DROUGHT ASSESSMENT AND RESPONSE PLAN
KING GEORGE COUNTY, VIRGINIA

Introduction:

The water resources of King George County are critical to our quality of life and are essential to public health, safety and welfare. During times of drought, the County has the authority to restrict the nonessential use of water.

Authority:

There are two sections of the Code of Virginia that give governing bodies the authority to restrict the use of water: Section § 15.2-923 pertains to the nonessential use of ground water and Section § 15.2-924 provides the authority to restrict the use of water during a water supply emergency. The sections of the Code are as follows:

> § 15.2-923. Local water-saving ordinances:
> Notwithstanding any contrary provision of law, as shall be necessary to protect the public health, safety and welfare, any locality may by ordinance (i) require the installation of water conservation devices in the case of the retrofitting of buildings constructed prior to July 1, 1978, and (ii) restrict the nonessential use of ground water during declared water shortages or water emergencies.
>
> For purposes of this section "nonessential use" shall not include agricultural use.
>
> § 15.2-924. Water supply emergency ordinances.
> A. Whenever the governing body of any locality finds that a water supply emergency exists or is reasonably likely to occur if water conservation measures are not taken, it may adopt an ordinance restricting the use of water by the citizens of such locality for the duration of such emergency or for a period of time necessary to prevent the occurrence of a water supply emergency. However, such ordinance shall apply only to water supplied by a locality, authority, or company distributing water for a fee or charge. Such ordinance may include appropriate penalties designed to prevent excessive use of water, including, but not limited to, a surcharge on excessive amounts used.

Drought Planning in King George County and in the Commonwealth:

King George County receives an average of 44.82 inches of rainfall annually[1]. In most years, rainfall is adequate to maintain and replenish the ground and surface water supplies. However, the occurrence of droughts is a normal part of the weather cycle and should be expected. During droughts, water available from streams, rivers, springs, and wells can be

[1] Source: 2006 Comprehensive Plan for King George County, Virginia, prepared by King George County Planning Commission, 2006.

severely diminished. In addition, water use can increase drastically during drought conditions.

Severe drought throughout the Commonwealth from 1999-2002 prompted the state government to establish a Drought Response Technical Advisory Committee. This committee was tasked with the development of a Drought Assessment and Response Plan for the Commonwealth. The Virginia Drought Assessment and Response Plan was used as a framework for this Drought Assessment and Response Plan for King George County. The Virginia Drought Assessment and Response Plan was used as a model in order to provide consistency with the Virginia Plan and to utilize the expertise and effort that went into the development of the Virginia Plan.

Important differences between the Virginia Drought Assessment and Response Plan and this local plan include:

1) Drought onset and stage declarations shall be made by the County Board of Supervisors after review of the drought indicators discussed herein.

2) In order to monitor drought severity, the County will use three indicators which are based on the amount of precipitation and the effect of the precipitation (or lack of precipitation) on the hydrologic system. These indicators are precipitation, groundwater levels, and the monitoring of King George County Service Authority's operating conditions. [2]

The extent to which rural residents' and communities' drinking water supplies are impacted by drought depends on many factors. Obviously, the more severe and long-lasting the drought is, the greater the impact will be. Responding proactively to a developing water shortage can greatly reduce the risk that residents will face serious drinking water shortages during drought.

The County website will be used to provide information regarding current drought conditions, recommended or required responses, and where to get additional information. Further, the County website will provide information to encourage water conservation at all times, not just during periods of low supply.

Overall Water Use Policy:

This Drought Response Plan is part of an overall water use policy that emphasizes the efficient use of water at all times, not just during drought. Overall water conservation efforts made by King George County and the King George County Service Authority include:

[2] The Service Authority will develop a plan for monitoring the water levels in fours wells. Three of the wells are active wells (Monmouth #1, Sealston, and Purkins Corner) and one well (Oakland Park 1A) is inactive. The monitoing of these wells is discussed on pages 5and 6 of this Drought Assessment and Response Plan.

- **Water Loss Reduction:** The King George County Service Authority will continue to reduce unaccounted for water by reducing water leaks in the water systems owned and operated by the Authority.

- **Water Efficiency:** King George County will encourage ongoing water demand management, water use efficiency and water conservation activities throughout the County by increasing public education efforts. The County website will be used for public education efforts.

- **Public Education and Outreach:** Improve the effectiveness of drought awareness by increasing public education efforts. The County website will be used to provide information about drought awareness and other forms of media (newspaper, radio and local television) will be used as well.

