

## **NK WATER 101**

North Kingstown's source of municipal water supply is groundwater, which is the water stored in the open spaces within underground rocks and unconsolidated material. The system's wells withdraw water from the Hunt-Annaquatucket-Pettaquamscutt Sole Source Aquifer system. An aquifer is defined as a water-bearing soil formation that is capable of yielding useable amounts of water. The public supply wells are sited in areas where there is a significant saturated zone (volume of water below ground) and where the physical properties of the below ground materials (porosity and permeability) allow groundwater to move easily.

### **NORTH KINGSTOWN'S WATER DISTRIBUTION SYSTEM**

North Kingstown Water owns and operates 11 municipal groundwater wells and five (5) water storage tanks.

The system is operated as three independent but connected water pressure service zones. That is, the three systems are physically connected via pipe sections, but are isolated by selectively closed gate valves and a pressure reducing valve (PRV). Basically this means that we typically operate as three separate water systems. The three pressure zones are referred to as:

- The Low Pressure Zone (also known as the Low Service Area)
- The Slocum High Pressure Zone
- The Saunderstown High Pressure Zone

In some cases we are able to move water from one service area to another, but this is always done under manually controlled conditions.

### **STORAGE AND PRESSURE ISSUES**

A common belief is that water is pumped from a well directly into a water storage tank. This is not the case. Groundwater is pumped out of the ground and treated by injecting water treatment chemicals (sodium hydroxide, polyphosphate and sodium hypochlorite (Low Service only)) in the piping network within the well station. This finished water is pumped into the distribution system where it is consumed by water customers. The amount of water that is in excess of the water demand is what makes its way to and fills the water storage tanks.

Water storage tanks provide distribution system pressure and water storage as follows:

"Equalization" Storage: Equalization storage is that volume required to meet system demands in excess of delivery capability of the pumping systems. It is the volume of the tank that typically cycles several times daily as water demand fluctuates (should not fluctuate more than 30 feet per Ten State Standards). Pumping supply and piping are sized to meet maximum day demands.

"Fire" Storage: Fire storage is that volume of water below equalization storage and above the emergency storage, dedicated for fire protection.

Needed fire flow is typically determined by the ISO based on area building types.

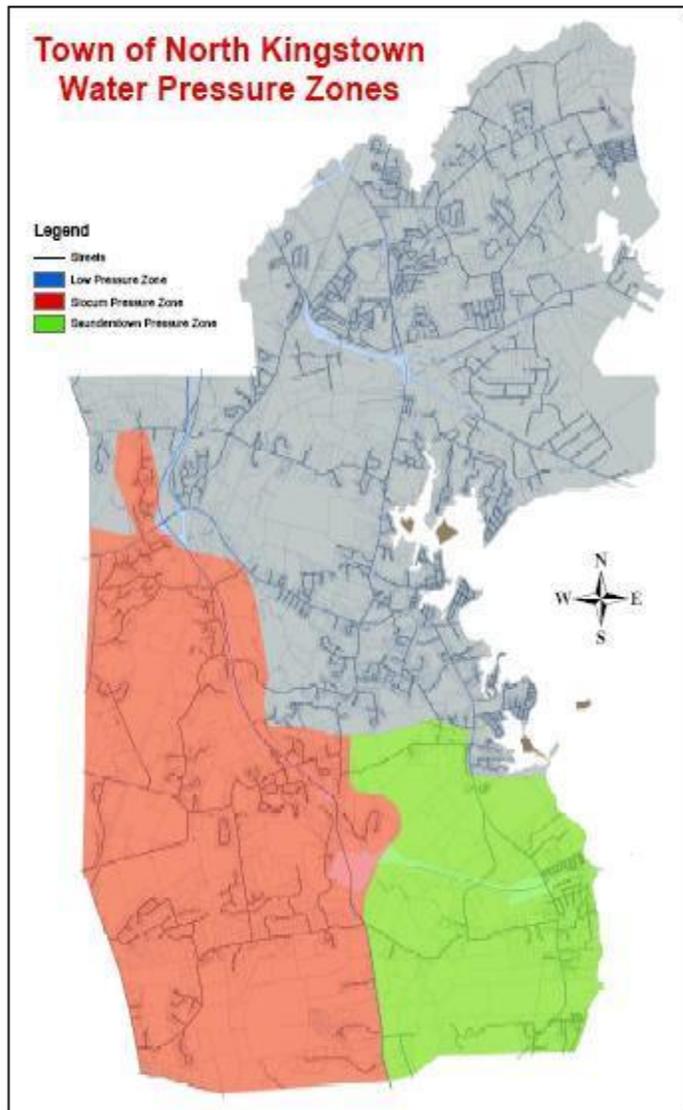
“Emergency” Storage: The volume of water in the tank situated below the fire reserve storage. Emergency storage provides for water during emergencies such as pipeline and equipment failures, power outages and natural disasters, etc.

