

Oswego County water resource  
management and Nestlé's water bottling  
plant impact



**Report Submitted by the  
Oswego County Environmental Management Council  
October 22 , 2007**

**OSWEGO COUNTY ENVIRONMENTAL MANAGEMENT COUNCIL  
REPORT  
Oswego County Water Resource Management and  
Nestlé's Water Bottling Plant Impact**

## Summary

As water shortages become major crises in many parts of the world, Oswego County is currently fortunate to have a plentiful supply of potable, good tasting water. A major source of water for much of Oswego County is the Tug Hill Aquifer. Recently plans for a water bottling plant in Oswego County have been unveiled by Nestlé's North America Waters. Nestlé's proposes to pump up to 1.25 million gallons of water per day from the Tug Hill Aquifer, which would be bottled and shipped throughout the northeast. Water would be withdrawn from the aquifer with an anchor well and up to 10-12 satellite wells. Demands for such a large water withdrawal from the Tug Hill aquifer presents serious issues that must be carefully investigated. This report presents such information and makes recommendation for the protection of this valuable natural resource. These issues include concerns about whether the aquifer in the regions being pumped can sustain the quantity of water being withdrawn, whether seasonal water level variations will be impacted by the withdrawal, and whether there will be consequences for businesses and residents that depend on the aquifer for their water supply. Data and information from Hydrology studies of the aquifer should provide answers to these concerns. Unfortunately the hydrology of the central region of the Tug Hill Aquifer has not been well researched and is poorly understood. It has been established that the middle section of the aquifer is mostly unconfined, which means that the ground water in the aquifer and the surface body waters (rivers, lakes, streams and ponds) are hydraulically connected, so that large pumping withdrawals in the region of surface water bodies will impact both the surface water bodies and the aquifer. Studies are urgently needed to determine the extent and the capacity of the Tug Hill Aquifer, and the characteristics of the aquifer's recharge areas. Serious concern also is raised by the lack of protection for the Oswego County water resources. The lack of Oswego County Water Resource Plans and regulations and the absence of local Zoning or Local Site Plan Review ordinances in the local communities (Albion, Altmar, Orwell and Williamstown) leave Oswego County vulnerable to large scale removal of water from the Tug Hill Aquifer.

It is recommended that: 1. Studies be conducted to better understand the characteristics and capacity of the entire Tug Hill Aquifer to facilitate management and protection of the county water resources. 2. The county provide financial support for the Tug Hill Aquifer Modeling Project to be accomplished by the USGS. 3. A Water Resource Management Plan be developed to protect, preserve and establish wise use guidelines and regulations for the Oswego County water resources. 4. A county commission, such as the Oswego County Water Quality Coordinating Committee, be activated to oversee and direct the Water Resource Management Plan.

The Nestlé's Water Bottling Plant proposal to withdraw large amounts of water daily from the Tug Hill Aquifer has exposed a serious deficiency of information about the hydrology of the aquifer and a lack of regulatory oversight and water resource management guidelines. It is imperative that correcting these inadequacies be given high priority in order to protect and preserve this valuable resource.

**OSWEGO COUNTY ENVIRONMENTAL MANAGEMENT COUNCIL  
REPORT (DRAFT)**

**Oswego County Water Resource Management and  
Nestlé's Water Bottling Plant Impact**

## **1. INTRODUCTION**

In 1999 the United Nations Environment Program (UNEP) reported that 200 scientists in 50 countries had identified water shortage as one of the two most worrisome problems for the new millennium (the other was global warming). Today, one person in five across the world has no access to safe drinking water, and one in two lacks safe sanitation.

Potable water is a natural resource that is becoming more valuable than oil. Increasingly, governments are seeking to solve their water problems by turning away from reliance on rainfall and surface water, and using subterranean supplies of groundwater from aquifers instead. This is like making constant withdrawals from a bank account without ever paying anything into it (BBC Science News Reports, 2007).

