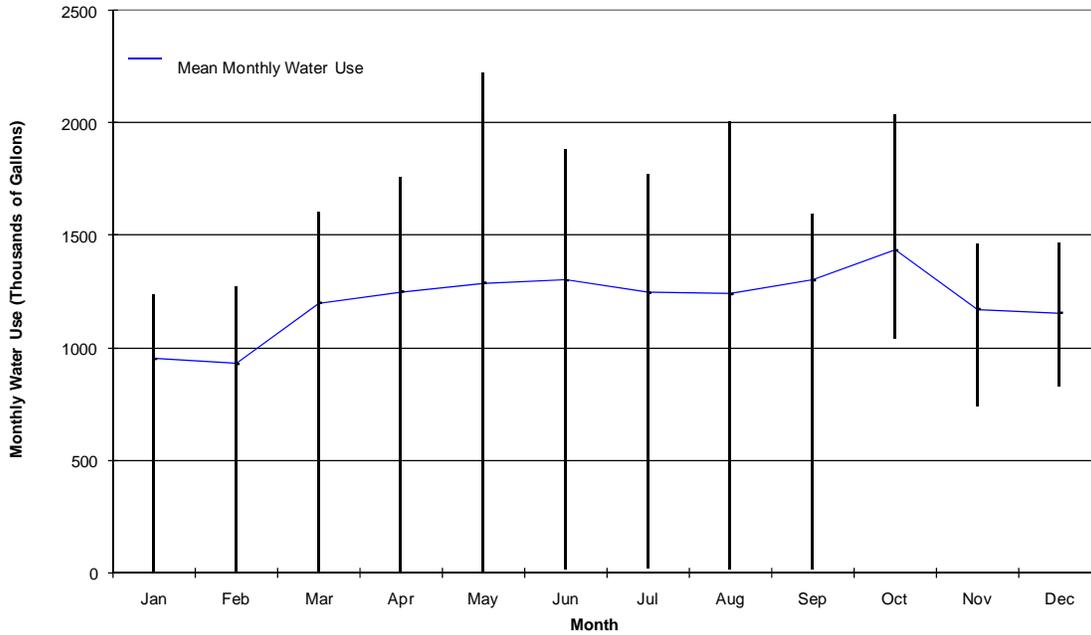
9.50 million gallons or 140 percent (Figure 1). This represents an increase of 951,200 gallons a year or 14 percent over the ten year period. The increase in water use by Pilgrim Foods directly reflects the increased production at the facility over this time.

Annual water use by Pilgrim Foods increased steadily from 1999 to 2007, except for the significant drop experienced in 2002 (Figure 1). The dramatic reduction in water use that year is reportedly due to a fire at the facility in December 2001, which significantly impacted their business operations. Since its peak in 2007, annual water use declined slightly in 2008.

The principal source of water for Pilgrim Foods has been the Greenville water supply, which was supplemented by water withdrawn from the Souhegan River Well. The use of the Souhegan River Well peaked in 2003 and 2004 and then quickly declined in 2005 and 2006. At the end of 2006, the lease that Pilgrim Foods had with the Town for the use of this well expired and they discontinued its use. Pilgrim Foods currently plans on using the two on-site wells to replace the water formerly withdrawn from the Souhegan River Well and to reduce the amount of water purchased from the Town.

Over the period of record, average monthly water use has varied over a narrow range (500,000 gallons), while the difference between the maximum and minimum monthly water use has been much larger (Figure 2 and Table 2). The highest total monthly water use was 2.23 million gallons (May 2001), the lowest total monthly water use was 0 (January 2002), with an average monthly use of 1.20 million gallons. Historically, the lowest mean monthly water use occurs from November through February because production is reduced in response to a seasonal decline in the demand for their food products.

The monthly water use data for Pilgrim Foods were converted from thousand gallons per month to cubic feet per second (cfs) by dividing the monthly totals by days and then multiplying them by a flow unit conversion factor. These values were also divided by the drainage basin area (171 sq. miles) relative to the location of the United States Geological Survey gaging station (01094000) on the Souhegan Designated River in Merrimack, New Hampshire and they were also normalized to the drainage area (64 sq. miles) of the Designated Reach above the impact point of the withdrawals.



**Figure 2 – Pilgrim Foods, Inc. Monthly Water Use 1999 through 2008**

**Table 2 - Monthly Water Use Statistics (Combined Sources 1999 through 2008)**

	<b>Low</b>	<b>High</b>	<b>Average</b>
<b>(thousand gal)</b>	0	2,225	1,200
<b>(cfs)</b>	0.000	0.110	0.061
<b>(cfsm at impact point)</b>	0.000	0.0035	0.0019
<b>(cfsm at Merrimack Gage)</b>	0.000	0.0007	0.0004

Based on these values, the average daily water use by Pilgrim Foods has ranged from a minimum of 0.00 cfs (several months of no reported water use) to a maximum of 0.11 cfs (71,742 gallons per day)(May 2001), and average use was 0.006 cfs (39,426 gallons per day) for the period of 1999 to 2008 (Table 2).

### **Potential for Water Use Management to Support Protected Instream Flows**

Pilgrim Foods has limited potential to support the Protected Instream Flows on the Souhegan Designated River. Its principal water source is the Town of Greenville, which obtains its water from the Tobey Reservoir. Supplementing this source is groundwater withdrawn from two on-site wells. The Dube Well (20681-S03) is located within 400 feet of the designated river. The well is over 1,000 feet deep, completed in bedrock and pumped at a rate between 4 and 8 gpm. The Davis Well (20681-S04) is located over 500 feet from the designated river, but within 400 feet of a tributary to it. This well is over 600 feet deep, completed in bedrock, sand and gravel and is pumped at a rate between 12 and 15 gpm. Due to their depth and low pumping rates, these wells are not expected to induce recharge from the river or the tributary stream. In addition, the wastewater produced by the facility is initially treated on site and then discharged into the Town of Greenville’s sewer system. This wastewater is further treated at the Town of Greenville

wastewater treatment facility and then discharged to the Souhegan Designated River upstream of the Pilgrim Foods facility.

### **Water Use Plan Activity**

Since the pumping of groundwater at Pilgrim Foods site is not expected to directly impact the Souhegan Designated River or its tributary stream, no Water Use Plan actions are required at this time.

### **Estimated Water Use Plan Implementation Costs**

Since no water use management actions are currently required for Pilgrim Foods, there are no costs associated with the implementation of the plan.

### **Water Use Plan Implementation Schedule**

Since no Water Use Plan actions are currently required for Pilgrim Foods, there is no implementation schedule.

### **Water User Contact Information**

**Water User:** Pilgrim Foods, Inc.  
**Address:** 68 Old Wilton Road, Greenville, NH 03048-3100  
**Contact:** Charles Santich  
**Phone:** 878-2100  
**Email:** charlies@pilgrimfoods.net

### **Conversion Factors for Volume and Flow Units**

1	cubic foot =	7.481	gallons
1	gallon =	0.1337	cubic feet
1	acre-foot =	43,560	cubic feet
1	acre-foot =	325,872	gallons
1	cfs =	448.86	gpm
1	cfs =	646,358.4	gpd
1	cfs =	0.65	MGD
1	gpm =	0.002227866	cfs
1	gpd =	0.00000154713	cfs
1	MGD =	1.5471	cfs

## **Sources of Information**

Env-Wq 1900 Rules for the Protection of Instream Flow on Designated Rivers, effective 5/28/11.

Personal communication with Charles Santich, Pilgrim Foods.

Personal communication with Ingrid Sweeney, Pilgrim Foods.

Survey of Souhegan River Affected Water Users performed by Normandeau Associates, Inc.

Water use reports on file with the Department of Environmental Services (DES).

# **WATER USE PLAN**

## **Pine Valley Dam (#20782)**

### **Introduction**

The following individual Water Use Plan (WUP) has been prepared for Pine Valley Dam, which is located on the Souhegan River in Milford, New Hampshire. This WUP was prepared using information provided by Milford Elm Street Trust and from their water use records reported to the Department of Environmental Services (DES). The dam is a privately owned hydropower facility that is licensed by the Federal Energy Regulatory Commission (FERC Project No. 9282) and registered with the Department of Environmental Services (DES) Dam Bureau (#254.01).

Under the Instream Flow Rules (Chapter Env-Wq 1900), Pine Valley Dam is considered an Affected Water User (AWU) because its registered water source is within 500 ft of the Souhegan Designated River. In addition, the dam is within the Souhegan River Water Management Planning Area (WMPA), which is the watershed area of the Souhegan Designated River. Under Chapter Env-Wq 1900, individual WUPs are to be prepared for each AWU located within the Souhegan River WMPA. Each individual WUP is to include:

- Water use data and information to define water use patterns and needs for each AWU,
- A description of the potential for water use modification, sharing or both to meet the protected instream flow requirements, including water use patterns and needs,
- An estimate of implementation costs of the plan for each AWU, and
- An implementation schedule for the individual WUP.

