Suffolk County Water Authority

Water Conservation Program Update

September 2011

Water Conservation Program

EXECUTIVE SUMMARY

In 2010, the Suffolk County Water Authority (SCWA) began an effort to update its Water Conservation Program, first adopted in 1989, and re-focus it as a more comprehensive program. New York State Environmental Conservation Law (ECL) Section 15-1503 requires that, as a condition of a water supply permit, applications must contain "...in accordance with local water resource needs and conditions, a description of the applicant's near term and long range water conservation program…". It is important to note that the law allows the conservation plan to be formulated to reflect "local resource needs and conditions".

A recent government survey showed that at least 36 states are anticipating local, regional, or statewide water shortages by 2013[i]. Severe water shortages in the Southwest and the Southeast have continued to press national and state drinking water agendas. Advances in public education and technology, tighter regulatory controls and innovative infrastructure design have helped in these geographic regions.

In most of the United States, water conservation has become synonymous with limiting consumption and maximizing a limited resource. However, in Suffolk County, where fresh water supply is not reaching any critical limit, these same measures may not be applicable. The focus of water conservation in Suffolk County is not a matter of limited quantity, but a matter of efficiency and system optimization.

Taking local resource needs and conditions into consideration, the goals of the SCWA water conservation program revolve around the economy of water conservation, the proper targeting of infrastructure improvements, and the prudent use of treated water. These goals include the following:

1. Improve the utilization and extend the life of existing facilities
2. Postpone capital costs of new infrastructure to supply, treat and deliver water
3. Optimize new source development
4. Improve drought and emergency preparedness
5. Expand public education about water resources
6. Evaluate and improve margins of safe and dependable yields
7. Improve coordination between public water suppliers and land use agencies
8. Reduce landscape irrigation demand
9. Conservation-oriented water pricing
10. Reduce water-related energy demands and associated greenhouse gas emissions

INTRODUCTION

Suffolk County's drinking water supply is obtained from underground aquifers. These aquifers have been extensively studied through various scientific investigations of the United States Geologic Survey (USGS) and others, and have been characterized as highly sustainable due largely to the fact that recharge exceeds discharge. Recharge to the aquifers from precipitation is widespread and extensive, and is enhanced by thousands of positive storm water drainage recharge systems located throughout Suffolk County. In very broad terms, annual precipitation and recharge are more than double the amount of fresh water that is used by all wells. The excess fresh water either: 1) flows off the land surface as storm water runoff; 2) evaporates or is transpired by plants; 3) enters the groundwater system as recharge, and ultimately discharges into surface water bodies.

The post-World War II suburban development pattern in Suffolk County (and throughout the United States) consisted of relatively large lawn areas surrounding single-family detached homes. In the SCWA service area alone, based on average lot size per customer, there are over 100,000 acres of grass turf area, equivalent in size to the whole Central Pine Barrens region or the combined geographical size of the Towns of Huntington and Smithtown. Landscape irrigation practices in the U.S. consume large quantities of potable water. Outdoor uses, primarily landscaping, account for 30% of the 26 billion gallons of water consumed daily[ii].

CONSERVATION PLANNING GOALS

1. Improve the utilization and extend the life of existing facilities
2. Postpone capital costs of new infrastructure to supply, treat and deliver water
3. Optimize new source development
4. Improve drought and emergency preparedness
5. Expand public education about water resources
6. Evaluate and improve margins of safe and dependable yields
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8. Reduce landscape irrigation demand
9. Conservation-oriented water pricing
10. Reduce water-related energy demands and associated greenhouse gas emissions

Improve the Utilization and Extend the Life of Existing Facilities

Water can be conserved and the costs per gallon of treated water can be minimized by closely monitoring pumping equipment, treatment and enhanced treatment equipment, the specific capacities of wells, and distribution line leakage.

Postpone Capital Costs of New Infrastructure to Supply, Treat and Deliver Water

Reduced demand can reduce or delay the capital cost of new infrastructure to supply, treat and deliver water. This is especially true for the Authority where the marginal cost of developing new water supplies to meet peak demand is relatively high. Eventually, the value of a future amount of conserved water will be equivalent to the most costly supply option available at that future point in time.

Optimize New Source Development

Through the use of hydraulic modeling, Automated Meter Reading (AMR) data, three dimensional groundwater modeling and analysis of land use and development trends, water sources can be constructed where most needed. Continuing analysis can be made of costs of in situ water treatment versus long-range water transmission.

Improve Drought and Emergency Preparedness

Planning for peak customer demand during long periods of hot dry weather (drought preparedness) must include a proper balance of engineering design and temporary customer conservation in order to optimize capital expenditures for peak demand design. This may also include Emergency preparedness planning that optimizes the level of service for reasonable use and fire protection in order to make best use of a finite system capacity.

Expand Public Education about Water Resources

Education needs extend beyond customers and their domestic/irrigation water use to public officials and the broader constituency for the purpose of highlighting the regional nature of source water protection and conservation. The Authority will better utilize its WaterSense partnership with EPA, the newly revitalized Groundwater Guardians chapter in Suffolk County, and the Suffolk Clean Water Coalition to broaden its outreach regarding the need to protect and conserve the local groundwater resources.

Evaluate and Improve Margins of Safe and Dependable Yields

Through the use of groundwater modeling, well log information, and operational analysis and statistics, water withdrawals can be maximized while remaining below sustainable yields.

Improve Coordination Between Public Water Suppliers and Land Use Agencies

The Authority is taking steps to ensure it is included in all SEQR coordination activities by local villages, towns and the County so that it can comment early on any potential adverse effects on our drinking water supply from proposed development.

Reduce Landscape Irrigation Demand

Most of the Authority's peak demand, and subsequently new water supply infrastructure needs, is the result of the exponential growth in automatic sprinkler systems by our customers. In many areas, water use doubles when customers start to irrigate their landscapes. Studies have shown that landscape irrigation is frequently inefficient and sometimes a high percentage of residential landscape irrigation is wasted as a result of overwatering, poor design, and poor maintenance.