Ninety-five percent of the United States' fresh water is underground. In the United States water resources have had a long history of debate and legislated control and regulation in several of the western states. The use of water for irrigation in these western states leads to groundwater being pumped faster than rain can replenish it. As a consequence the water tables are dropping and the price of fresh water is increasing dramatically.

Fortunately Oswego County currently has a plentiful supply of potable, good tasting water. A major source of water for much of Oswego County is The Tug Hill Aquifer. Recently a water bottling industry, (Nestlé's North America Waters) has expressed interest in pumping water from this aquifer in the area of Orwell. In order to make such a facility economically viable they would need to pump approximately 1 million gallons of water per day from the Tug Hill Aquifer. This bottled water would be transported throughout the Northeast. In addition there is an increased need for residential water supplies in this area as land development and community growth continue to increase demands on water withdrawal from this aquifer.

Other local issues include changes in the water levels caused by the Schoeller Paper Company pumping less water from its wells in Richland and the need for a more stable supply of water for the Altmar Fish Hatchery. Also on a regional level, questions have been raised concerning the impact of environmental changes and global warming on the recharge of the aquifer.

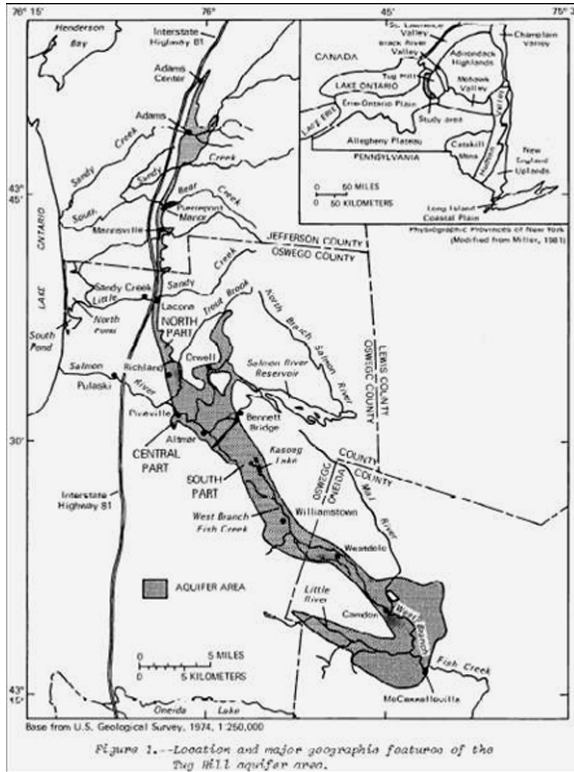
Such demands for water withdrawal from the Tug Hill aquifer present serious issues that must be carefully investigated. This report presents such information and makes recommendations for the protection of this valuable natural resource. In addition it is recommended that Oswego County studies and establishes an effective Water Resource Management Plan before outside pressures for industries making large withdrawals from the fresh water supply create a crisis in destabilizing the condition of the Tug Hill Aquifer.

## **II. DESCRIPTION OF THE TUG HILL AQUIFER**

The Tug Hill Aquifer is a 47-mile-long crescent-shaped underground rock and soil formation bending around the western and southwestern side of the Tug Hill region, from Jefferson County through Oswego County and into northern Oneida County.

The aquifer is composed of sand and gravel that was deposited by retreating glaciers approximately 12,000 years ago. Unconsolidated soil and rock fragments sorted into

layers (like the Tug Hill Aquifer) will typically yield high amounts of water from coarse-grained sand and gravel, but low amounts from fine-grained sand, silt or clay. The Tug Hill Aquifer has sections which are unconfined (water table conditions) and confined (capped and pressurized by a layer of impermeable material such as silt and clay).



