



Amended October 22, 2002;
2020 updates are pending approval and will be posted upon completion

WATER CONSERVATION AND DROUGHT MANAGEMENT PLAN POLICY

The purpose of this section is to establish policies that support County Ordinance, Chapter 11, Article VI, Drought Management.

Water Conservation Plan

Introduction

Population projections and economic growth within James City County have raised public awareness of the inadequacy of public water supplies to satisfy future needs. Of particular concern is the reliability of the quality and quantity of the surface water and groundwater resources in the region. Another concern is the adequacy of surface and groundwater supplies to meet current and projected demands during drought conditions or during a well facility failure. Therefore, conservation of available and proposed water supplies shall be a key element of the James City Service Authority's (JCSA) long-range strategy for public water supply management. Conservation is not the complete solution. However, conservation can extend a finite water supply, postponing the need for costly repairs and expansion while reducing the impacts of future growth and water supply emergencies.

The goals of this water conservation program are:

- Reduce future demands on limited water supplies.
- Reduce the magnitude of seasonal peak water demands.
- Fully integrate water conservation into long-range water supply planning and management.
- Fully integrate water conservation into land use planning and development.

Water conservation means measures intended to improve the efficiency of water use and reduce waste. The intent of this definition is to focus on technical methods of reducing water demands through efficiency. This definition is not to be equated with a similar level of sacrifice by end users to comply with temporary emergency measures that are implemented during drought conditions or a water supply emergency.

Conservation Measures

(a) Water Conservation Staff

In 2000, JCSA upgraded the part-time Water Conservation Coordinator to a full-time staff position. The Water Conservation Coordinator is responsible for implementing and managing all conservation related activities, with an emphasis on public information and education.

(b) Public Information and Education

Public acceptance of this conservation plan requires information and education. The primary goals of the education program are as follows:

- (1) Educate citizens of local public water supply issues and problems.
- (2) Inform citizens of the benefits of water conservation that include:
 - Optimized use and efficiency of public water supplies
 - Cost savings by reducing, delaying, or eliminating utility system expansions
 - Reduced risk of public water supply shortages
 - Protection of economic viability of the area
- (3) Educate citizens on water-conserving measures such as water efficient landscaping and low-flow fixtures.

Local target groups for water conservation education include:

- Government boards and commissions
- News Media
- Homeowners associations
- Industrial and commercial establishments
- Students and teachers
- Community leaders and influential citizens
- Professionals and tradesmen, landscape contractors, irrigation contractors, nursery owners, builders and developers)
- High water-use industries and businesses (golf courses, laundries, motels, hotels, car washes, and restaurants)

In April 2001, the JCSA launched "Let's be Water Smart," a public/private water management initiative. The goal of Let's Be Water Smart is to promote responsible water usage in James City County.

Let's be Water Smart is a public education program and a partnership between JCSA and local stakeholder businesses, including landscape contractors, irrigation contractors, nurseries, builders and developers. The program offers partnership opportunities to these businesses, in exchange for promoting "Water Smart" practices to their customers. Most, if not all, of JCSA's water conservation efforts are promoted as Let's Be Water Smart

programs. The program includes educational advertising, brochures, product giveaways, contests, workshops, demonstration landscapes, public presentations, environmental events participation, Water Smart communities, and policy development.

The JCSA also participates in the Hampton Roads Water Efficiency Team (HRWET) a regional organization representing all water purveyors in the Hampton Roads area. The mission of HRWET is to educate the public and promote water conservation. The group distributes educational material at public events and to groups across the region. The following is a list of potential public education "forums": The Water Conservation Coordinator represents JCSA at HRWET meetings and events.

Water Conservation Committee

In January 2000, the JCSA Board of Directors adopted a resolution establishing a citizen-based Water Conservation Committee. The Committee's purpose is to "raise public awareness of water conservation issues and recommend water conservation initiatives." The Committee works with staff to achieve the following goals:

- Provide a community perspective on water conservation issues;
- Assist and advise the JCSA and Water Conservation Coordinator in the development of water conservation programs;
- Assist in the promotion of water conservation goals throughout the County;
- Provide citizen input on the implementation of JCSA/JCC water conservation programs; and
- Raise public awareness of the County's water supply and the need to use water efficiently with the objective of changing water use habits.