Drought Monitoring:

This plan includes a monitoring framework that relies upon the monitoring of drought indicators to determine drought stages and resulting actions in the County. At the State level, during periods of normal moisture conditions, the Virginia Department of Environmental Quality (DEQ) monitors the National Oceanic and Atmospheric Administration (NOAA) U.S. Drought Monitor, and produces information from those reports specific to Virginia on a monthly basis.

The Virginia drought map is produced concurrent with the release of NOAA monthly and seasonal outlooks, which usually are released on the Thursday closest to the middle of the month. County staff will monitor the Drought Map and the advance of drought conditions in the Commonwealth using the drought indicators described herein in order to determine when conditions warrant a drought stage declaration. Other indicators such as the Standardized Precipitation Index, Palmer Drought Severity Index, Crop Moisture Index, Keetch-Byrum Drought Index, and NOAA monthly and seasonal precipitation outlooks will be monitored and will be used as necessary to enhance decision-making regarding drought declaration.

Local Drought Indicators:

In order to monitor potential drought conditions King George County staff will use two indicators to evaluate drought severity. These indicators include precipitation and groundwater levels. Both indicators are discussed below. Further, the King George County Service Authority will develop a procedure to monitor four Service Authority wells.

- **Precipitation Deficits** – Precipitation deficits will be monitored by comparing current precipitation amounts with historical precipitation values as a percent of normal long-term average values.

  Comparisons will be made using data compiled by the Office of the State

Climatologist. Normal long-term average precipitation is defined as the mean precipitation for a thirty-year period of record for the area and time period being evaluated. Precipitation amounts will be evaluated based on the water year (beginning October 1)[3]. If a precipitation deficit outside of the normal range exists at the end of a water year, the precipitation records will carry forward until a normal condition is reached (i.e. if a precipitation deficit exists on October 1, precipitation records for the previous twelve months will be evaluated until the twelve month deficit is eliminated).

Because the significance of a precipitation deficit changes as the water year progresses, drought response stages will be declared at different percentages of normal depending on the date of evaluation. The criteria for the three drought response stages for precipitation levels are as follows:[4]

Table 1: King George County - Drought Stages Based on Precipitation Levels

Months Analyzed	Normal (% of Normal Precipitation)	Watch (% of Normal Precipitation)	Warning (% of Normal Precipitation)	Emergency (% of Normal Precipitation)
October – December	>75.0	<75.0	<65.0	<55.0
October – January	>80.0	<80.0	<70.0	<60.0
October – February	>80.0	<80.0	<70.0	<60.0
October – March	>80.0	<80.0	<70.0	<60.0
October – April	>81.5	<81.5	<71.5	<61.5
October – May	>82.5	<82.5	<72.5	<62.5
October – June	>83.5	<83.5	<73.5	<63.5
October – July	>85.0	<85.0	<75.0	<65.0
October – August	>85.0	<85.0	<75.0	<65.0
October – September (and previous 12 months)	>85.0	<85.0	<75.0	<65.0

- **Ground Water Levels –** There are several DEQ/USGS observation wells in King George and Westmoreland Counties. The wells are as follows:[5]

[3] Water years are a natural dividing point for water supply drought, as precipitation that falls in the first six months of a water year is analogous to putting money in the bank. Precipitation that occurs during this six-month period has the potential to recharge ground water, which will sustain stream flows and support withdrawals from wells during the following six-month period when moisture deficits naturally develop as evaporation and plant transpiration generally exceed precipitation.

[4] See Appendix I for sample precipitation data from NOAA.

[5] Information from the USGS website is included in Appendix I.

Table 2: DEQ/USGS Observation Wells in and Near King George County

Locality	Site ID	Site Name	National Aquifer	Local Aquifer	Depth of Well
King George Co.	382129077005801	54Q21	No. Atlantic Coastal Plain	Paleocene Series	219.25 ft.
King George Co.	382341077032401	54R2	No. Atlantic Coastal Plain	Patapsco Formation	806 ft.
Westmoreland Co.	380538076490801	56N1SOW016	No. Atlantic Coastal Plain	Upper Cretaceous	641 ft.
Westmoreland Co.	381110076550501	55P5	No. Atlantic Coastal Plain	Patapsco Formation	471 ft.
Westmoreland Co.	381132076551001	55P9	No. Atlantic Coastal Plain	Quaternary System	22.6 ft.