The entire Tug Hill Aquifer is the source of drinking water for a number of municipalities, as well as private drinking water wells for residences, manufactured home parks, campgrounds, and other facilities. Additionally, water from the aquifer is used in manufacturing, industry, agriculture, and the NYSDEC Fish Hatchery in Altmar, NY. According to the Central New York office of the New York State Department of Health and the Region 6 office of the New York State Department of Environmental Conservation, communities who use water from the aquifer as a drinking water supply throughout the region are (from north to south) portions of the Town of Adams, the Village of Adams, the Town of Rodman, portions of the Town of Ellisburg, the Village of Mannsville, the Villages of Sandy Creek and Lacona, the

Village of Pulaski, the Town of Orwell, portions of the Town of Camden, and the Village of Camden (Tug Hill Commission – Draft 1, July 27, 2007).

The Oswego County Village of Lacona petitioned the Environmental Protection Agency (EPA) on September 16, 2003 to designate the Northern Tug Hill Glacial Aquifer as a sole source aquifer. The village pursued the designation based on concerns it had over land uses taking place near its groundwater wells, specifically the spreading of liquid manure from area farms. The EPA granted designation of the Northern Tug Hill Glacial Aquifer as a Sole Source Aquifer in November of 2006. A Tug Hill Commission report “Designation of the Northern Tug Hill Aquifer as a sole Source Aquifer” (March, 2007) explains what the Sole Source Aquifer designation means, how the Northern Tug Hill Glacial Aquifer came to be designated, and the future implications of the designation. It is important to note that Sole Source designation includes not only the land surface directly above this section of the aquifer and where water exists under ground, but also the land surface over the entire tributary surface watershed in this section of the aquifer. No such protection exists for the central or southern regions of the aquifer.

### III. NESTLE WATERS NORTH AMERICA BOTTLING PLANT

During an August 8, 2007 meeting, attended by Oswego County EMC members and several Oswego County administrators and staff members, Kent Koptiuch, Natural Resource Manager for Nestle Waters North America, presented information regarding Nestlé’s plans for establishing a water bottling industry in Oswego County.

Mr. Koptuich confirmed that Nestlé's plans to withdraw up to 1.25 million gallons per day for a water bottling plant and is under contract to purchase a 400 acre farm on the Richland /Orwell border. The Richland/Orwell site is across Potter Road from Orwell Brook and drains into Trout Brook. They are installing monitoring instruments up and down stream on Trout Brook. Nestlé's is currently conducting well drilling and water sampling studies on that property, as well as several other sites in the area. Studies involve investigating the amount of spring water that is available. A minimum of 350,000 gallons per day is required from the anchor spring. Water from the anchor spring would be piped to a water bottling plant. In addition, in order to meet their daily production needs (1.25 million gallons a day) Nestlé's would seek 10-12 satellite wells. Water from the satellite springs would be piped or trucked to the plant. Nestlé's is testing several sites: on the Orwell/Richland property and in Altmar, Williamstown, and Camden They bottle *spring* water (definition: a spring is a place where the aquifer intersects the surface) Geologists have been employed by Nestlé's to select sites and drill 3" bore holes. They will install 20-30 monitoring wells. Mr Koptuich indicated that information gained from the exploratory borings would be reported to DEC and would be public information. Mr Koptuich also reported that as a part of the DEC permitting and SEQR process, a determination of daily/annual withdrawal is made for purposes of protecting the water supply for other current and future uses. Part of this due diligence is to determine the 1, 2, and 3 year capture zones for aquifer recharge and protect these zones by purchase, easement, or lease. In the end this may amount to several hundred or few thousand acres that need to be protected

In these protected recharge zones hunting, fishing, and limited timber harvest would be allowed. No new residential building would be allowed. If there is existing residential property there, Nestlé's would replace their septic with a closed tank, and pump it for them. Chain link fence would be used to protect the spring source and bore holes. If there are exiting snowmobile trails or fishing access sites they may need to be moved to protect the well sites from fuel spills.

Criteria for the bottling plant would be the proximity to the anchor spring and to Interstate 81. An underground 12" pipeline from the anchor spring to the bottling plant should be as short as possible with no more than 2to 3 miles preferred. Nestlé's would negotiate for rights-of-way to build the pipeline. Water from satellite springs would be piped or trucked up to 12 miles.