### **Water Source and Uses**

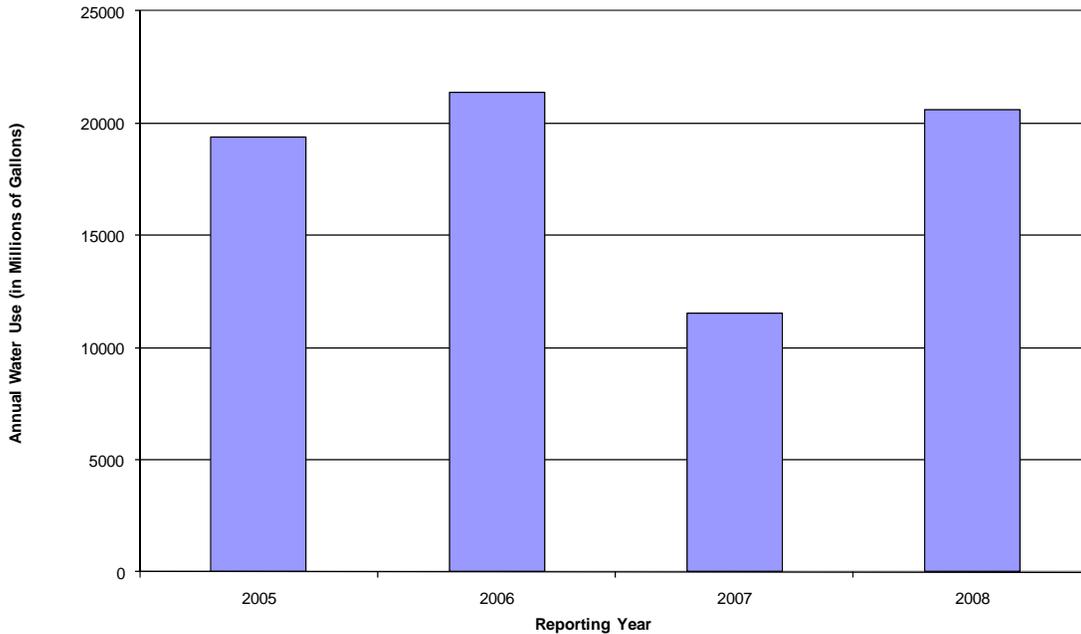
The source of water for the hydropower operations at Pine Valley Dam is the main stem of the Souhegan River and the impoundment formed upstream of the dam. The dam is operated as run-of-river, meaning that the operation of the dam does not alter the flow of the river and that all of the water diverted through the hydroelectric operations is returned to the river. The return point (#20782-D01) is located approximately 0.6 miles downstream of the dam at a former mill building between Wilton Road and North River Road located in Milford, New Hampshire.

The hydroelectric operations use water 24 hours per day, year round. The only flow restrictions on the facility are a FERC permitted minimum instream flow of 25 cfs along with a minimum production flow of 15 cfs for a total minimum flow restriction of 40 cfs. When electricity is not being produced by the facility, flow either goes over the dam and/or through the bypass pipe on the north side of the dam, but not through the penstock.

### **Water Use Patterns**

Water use data for the Pine Valley Dam for the period of 2004 through 2008 were obtained from the DES and are summarized in Figures 1 and 2 as well as in Tables 1 and 2. Water use records for 2004 were incomplete, so they are not included in the annual use summaries.

Water use by Pine Valley Dam is dependent on river flow. Between 2005 and 2008 annual by Pine Valley Dam ranged from a high of 21,400 million gallons (2006) to a low of 11,500 million gallons (2007), and average use was 18,200 million gallons for the four years that a complete record was available ((Figure 1 and Table 1). During this period, annual water use has not shown significant upward or downward trends.



**Figure 1 – Pine Valley Dam Annual Water Use 2005 through 2008**

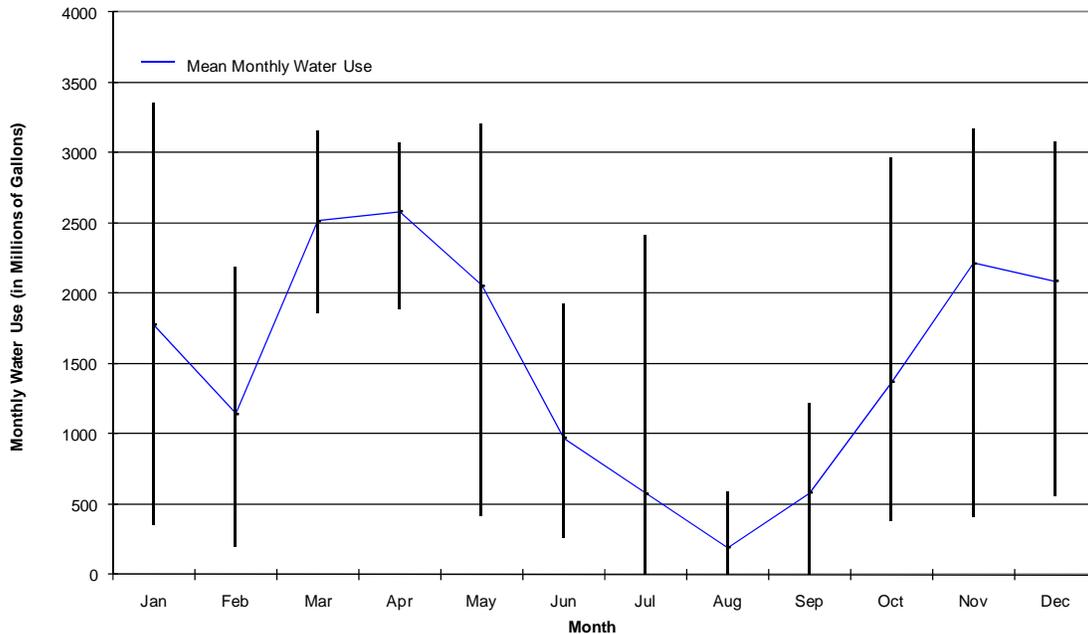
**Table 1 – Pine Valley Dam Annual Water Use Statistics (2005-2008)**

	Low	High	Average
<b>(million gal)</b>	11,500	21,400	18,200
<b>(cfs)</b>	48.9	90.8	77.3
<b>(cfsm at impact point)</b>	0.482	0.895	0.762
<b>(cfsm at Merrimack Gage)</b>	0.286	0.531	0.452

The minimum monthly water use at Pine Valley Dam during this period was 0 gallons (July, 2007; August, 2005; September 2006) with a maximum of 3,360 million gallons (January, 2006) and an average of 1,500 million gallons (Figure 4 and Table 2). The four years of reported data show monthly water use to be quite variable and typically follows the normal river flow. Peak usage occurs during April (2,580 million gallons) and minimum usage occurs during August (195 million gallons), which is typical of a run-of-river hydroelectric dam in New Hampshire.

The monthly use data, in thousands of gallons, were then converted to cubic feet per second. Daily water use by the Pine Valley Dam has ranged from a minimum of 0 cfs (July 2007, August 2005 and September 2006) to a maximum of 168.0 cfs (108.6 million gallons per day, January

2006), and average use was 76.6 cfs (49.5 million gallons per day) for the period of 2004 to 2008.



**Figure 2 – Pine Valley Dam Monthly Water Use 2005 through 2008**

**Table 2 - Monthly Water Use Statistics (2004-2008)**

	Low	High	Average
<b>(million gal)</b>	0	3,360	1,500
<b>(cfs)</b>	0	168.0	76.6
<b>(cfsm at impact point)</b>	0	1.650	0.755
<b>(cfsm at Merrimack Gage)</b>	0	0.980	0.448

**Potential for Water Use Management to Support Protected Instream Flows**

Pine Valley Dam has limited potential to manage its water use to support the Protected Instream Flows because it is operated on a run-of-river basis and it’s already required to support minimum flows in the Souhegan Designated River as a condition of its FERC operating license. The dam is operated on a run-of-river basis and storage in the impoundment upstream of the dam is not actively managed to produce hydroelectricity. So the water use of the dam reflects the discharge of the river, which is greatest during the spring and then declines and flattens during the summer.

Under the terms of its FERC operating license the facility must allow for a minimum outflow of 25 cfs and the facility does not produce power when flows are less than 40 cfs. At flows below 40 cfs no water is diverted to the penstock and all water flows over the dam or through the

bypass pipe at the dam. This minimum flow of 40 cfs is greater than both the Critical and Rare protected instream flows established for the GRAF Spawning and the Rearing & Growth bioperiods, which are during the summer (June through September).

### **Water Use Plan Activity**

Since Pine Valley Dam is operated on a run-of-river basis, and is required to maintain minimum flows in the Souhegan Designated River, the only water use management action to be taken to support the protected instream flows is to pass relief flows un-attenuated (with no diversion to the penstock) from the dams located upstream during a water management action event. The DES Instream Flow Program will notify the dam owner 24 hours in advance of any relief flow releases from the upstream dams.

### **Estimated Water Use Plan Implementation Costs**

Since the water use management action for Pine Valley Dam is to allow any relief flows to pass un-attenuated, there is no direct cost associated with the implementation of the plan.

### **Water Use Plan Implementation Schedule**

By June 1, 2014, Pine Valley Dam will implement its Water Use Plan and will institute the measures required to support the protected instream flows.

### **Water User Contact Information**

**Water User:** Pine Valley Business Center  
**Address:** 37 Wilton Road, Milford, NH, 03055  
**Contact:** Lisa Morrison  
**Phone:** 880-6655  
**Email:** Not available

### **Conversion Factors for Volume and Flow Units**

1	cubic foot =	7.481	gallons
1	gallon =	0.1337	cubic feet
1	acre-foot =	43,560	cubic feet
1	acre-foot =	325,872	gallons
1	cfs =	448.86	gpm
1	cfs =	646,358.4	gpd
1	cfs =	0.65	MGD
1	gpm =	0.002227866	cfs
1	gpd =	0.00000154713	cfs
1	MGD =	1.5471	cfs

## **Sources of Information**

Env-Wq 1900 Rules for the Protection of Instream Flow on Designated Rivers, effective 5/28/11.