Landscape water conservation can yield multiple benefits including reduced use of fertilizers, pesticides and herbicides, as well as reduced runoff of these chemicals. The use of native plants and low water using varieties of plants can also reduce overall irrigation demand.

Conservation-oriented Water Pricing

Water rates that encourage conservation can be powerful tools to reduce per capita use. Three effective conservation rate structures include volumetric pricing with uniform or increasing block rates, seasonal pricing, and allocation-based rates.

The Authority could potentially correlate operating and capital cost recovery to seasonal peak demand in order to develop an appropriate conservation rate structure. Upon completion of AMR for the entire service area, SCWA will be able to isolate peak customer demand in order to determine whether the incremental design and capital costs associated with peak demand should be borne by the high demand customers.

Reduce Water Related Energy Costs and Associated Greenhouse Gas Emissions

SCWA is the sixth largest year-round and 2nd largest summer time consumer of electricity on Long Island. Global climate change will affect water management. Water conservation will not only mitigate the impacts of climate change on the region by reducing greenhouse gas emissions, but also help the region adapt to climate change by reducing water use.

All leaks represent wasted energy and wasted natural resources. All SCWA water is first pumped from a well, treated to control pH and then disinfected before it is sent into the distribution system. Power is expended to pump the water from each of 600 SCWA supply wells, and then move it through underground distribution mains and storage tanks (situated either at ground level or elevated). Efficient water use can therefore reduce water-related energy demands and associated greenhouse gas emissions.

Enhanced treatment media such as carbon, greensand, and plastic resins (which are utilized on some SCWA wells to remove environmental contaminants) are all energy consumptive in their manufacture, shipping, use, and disposal. Water wasted by leakage from water mains increases the cost per thousand gallons of water delivered to SCWA customers. SCWA ratepayers enjoy a very low production cost per thousand gallons, in the lowest 25% nationally of water purveyors. When water is lost to leakage, all of the components necessary to deliver the finished water (e.g. electrical energy, fossil fuel expended for production, shipping and disposal of treatment and enhanced treatment components) are also lost. Therefore, conservation of finished water saves not only the water itself but a myriad of other natural resources.

WATER SYSTEM PROFILE

The Authority currently serves approximately 85% of the total population of Suffolk County (approximately 1.3 million people), with 379,511 customer accounts in 2010. Our average annual water rates were $310 in calendar year 2010, with an annual consumption of just over 182,000 gallons per customer. The remaining population of Suffolk County is served by other municipal water districts (12%), smaller community and non-community public water systems, or private wells (3%). The Authority projects an annual growth rate of slightly less than one-half percent over the next several years.

The Suffolk County Water Authority's water system is divided into 45 pressure zones and 29 distribution areas. The size of the distribution areas range from very small, serving a few homes, to very large, serving tens of thousands of homes. The overall water system is currently comprised of 603 wells, 237 pump stations, 63 storage facilities with a total storage capacity of 66.4 million gallons, 36,703 fire hydrants and 5,894 miles of water main.

In 2010 the Authority pumped 75 billion gallons of water. Of that total, we billed our customers for approximately 69 billion gallons. The difference of 6 billion gallons is not accounted for and represents water used for flushing water mains, firefighting, street cleaning and other purposes, and water lost from the system.

Water Supply: Operational Constraints

Permits & Regulatory Approval

The NYSDEC is charged with regulatory oversight of Long Island's aquifers. Water withdrawal permits and well construction permits are granted by the NYSDEC, subject to certain conditions, which are stipulated in order to protect the aquifers from overuse (water quantity). The New York State Department of Health (NYSDOH) is the principal regulator of drinking water quality. The SCWA will continue to comply with permit conditions for existing wells, seek capacity modifications based on sound research and data collection, and seek to conserve well capacity where this is warranted. The best way for SCWA to keep regulators apprised of on-going activities is to continue to enhance the current information sharing through the Engineering Department and the Laboratory (LIMS). In future, the reporting and analysis of end point consumption data via AMR will provide more specific context to well permit applications.

State Environmental Quality Review Act (SEQRA)

Enacted by the State in 1995, the SEQR Act mandates early review of all public and private sector projects that might have an environmental impact. The documentation that is submitted by the applicant and adopted by county, town and village governments is not geared specifically toward impacts to drinking

water or groundwater resources. The SEQRA forms have only two water related questions:

1. “Is the project located within a designated Sole Source Aquifer?” and;
2. “Does the project have access to public water supply?”

The SCWA is often, but not always, one of many reviewing agencies in the SEQRA process, and will comment on project-specific issues that may have a bearing on sufficiency of supply to a project or possible negative impact to an existing or future SCWA well field. Referral by the lead Agency of SEQRA reviews to SCWA is not mandatory and can be inconsistent. It is within the jurisdiction of local government to promote water conservation through deed restrictions on fertilized and irrigated vegetation, clearing of native (drought tolerant) plants and limitations on automatic irrigation systems. Through SEQRA review, SCWA can also have an impact on water conservation, but it is secondary and indirect.

On-going Environmental Impacts

In addition to the SEQRA process, there are a variety of on-going activities with potential environmental impacts. These can include changes in land use, construction activity, and public works projects. Additionally, spills of toxic or hazardous waste, and plumes emanating from leaking underground storage tanks can impact the efficiency of water production and treatment, and therefore have a bearing on water conservation. SCWA will continue to use the various investigatory tools at its disposal to identify and mitigate these impacts.

Legislative Actions with Drinking Water Impacts

The number of State and County elected officials in the Legislative branch of government is relatively small. Therefore, continued emphasis on personal briefings with representatives will help these officials to have a fully informed understanding of how such issues as operational improvements, proposed rate changes, water and energy conservation efforts, or new innovations benefit customers or local government. On both the national and state level, legislative actions to address drinking water issues sometimes have unintended consequences. For example, conservation measures that address declining levels in New York City’s reservoirs do not involve SCWA. Yet, SCWA may be affected as a public water utility by mere association. Water conservation efforts in Suffolk County, where groundwater supply is plentiful and sustainable, are very different from those in other parts of the State that rely on surface waters, or even in other parts of the country that do rely on groundwater. A full understanding of these differences provided by SCWA to elected officials will help to minimize unintended consequences of legislation with broad drinking water impacts.