Nestlé's would use 200-250 of their own trucks per day to ship the bottled water. The trucking would be part of SEQR process which would take into account truck routes and scheduling. Sometimes road work is paid for as well as working with the community on traffic issues.

The bottles would be manufactured on site. They have a self contained machine with no smoke stacks, no emissions, and very little waste is expected. A decision as to whether to site a water bottling plant is 18-24 months away.

#### IV. HYDROLOGY AND TECHNICAL INFORMATION

In the late 1980's and early 1990's, the United States Geological Survey (USGS) was asked to investigate the boundaries and characteristics of the Tug Hill Aquifer. This request was in response to citizen groups and agencies needing more information about the potential impacts of a landfill that was being sited just east of the Village of Rodman, in the northern portion of the aquifer. This study resulted in a number of plates being developed by USGS that illustrated the general direction of groundwater flow, soil characteristics, and general boundaries of the various parts of the aquifer. The Commission also conducted a general education effort about the aquifer at the time.

USGS found that the 47-mile long aquifer, though connected throughout to some degree, seemed to have three primary areas of water yield – a northern section, a mid-reach section and a southern section. The northern section is unique in that the groundwater gathers as it flows from east to west toward Lake Ontario. It is a narrow strip, oriented north to south. The mid-reach section is the highest-yielding aquifer portion, generally oval in shape, with optimal soils for water pooling. Recharge to this section of the aquifer occurs primarily from the east, although also partially from the west and north. The southern section of the aquifer is a valley system consisting of pebbly sand. Water yields here are more limited. The southern section's recharge comes primarily from the northeast and southwest. The mid-reach section is mostly **unconfined**, which means that the ground water in the aquifer and the surface water bodies (rivers, streams, lakes, and ponds) are hydraulically connected. Therefore, large pumping withdrawals in the vicinity of surface water bodies will impact the conditions in both the water bodies and the aquifer. If the cone of depression extends to a body of water on the surface, it will cause induced infiltration from the stream to the ground-water system and a reduction in stream flow will occur. Induced stream infiltration can also affect the quality of the ground water. Todd Miller (USGA Hydrologist) reported that: “The amount of induced infiltration may not be significant for a large stream such as the Salmon River; however, if the nearby streams, such as Orwell Brook or Trout Creek, are small, a large pumping well will have a larger impact and may even cause the streams to dry up.”

This concern is magnified by the conditions in the Salmon River basin during the summer of 2007. Water levels in the Salmon River are regulated by the Federal Energy Regulatory Commission [FERC]. NYSDEC and the United States Fish and Wildlife Service (USFWS) developed protocols for specific water releases called base flows in the license to provide a biologically stable aquatic system. Seasonal base flows are designed in the fall to enhance runs of migratory salmon and provide spawning habitat, in the winter to provide incubation of the eggs in the streambed, and in the summer to provide juvenile habitat for the hatched eggs along with habitat for summer run adult Atlantic salmon and Skamania steelhead. Reservoir levels have to be regulated also to provide the necessary year round base flows and provide seasonal protection of habitat in the reservoir. The first priority of the license is biological integrity of the river and hydro production. Recreational use is the next priority. (From: Tug Hill Commission – Draft 1, July 27, 2007)

The mid reach section of the aquifer, which is region for the proposed Nestlé's water bottling plant, is the section of the aquifer that supplies water for Schoeller Paper, the Village of Pulaski, the Town of Richland, and the NYSDEC Salmon River Fish

Hatchery. Although this is the highest yielding section of the aquifer past studies indicated that the use of this water source may have been close to capacity, leaving little room for expansion of the supply to future users [Todd Miller, USGS]. The quantity and quality of well water has been and still is a constant problem for the Salmon River Fish Hatchery.