New Hampshire Dam Bureau, NHDAMS Data Sheet for Pine Valley Hydro Mill Dam.

Survey of Souhegan River Affected Water Users performed by Normandeau Associates, Inc and completed by Paul Robichaud of Milford Elm Street Trust.

Water use reports on file with the Department of Environmental Services (DES).

# WATER USE PLAN

## Savage Municipal Water Supply Superfund Site (#20833)

### Introduction

The following individual Water Use Plan (WUP) has been prepared for Savage Municipal Water Supply Well Superfund Site (Savage Well site), which is located in Milford, New Hampshire. This WUP was prepared using information from the Savage Well water use registration and water use data reported to the Department of Environmental Services (DES). There are two remediation areas (OU1 – also referred to as the OK Tool site, discussed separately, and OU2 – the Savage Well site) at the site with active groundwater pump and treatment systems. Treated groundwater from the contaminated areas is re-infiltrated to the aquifer via underground injection or is discharged directly into the Souhegan River

Under the Instream Flow Rules (Chapter Env-Wq 1900), the Savage Well site is considered an Affected Water User (AWU) because its registered water source is within 500 ft of the Souhegan Designated River. In addition, its registered water source is within the Souhegan River Water Management Planning Area (WMPA), which is the watershed area of the Souhegan Designated River. Chapter Env-Wq 1900 requires the preparation of water use plans for each AWU located within the Planning Area, and must include:

- Water use data and information to define water use patterns and needs;
- A description of the potential for water use modification, sharing or both to meet the protected instream flow requirements, including water use patterns and needs;
- An estimate of implementation costs of the plan; and
- An implementation schedule.

### Water Source and Uses

The Savage Well site covers the groundwater contamination plumes in the Souhegan River aquifer between the OK Tool Source Area (#20832) and the Souhegan River. Groundwater is extracted from a wellfield (20833-S01) that consists of three wells in the plume area. The water is treated for volatile organic compounds (VOCs) via air stripping and returned to the aquifer up-gradient of the extraction wells through a wellfield (20833-D01) that consists of three injection wells. During times of high groundwater levels treated water is also discharged directly to the Souhegan River via a surface water discharge (20833-D02).

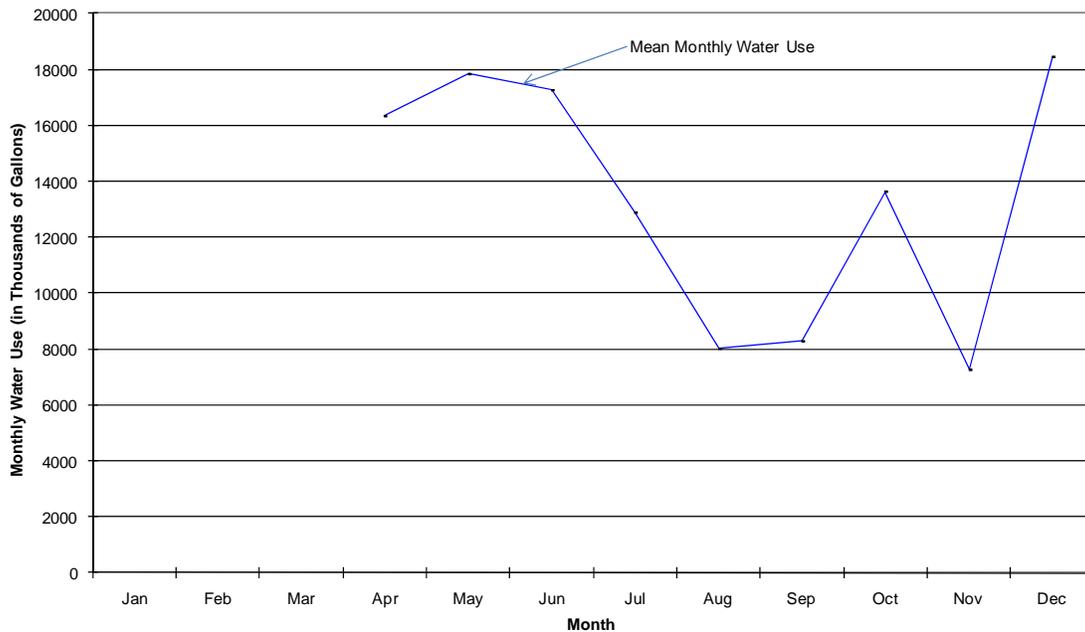
### Water Use Patterns

Water use is nearly continuous during treatment operations and the wells are generally pumped at a uniform rate (25 gallons per minute or gpm). Groundwater pumping is metered and is recorded monthly, as well as reported to the DES.

According to the water use registration forms on file with the DES, the extraction wells are typically pumped at a constant rate of 648,000 gallons per day (gpd) with an average annual use of 236,520,000 gallons. The water pumped from the extraction wells is either returned to the aquifer through underground injection or discharged directly into the Souhegan River, thus, there is no net water consumption at this site.

Water use data for the Savage Well wellfield for 2008 were obtained from the DES and are summarized in Figure 1 and Table 1. Since only a partial record of water use is available, only monthly data are presented. From April to December 2008 the highest total monthly water use was 18.4 million gallons (December), the lowest total monthly water use was 7.3 million gallons (November), with an average monthly use of 13.3 million gallons.

The monthly water use data were converted from thousand gallons per month to cubic feet per second by dividing the monthly totals by days and then multiplying them by a flow unit conversion factor. These values were also divided by the drainage basin area (171 sq. miles) relative to the location of the United States Geological Survey gaging station (01094000) on the Souhegan Designated River in Merrimack, New Hampshire and they were also normalized to the drainage area (104 sq. miles) of the Designated Reach above the impact point of the withdrawal.



**Figure 1 – Savage Well Site Monthly Water Use for 2008**

Based on these values, the average daily water use for the Savage Well wellfield has ranged from a minimum of 0.37 cfs (239,138 gallons per day, November) to a maximum of 0.92 cfs (594,614 gallons per day, December), and average use was 0.68 cfs (439,498 gallons per day) for 2008 (Table 1).

**Table 1 – Savage Well Site Monthly Water Use Statistics for 2008**

	<b>Low</b>	<b>High</b>	<b>Average</b>
<b>(thousand gal)</b>	7,300	18,400	13,300
<b>(cfs)</b>	0.3746	0.9210	0.6750
<b>(cfsm at impact point)</b>	0.0036	0.0088	0.0065
<b>(cfsm at Merrimack Gage)</b>	0.0022	0.0054	0.0039

### **Potential for Water Use Management to Support Protected Instream Flows**

The Savage Well site has limited potential to support the Protected Instream Flows due to the direct recharge of the treated groundwater back into the Souhegan River and the seasonal discharge of treated groundwater directly into the Souhegan Designated River via a surface discharge on site.

### **Water Use Plan Activity**

Since the groundwater withdrawn from the Savage Well site is effectively recycled, or discharged to the river during periods of high groundwater levels thereby limiting the potential for water use management, no Water Use Plan actions are currently required for the site.

### **Estimated Water Use Plan Implementation Costs**

Since no water use management actions are currently required for the Savage Well Site, there are no costs associated with the implementation of the plan.

### **Water Use Plan Implementation Schedule**

Since no Water Use Plan actions are currently required for the Savage Well site, there is no implementation schedule.

### **Water User Contact Information**

**Water User:** Hitchner Manufacturing Co. Inc. & Thomas & Betts Corp.  
**Address:** McLane, Graf, Raulerson & Middleton, PA, Suite 500, 11 South Main Street,  
Concord, NH, 03301  
**Contact:** Greg Smith  
**Phone:** 230-4401  
**Email:** [gsmith@mclane.com](mailto:gsmith@mclane.com)

### Conversion Factors for Volume and Flow Units

1	cubic foot =	7.481	gallons
1	gallon =	0.1337	cubic feet
1	acre-foot =	43,560	cubic feet
1	acre-foot =	325,872	gallons
1	cfs =	448.86	gpm
1	cfs =	646,358.4	gpd
1	cfs =	0.65	MGD
1	gpm =	0.002227866	cfs
1	gpd =	0.00000154713	cfs
1	MGD =	1.5471	cfs

### Sources of Information

Env-Wq 1900 Rules for the Protection of Instream Flow on Designated Rivers, effective 5/28/11.

Water use registration forms on file with the Department of Environmental Services (DES).

Waste Site Cleanup & Reuse in New England – Savage Municipal Water Supply, United States Environmental Protection Agency. website:  
[http://yosemite.epa.gov/r1/npl\\_pad.nsf/701b6886f189ceae85256bd20014e93d/83c7d221bb30028c8525691f0063f6f4!OpenDocument](http://yosemite.epa.gov/r1/npl_pad.nsf/701b6886f189ceae85256bd20014e93d/83c7d221bb30028c8525691f0063f6f4!OpenDocument)

# **WATER USE PLAN**

## **Souhegan Woods Golf Club (#20523)**

### **Introduction**

The following individual Water Use Plan (WUP) has been prepared for the Souhegan Woods Golf Club, which is located off of Thornton Ferry Road in Amherst, New Hampshire. This WUP was prepared using information provided by the Souhegan Woods Golf Club and from their water use records reported to the Department of Environmental Services (DES). This 18-hole golf course was built in 1991 and is open to the public. This facility uses water withdrawn from the Souhegan Designated River for the irrigation of its golf course.