Water Conserving Plumbing Code

Interior water-use in both residential and commercial settings is largely "technology based," that is, the water use rate of fixtures and appliances determines the amount of water required to accomplish a function. Improvement of end use efficiency by reducing water use rates is a major means of conserving public water supplies.

The various methods of increasing interior water-use efficiency can be classified in two basic categories: (1) code standards for new construction; and (2) retrofitting of existing structures. Although the potential water savings for each category are similar, they differ in the institutional and regulatory issues and the water savings they realize.

The Regulations allow the termination of utility service when "service to a customer is of such magnitude or such character that utility service to other customers is affected" or for "negligent and wasteful use of water during periods when restrictions on consumption are imposed to conserve water."

James City County adopted the Uniform Statewide Building Code (USBC) as the County building code in 1974. The 1984 revision of this code required the installation of low flow (3 gallons per minute) shower heads, low volume (3.5 gallons per flush) toilets, water saving washing and dishwashing machines, and flow controlled or aerated faucets in new construction and renovation of existing structures. The 1996 Edition of this code with 2000 Amendments further increased conservation methods by requiring the installation of low flow shower heads (2.5 gallons per minute), low volume toilets (1.6 gallons per flush), and water conserving sink faucets (2.2 gallons per minute).

The General Assembly passed legislation in 1993 allowing localities to adopt standards for plumbing fixtures more stringent than those of the 1990 Building Officials and Code Administration (BOCA) Plumbing Code. The 1993 revision of the BOCA Plumbing Code further decreased the flow rate, or consumption of water per use, for plumbing fixtures. The Virginia Department of Housing and Community Development incorporated the 1993 BOCA Plumbing Code into the USBC in April 1994. The JCSA incorporated those rates in the latest revision of the Regulations. The 1995 BOCA Plumbing Code further decreased flow rates to the same rates as the 1996 USBC Edition.

All plumbing work in James City County must conform to the latest requirements for water conserving fixtures. High water use plumbing fixtures remain on the market, and home or business owners may replace water-saving fixtures with higher usage fixtures if the replacement is not part of a renovation project.

Water Conservation Retrofit Program

The water demand projections prepared by County staff 1986, considered that residential demand should reduce from 81 gallons per capita day (gpcd) to 69 gpcd through an active water conservation program, new construction utilizing water-conserving fixtures required by the plumbing code, and the replacement of existing fixtures with water-conserving fixtures. Replacement of existing fixtures was projected to occur at a rate of 1 percent per year.

In March 2000, the JCSA participated in an EPA Environmental Justice Grant, administered by the Hampton Roads Planning District Commission, HRWET's umbrella organization. With EPA grant monies, JCSA, HRWET, and local volunteers retrofitted ninety lower-income homes with 1.6 gpcd low flow toilets.

Water Conservation-Oriented Rate Structure

The key issues that must be addressed to achieve demand reductions through the rate structure are conservation pricing and marginal cost pricing.

Conservation Pricing

Water is relatively inexpensive in comparison to other household purchases so reduction in use is limited even when price increases. Most studies have found consumption somewhat responsive

to price changes, but the change in consumption is usually proportionally less than the associated price change and often is only temporary. Essential water uses are generally less responsive to price changes than nonessential uses. Water use within the home, for example, is less responsive to price increases than exterior water use.

Estimates of the price elasticity in water demand from other areas vary widely. Studies estimate a 100 percent increase in water rates will decrease total residential water use from 1 to 60 percent and exterior water use from 27 to 70 percent. These studies suggest consumer behavior can be modified with rate increases but permanent behavioral adjustment may take several years to occur.