Activity Milestones- System Audit

Annually, as part of a larger benchmarking effort including the setting of Authority-wide internal goals and objectives, SCWA can monitor and report to

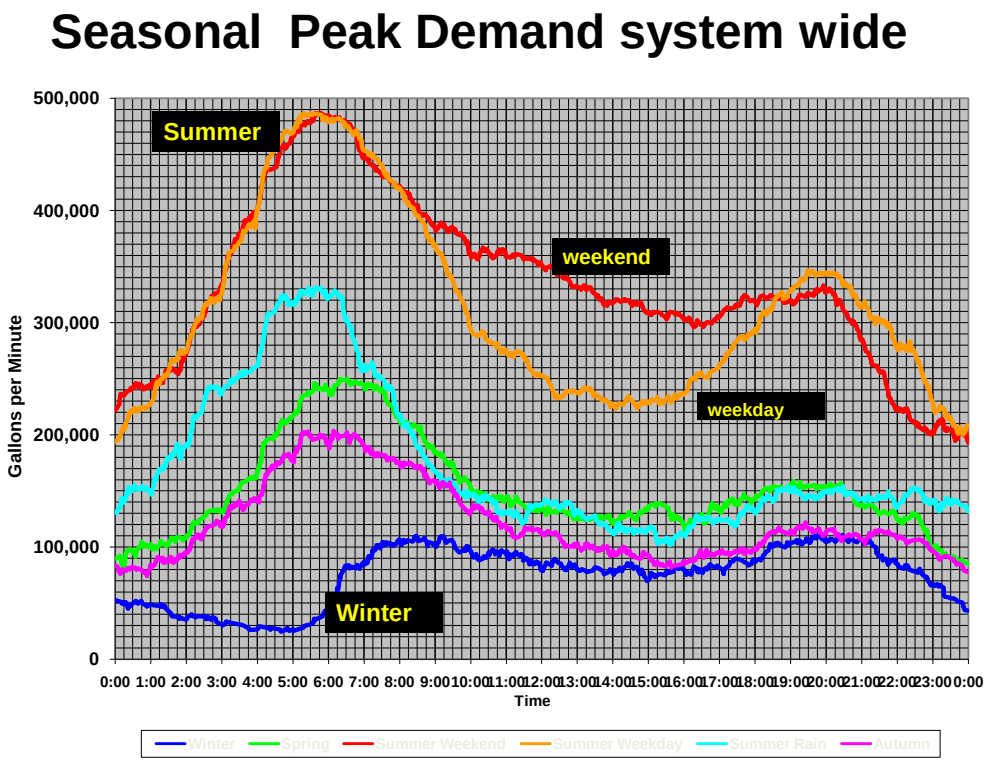
others on water conservation efforts, in keeping with the goals established in this plan.

Activities of Other Water Purveyors

By encouraging information sharing through a “Long Island Aquifers” Sub-Committee of the Long Island Water Conference or NYSAWWA, the SCWA can sponsor collaborative efforts to improve stewardship of the aquifers and coordinate future use on a localized basis, using GIS and groundwater modeling to improve regional planning. Water conservation techniques from SCWA and other water purveyors can be shared and expanded.

WATER USE

Growth in Seasonal Water Demand

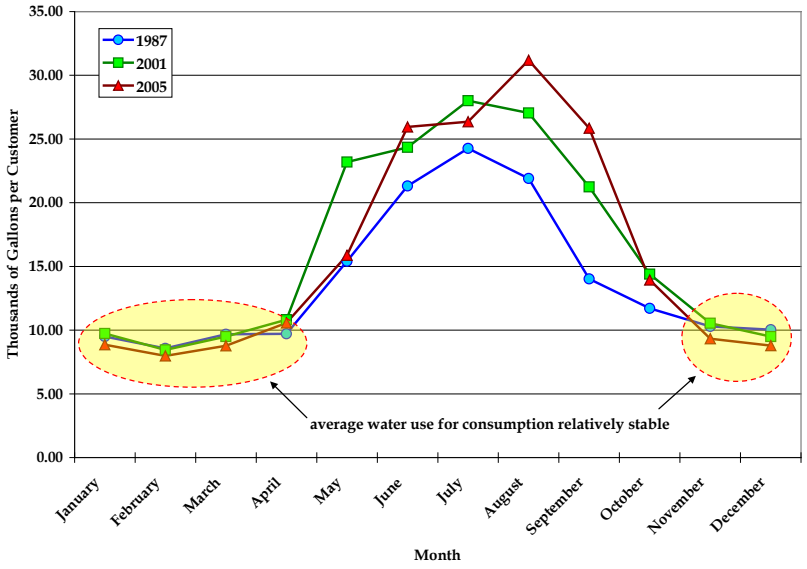


From its operational inception in 1951 until the late 1990's, SCWA had steady and vigorous customer growth. Beginning in the mid-1980's however, while the number of customer accounts slowed through saturation, the annual water consumption continued to grow steadily. A study was initiated in 1987 in order to examine customer accounts, weather related phenomena (annual precipitation, temperature, and average humidity), and demand by month and by year from 1987- 2002. This effort yielded significant water-use data. Domestic water use during the month of January averaged 10,000 gallons per month per home throughout the 15 year period of evaluation. This is roughly equivalent to the 300 gallon per day SCDHS sanitary standard for a single-family home. The reason for this steady water use is that, despite the construction of larger "average" sized homes during this period, the use of low-flow fixtures as required by and incorporated into the State Building Code during this time allowed wintertime (indoor) water use to remain constant.