Under the Instream Flow Rules (Chapter Env-Wq 1900), Souhegan Woods Golf Club is considered an Affected Water User (AWU) because its registered water source is within 500 ft of the Souhegan Designated River and its registered water source is within the Souhegan River Water Management Planning Area (WMPA), which is the watershed area of the Souhegan Designated River. Chapter Env-Wq 1900 requires the preparation of water use plans for each AWU located within the Planning Area, and must include:

- Water use data and information to define water use patterns and needs;
- A description of the potential for water use modification, sharing or both to meet the protected instream flow requirements, including water use patterns and needs;
- An estimate of implementation costs of the plan; and
- An implementation schedule.

### **Water Source and Uses**

The Souhegan Woods Golf Club has a registered withdrawal from the Souhegan Designated River (20523-S01), which is the source of irrigation water for the facility. Water is withdrawn from the river via a suction line that extends approximately 15 feet out from the shore and approximately six feet below the water surface.

Water is withdrawn on an “as needed” basis, which is defined as the minimum amount of water necessary to maintain healthy turf as determined through the physical monitoring of soil moisture levels. The water withdrawn from the river by the Souhegan Woods Golf Club is used to irrigate 70 acres of golf course fairways and greens and for equipment cleaning. Irrigation of the courses is necessary to ensure that the various grasses used at the courses remain healthy and adequately watered and to meet user expectations in terms of course appearance, condition and playability.

### **Water Use Patterns**

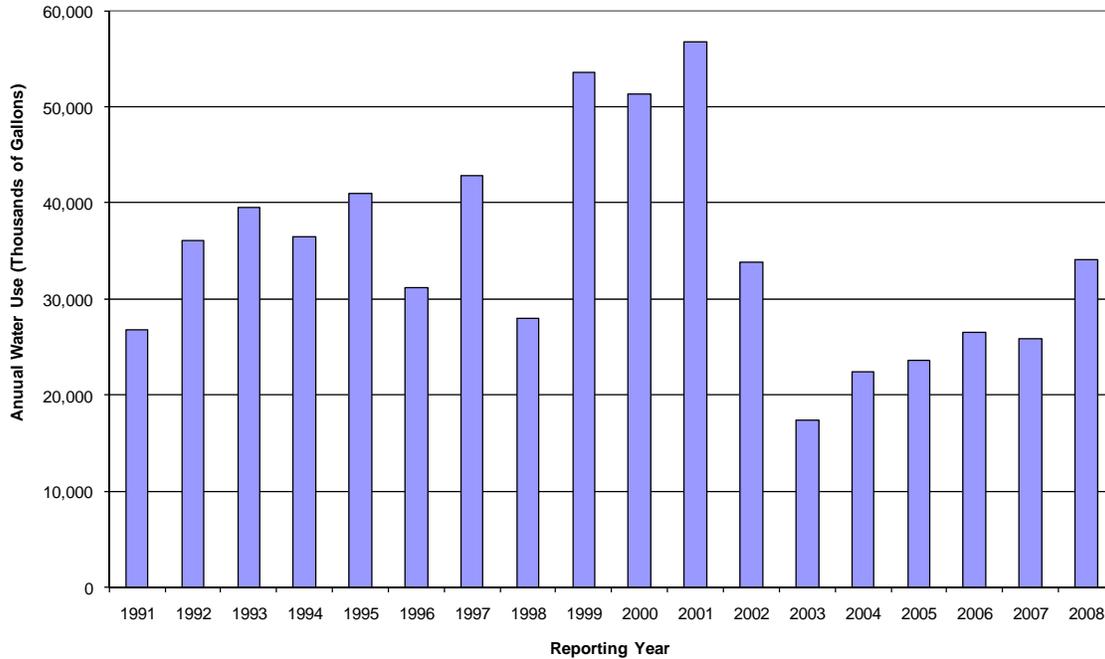
Water use is metered, recorded monthly and reported to the DES on an annual basis. A new recording meter was installed in April 2009 and the meters have been checked and calibrated each spring upon start-up.

As noted, water use is on an as needed basis, varying from every day to twice a week, with the greatest use during the spring through the fall, but is also weather dependent. Weather conditions are monitored using information from local weather stations available via the internet. Irrigation is typically performed on a daily basis from 8 pm to 6 am. But, this irrigation schedule can change depending on the results of the soil moisture monitoring performed on the course and in response to any mechanical failures of the irrigation system. If a mechanical failure of the irrigation system occurs during the normally scheduled time, it may be run outside of the 8 pm to 6 am time period. Although, daytime irrigation may not be as efficient as during the night, it requires much less water to maintain adequate soil moisture levels, than it does to recover from inadequate (below normal) soil moisture levels.

Water use data for the Souhegan Woods Golf Club for the years of 1991 through 2008 were obtained from the DES and are summarized in Figures 1 and 2 as well as Tables 1 and 2. The tables include the conversion of the water use from thousands of gallons to cubic feet per second (cfs) and cubic feet per second per square mile of the drainage area to allow for their comparison with streamflow values reported for the Souhegan Designated River.

Between 1991 and 2008 annual water use by Souhegan Woods Golf Club ranged from a high of 56.8 million gallons (2001) to a low of 17.4 million gallons (2003), and average use was 34.9 million gallons (Figure 1 and Table 1). During this period, annual water use increased by 7.27 million gallons or by 27 percent. This represents an increase of 404,000 gallons a year or 1.5 percent per year.

From 1991 to 2001 annual water use increased by 112 percent, but declined from 2001 to 2003 due to changes in water use management to increase water use efficiency. These changes included the introduction of new turf grasses and wetting agents and improvements in their pumping operations. Water use increased again between 2003 and 2008.

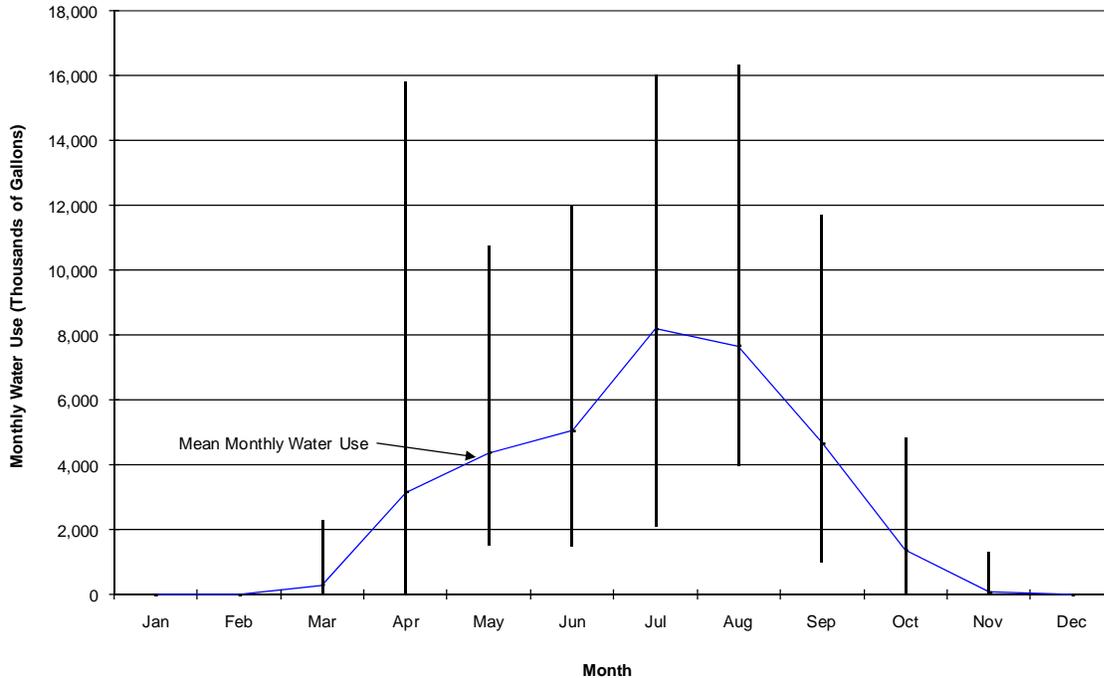


**Figure 1 – Souhegan Woods Golf Club Annual Water Use 1991 through 2008**

**Table 1 – Souhegan Woods Golf Club Annual Water Use Statistics (1991 through 2008)**

	<b>Low</b>	<b>High</b>	<b>Average</b>
<b>(thousand gal)</b>	17,400	56,800	34,900
<b>(cfs)</b>	0.0740	0.2410	0.1480
<b>(cfsm at impact point)</b>	0.0005	0.0015	0.0009
<b>(cfsm at Merrimack Gage)</b>	0.0004	0.0014	0.0009

Water withdrawals typically begin in April, but have occasionally occurred in March (six years), increase to a maximum in July, then decline and typically end by November (Figure 4). The range in water use reflects the weather conditions that affect the water demand by the golf course turf. Total monthly water use for the reporting period has ranged from 0 (multiple occurrences) to 16.3 million gallons (August 2001, a period of drought) and averaged 2.89 million gallons per month over the year (Table 2). When averaged for just the April-October period, average monthly water use was 4.93 million gallons.