Presently Schoeller Paper has been downsized and is operating on a much smaller scale. Water use at the plant at its full operating potential utilized a maximum of 1.7 million gallons a day. Approximately 40% of that was consumed in the process of making paper with the rest returned as treated water to the river system. Although Schoeller is gradually expected to increase production and hiring of employees at the plant, a newer process of production will not necessitate the use of high volumes of water as in the past. [Verdoliva, personal communication with Schoeller] Because of this Schoeller is in the process of selling their well fields to the Town of Richland for future expansion of the town's water district. Expansion of the water district and the development of a water bottling facility, even with Schoeller's reduced water use, will put additional stresses on this mid section of the aquifer and could result in reduced quantity and quality of water.

Drought conditions in the Summer of 2007 have created conditions on the Salmon River where the Executive Committee of the Flow Management Advisory Team (NYSDEC, USFWS, & Brookfield Power) have had to reduce the legally mandated base flows of the license in order to continue having some flow into the river without draining the entire reservoir to a point where releases would not be possible. This is occurring during the peak of the fall salmon run. Current flows (October 1 2007) are at 100 cubic feet per second [ cfs.] as compared to the prescribed 335 cfs. **Salmon River Reservoir levels are about 14 feet below normal.** This drought has affected all the rivers, streams, wetlands, ponds, and artificial reservoirs that drain the Tug Hill Plateau and are fed ground water by the Tug Hill Aquifer. As a consequence the mile long Lower Fly Fishing Catch & Release Area adjacent to the Salmon River Hatchery has had its opening delayed from Sept.15 to Oct. 15 in order to protect staging salmon that would run into the hatchery and the eggs they would supply for spawning. Low river levels and warm water temperature delayed the annual salmon run. Fishing for salmon during the fall salmon run contributes immensely to the economy of Oswego County.

The effect of future large water withdrawals from the aquifer as it relates to migratory runs of salmon and trout needs to be fully investigated. Although the effect on the main stem of the Salmon River itself may be small, the large withdrawal of ground water could have serious consequences for the tributary streams that enter the Salmon River. These streams rely on ground water to provide the cold water necessary for successful natural reproduction.

The Salmon River has two tributaries that are significant for natural reproduction, Trout and Orwell Brook. They produce the majority of naturally spawned steelhead in Lake Ontario on the NY side. Withdrawing 1.5 million gallons a day as suggested as the goal for a water bottling facility is equal to about 2.5 cubic feet per second. In comparison to the Salmon Rivers base flow during the fall season of 335 cubic feet per second this is a minimal amount. In comparison if looking at the base flows of Trout & Orwell Brook where base flows are 5 cubic feet per second and rely on ground water, then there is the potential to reduce their base flow in half which could have dire consequences on natural

reproduction in those streams. Present plans and location for a future water bottling facility and wells to feed it are in close proximity to both of these streams.

The hydrology throughout much of the central portion of the aquifer is not well understood. The impact of seasonal changes, such as extended dry seasons or heavy/light snowfall seasons needs to be studied. Dr. Miller recommended several strategies (see VI. Recommendations and Actions Section) that is urgently needed to provide more detailed understanding of the hydrology of the entire aquifer system.

## **V. REGULATIONS AND PERMITS**

On December 13, 2005, the Great Lakes Governors and Premiers signed the Great Lakes—St. Lawrence River Basin Sustainable Water Resources Agreement and the Great Lakes—St. Lawrence River Basin Water Resources Compact (commonly called “Annex 2001”). The agreements detail how the States and Provinces will manage and protect the Basin and provide a framework for each State and Province to enact laws for its protection.

The agreements include the following points:

- There will be a ban on new diversions of water from the Basin. Limited exceptions could be allowed, such as for public water supply purposes in communities near the Basin, but exceptions would be strictly regulated.
- A Proposal to Withdraw Water and to remove it from the Basin in any container greater than 5.7 gallons (20 liters) shall be treated under this Agreement in the same manner as a Proposal for a Diversion. *Each Party shall have the discretion, within its jurisdiction, to determine the treatment of Proposals to Withdraw Water and to remove it from the Basin in any container of 5.7 gallons (20 liters) or less* (from the “Annex 2001 Implementing Agreements” by the Council of Great Lakes Governors.).