Seasonal Water Use

- **Significant pumping required for irrigation systems**

- Pumping per customer (SCWA) relatively stable **during non-summer months** over past 20 years



In contrast, the typical July consumption during the study period was not consistent with the January data. In 1987, average per customer July consumption doubled to 20,000 gallons due to seasonal activities such as lawn watering, car washing, and the opening of swimming pools By 2002, typical July customer consumption had increased to 40,000 gallons per home, with lesser but significant incremental increases in April, May, June, August and September. The fall and winter months showed very little change in customer use during the study period. The data collected in the study indicate that the dramatic increase in seasonal demand is due to the increased reliance by homeowners on automatic lawn irrigation systems. Additional examination was made of the low-density neighborhoods of principally 2-5 acre home sites on the north shore and south fork and the pump stations supplying these areas. These pump stations showed the most pronounced and consistent drop in operating pressures (sometimes 40 psi difference) during the early morning hours of the summer months, another indicator of wide-spread automatic (time clocked) irrigation peak demand. Using the SCWA's Supervisory Control and Data Acquisition (SCADA) system, the total system characteristics can be compiled to report a seasonal system-wide demand on the wells that increases from 25,000 gallons per minute in January to over 500,000 gallons per minute on a hot dry July pre-dawn morning. Consequently, SCWA can operate on less than 100 wells in the wintertime (off peak season), yet needs over 600 wells, and additional capacity from storage, to meet the peak during summer months. The bulk of SCWA's

infrastructure is therefore needed almost entirely for lawn watering during the summer months.

Demand Forecasting

Peak Demand

Various strategies have been used to meet peak demand. On the operations side, these actions have ranged from seeking increases in permitted pumping where well capacity and aquifer conditions can support the change, to replacing undersized distribution mains with larger diameter pipe (especially in high demand areas where age, leakage, interior pipe quality reduce flow). In extreme cases, additional peaking wells have been added at high demand pump stations to provide added supply to fill elevated storage tanks or maintain water pressure within the mains during peak periods. Special hydraulic modeling studies have been undertaken to mitigate pressure drops caused by peak demand. These studies can result in booster pump installations, pressure zone alterations, zone interconnections, hydro-pneumatic tank installations or other engineering modifications. On the customer service side, actions have included alerts to customers, and requests for “odd-even” or reduced lawn watering.

Capital Program of Planned Facilities

The Capital Program delineates a five-year forecast to track the development of multi-year projects. This forecast is keyed to future demand in a general sense, although somewhat imprecise due to the influences of a myriad of additional factors. The Capital Program allows for flexibility to prioritize projects based on a variety of needs, but is still broad based generalized instrument, and does not yet reap the benefits of AMR premise-based customer demand data.

Capital improvements are planned to maintain a peak design standard of at least 20 psi pressure in the distribution water mains for fire protection during all times of the highest peak customer demand. Capital improvement construction cycles are based on a five-year horizon of monitoring the efficiency of old wells, monitoring the raw water quality (to determine need for enhanced treatment), monitoring demand, and monitoring distribution pipe life and recurring leaks. Capacity improvements can be made by increasing well pump horsepower, by reconditioning well screens and replacing antiquated wells, and by shifting backwash cycles and operations procedures into off-peak hours.

SCADA information

The Suffolk County Water Authority’s radio-based Supervisory Control and Data Acquisition (SCADA) network enables the Authority to have very accurate and very detailed information about the production of drinking water at the pump stations. This information includes a full array of detailed, time increment data showing pressure, tank use, pump use, power use, gallons exported from the station and a wide variety of data-based reports. With the data provided by the SCADA system reporting capabilities and with the inclusion of the customer

information system and construction and maintenance schedule of main improvements and extensions, demand forecasting modeling has much greater potential for operational use and system optimization.

Production Control, New York State Department of Environmental Conservation (NYSDEC) Monthly Production Report

Each month the Production Control Department generates a series of reports. Some of these reports compare monthly production of water with the same month in the prior year, the prior months in the same year and with the historical five-year average. The Engineering Department utilitzes these reports as part of its application for well permits with the NYSDEC. All these documents and reports are tremendously useful when attempting to forecast future water demand. The robust nature of the information can assist SCWA in determining future demand, especially peak seasonal demand as every summer season unfolds. The Synergee Hydraulic model can also be useful in the future demand forecasting associated with any large development projects, especially multi-story development with specific peak fire-flow requirements.

Water Supply Applications (WSA)

Demand forecasting has been the principal determinant of new water supply applications to the NYSDEC. The compiled and aggregate information on historical peak demand and trends at any particular pump station has bolstered the need for additional capacity of existing wells or for the construction of new wells. The hydraulic model indicates how the water will be fed into the pressure zone, and which portions of the distribution system will benefit most from a new well.

The Engineering Department produces a Water Supply Application (WSA) for each well built by the SCWA, which is then submitted to the NYSDEC for review prior to issuance of a water withdrawal permit. The information contained within the WSA provides justification for the need for the additional water supply. This information is a compilation of various data pertaining to population, current and future demand, and fire flow requirements. Historical peak demand trends at a pump station are reviewed to determine the need for additional capacity of existing wells or the construction of new wells.

Demand per Service Analysis and Future Projections

The SCADA system and the Hydraulic model are able to characterize demand and help to forecast future demand. The full implementation of AMR will allow the Authority to fully understand and analyze customer water demand at the end points of use. In addition, AMR analysis will also help mitigate unaccounted for (“lost”) water. For future demand projections on customer use, the Authority will continue to develop its automatic irrigation data field within the Customer Information System (CIS). Started in 2003, the data set indicates the presence of an automatic irrigation system at a customer’s premises. With the completion of this data set, the Authority will be able to forecast and design for

very specific peak seasonal customer demand using a GIS-based data set which incorporates the CIS, the Hydraulic model, and SCADA information.

Contingency and Preparedness Planning

Water conservation becomes especially critical during times of emergency. For Long Island, this has historically revolved around widespread power outages, ice storms and hurricanes. After September 11, 2001, terrorist activities and updated reformulated vulnerability assessments were added to emergency planning scenarios. The SCWA first drafted an Emergency Operations Plan in 1988 as part of the mandates of the Safe Drinking Water Act (SDWA). Every five years this plan is updated and filed with the NYSDOH and SCDHS. In 2002 the *Safe Drinking Water Act* was amended to require all water suppliers to complete a system wide vulnerability assessment and to provide emergency plans that had to be accepted by the local health department. Water utilities were also required to submit their vulnerability assessments to the EPA. The amendment to the safe water drinking act became known as the 2002 Bioterrorism Act. In 2003, Homeland Security Presidential Directive 7 was issued and it designated the EPA as the responsible agency for protecting the nation's water supply.