**Figure 2 – Souhegan Woods Golf Club Monthly Water Use 1991 through 2008**

**Table 2 – Souhegan Woods Golf Club Monthly Water Use Statistics (1991 through 2008)**

	Low	High	Average	Apr-Oct avg
<b>(thousand gal)</b>	0	16,300	2,890	4,930
<b>(cfs)</b>	0	0.816	0.147	0.249
<b>(cfsm at impact point)</b>	0	0.0051	0.0009	0.0016
<b>(cfsm at Merrimack Gage)</b>	0	0.0048	0.0009	0.0015

The monthly water use data were converted from thousand gallons per month to cubic feet per second (cfs) by dividing the monthly totals by days and then multiplying them by a flow unit conversion factor. These values were also divided by the drainage basin area (171 sq. miles) relative to the location of the United States Geological Survey gaging station (01094000) on the Souhegan Designated River in Merrimack, New Hampshire and they were also normalized to the drainage area (159 sq. miles) of the Designated Reach above the impact point of the withdrawal.

Based on these values water use by the Souhegan Woods Golf Club has ranged from a minimum of 0 cfs (December through February in all years, November in all but one year (1999), ten years in March, two years in April and October) to a maximum of 0.816 cfs (527,397 gallons per day, August 2001) with an average of 0.249 cfs (160,934 gallons per day) for the April – October period and 0.147 cfs (95,009 gallons per day) annually during the past 18 years (Table 2).

## **Potential for Water Use Management to Support Protected Instream Flows**

Presently, the Souhegan Woods Golf Club is solely dependent upon the direct withdrawal of water from the Souhegan Designated River as its source for irrigation water, and as a result, has limited potential to manage its water use to support the protected instream flows. During those infrequent periods when a reduction in water withdrawals is needed to support the protected instream flows, alternative off-stream sources of water may have to be used. These may include:

- withdrawals from existing ponds on the golf course;
- the development of additional water hazard/storage ponds; and
- the development of a new groundwater supply

There are a total of four small ponds, having a combined surface area of roughly an acre, located on the Souhegan Woods Golf Club course. The exact volume of the ponds is unknown, but there is some potential that these ponds could be used as a temporary source of water for irrigation. This would allow Souhegan Woods Golf Club to reduce their withdrawal of water from the Souhegan Designated River when streamflow falls below the Critical or Rare flow thresholds for a period greater than their catastrophic durations.

The construction of additional water hazards or storage ponds on the Souhegan Woods Golf Club appears to be limited due to the lack of undeveloped land. The potential for expanding the existing water hazards for water storage is also limited due to the impact that they would have on the existing golf course operations.

Another potential alternative off-stream water supply source would be the development of a new groundwater supply. Based on information available from the United States Geological Survey (Toppin 1987), Souhegan Woods Golf Club is located on a stratified-drift aquifer. Production from a new well could be used during periods when streamflow in the river falls below the Critical or Rare flow thresholds for periods greater than their catastrophic durations, thereby replacing or reducing its direct withdrawal from the river.

Each of these alternatives would require additional evaluation to determine their feasibility. Important factors in determining their feasibility would include: the amount of water made available by the development of the alternative; the identification and evaluation of any hydrologic impact to the Souhegan Designated River as a result of the development of the alternative; the cost of each alternative; and permitting requirements.

### **Water Use Plan Activity**

The highest mean and total monthly water use by Souhegan Woods Golf Club occurs during the months from June through September, which also coincides with the two bioperiods (GRAF Spawning and Rearing & Growth – June 15 to September 30) that have the lowest protected instream flow values (Critical flow of 26 cfs and Rare flow of 17 cfs, DES 2008). To support the protected instream flows, Souhegan Woods Golf Club will reduce its direct withdrawal of water from the Souhegan Designated River to the *de minimis* amount when mean daily discharge, as measured at the USGS gaging station (01094000) in Merrimack, falls below the Critical flow

threshold of 26 cfs for a period exceeding its Catastrophic duration of 20 days or when the mean daily discharge falls below the Rare threshold of 17 cfs, prior to this. Mean daily discharge at the USGS gaging station and the protected instream flow conditions will be tracked by DES and will be available at its web page:

<http://www2.des.state.nh.us/OneStopPub/Watershed/souhegan-lower-pisf-track.xls>

Under Env-Wq 1900 Rules for the Protection of Instream Flow on Designated Rivers, the *de minimis* amount of water shall always be available for use: where the *de minimis* amount is defined as being “equal to 5 percent of 7Q10 at that location” (Env-Wq 1902.07). 7Q10 means the lowest average flow rate for a period of 7 consecutive days on an annual basis with an expected recurrence interval of once in every 10 years (Env-Wq 1902.01). Based on the discharge records for the USGS gaging station (01094000) in Merrimack, the 7Q10 for the Souhegan Designated River is 12.9 cfs, so the *de minimis* amount (5 percent) is equal to 0.65 cfs or 416,876 gallons per day. This *de minimis* amount of water is to be shared equally among those withdrawing water under this condition; the Amherst Country Club/Ponemah Green Family Golf Center, Souhegan Woods Golf Club, and Mr. de Bruyn Kops.

Since there are two other direct withdrawals on the Souhegan Designated River, the portion available to Souhegan Woods Golf Club is 0.22 cfs or 142,190 gallons per day. While the *de minimis* amount is slightly higher than the historical average monthly water use (in cfs) by Souhegan Woods Golf Club (Table 2) it is less than the average water use during the months of June through September. This suggests that more stringent water conservation measures would need to be implemented as a management action by Souhegan Woods Golf Club to reduce water demand or that an alternative source(s) of water would need to be used to supplement the water withdrawn from the river.

The reduction in the direct withdrawal of water from the Souhegan Designated River will be rescinded when daily mean discharge, as measured at the USGS gaging station (01094000) near Merrimack exceeds 26 cfs, from a natural recharge event, for two consecutive days.

### **Estimated Water Use Plan Implementation Costs**

During periods of reduced withdrawals from the Souhegan Designated River, Souhegan Woods Golf Club would need to either reduce their irrigation operations by taking additional conservation measures or supplement the withdrawal of water from new on-site storage ponds or from a new groundwater supply well. The development of a new groundwater supply well has several potential advantages over new on-site storage ponds, the most important being that it would provide a larger and more continuous source of water for irrigation. The estimated cost for the exploration, permitting and development of a new well is dependent on the site specific conditions, but this cost could exceed \$100,000.

### **Water Use Plan Implementation Schedule**

By June 1, 2014, Souhegan Woods Golf Club will implement its Water Use Plan and will institute the measures required to support the protected instream flows on the Souhegan

Designated River during the GRAF Spawning and Rearing & Growth bioperiods from June 15 to September 30.

### **Water User Contact Information**

**Water User:** Souhegan Woods Golf Club  
**Address:** 65 Thorton Ferry Road II, Amherst, NH, 03031  
**Contact:** Ryan Lane, Superintendent  
**Phone:** 424-4122  
**Email:** rustyone33@yahoo.com

### **Conversion Factors for Volume and Flow Units**

1	cubic foot =	7.481	gallons
1	gallon =	0.1337	cubic feet
1	acre-foot =	43,560	cubic feet
1	acre-foot =	325,872	gallons
1	cfs =	448.86	gpm
1	cfs =	646,358.4	gpd
1	cfs =	0.65	MGD
1	gpm =	0.002227866	cfs
1	gpd =	0.00000154713	cfs
1	MGD =	1.5471	cfs

### **Sources of Information**

Env-Wq 1900 Rules for the Protection of Instream Flow on Designated Rivers, effective 5/28/11.

Department of Environmental Services (DES) 2008. Final Souhegan River Protected Instream Flow Report. Prepared by University of New Hampshire, University of Massachusetts and Normandeau Associates, Inc.

Personal communication with Ryan Lane, Souhegan Woods Golf Club.

Survey of Souhegan River Affected Water Users performed by Normandeau Associates, Inc. and completed by Ryan Lane, Souhegan Woods Golf Club.

Toppin, K.W. 1987. Hydrogeology of Stratified-Drift Aquifers and Water Quality in the Nashua Regional Planning Commission Area. South-Central New Hampshire. United States Geological Survey Water-Resources Investigations Report 86-4358. Prepared in cooperation with the Nashua Regional Planning Commission and the New Hampshire Water Resources Board.

Water use reports on file with the Department of Environmental Services (DES).

# **WATER USE PLAN**

## **Waterloom Falls Dam (#20228)**

### **Introduction**

The following individual Water Use Plan (WUP) has been prepared for Waterloom Falls Dam, which is located on the Souhegan River in New Ipswich, New Hampshire. The following WUP was prepared using information provided by Alden Engineering and from their water use records reported to the Department of Environmental Services (DES). The dam is a privately owned hydropower facility that is licensed by the Federal Energy Regulatory Commission (FERC Project No. 7920) and registered with the DES (DES) Dam Bureau (#175.09).

Under the Instream Flow Rules (Chapter Env-Wq 1900), Waterloom Falls Dam is considered an Affected Water User (AWU) because its registered water source is within 500 ft of the Souhegan Designated River. In addition, the dam is within the Souhegan River Water Management Planning Area (WMPA), which is the watershed area of the Souhegan Designated River. Chapter Env-Wq 1900 requires the preparation of water use plans for each AWU located within the Planning Area, and must include:

- Water use data and information to define water use patterns and needs;
- A description of the potential for water use modification, sharing or both to meet the protected instream flow requirements, including water use patterns and needs;
- An estimate of implementation costs of the plan; and
- An implementation schedule.