Marginal Cost Pricing

Utilities have set water rates in the past to reflect the average cost of water. Economists have argued that water rates should reflect the cost of the next unit of water obtained by the utility, or the marginal cost. The charge for water from a new and expensive source should reflect that additional cost even if it is greater than the average cost. Rates based on these marginal costs would reflect the increasing scarcity and cost of new water supplies.

Effective October 1, 2000, a new increasing block rate structure replaced the existing block rate structure for residential customers.

Other rate options that may be set up if needed are: replacing the single block rate that will remain in effect for commercial customers with the increasing block rate; implementing the seasonal surcharge and apply it to residential customers again; eliminating the current practice of allowing sub-meters off private service lines for outdoor uses and require a separate service connection and meter with appropriate fees; and assessing a pumpage fee similar to the peaking factor charged by electric utilities to encourage individual conservation efforts.

Universal Metering and Meter Repair and Replacement

The JCSA meters all customer accounts. Studies show that metering results in lower water use since customers become "sensitized" to the amount of water used through the effect it has on the water bill. Metering is also an aid to detecting leaks on both sides of the meter.

Maintenance programs for water meters are essential to ensure that an accurate measure of system integrity is obtained. Under-registration by meters may result in a significant percentage of unaccounted for water and loss of revenue.

The JCSA has a meter replacement program that requires the replacement of residential meters every 15 years. Fifteen (15) years is the average service life of residential meters. After all residential meters are within that 15-year service life, a percentage of the total meters in the system will be changed every year to maintain that standard.

The JCSA is also considering a program to evaluate the sizing of meter installations for larger commercial customers. This study will evaluate the development of a routine maintenance and

replacement program for these meters. Meanwhile, these meters are calibrated and repaired or replaced upon special request by a customer or based on irregular readings in error by three percent or greater.

The JCSA has an ongoing program for purchasing private water systems in James City County. Many systems the JCSA acquired were not metered or there were no records about the maintenance or age of the customer's meters. The JCSA installed meters in those systems that were not metered and replaced the meters in the systems that had no records of their age.

Water Conserving Landscaping

Landscape irrigation can create seasonal peak water demands. Landscape irrigation use is largely dependent on weather conditions so large variations in peak demand occur between wet, normal, and dry years. Drought conditions typically increase total water use and peak water demands. In 2001, the average peak summer month demands on the JCSA systems were 18% greater than average day demands, and the highest peak demand month was 82% higher than the lowest demand month of 2001. Reducing the magnitude of seasonal peak water demand offers the greatest potential for optimal sizing of water supply, treatment, transmission, and distribution facilities.

One method of reducing the seasonal peak demand for landscape irrigation is to promote and encourage water efficient landscape practices for this region, such as:

- Planning and design to maximize water efficiency.
- Implementing an annual maintenance plan for the specific needs of the landscape.
- Replacing turf with landscaped beds, mulched areas, ground covers, or hard structures.
- Improving soil to ensure water holding capacity, absorption properties, and nutrients for plant growth.
- Using native and other adapted low-water-use plants.
- Efficient irrigation.

The acceptance and use of water efficient landscaping by County citizens is necessary for the long-term success of this Conservation Plan. To achieve widespread use of water efficient landscape practices, JCSA/JCC will:

- Use all available educational resources to ensure public awareness of the fundamentals, long-term benefits, and cost-effectiveness of the Water Smart concept.
- Require all new developments requiring a special use or rezoning permit to include water conservation proffers in their plans, including Water Smart landscaping practices, and develop specific water conservation guidelines for each development.
- Design and properly maintain demonstration landscapes in highly visible areas within James City County such as County buildings.
- Encourage the use of automatic underground drip irrigation systems for both turf areas and landscaped beds.

Leak Detection and Water Audits

Good construction standards for public water systems and a water main replacement program for areas where leaks recur will result in fewer leaks. The JCSA established and maintains **Standards and Specifications for Water Distribution Systems**, which defines material and construction standards for wells, water mains, storage and pumping facilities and appurtenances. These Standards are reviewed and updated routinely to ensure they accurately reflect the best engineering practices, materials, construction standards, and inspection techniques. The JCSA also has an active ongoing program for leak detection and repair.