A decentralized water production and distribution system has characteristics that lower its exposure to vulnerability and risk to an adverse incident or event. SCWA customers have their water supply within a 1-3 mile distance from their home or business. With pressure balancing through interconnected zones of supply, outages at one pump station can be immediately supplemented from other sources. The placement of emergency generators at over one third of the pump stations allows for uninterrupted service to SCWA customers, as was the case during the August 2003 northeast power grid failure. The use of a system wide Supervisory Control and Data Acquisition (SCADA) system allows SCWA to remotely operate and monitor all key infrastructure (pumps, filters, tanks, generators, and valves) from a single location (with an emergency back-up location) and also continuously monitor water quality parameters (such as pH and chlorine residual). On Fire Island, most infrastructure is geo-located to enable buried system components to be dug out in areas of heavy sand deposition after a severe hurricane.

The emergency plan contemplates a number of contingencies and scenarios providing for response to production problems, distribution system interruptions, and water quality issues. The deployment of multiple mobile tanks, tanker trucks, small emergency generators, and water tap manifolds allows SCWA to assist other water purveyors (or neighborhoods without public water) in times of emergency.

WATER RESOURCE MANAGEMENT

Ground Water Modeling

Three-dimensional computerized modeling of the groundwater system on Long island is now an accepted tool for proper groundwater resource evaluation and management. Beginning in 1996, hydrogeologists at the SCWA, working together with hydrogeologists and engineers from agencies within Suffolk County government, began a project to develop a groundwater model of the entire County that would be accepted by regulatory agencies. This project was completed in 2002, and proved so successful in achieving this goal that it was immediately utilized for a regional water resource management task. The groundwater model can assist water suppliers in quantifying the potential effects of pumping individual wells on specific contaminant sources and on the groundwater system in general

Source Water Assessment Program

The 2003 New York State Source Water Assessment Program (SWAP) utilized the Suffolk County Groundwater Model to delineate the contributing areas to public supply wells throughout Long Island. The source area configuration was calculated based on inputs to the model (such as pumping rate, well screen depth, and precipitation) and served as the basis for determining the susceptibility of public supply wells throughout Suffolk County to contamination from either specific point sources or from general land uses in the well's source (contributing) area. Maps of these contributing areas, together with the contaminant data, are now available to the public water suppliers and can serve as a guide for water resource management decisions.

Monitoring Well Data

The SCWA maintains its own network of monitoring wells throughout Suffolk County, and also participates in data sharing with other agencies' monitoring well networks. Such agencies include the SCDHS and the USGS. Access to both water level and water quality information from these networks is invaluable in assisting the SCWA in making water resource and facilities management decisions based either on water quality (i.e. potential contamination) or quantity (i.e. water level impacts due to pumping).

Source Water Protection

Throughout its history, the SCWA has demonstrated a commitment of staff and many hundreds of millions of dollars to the various resources needed for the production of a clean, safe drinking water supply. These financial resources have included the purchase of land and easements for source water protection, and major funding in 1987 and 2006 for comprehensive groundwater resources planning and management studies conducted by the Suffolk County Department of Health Services (SCDHS). In 1993, this commitment was deepened with the support for the Long Island Pine Barrens Protection Act to protect future source waters in the Central Pine Barrens. In 2010, SCWA purchased 34 easements

throughout Suffolk County, covering lands held in trust by the County for water supply infrastructure. These easements, in preserved areas, will ensure the protection of future water supplies and counteract the possible degradation of future resources. SCWA is also in the process of developing a Source Water Protection Policy to guide its decisions regarding source water protection into the future.

Regional Climate and Precipitation Trends

Long Island's climate, precipitation, water levels, and stream flows have been studied for over 50 years, and data gathered over those decades has allowed water resource managers to make decisions based on the comparison of data collected to historical trends. The water supply and environmental impacts stemming from higher- or lower-than-normal precipitation (and the corresponding response of water supply pumpage) can therefore be easily discerned. Fortunately, data shows that there has been no long term decline in water levels or decrease in water quantity in spite of population (and water supply pumping) increases, urbanization, or sewering.

WATER CONSERVATION MEASURES – CURRENT PROGRAMS

Past Customer Conservation Assistance Programs

There have been a variety of efforts over the years to engage customers in water conservation. Many were weather dependent and became less popular (or were ultimately ignored all together) with the eventual return of cool, wet weather. Some conservation programs have principally been confined to locations within the service area where high quality supply had been limited. The Montauk area, prior to the 1998 installation of a transmission main across the Napeague strip from Amagansett to Hither Hills (which allowed for the interconnection with the East Hampton system), was an area prone to salt water upconing. The salt water upconing was due to both the shallow, thin aquifer hydrogeology as well as heavy pumping in the summer months, which was necessary to satisfy the increased summer population. The SCWA purchased water conservation kits, consisting of educational brochures, a low flow showerhead, two low flow water faucet aerators and a packet of leak detection tablets for toilet tanks. These were distributed, with the assistance of the Montauk Fire Department to hotel/motel operators in the Montauk area. A few years later, additional conservation kits were distributed on the north fork, with the assistance of the North Fork Environmental Council. Prior to the construction of additional supplies in Jamesport, the north fork had limited supply and distribution systems and the extremely poor water quality made conservation a preferred choice to enhanced treatment for contaminants.