The Tug Hill Aquifer is located within Great Lakes Water Basin Boundaries. As stated in the Agreement under the provision for bulk water transfer regulations restricting water withdrawal applies to amounts greater than 5.7 gallons. Because water bottling industries, such as Nestlé’s, package their product below this amount with 5 gallons the largest size container, these regulations do not currently apply, but, when fully in force, local jurisdictions would have authority to pass on proposals for such projects.

### **Likely Permits Required for Water Bottling Industry include:**

- US Food and Drug Administration for Bottled Water
- NYS Department of Health Public Water Supply Permit.
- NYS Department of Environmental Conservation Well Permit (may only require registry)
- SEQR review and permits
- Local Zoning or Local Site Plan review pursuant to local law. Currently, of the Oswego County towns and villages in the Tug Hill Aquifer Sandy Creek and Lacona in the upper section and Richland have zoning ordinances, **while**



**Albion, Altmar, Orwell, and Williamstown do not have zoning or site plan review ordinances.**

**The lack of Oswego County Water Resource Management Plans, Guidelines and Regulations leaves Oswego County vulnerable to the large scale removal of water from the Tug Hill Aquifer as additional industries site their businesses here.**

## **VI. RECOMMENDATIONS AND ACTIONS**

Since only a small area of the Tug Hill Aquifer is under local planning regulations, it is important that the County become proactive in establishing regulations, and permitting procedures to protect the county's water resources. Water resources provide drinking water, recreational opportunities and environmental benefits, and should be protected and used appropriately.

The availability and quality of drinking water is a countywide issue. Groundwater, surface water and wetlands are interconnected and function as a combined system. With the increase in population, homes and industry the potential for contamination by a pollutant to a water source by a chemical spill, fuel contamination, or septic system is a real threat. Land use and facilities that could cause a threat to water supplies should be located well away from potable water sources.

Studies to determine the extent of our aquifers and identify their recharge areas are critical to the protection of these resources and ensure that there is an adequate, and sustainable supply of water for future use. The following are recommended actions needed to be instituted by the County to safeguard the County's water resources:

### **A. Immediate Actions**

It is important to establish a baseline collection of data for the characteristics of the Tug Hill aquifer prior to new withdrawals of water such as those proposed by the Nestle's project. Data collection should involve:

1. installation of continuous ground water level monitors
2. installation of stream flow gauges in all streams in region
3. temperature and bacteriological monitoring procedure
4. measurements of steelhead and other fish densities and sizes in streams
5. establishment of a local Citizens Ground Water Monitoring Network

These data collection activities should be continued as longitudinal studies over each season for several years. Nestles is collecting data for some of these items and has agreed to share them, however additional independent data collection is important.

### **B. Develop long term management tools**

Several strategies are available to facilitate the management and protection of the county water resources:

1. Establish an information base about characteristics of the Tug Hill Aquifer such as the hydrogeology, water quality, ground water flow, seasonal and long term changes by conducting MODFLOW Studies of the entire Tug Hill Aquifer.

MODFLOW is a numerical Ground Water flow model recommended by the USGS that can simulate a wide variety of hydrologic features to predict the impact of natural (seasonal, temperature) and withdrawal use of water on the aquifer. A full description of the MODFLOW procedures and a proposal for this project has been developed by the Tug Hill Commission. A copy of this proposal is attached.

This project will be conducted in stages and will require four to five years for completion. It will require funding support from various county, municipal and federal sources. Nestlé's has indicated a willingness to provide some financial support for this project. It is important that Oswego County provide financial support for this project, since most of the aquifer is within the county as is the potential use of its water.

2. LIDAR Mapping: The County should extend the LIDAR Mapping Project to include the Tug Hill Aquifer regions. It would provide fine scale digital elevation modeling for this region.

### **C. Establish Water Resource Management Guidelines**

Water resources provide drinking water, support comfortable living and industrial growth, provide recreational opportunities, and are beneficial to the environment. Oswego County should act immediately to consider the value of our abundant water resource while it is still of very high quality, and take control of how it will be developed and used, so we do not continue to leave ourselves vulnerable to the objectives of outside interests. Conducting studies and a management plan, while a large project such as the Nestlé's proposal goes forth, is like "closing the barn doors after the horses get out." Once the Nestlé's project is permitted it will be too late to change.