It is not at all unusual for storage tank levels to dip below the equalization range during the summer months. This is an indication that water demand during a given time period is in excess of our pumping capacity (peak hour demand). Tank levels become a concern when water demand exceeds pumping capacity for extended periods of time, resulting in the inability to recover (meaning an inability to get tank levels back into the equalization range). Operating with low tank levels means that distribution system pressures are reduced and less water is available for fire fighting and other emergencies.

North Kingstown’s distribution system pressure is primarily controlled by the storage tanks, specifically, the water level above your home fixtures. Pressure zones are established so that adequate pressures can be maintained in the distribution system at all elevations in the landscape. Every 2.31 feet of water (above your tap) equals one (1) pound per square inch (psi) of water pressure. So, if you think about this in relation to the Town of North Kingstown’s topography, we must maintain adequate pressure in elevations that range from sea level to 232 feet above sea level. The amount of water in a storage tank that is considered “usable storage” is the volume of water that can be supplied to the system while still maintaining adequate pressure at all elevations in the distribution system.

### **RAW WATER STORAGE**

In a water system that is supplied by surface water, precipitation that falls throughout the year fills the raw water reservoir and becomes available to be treated and distributed. What is often misunderstood is that groundwater based systems like North Kingstown have no way to take advantage of the significant rainfall that occurs in the late winter and early spring, since there is no way to capture and store this water. While some of this precipitation infiltrates into the ground to recharge the aquifer, most of the precipitation is lost as it runs off impervious ground surfaces into surface water bodies. Regardless of the amount of precipitation that actually infiltrates down into the groundwater aquifer, the amount of water that can be supplied is limited by pumping capacity.



**LOW PRESSURE ZONE** (highest land elevation = 115 feet)

**Well Pumping Stations**

WELL #	LOCATION	YEAR	FLOW RATE
1	Oak Hill Rd	1942	623
2	Oak Hill Rd	1956	330
6	Stony Lane	1978	645
9	Post Rd, Warwick	1941	890
10	Post Rd, E. Greenwich	1943	1430

**Usable Storage Volume = 3.196 million gallons**

- Forge Road Standpipe, Forge Rd.
- Juniper Hill Standpipe, Standpipe Ln
- Bow Hunters Storage Reservoir, Ten Rod Rd

**SLOCUM HIGH PRESSURE ZONE** (highest land elevation = 232 ft)

**Well Pumping Stations**

WELL #	LOCATION	YEAR	FLOW RATE
4	Oak Hill Rd	1967	625
5	Col Rodman Hwy	2005	920
11	Indian Corner Rd	2004	640

**Usable Storage Volume = 0.514 million gallons**

- Slocum Elevated Storage Tank, Dry Bridge Rd.

**SAUNDERSTOWN HIGH PRESSURE ZONE** (highest land elevation = 198 feet)

**Well Pumping Stations**

WELL #	LOCATION	YEAR	FLOW RATE
3	Gilbert Stuart Rd	1960	166
7	Gilbert Stuart Rd	1980	270
8	Gilbert Stuart Rd	1980	226

**Usable Storage Volume = 0.222 million gallons**

- Saunderstown Standpipe, Snuff Mill Rd

Average Day Demand (ADD) = 3.45 mgd  
 Maximum Day Demand (MDD) = 8.12 mgd  
 Peak Hour Demand (PHD) = 7,781 gallons per minute (gpm)

## **SUPPLY TO OTHER COMMUNITIES**

### **NARRAGANSETT**

The Town of Narragansett purchases all of its water supply wholesale from both United Water located in Wakefield and North Kingstown. North Kingstown has sold water to Narragansett since 1965. We have one connection to Narragansett Water located at the town line on Boston Neck Road. Narragansett Water serves a total of 5,300 customers. Approximately 900 of their customers in the north end of Narragansett receive their water from the North Kingstown system. The annual water use by Narragansett for calendar year 2012 was 58,199,100 gallons. Narragansett is billed monthly and pays the same rates as North Kingstown customers and typically has odd/even watering restrictions during the summer months. A letter was sent to the Narragansett Interim Town Manager in May 2013 asking that restrictions similar to North Kingstown's be imposed.