Additional water conservation programs have included a rain sensor rebate program with the requisite advertising and publicity, a campaign to encourage people to properly maintain their automatic irrigation systems, and a pilot program aimed at restaurant/catering facilities in sewered areas. This program was designed to replace a shower-head style pre-dishwashing sprayer attachment, with a high pressure spray attachment, to reduce the amount of water going through grease traps, reduce the amount of energy for water heating, reduce sewer and water bills, and save employee time loading dishwashers. However, Customer savings on water consumption did not approach the 34,000-gallon reduction needed to justify the cost for the SCWA to pay for the device.

Current Customer Conservation Assistance Programs

Drought Announcements

During extended periods of peak demand (usually during a hot dry portion of the summer season) customer alerts are graded by action level and involve different responses and requests to customers to conserve water. Localized water shortages are announced through PSAs on the radio and television, by reverse telephone calls, and by customer service representatives going door-to-door with requests to conserve water.

The NYSDEC has the authority to make a declaration of drought emergency, either statewide or regionally. In the event of a declaration of

drought emergency, water conservation plans and appropriate water alerts would be initiated.

Metering

Meter-Accuracy Analysis

The SCWA maintains a meter shop capable of testing possibly defective meters. Additionally, customers, can have their meter removed and tested. The results of the testing can be reported to a customer if they are challenging a high consumption bill and believe that the meter is defective.

Test, Calibrate, Repair, and Replace Meters

The SCWA Meter shop staff can recycle, recalibrate and reassemble meters. The accuracy of meters begins to deteriorate from the moment they are first put into service. All meters are currently in the process of being replaced as part of the AMR ten-year business plan.

Service-Connection Metering

In 2008 the Suffolk County Water Authority began a ten-year plan to replace all water service meters with a radio-frequency device/meter capable of emitting readings every seven seconds for approximately 20 years. Even before this project is complete, the resulting AMR data can be integrated into the databases of SCADA and the other Oracle databases.

Water Loss

Water Accounting and Loss Control

Further refinement of the AWWA water auditing process and integration with AMR will enable the SCWA to target specific areas and customer accounts. Because of the relatively inexpensive cost of water, customers may not be sufficiently motivated or alerted to seek out reasons for high consumption, such as leaks in irrigation systems or in marina dock water lines. Further, the nature of very small toilet tank leaks or shower drips may go completely undetected, yet could represent the waste of 100-200 gallons per day.

Water System Audit

In 2006, the American Water Works Association published water audit software that enabled water utilities to more closely account for water produced. This helped to clarify terms such as “lost water”, “un-accounted for” water, and “non-revenue” water. Beginning in 2007, SCWA began to publish reports that accounted for all water extracted from the ground. The SCADA system acts as the starting point for water production and customer billings are the end point for water use. It is important to note that the difference between the two amounts to “lost” water.

Further, customer use based on conventional meter readings cannot yet measure leaks on the customer side of the meter with precision. Pump station unmetered water-use may include backwashing, chemical analyzers, tank maintenance, make-up water in chemical tanks, and station hydrant use. In

addition, “water loss” may occur in between the pump stations and the customers: there may be hydrant flushing, distribution system sampling, fire department and landscaper use of hydrants, pipe flushing and construction operations. The AWWA water audit software coupled with the increased sophistication of SCADA, hydraulic modeling, AMR-based leak detection, Construction and Maintenance leak detection, newly installed meters at Fire Department facilities will all be employed to narrow the gap between “accounted for” water and water that is not accounted for.

Utilizing SCADA to analyze water production and AMR to analyze water consumption, and the AWWA water audit software, SCWA will be better able to differentiate between production of finished water and customer use, to determine levels of either hydrant use or distribution system leakage. This yearly water audit will be a major water conservation tool for SCWA to ensure that high quality treated and filtered water is not being wasted through leakage.

Leak Detection and Repair

The AMR devices, with their embedded leak detection and reporting system will enable SCWA to isolate leaks on the customer side of the meter and seek to have these leaks repaired. This will greatly enhance water conservation efforts. Prior to AMR, meters were read quarterly and sometimes readings were estimated for multiple quarters. Leaks potentially went undetected for many months, resulting in excessively high customer bills, customer aggravation, and SCWA revenue loss. The water auditing and the constant comparison between metered production and metered consumption can help to identify distribution system leaks.

This will be an especially critical conservation tool in the Southwest Sewer District (SWSD). The unpressurized gravity sewers below the groundwater table allow groundwater and surrounding soil sediment to leak into the sewer lines and manholes. This process causes nearby pressurized cast iron water pipes to sag at the joints for lack of soil support. This sagging begins with minor drip leaks and ends with a water main break and loss of pressure. Since inception of the SWSD and the payment of millions of dollars by sewer contractors to SCWA for construction damage, fully two thirds of all water main breaks on the 5,800 linear miles of distribution pipe continue to be vertical cracks or pipe joint failures in the Southwest Sewer District. Isolation of leaks through the Construction and Maintenance leak detection program and AMR may help to minimize water loss from leaks and also resultant damage and disruption caused by main breaks.

Loss Prevention Program

Customer Service currently uses the AMR leak detection system associated with individual customer accounts to advise customers of possible leaks in their service lines, homes or irrigation systems. Account readings are red-flagged in the consumption reporting software based on detection of continuous flow during a seven-day period. Customer Service can then dispatch field personnel in a timely manner to investigate the source of the leak. Losses can also be reduced through the refinement of the Avantica Synergee hydraulic

model used by the Construction and Maintenance (CM) Department. Through the continued interaction of CM and Production Control, well production and operating pressures in the distribution zones can be optimized to limit water loss through pressure reduction where possible. The use of Pressure Reducing Valves can keep operating pressures acceptable for customer use and fire protection, but reduce pressure and thereby lower the undetected leakage level within portions of the distribution system.

On-going Public Education and Outreach

SCWA customers have demonstrated their interest in drinking water related issues through voter referenda and civic organization. The SCWA provides an ongoing education program through various media including the Annual Water Supply Statement, billing inserts, in-class presentations to schools as well as a presence on the internet. The SCWA also utilizes various means of distributing information to the public such as newspaper ads, television & radio announcements, and posters/plaques on SCWA vehicles. The SCWA makes itself available to all vested or interested parties, groups and citizens through talks, presentations, round-table discussions and school visits. SCWA's public education efforts can be an important catalyst to proper and efficient use of water supply infrastructure.