Ground elevations in James City County range from sea level to nearly 120 feet. This represents a pressure variation of approximately 50 pounds per square inch (psi) between the high and low areas of the County. In order to provide for adequate, but not excessive, system pressure in both the high and low areas the system is divided into main and secondary pressure zones. The secondary pressure zones are separated from the main pressure zone through a series of pressure reducing valves (PRV's).

Using PRVs to reduce system pressure aids conservation in two (2) ways. The first is by reducing losses from leaks or faulty fixtures that might go undetected for long periods. Secondly, PRVs will also reduce the amount of water consumed in "time dependent" uses such as showers.

Water audits offer a way to identify and eliminate excessive use of public water. Public water purveyors routinely compare the metered amount of water they produce with the metered consumption of their customers to determine the amount and percentage of unaccounted for water in their system(s). The last audit of the JCSA system was done in 1990 and concluded the unaccounted for water equaled 6% of system demand. This is very favorable when compared to the national average of 10-15%.

The JCSA systems will be audited during the first two years of each groundwater withdrawal permit. The results of these audits will be used to identify areas for the JCSA's active ongoing leak detection and repair program. Areas of recurring leaks will be included in the capital improvement program for line replacement.

Wastewater Reuse and Recycling as a Conservation Measure

The RRWSG evaluated wastewater reuse as a long-term alternative supply to meet the water demands on the York-James Peninsula. In light of strong opposition to this alternative from the Virginia Department of Health, the consultant's report concluded, "it is highly unlikely that the Commonwealth of Virginia would approve a Lower Peninsula wastewater reuse project for potable use." This report went on to state that wastewater reuse to meet non-potable demands such as industrial cooling, irrigation and car washes might be more viable. The Federal agencies reviewed the scope of the study performed for the Regional Raw Water Study Group and concurred with the consultant's recommendation that further evaluation of wastewater reuse is needed to meet non-potable demands only.

"Wastewater reuse" is a general term applied to any process in which a wastewater stream is employed for any beneficial use. Wastewater recycling is a subclass of wastewater reuse and refers to a situation where the same water is used over and over to satisfy the same demand. For the purpose of this discussion, wastewater reuse is defined as a deliberate strategy of directly reusing wastewater effluent, treated to the degree appropriate for the intended reuse, to satisfy non-potable demands.

The JCSA Regulations require process water reuse in certain commercial/industrial operations, i.e., car washes. The water connection fees based on the size of the water meter, and also the associated sewer connection fees, encourage wastewater reuse by all commercial/industrial customers. Correct sizing of water meters to accurately register consumption has already been addressed in item 5, Universal Metering, above.

Sewage treatment in the Hampton Roads area is provided by the Hampton Roads Sanitation District who recently initiated a regional effort to develop a plan for permitting and implementing a program to satisfy non-potable demands through wastewater reuse. James City County is represented by staff from the JCSA and is dedicated to maximizing the effectiveness of this initiative.

Outdoor Water-Use Ordinance

In order to encourage a reduction in Outdoor Water Use and better manage water supply, the Board of Supervisors of James City County approved an Ordinance regulating the day of week and time of day that property owners/occupants can use water outdoors. The Ordinance provides that between May 1 and September 30 of each year, structures with even street numbers can use water outdoors on Tuesday, Thursday, and Saturday; structures with odd street numbers can use water outdoors on Wednesday, Friday, and Sunday. No water is allowed to be used outdoors on Monday's or between the hours of 9 a.m. and 5 p.m., except with a hand-held hose with an automatic cutoff.

Drought Contingency Plan

1. Water System Background

The JCSA draws water from numerous wells located throughout James City County. The wells are interconnected to improve reliability and provide fire flows. These wells form the Central Water System.

The water withdrawn from these wells is pumped into distribution systems and storage facilities to provide water service to the Primary Service Area (PSA). The PSA is the part of James City County identified in the County's Comprehensive Land Use Plan as receiving urban-level services such as public water and sanitary sewer.