A Water Resource Management Plan is needed to protect, preserve and establish wise use of the County's water resources. Oswego County should establish an ongoing, continuous study and evaluation of a **management plan** for the wise and effective use of the County's potable water resources. Of primary importance in this management plan must be the protection of the Oswego County Water supply, the Tug Hill Aquifer and community wellheads and their sources, both environmentally and physically.

The following guidelines are recommendations for the protection of these water sources.

1. A continued review and updating of source data, MODFLOW, and usage data for county cities, communities and water districts to assess impact of development and changes in water usage.
2. Conduct MODFLOW studies for areas not already done, especially the Tug Hill Aquifer.
3. Study the impact of commercial mining of water in Oswego County, assessing the long term environmental, recreational and commercial impact and the effect on nearby communities' development and growth. Establish legislation to control and regulate additional development of water use industries.
4. Develop the Oswego County Water Management Plan. Utilize federal and state laws and institute County laws to **establish a set of countywide guidelines and requirements for communities and industry that would protect the residents,**

**towns and villages currently and for future use, from loss and or contamination of their water supplies.**

5. Activate a County Commission or Committee to oversee and direct the Oswego County Water Management Plan.

NOTE: There is record of the provision for such a county group already in place. The Oswego County Water Quality Coordinating Committee (OCWQCC) was organized to promote and advocate the protection and to improve the County's water resources. The OCWQCC should be the group that is charged with these directives. It is recommended that this group, dormant since last meeting in 2002 and 2004, should be reactivated to meet these needs.

#### **D. Provide Support for the Tug Hill Aquifer Modeling Project**

A group of local officials and agency representatives meeting to discuss the above issues, has concluded that not enough is known at this time about the aquifer to anticipate and mitigate the impacts of current or future usage. We know the basics, but not the details that would allow communities to make sound policy decisions about groundwater use. Specifically, the following items need to be explored:

- Connection between potential withdrawal stoppages and additions so that communities can plan more effectively (For instance, are wet basements in Richland connected to Schoeller not drawing water from the aquifer any longer? Will mid-reach withdrawals affect Pulaski's gravity-fed water system?)
- Potential projects that will draw large amounts of water from the aquifer
- Greater demand on the system due to growth in some communities
- How to anticipate changing climate and weather patterns that could cause changes in recharge of the aquifer
- Interaction between surface water and aquifer levels (important for fisheries, especially in the mid-reach of the aquifer, with Trout, Orwell, and Lindsay Brooks being of special concern)

We propose that a model for the Tug Hill Aquifer be conducted by USGS and multiple local, county and state partners. USGS staff estimates such an effort would take 5 years to complete, with an average cost of \$200,000 per year. A similar model was completed recently for a coalition partnership in New York's southern tier, with one-third funded by USGS, one-third funded by town and one-third funded by the county. We propose a similar arrangement, with partners, such as the Tug Hill Commission and neighboring counties, working together to raise the funding. Partners will seek a variety of grant and operational sources to obtain the match. A proposal for this project, written by the Tug Hill Commission and the USGS, is attached.

#### **References and Resources**

Buffers: <http://www.crjc.org/riparianbuffers.htm>.

"Designation of the Northern Tug Hill Aquifer as a Sole Source Aquifer" Tug Hill Commission Issue Paper Series, March 2007.

Oswego County Water Quality Coordinating Committee Water Quality Strategy  
Tompkins County, NY, Planning Dept. – Water Resources

<http://www.tompkins-co.org/planning/Water%20Resources/index.htm>

Tompkins County, NY, Planning Dept. – Watershed Assessments for Tompkins County  
[http://www.tompkins-co.org/planning/Water%20Resources/watshd\\_assess.htm](http://www.tompkins-co.org/planning/Water%20Resources/watshd_assess.htm)