Civic outreach, via special presentations, can help to engage customers in a better understanding about their water use. Reviewing the history of high billing complaints indicates an almost universal lack of understanding about how much water is used by automatic irrigation systems. Increased and frequent direct contact with customers can help to promote water conservation.

Schools

The SCWA will continue its educational program, which has become a very successful part of the elementary school curriculum. While the program responds to the State Education Department teaching requirement about the Water Cycle, the SCWA program also adds human impacts (highlighting water pollution and water conservation) into the discussion of the natural water cycle.

Website

The current SCWA website section devoted to water conservation continues to be a valuable resource and location for a variety of information, and is in the process of being updated as the Authority overhauls its entire website. Many water companies have also incorporated interactive "trivia" quizzes, similar to the one on the SCWA website to make learning about water conservation interesting. The website and associated links can be continually revisited and can also be linked to in-school programs.

Bill Stuffers

The Authority periodically utilizes its ability to include small notices with customer bills to encourage water conservation practices.

Water Consumption Bills

Upon the completion of AMR, the Authority can go to a monthly billing cycle for residential customers, in addition to the commercial customers. Customers will be able to review their water use on a seasonal basis and on an historical basis. The report will include a graphics based representation to illustrate how a customer's water use compares with typical use and with their own year round use month-to-month.

Other Media - TV, Radio, Truck Signs, and Community Fairs

Announcements regarding emergency conservation measures are suited to radio and TV, supplemented by targeted and automatic out-bound direct calling to customers. Truck/Van signs, because of the high visibility of the SCWA fleet, can be a great platform to convey water conservation practices. Ecology fairs, community festivals, and the like are places where SCWA representation can have a high educational impact on visitors. Targeted SCWA staff members are encouraged to attend water conservation training sponsored by local organizations and educators.

WATER CONSERVATION MEASURES – STRATEGIES UNDER EVALUATION

Reduce Landscape Irrigation Demand

Landscape water use has the greatest potential for reduction of any water use sector. There are many actions that may be taken to improve landscape water use efficiency. Professional landscape and irrigation design, proper installation, careful maintenance and management of the site, and the selection of high quality irrigation equipment are some of the factors that can influence the efficient use of water in the landscape.

Residential Weather-Based Irrigation Controllers

Studies have shown that landscape irrigation is frequently inefficient and, in some cases, a high percentage of residential landscape irrigation is wasted as a result of overwatering, poor design and poor maintenance. Single-family homes can be cost-effectively retrofitted with weather-based irrigation controllers that take much of the guess work out of scheduling and determining the needed quantities of water. Many suppliers are experimenting with this measure.

Mandate or Incentivize the Use of Pressure Reducing Valves (PRVs) for Domestic Irrigation Systems

PRVs would maintain an operating pressure in the sprinkler system that is slightly lower than that of the home, and thereby reduce the overall usage of the sprinkler system. This would have the effect of reducing the peak demand and spreading the peak out over a longer period of time. The Authority's peak five-hour pumpage would be reduced, and therefore eliminate the need for construction of some wells solely for the purpose of meeting peak demand.

Last summer the Authority experimented with this method by installing PRVs on several tanks throughout Southampton and East Hampton where meeting peak summertime demand is challenging. These installations were effective in reducing distribution system pressure overnight, therefore reducing water used for irrigation purposes.

Partner with Cornell Cooperative Extension to Investigate Alternative Irrigation Techniques

Turfgrass test plots could be set up in various locations throughout Suffolk County on Authority property. One set of test plots could be irrigated conventionally while another set is irrigated with low volume subsurface drip irrigation. Each plot's irrigation system could be metered to measure the overall water use and compare differences in water consumption by each method as well as the physical appearance and characteristics of the plots.

Restrictions on Use of Sprinklers

Nassau County has implemented both odd/even day ordinances and time of use ordinances, as have many other local governments and water districts throughout the country, to varying degrees of success. The Authority

should certainly investigate the effectiveness and feasibility of implementation and enforcement of such programs to determine their local applicability.

Work with Local Governments to Mandate Landscape Irrigation Best Management Practices (BMPs) as Part of All Local Codes

Just as the Suffolk County Planning Commission has been working with local governments to create model codes for wind, solar and stormwater management, perhaps the Authority could work with it to develop a model landscape irrigation code to promote water conservation and efficiency. BMPs are generally considered to be the minimum level of effort necessary for a credible water conservation program. Because landscape water conservation offers so much potential for increased efficiency, a comprehensive approach to implementation of BMPs will lead to quantifiable results.

Supply Side Restrictions: Install PRVs on SCWA Storage Tanks

Given the success of last summer's pilot program of PRV installations in Southampton and East Hampton at reducing overall usage by sprinkler systems, the Authority could expand this method to more storage tanks throughout the distribution system.

Water Audits

For those customers with frequently above-average or unusually high water consumption, the Authority could offer free water-use audits to help them improve efficiencies and conserve water. This will be much easier to implement once AMR is fully deployed throughout the distribution system.

Quantification of Drought Indices

There is an opportunity for the Authority to partner with USGS, NYSDEC and perhaps the LIWC to fund a study to determine "groundwater action levels" for Long Island's aquifer system. These "actions" would trigger prior to aquifers falling to levels that would degrade local wetlands and/or increase the potential for salt-water intrusion. The USGS is the principle source of scientific data that would indicate a drought, but NYSDEC is often the entity that makes the declaration of drought. The Authority isn't aware of any specific groundwater-action levels that the NYSDEC uses on Long Island to determine potential drought conditions.

A 2005 report by the USGS, in cooperation with NYSDEC, analyzed long-term hydrologic records on Long Island for selection of drought-monitoring sites. The report concluded that further studies are needed to determine how to best implement the use of indices to monitor the groundwater system and what exceedence percentiles should be used to implement water-use restrictions during a drought or other water emergency. Such additional studies would give water managers a comprehensive and adaptable tool for drought monitoring and protection of the aquifer system, ultimately leading to more efficient use of our water resources, including conservation.