The JCSA also operates several independent water systems that are not connected to the Central System.

Within the PSA, the JCSA provides water service to approximately 13,500 (2002) customers (9,100 after 1997), all public schools (2002), and over 1,000 commercial and industrial customers. The number of JCSA water customers increased by approximately 600 per year over the last several years. This trend is expected to continue.

2. **Normal Water Demands and Flows**

The Central System has a Virginia Department of Health (VDH) Operating Permit which establishes a system capacity based on a formula that includes water production capacity, storage, pump and well capacity, etc.

Groundwater withdrawals to support system demands are permitted by the Department of Environmental Quality (DEQ). The permit establishes maximum monthly and annual limits.

Fire flow standards at any point in the distribution system are established at a minimum of 1,000 gallons per minute (gpm) by Camp Dresser and McKee during the 1998 update of the Master Water Plan.

There is limited data for maximum day and maximum hour demands in the JCSA water systems. However, during moderate droughts experienced in 1998 and 1999, daily peak demands exceeded average daily demands by 50%. This plan is intended to assist in managing and lowering peak water demands. Extended peak demands can be detrimental to the water system.

3. **Water Emergency Ordinance**

A Drought Management Ordinance has been adopted to give the County standby emergency powers. The ordinance provides for the following:

- Declaration of a water emergency, each stage, and authority to impose water conservation methods.
- Enforcement authority with penalties for above-normal, and incentives for below-normal, water consumption as defined in each stage of the ordinance.
- Stiffer penalties for noncompliance with conservation directives as listed above after due public notice. Similar restrictions, penalties, and incentives will also be imposed upon all County industrial and commercial users.
- These regulations only apply to water customers of the James City Service Authority.

4. **Proposed Emergency Water Sources**

During a drought situation, the JCSA General Manager will designate certain Central System wells as emergency water sources, if necessary, to provide domestic water for groundwater users whose wells have failed.

5. **Parameters for Drought Declaration**

- (a) Stage I: A drought declaration will be issued when:
- the average daily demand for the Central System exceeds 80% of the DE groundwater withdrawal permit daily equivalent for 30 consecutive days or;

- by mutual agreement among the water purveyors in James City County or;
- a water emergency is declared by the Executive Director of the Department of Environmental Quality in accordance with the Groundwater Management Act.

The declaration is described in Paragraph 6, Drought Declaration. The Stage I emergency plan will then be initiated as outlined in Paragraph 7, Emergency Actions.

- (b) Stage II: Emergency actions will start when:
- the average daily demand for the Central System exceeds 85% of the DE groundwater withdrawal permit daily equivalent for 45 consecutive days, or;
 - by mutual agreement among the water purveyors in James City County, or;
 - a water emergency is declared by the Executive Director of the Department of Environmental Quality in accordance with the Groundwater Management Act.

The declaration is described in Paragraph 6, Drought Declaration, and will be carried out in accordance with that section. The Stage II emergency plan will then be initiated as outlined in Paragraph 7, Emergency Actions.

- (c) Stage III: Emergency actions will start when:
- the average daily demand for the Central System exceeds 85% of the DE groundwater withdrawal permit capacity daily equivalent for 60 consecutive days, or;
 - Stage II has been in effect for 15 days and demand has not stabilized at the Stage II trigger level or has not declined, or;
 - by mutual agreement among the water purveyors in James City County, or;
 - a water emergency is declared by the Executive Director of the Department of Environmental Quality in accordance with the Groundwater Management Act.

The declaration is described in Paragraph 6, Drought Declaration, and will be carried out in accordance with that section. The Stage III emergency plan will then be initiated as outlined in Paragraph 7, Emergency Actions.

- (d) Stage IV Emergency Actions will start when:
- the average daily demand for the system exceeds 85% of the DEQ groundwater withdrawal permit daily equivalent for 75 consecutive day, or
 - by mutual agreement of water purveyors in James City County, or
 - a water emergency is declared by the Executive Director of the Department of Environmental Quality in accordance with the Groundwater Management Act.