### **Water Source and Uses**

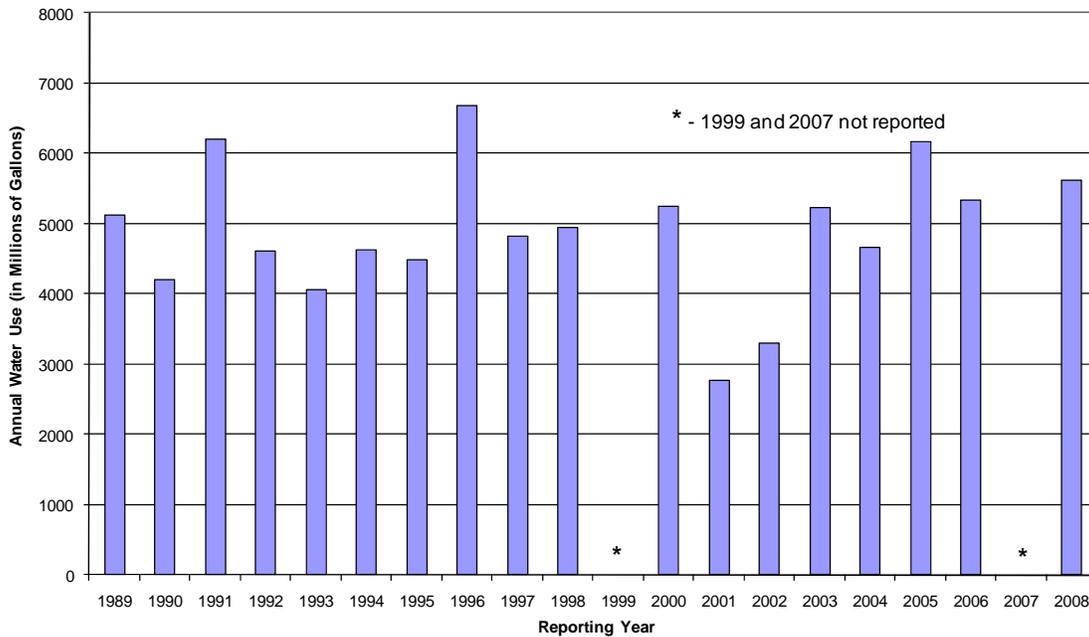
The source of water for the hydropower operations at Waterloom Falls Dam is the main stem of the Souhegan River and Waterloom Pond, the impoundment formed upstream of the dam. The dam is operated as run-of-river, meaning that the operation of the dam does not alter the flow of the river and that all of the water diverted through the hydroelectric operations is returned to the river.

If sufficient flow is available, the hydroelectric operations at Waterloom Falls Dam can produce power 24 hours a day, seven days a week, 365 days a year. Under the terms of its license to operate the facility, it must allow for a minimum outflow of 10 cubic feet per second (cfs) during the summer (June through September) and 15 cfs during the winter. When the hydropower facility is not operating all of the flow goes over the dam's spillway.

### **Water Use Patterns**

Water use data for the Waterloom Falls Dam for the period of 1989 through 2008 were obtained from the DES and are summarized in Figures 1 and 2 as well as in Tables 1 and 2. Monthly water use records begin in January 1989 and are complete except for the years 1999 and 2007 when no water use data were reported.

Water use by Waterloom Falls Dam is dependent on river flow. Between 1989 and 2008 annual water use by Waterloom Falls Dam ranged from a high of 6,680 million gallons (1996) to a low of 2,760 million gallons (2001), and average use was 4,890 million gallons for the 18 years that a complete annual record was available (Figure 1 and Table 1). Annual water use has not shown significant upward or downward trends and has mirrored water usage at other Souhegan River dams.



**Figure 1 – Waterloom Falls Dam Annual Water Use 1989 through 2008**

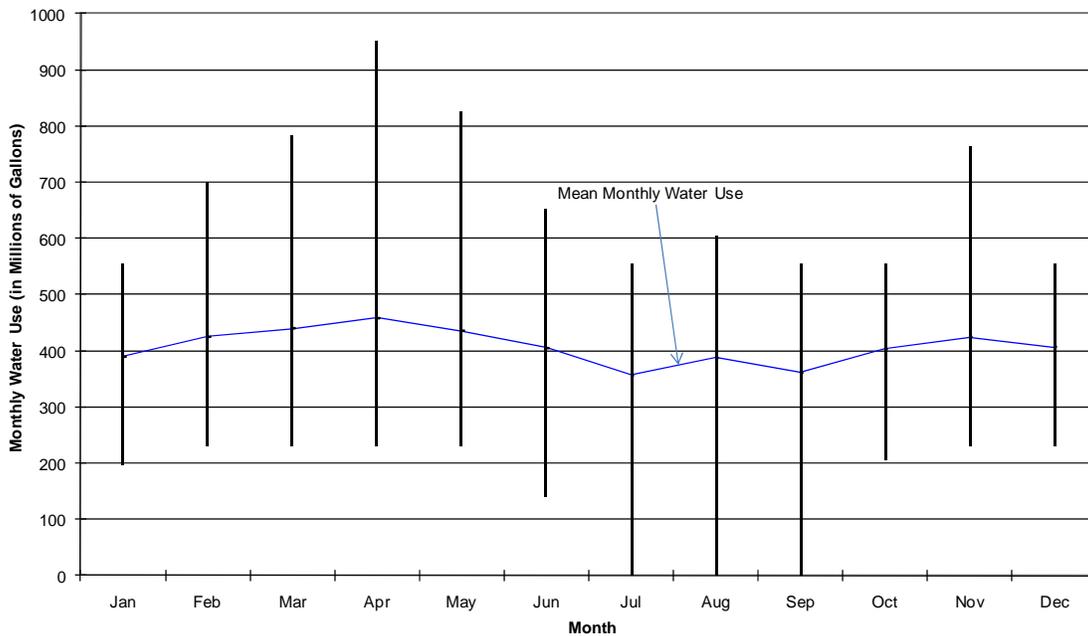
**Table 1 – Waterloom Falls Dam Annual Water Use Statistics (1989 through 2008)**

	Low	High	Average
(million gal)	2,760	6,680	4,890
(cfs)	11.70	28.30	20.80
(cfsm at impact point)	0.5180	1.2500	0.9170
(cfsm at Merrimack Gage)	0.0686	0.1660	0.1210

The monthly water use records for Waterloom Falls Dam begin in January 1989. The total and average monthly water use was highest during the spring (March through May) which coincides with the seasonal period of high streamflow, while the lowest total and average monthly water use occurs during the summer (July through September), when flows on the river are typically lowest (Figure 2). The highest total monthly water use was 951 million gallons (April 2008), the lowest total monthly use was 416,000 gallons (July through September 1990), with an average monthly use of 408 million gallons (Figure 2 and Table 2).

The monthly use data for Waterloom Falls Dam were converted from thousands of gallons per month to cubic feet per second by dividing the monthly totals by days and then multiplying them by a flow unit conversion factor. These values were also divided by the drainage basin area (171 sq. miles) relative to the location of the United States Geological Survey gaging station (01094000) on the Souhegan Designated River in Merrimack, New Hampshire and they were also normalized to the drainage area (23 sq. miles) of the Designated Reach above the impact point of the withdrawal.

Based on these converted values, daily water use by the Waterloom Falls Dam has ranged from a minimum of 0.02 cfs (12,926 gallons per day, July and August, 1990) to a maximum of 49.10 cfs (31.7 million gallons per day in April 2008), and average use was 20.80 cfs (13.4 million gallons per day) for the period of 1989 to 2008 (Table 2).



**Figure 2 – Waterloom Falls Dam Monthly Water Use 1989 through 2008**

**Table 2 – Waterloom Falls Dam Monthly Water Use Statistics (1989 through 2008)**

	<b>Low</b>	<b>High</b>	<b>Average</b>
<b>(million gal)</b>	0.416	951	408
<b>(cfs)</b>	0.02	49.10	20.80
<b>(cfsm at impact point)</b>	0.0009	2.1700	0.9170
<b>(cfsm at Merrimack Gage)</b>	0.0001	0.2870	0.1210

## Potential for Water Use Management to Support Protected Instream Flows

Waterloom Falls Dam has limited potential to manage its water use to support the protected instream flows because it is operated on a run-of-river basis and it's already required to support minimum flows in the Souhegan Designated River as a condition of its FERC operating license. The water use of the dam largely reflects the discharge of the river.

### Water Use Activity

Since Waterloom Falls Dam operated on a run-of-river basis, and is required to maintain minimum flows in the Souhegan Designated River, the only water use management action to be taken to support the protected instream flows is to pass relief flows un-attenuated from the dams located upstream during a water management action event.

### Estimated Water Use Plan Implementation Costs

Since the water use management action for Waterloom Falls Dam is to allow any relief flow to pass un-attenuated, there is no direct cost associated with the implementation of the plan.

### Water Use Plan Implementation Schedule

By June 1, 2014, Waterloom Falls Dam will implement its Water Use Plan and will institute the measures required to support the protected instream flows.