Conservation-Oriented Rates

Water rates that encourage conservation can be powerful tools to reduce per capita use. Three effective conservation rate structures include volumetric pricing with uniform or increasing block rates, seasonal pricing, and allocation-based rates. Increasing block rates charge a higher amount per gallon as usage increases, which provide an incentive to keep use low. Seasonal rates charge a higher amount per gallon during the irrigation season when the water supplier's demands are highest, because the peak demands are generally most expensive for the supplier to meet. Allocation-based rates include higher per-gallon costs for usage exceeding base usage established for each customer according to customer characteristics, such as number of occupants or size of irrigated landscapes.

With the advent of full AMR reporting on all water meters scheduled for completion in 2017-2018, the capability to monitor wasted water and to conserve will be dramatically increased. All water production will be linked to water use at the end points. Nationally, water companies in ever-increasing numbers are embracing a water conservation strategy that places some additional rate burden on the customers who are using an inordinate amount of water. While there is adequate supply to serve the peak demand, the cost for peak demand design of the system falls to all customers equally via the uniform rate base. There is no incentive and no reward for customers to conserve treated water.

One possible rate modification after completion of AMR would be to create an off-peak rate for domestic water use between November 1 to March 31, and a peak rate from April 1 to October 31. After examining the uniform rate base, the rates could be divided with a rate decrease in the off-peak and a rate increase in the peak period. Since the bulk of peak demand design costs are directly related to automatic sprinkler use, customers with large automatic sprinkler systems will pay more for their water and costs to them will be directly linked to the costs of system enhancement to cope with pressure loss from overnight peak demand. Thus, there will some additional water conservation as customers begin to understand the costs associated with maintaining peak demand design.

A careful and judicious setting of the bifurcated rate blocks can allow for some modest increase in rates overall annually, but with a shifting of the overall cost of paying for water service to those customers who are most responsible for creating the need for additional peaking wells, booster pumps, larger pipe diameters that are only needed in the summer months.

Water Conservation Kits

The Authority could provide water conservation kits, along with a public awareness program, to customers in targeted areas throughout the distribution system where conservation and efficiency measures are most needed. The kits can be customized to our needs and include items such as low-flow showerheads, sink aerators, leak detection tablets and tips for toilets, flow meter bags to identify wasteful flow rates in sinks and showers, toilet tank bank which

displaces water to reduce wasting water when flushing, and useful everyday tips for water conservation.

WaterSense, an EPA partnership program, seeks to protect the future of the nation's water supply by offering people a simple way to use less water with water-efficient products, new homes and services. In just five years, the program has saved 125 billion gallons of water and $2 billion in water and energy bills.

Waterfootprinting

The Authority may want to encourage its customers to measure their "water footprints" to help them better understand just how much water they consume on a daily basis and why even small improvements in conservation and efficiency can have tremendous cumulative impacts. The online Water Footprint Calculator is an innovative public educational tool that quickly calculates individual water use and offers easy tips on how to conserve water. In addition to the Calculator, the website provides issue pages, water-saving tips and other resources to show the importance of conserving water.

IMPLEMENTATION AND EVALUATION

Suffolk County Water Authority recently created a new position, Chief Sustainability Officer, to implement an authority-wide program of sustainability. One of the elements of this sustainability program is a water conservation plan.

Public Involvement

Water conservation can begin and end with the Authority itself, but without public involvement, there is no understanding or appreciation for the role that customers play in water conservation. Public education is critical, but involvement by the public in the formulation of educational programs helps to make these efforts more understandable and less technical.

This involvement can take many forms:

- Engagement of teachers and students as a follow up to the classroom presentations currently being made by employees.
- Incorporation into the SCWA website as brief incentive-based surveys or billing-based notifications
- Linking installation of AMR devices with a better understanding by customers as to how AMR can help them conserve water, especially through leak detection, to minimize wasted water and save them money on their water bills
- Employees visiting customers in their homes can leave material encouraging customers to become more involved in their drinking water issues

WaterSense

The Authority is an EPA WaterSense Partner and will make more effective use of the WaterSense tools to engage the public in water conservation efforts.

Groundwater Guardian

The Authority is participating in a revitalized Suffolk Groundwater Guardian team. Groundwater Guardian is a program of the Groundwater Foundation that supports, recognizes and connects communities protecting groundwater. It is designed to empower local citizens and communities to take voluntary steps toward protecting their groundwater resources, including conservation efforts.

Drinking Water Week

Next year the Authority plans to actively participate in AWWA's Drinking Water Week which is always held during the first week in May. Drinking Water Week is a unique opportunity for both water professionals and the communities they serve to join together to recognize the vital role water plays in our daily lives.

Protect Your Groundwater Day

This year SCWA will celebrate "Protect Your Groundwater Day" on September 13th, an annual event sponsored by the National Groundwater Association (NGWA) to help raise awareness of the simple steps everyone can take to protect groundwater. NGWA targets two areas for action: keeping our water safe from contamination and using it wisely by not wasting it.

Monitoring and Evaluation

Monitoring of the plan will occur at two levels: a full evaluation of the conservation strategies under consideration specified in the plan and measurement of progress in reduction in per capita water use, especially during periods of peak demand. Once AMR is fully deployed, the Authority will be able to more accurately measure the impact of the conservation plan.

Plan Updates

The Water Conservation Program will be updated every five years to ensure it is kept current and accurately reflects the Authority's experience with conservation practices.

Adoption of the Plan

This Water Conservation Plan was completed on September 19, 2011 and approved by the Board of the Suffolk County Water Authority on October 24, 2011 (resolution attached).

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[i] U.S. Environmental Protection Agency, WaterSense. Water Efficiency. http://www.epa.gov/watersense/water_efficiency/index.html (accessed April 2011).

[ii] U.S. Environmental Protection Agency, Office of Water. Water Efficient Landscaping. http://www.epa.gov/watersense/docs/water-efficient_landscaping_508.pdf (accessed April 2011)