Narragansett Water accounts for about 4-5% of North Kingstown's total annual water use. Their 2012 summer water use was about 198,039 gallons per day. North Kingstown's 2012 summer daily water use was about 3.3 million gallons per day. It has been suggested that if North Kingstown were to stop supplying water to Narragansett more water would be available for North Kingstown residents. At present there is no benefit to pursuing this since there is no automated way to move this water from the Saundertown Pressure Zone into the Low Pressure Zone and even if there was the water would not be available to those areas with higher demand.

### **JAMESTOWN**

In September 1993, North Kingstown agreed to provide water to the Town of Jamestown on an emergency basis in response to unprecedented low levels in their water supply reservoir. The initial agreement was for a six (6) month period and was renewed a number of times. Files indicate that water was provided to Jamestown via a temporary pipe (over the old Jamestown Bridge) periodically on a strictly emergency basis, the last time being for seven (7) days in July 2002. The temporary pipe was dismantled prior to the demolition of the old bridge. The emergency interconnection potential still exists through the use of an Angus Super Aqueduct, which is a potable water hose and flexible pipeline that would be laid across the bridge.

### **INTERCONNECTIONS**

In addition to Jamestown, North Kingstown has the following emergency interconnections:

- Kent County Water Authority at Frenchtown Rd\*
- Quonset Development Corporation at Post Rd and Newcomb Rd\*
- Warwick Water Department at the Forge Rd bridge\*

\*Kent County Water has been facing similar increases in seasonal demand

\*\*North Kingstown operates at a higher hydraulic grade so water flows from North Kingstown into the other system

### **REDUNDANCY**

In a water system redundancy is necessary in order to provide reliable water service. Periodic routine maintenance includes redeveloping and cleaning wells and draining storage tanks for cleaning, recoating, etc. It would be impossible to accomplish this work while continuing to provide uninterrupted water service without system redundancy. As we have mentioned before, mechanical or water quality problems occurring during the summer months that would require wells or tanks to be removed from service for repair would require that water use be restricted.

## **WATER RATES**

In 1997, in response to concerns about revenue shortfalls, the Director of Water Supply conducted a rate study using a computer model (RateMod Pro) that was developed in cooperation with the United States Environmental Protection Agency. Using the model, a schedule of rates was developed for the years 1997 through 2002. The model was again used to establish a schedule of rates for the period June 2004 through June 2008. The rate structure included a flat service charge and a water use charge per 1,000 gallons of water consumed. Rates were based on full cost of service allocation accounting, which attempts to recover production, operation, maintenance and administrative costs. Cost of service allocation establishes uniform rates where all customers contribute equally to services they equally receive, such as fire protection and billing but pay individually for the amount of water they actually use. The basis of these rate studies were then current and projected financial information from both the Water Department operational budget and the Water Department Capital Improvement Plan.

In 2007 the Town contracted with Raftelis Financial Consultants to conduct a water rate study. The goals included:

- providing a predictable and stable revenue stream
- discouraging the wasteful use of water and reducing excessive discretionary summer water use
- promoting fairness and equity
- maintaining simplicity
- compliance with all applicable laws

In May 2008 Raftelis presented a single year inclining block rate structure to the Town Council. After quite a bit of public discussion the Town Council decided to retain the inclining block rate structure, adopt a two year schedule but modify (lowered) the proposed rates.

One of the management options discussed by the Town Council in 2010 was adjusting the water rates to include a forth tier to discourage excessive water use and reduce peak demand. As a result of these discussions the Town Council adopted a revised rate schedule with the fourth tier included and agreed to modify the Town's Water Service Area.