### Water User Contact Information

**Water User:** Alden Hydro LLC  
**Address:** 69 Spring Hill Road, Sharon, NH 03458  
**Contact:** Robert Greenwood  
**Phone:** 924-5777  
**Email:** greenwoodandson@aol.com

### Conversion Factors for Volume and Flow Units

1	cubic foot =	7.481	gallons
1	gallon =	0.1337	cubic feet
1	acre-foot =	43,560	cubic feet
1	acre-foot =	325,872	gallons
1	cfs =	448.86	gpm
1	cfs =	646,358.4	gpd
1	cfs =	0.65	MGD
1	gpm =	0.002227866	cfs
1	gpd =	0.00000154713	cfs
1	MGD =	1.5471	cfs

## **Sources of Information**

Env-Wq 1900 Rules for the Protection of Instream Flow on Designated Rivers, effective 5/28/11.

Department of Environmental Services (DES) Dam Bureau, NHDAMS Data Sheet for Waterloom Falls Dam.

Personal communication with Robert Greenwood, Alden Hydro LLC.

Survey of Souhegan River Affected Water Users performed by Normandeau Associates, Inc. and completed with input from Robert Greenwood of Alden Engineering.

Water use reports on file with the Department of Environmental Services (DES).

# **WATER USE PLAN**

## **Wilton Water Works (#20065)**

### **Introduction**

The following individual Water Use Plan (WUP) has been prepared for Wilton Water Works, which supplies water for the Town of Wilton, New Hampshire. This WUP was prepared using information provided by Wilton Water Works and from their water use records reported to the Department of Environmental Services (DES). Wilton Water Works has two registered water sources that are located between Route 31 and the Souhegan Designated River, in the south-central portion of the Town.

Under the Instream Flow Rules (Chapter Env-Wq 1900), Wilton Water Works is considered an Affected Water User (AWU) because its registered water sources are within 500 ft of the Souhegan Designated River and its registered water sources are within the Souhegan River Water Management Planning Area (WMPA), which is the watershed area of the Souhegan Designated River. Chapter Env-Wq 1900 requires the preparation of water use plans for each AWU located within the Planning Area, and must include:

- Water use data and information to define water use patterns and needs;
- A description of the potential for water use modification, sharing or both to meet the protected instream flow requirements, including water use patterns and needs;
- An estimate of implementation costs of the plan; and
- An implementation schedule.

### **Water Source and Uses**

The Wilton Water Works supply source consists of two registered groundwater wells, the Everett Well (20065-S01) and the Abbott Well (20065-S02). These gravel-packed wells are located 849 and 97 feet west of the Souhegan Designated River. These two ground water wells are the current water supply sources for residents and businesses in the Town.

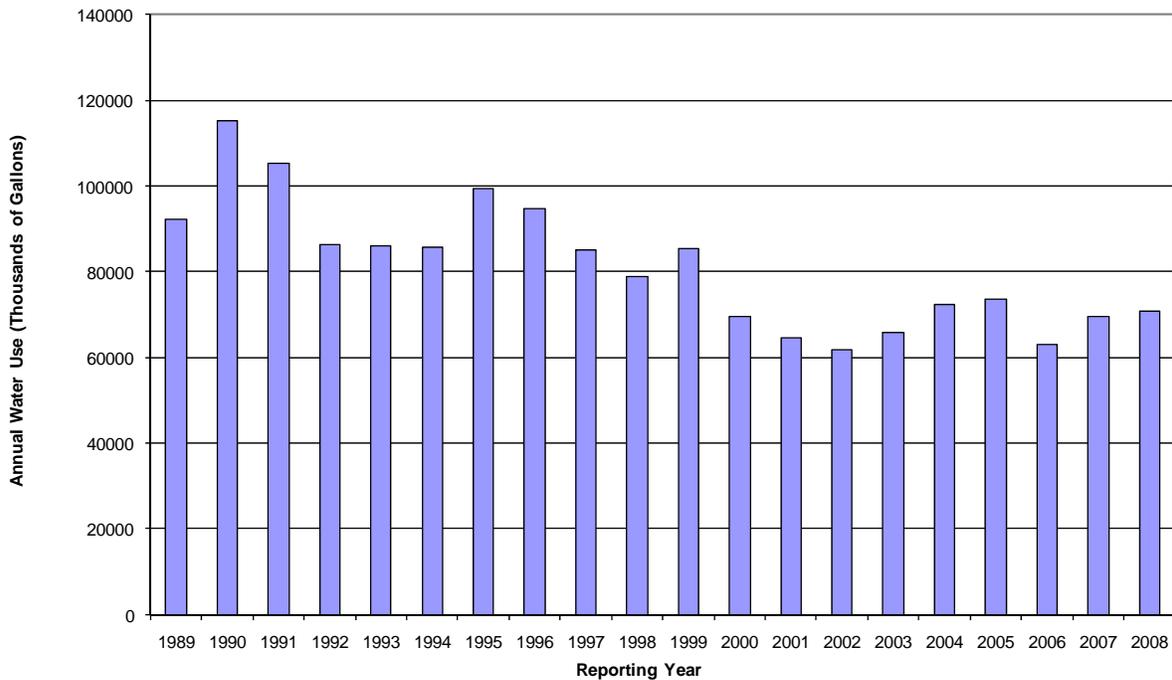
The wells are located in a stratified drift formation connected to the Souhegan River and intercept groundwater flowing to the river. An analysis of induced recharge by these wells was performed as part of the Instream Flow Study (DES 2005). These results of the analysis indicated that the wells do not induce river recharge at normal and maximum pumping levels. A more detailed hydrogeologic assessment of the production wells has since been performed by Emery & Garrett Groundwater, Inc. (2008) for the Wilton Water Commission. The objective of the study was to delineate the wellhead protection area around the wells. Based in the study's findings, Emery & Garrett Groundwater, Inc. (2008) concluded that approximately 32 percent of the groundwater being withdrawn from the Abbott Well was induced from the Souhegan River, while there was no evidence that the Everett Well induced recharge from the river.

## **Water Use Patterns**

Water withdrawal for the Town's water supply needs is continuous and pumping alternates between the two wells to reduce drawdown in the aquifer. The active well is pumped 6 to 8 hours and then shut down for 16 to 18 hours. When system demand exceeds the present pumping rate of the active well, the second well automatically comes on line. The pre-set flow rate for the Abbott Well is 400 gallons per minute (gpm), while the Everett Well pumping rate is pre-set at 450 gpm. Daily water demand varies diurnally with the highest demand during the day and the lowest demand at night. When pumping exceeds demand, excess water fills storage (one tank of 616,000 gallons), and when pumping is less than demand, stored water makes-up the difference. Both wells are metered and withdrawals are recorded monthly and reported to DES quarterly.

Water use data for the Wilton Water Works for the years of 1988 through 2008 were obtained from the DES and are summarized in Figures 1 and 2 as well as in Tables 1 and 2. Water use records were incomplete for 1988, so they are not included in the annual use summaries. The monthly summaries include both complete and incomplete records for the years 1988 through 2008.

Between 1989 and 2008 annual water use by Wilton Water Works ranged from a high of 115.2 million gallons (1990) to a low of 61.6 million gallons (2002), and average use was 81.2 million gallons (Figure 1 and Table 1). During this period, annual water use has decreased by 21.4 million gallons or 23 percent. This represents a decrease of 1.07 million gallons a year or 1.2 percent per year over the 20 year period. The decline in water use after 1995 is most likely the result of the metering of all of the water users in the Town during that year. Prior to the installation of water meters, water users only paid a flat base fee.



**Figure 1 – Wilton Water Works Annual Water Use 1989 through 2008**

**Table 1 – Wilton Water Works Annual Water Use Statistics (1989 through 2008)**

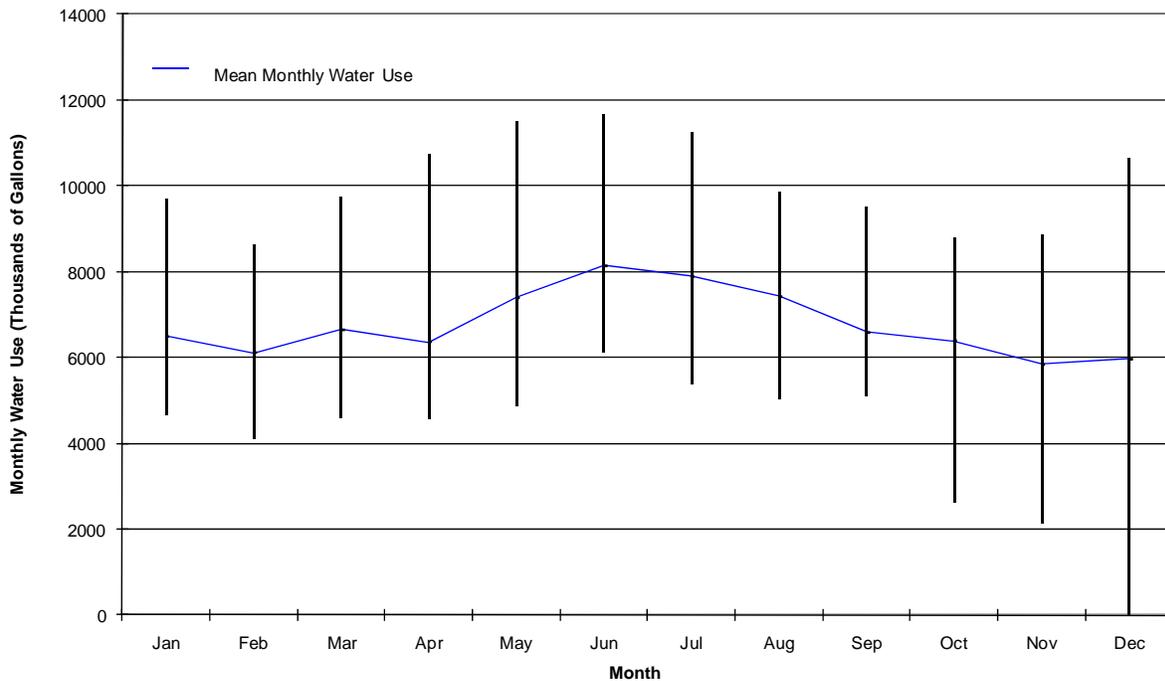
	Low	High	Average
<b>(thousand gal)</b>	61,650	115,200	81,200
<b>(cfs)</b>	0.0262	0.4889	0.3446
<b>(cfsm at impact point)</b>	0.0056	0.0074	0.0105
<b>(cfsm at Merrimack Gage)</b>	0.0015	0.0029	0.0020