6. *Drought Declaration*

Once the parameters for drought determination are met, as listed in Paragraph 5 above, the County will issue an emergency declaration that will initiate conservation measures as defined in Paragraph 7 below. The declaration will be issued to the public, and to commercial and industrial customers through local newspapers and cable television public access Channels and any other means of communication deemed appropriate. The declaration will state specific conservation efforts to be taken.

7. *Emergency Actions*

(a) Stage I

Once a drought declaration is issued, the following emergency actions for Stage I will be put into effect:

- Voluntary water conservation measures will be encouraged.
- A public awareness and information process will be implemented to distribute additional water-conservation information and other special notices to JCSA customers. Industrial and commercial users will be asked to initiate internal conservation plans.
- New construction under County's Landscaping Ordinance may delay landscape installation with a bond when drought declaration is evoked. This is in lieu of voluntary water conservation measures.

(b) Stage II

If Stage I fails to bring about necessary water savings, or when a parameter described in Paragraph 5 for Stage II is reached, Stage II will be put into effect. The following emergency actions will occur in Stage II:

- The watering of shrubbery, trees, lawns, grass, plants, or any other vegetation is not permitted, except indoor plantings, greenhouse, or nursery stocks, or from a bucket or other container not exceeding three (3) gallons in capacity and except watering by commercial nurseries of plants freshly planted and once a week for five weeks following planting or until the drought emergency declaration is revoked.
- Washing of automobiles, trucks, trailers, boats, airplanes, or other types of mobile equipment is not permitted except in facilities operating with a water recycling system approved by the General Manager of the JCSA, or except from a bucket or other container not exceeding three (3) gallons in capacity; provided, however, that any facility operating with an approved water recycling system shall prominently display in public view a notice stating that such system is in operation. In lieu of the provision hereof the County Administrator may curtail the hours of operation of commercial enterprises offering such services or washing their own equipment.
- Washing of streets, driveways, parking lots, service station aprons, office buildings, the exterior of homes or apartments, or other outdoor surfaces by commercial washing/cleaning services is not permitted except from a bucket or other container not exceeding three (3) gallons of capacity.
- The operation of any ornamental fountain or other structure making similar use of water is not permitted.
- The filling of swimming and/or wading pools, or the refilling of swimming and/or wading pools that were drained after the effective date of the declaration is not permitted.
- The use of water from fire hydrants for any purpose other than fire suppression or other emergency is not permitted except as authorized by the General Manager of the JCSA.
- Serving of water in restaurants, except upon request of customers, will not be permitted.

(c) Stage III

If Stage II fails to bring about necessary water savings, Stage III will be put into effect. The following emergency actions will occur in Stage III:

- The General Manager of the JCSA shall allocate water to customers based on a reduction of either the average consumption of their last twelve months billing or water consumption data available from similar activities of equal intensity.
 - a. Residential, Industrial, commercial, and school use of water shall be reduced by 25% of normal consumption.
 - b. The amount of water allocated shall not be less than fifty (50) gallons per person per day per household.
- Increased water rates of 300% will be charged for water use in excess of the conservation goal.
- Installation of new water service connections will be suspended.
- Application for appropriate state or federal drought emergency grants will be submitted.

(d) Stage IV

- The Board of Supervisors, County Administrator or his designee, may implement additional restrictions determined prudent to reduce water demand.
- No new water service connections will be sold, and permits for the installation of new wells will not be issued, except for replacement of failed private domestic wells where public water service is not available.

8. *Revocation of Drought Declaration*

When the average daily demand for the Central System has fallen below the trigger levels for each increased stage of water conservation and has remained below that level for 15 consecutive days, or by mutual agreement of the water purveyors in James City County, or when the declaration of a water emergency is lifted by the Executive Director of the Department of Environmental Quality in accordance with the Groundwater Management Act, the drought management requirements for that stage may be lifted. All customers will be notified in accordance with Paragraph 6. It should be emphasized that personal conservation efforts shall be maintained to avert other emergency situations.