The monthly water use records for the system begin in October 1988. Monthly water use varies in response to weather conditions and changes in seasonal demand. For the system, the total and average monthly water usage was highest during summer and lowest during winter. This seasonal pattern reflects increased outdoor water usage (lawn irrigation, garden watering, vehicle washing, etc.) during the summer months, which then declines during the fall; remains low during the winter and begins to increase again in the spring. The highest total monthly use was 11.7 million gallons (June 1991), the lowest total monthly use was 0 gallons in December 2008, but this was due to the recording meters being damaged as a result of an ice storm. Otherwise, the lowest total monthly water use was 2.1 million gallons in November 2002. The average monthly use was 6.8 million gallons (Figure 2 and Table 2).

The monthly water use data for Wilton Water Works were converted from thousand gallons per month to cubic feet per second by dividing the monthly totals by days and then multiplying them by a flow unit conversion factor. These values were also divided by the drainage basin area (171

sq. miles) relative to the location of the United States Geological Survey gaging station (01094000) on the Souhegan Designated River in Merrimack, New Hampshire and they were also normalized to the drainage area (46.8 sq. miles) of the Designated Reach above the impact point of the withdrawals.

Based on these values, the average daily water use by Wilton Water Works has ranged from a minimum of 0 cfs (0 gallons per day, December 2008) to a maximum of 0.583 cfs (376,805 gallons per day, June 1991), and average use was 0.345 cfs (222,980 gallons per day) for the period of 1988 to 2008 (Table 2).



**Figure 2 – Wilton Water Works Monthly Water Use 1988 through 2008**

**Table 2 – Wilton Water Works Monthly Water Use Statistics (1988 through 2008)**

	Low	High	Average
(thousand gal)	0	11,700	6,800
(cfs)	0	0.5831	0.3445
(cfsm at impact point)	0	0.0125	0.0074
(cfsm at Merrimack Gage)	0	0.0034	0.0020

### Potential for Water Use Management to Support Protected Instream Flows

The potential for the management of water use by Wilton Water Works to support the protected instream flows on the Souhegan Designated River is high. Wilton’s water supply consists of two production wells, only one (Abbott Well) of which has been shown to induce flow from the

Souhegan Designated River. Use of this well should be reduced during the summer and early fall when flows on the Souhegan Designated River fall below the Critical or Rare protected instream flow levels by reducing water demand through the implementation of outdoor water use restrictions.

### **Water Use Plan Activity**

Wilton Water Works has an established Emergency Plan Guide (Wilton Water Works 2009) that includes water conservation measures that can be implemented during an emergency or drought. Discussions with public water suppliers indicated an interest and willingness to coordinate reductions in outside water use that is linked with stream flow conditions in order to reduce system demand and support the protected flows.

Outdoor water use reduction will be accomplished by implementing the measures included in the Emergency Plan Guide (Wilton Water Works 2009). Outdoor water use is heaviest during the summer and early fall. The outdoor water use reduction plan will apply to the two bioperiods that correspond with the highest levels of water use, occurring from June 15 to September 30, and when flows in the Souhegan Designated River fall below the Critical and Rate protected instream flow levels (DES 2008). Under this Water Use Plan, outdoor water use will be reduced in three stages: an alert with voluntary water conservation, water use restrictions, and a water use ban.

The prompts for these water use actions are defined by the upper Souhegan Protected Instream Flows (DES 2008) as determined from daily flow measurements at the United States Geological Survey gaging station (01093852) on the Souhegan Designated River near Milford, New Hampshire. The Town will act on its Water Use Plan based on mean daily flow conditions at this gage or based on conditions defined on the DES web page:  
<http://www2.des.state.nh.us/OneStopPub/Watershed/souhegan-upper-pisf-track.xls>.

The first action is an alert to its customers and town-wide that voluntary water conservation measures should be taken and that further actions may begin soon. The alert will be enacted by the Town on the day after daily mean discharge at the gage falls below 11 cfs during the GRAF Spawning bioperiod (June 15-July 14) or below 16 cfs during the Rearing and Growth bioperiod (July 15-September 30). The Town will inform its water users through its notification process to implement voluntary water conservation measures and prepare for further actions. An alert may be rescinded when daily mean discharge from a natural recharge event exceeds either 11 or 16 cfs threshold during the appropriate period for two consecutive days.

If daily mean discharge in the Souhegan Designated River continues to decline and fall below the Critical protected flow level of 11 cfs during the GRAF Spawning bioperiod (June 15-July 14) for longer than the 20 day Catastrophic duration or below 16 cfs during the Rearing and Growth bioperiod (July 15-September 30) for longer than the 35 day Catastrophic duration, then the Town will implement their outside water use restrictions described in its Emergency Plan Guide (Wilton Water Works 2009). Restrictions on the watering gardens, lawns, and other landscaped areas; the washing of cars, trucks, RV's, driveways, sidewalks, patios and decks along with the filling of swimming pools from the water system will be imposed. These

restrictions may be rescinded when daily mean discharge from a natural recharge event exceeds either the 11 or 16 cfs threshold during the appropriate period for two consecutive days.

If daily mean discharge in the Souhegan Designated River falls below the Rare protected flow level of 8 cfs during the GRAF Spawning bioperiod (June 15-July 14) for longer than the 15 day, Catastrophic duration or below 10 cfs during the Rearing and Growth bioperiod (July 15-September 30) for longer than the 30 day Catastrophic duration, then a ban on outside water use will be imposed, as described in the Emergency Plan Guide (Wilton Water Works 2009). The ban on outside water use may be rescinded or reduced to an earlier restriction level when daily mean discharge from a natural recharge event exceeds either the 8 or 10 cfs threshold during the appropriate period for two consecutive days.

Nothing in this Plan precludes the Town from implementing more restrictive water use actions on its own initiative.

Whenever operational considerations of the water system allow during periods when outdoor water use restrictions are recommended or during a ban on outdoor water use, the Town will manage pumping from its water supply wells to further minimize potential impacts to the Souhegan Designated River. This includes minimizing the withdrawal of groundwater from the well located closest to the river and balancing this reduction with increased pumping from the well farthest from the river and operating the withdrawal at lower withdrawal rates over longer periods of time in preference to higher withdrawal rates for shorter periods.

### **Estimated Water Use Plan Implementation Costs**

The water use management actions are the implementation of outside water use reductions or bans when flows on the Souhegan Designated River fall below the Critical or Rare protected instream flow levels during summer and early fall during periods exceeding the catastrophic duration. There are no additional direct costs associated with the implementation of these water use management actions.

### **Water Use Plan Implementation Schedule**

By June 1, 2014, the Town of Wilton will implement its Water Use Plan and will institute the measures required to support the protected instream flows on the Souhegan Designated River during the GRAF Spawning and Rearing & Growth bioperiods from June 15 to September 30.

### **Water User Contact Information**

**Water User:** Wilton Water Works  
**Address:** P.O. Box 83, 42 Main Street, Wilton, NH, 03086  
**Contact:** Charles McGettigan, Jr., Water Commissioner  
**Phone:** 654-6602  
**Email:** Not available

## Conversion Factors for Volume and Flow Units

1	cubic foot =	7.481	gallons
1	gallon =	0.1337	cubic feet
1	acre-foot =	43,560	cubic feet
1	acre-foot =	325,872	gallons
1	cfs =	448.86	gpm
1	cfs =	646,358.4	gpd
1	cfs =	0.65	MGD
1	gpm =	0.002227866	cfs
1	gpd =	0.00000154713	cfs
1	MGD =	1.5471	cfs

## Sources of Information

Env-Wq 1900 Rules for the Protection of Instream Flow on Designated Rivers, effective 5/28/11.

Department of Environmental Services (DES) 2005. Souhegan River Instream Flow Task 2 Report. Prepared by Dr. Tom Ballestero, University of New Hampshire.

Personal communication with Charles McGettigan, Jr., Wilton Water Commission.

Personal communication with Jim Tuttle, Wilton Water Commission.

Emery & Garrett Groundwater, Inc. 2008. Delineation of the Wellhead Protection Area around the Abbott and Everett Production Wells, Wilton, New Hampshire. Prepared for the Wilton Water Commission.

Personal communication with Jim Tuttle, Wilton Water Commission.

Survey of Souhegan River Affected Water Users performed by Normandeau Associates, Inc. completed by Charles McGettigan, Jr. of the Wilton Water Commission.

Wilton Water Works 2009. Emergency Plan Guide. Effective March 2009, Updated July 2009.

Water use reports on file with the Department of Environmental Services (DES).