Of the wells listed above, only the Westmoreland County well identified as 55P9 will be used as a drought indicator. This well will be used to monitor shallow ground water response to drought conditions. Measured ground water levels will be compared with historic level statistics for the period of record.[6]

Table 3: King George County - Drought Stages Based on Groundwater Levels

Drought Stage	Criteria
Watch	Measured groundwater level below the 25th percentile for all historic levels.
Warning	Measured groundwater level between the 25th and 10th percentile for all historic levels
Emergency	Measured groundwater level less than the 10th percentile for all historic levels.

Measured ground water level above the 25th percentile for all historic levels will be defined as normal conditions. Measured ground water level below the 25th percentile for all historic levels will be defined as drought watch conditions. Measured ground water level between the 25th and 10th percentile for all historic levels will be defined as drought warning conditions. Measured ground water level below the 10th percentile for all historic levels will be defined as drought emergency conditions. Additional data may be available from the groundwater monitoring network established and maintained by USGS. Note this section is meant to address users from shallow wells only.

Monitoring of Service Authority Wells – King George County Service Authority staff will develop a protocol for measuring the water levels in three active wells and one inactive well. The three active wells that will be monitored are: Monmouth #1, Sealston, and Purkins Corner. Generally, the protocol for monitoring the wells will be as follows: the Service Authority staff will measure water level before turning the pump off, measure and record the water level in the well then continue to measure

[6] See Appendix I for sample well data for this well and other nearby wells.

the levels every 5 minutes for one (1) hour with an air line gauge or electronic water level meter to determine the ability of the well to recover. Each of the three wells will be monitored on a quarterly basis. The Service Authority will review the data and use the data as an indicator of the operating condition of the three active wells. If deemed necessary, the Service Authority will advise the County Administrator of declining conditions in the wells.

Oakland Park 1A is an inactive well that will be monitored monthly by the Service Authority. The level of water in this well will be used as an additional source of information for determining if the County Administrator should be advised of the need to declare a drought.

Other Indicators - Staff will evaluate other available drought information during deliberations related to the development of drought stage recommendations. Other drought indicators that may be considered include the Standardized Precipitation Index, Palmer Drought Severity Index, Crop Moisture Index, NOAA monthly and seasonal precipitation outlooks. Also, antecedent effective ground-water recharge rates, as estimated from hydrograph separation techniques, will be considered.

Declaration of Drought:

Staff will use the following general descriptions of three drought stages when advising the County Administrator concerning drought declarations. These descriptions should not be viewed as absolute requirements for drought designation, but as a mechanism to be used by staff to reach the appropriate drought advisement. The specific response activities that are delineated Appendix III for the three drought stages should be viewed as activities that should be initiated in response to a drought stage declaration.

In the event that the Governor or the Virginia Drought Coordinator declares a drought emergency in the Northern Coastal Plain Region (which includes King George County), the mandatory conservation measures detailed below will be implemented upon the drought declaration, unless the governor's restrictions are more restrictive, or unless local conditions differ.

Drought Stages:

In King George County, there are three drought stages that are governed by precipitation levels and groundwater levels. These drought stages include drought watch, drought warning, and drought emergency. If the indicators (precipitation levels, groundwater level or level of water in the King George County Service Authority wells) meet the criteria for a drought stage to be declared, the stage will be declared by the County.

- **Drought Watch**
  The drought watch stage is intended to increase public awareness of climatic conditions that are likely to precede the occurrence of a significant drought event. When a drought watch is warranted, the County Administrator will, through

appropriate means, call upon the general population to employ prudent restraint in water usage, and to conserve water voluntarily. See Appendix III for a list of suggested voluntary conservation efforts.

It is unlikely that significant water use reductions will occur at this stage although it is possible that the increased public awareness of water conservation activities may reduce water use up to 5%.

- **Drought Warning**
  When a drought warning is declared in accordance with the Drought Assessment and Response Plan, the County Administrator shall request voluntary reduction of non-essential usages of water. See Appendix III for a list of water uses that should be curtailed during a drought warning stage.

  Water conservation activities at this stage would be voluntary. Voluntary water conservation activities generally result in reductions in water use of 5-10%. In this stage all water users would be encouraged to spread out water use. For example, rather than filling large livestock water troughs once a day, consider installing automatic waterers that respond to demand by livestock throughout the day.

- **Drought Emergency**
  When a drought emergency is declared in accordance with the Drought Assessment and Response Plan, the County Administrator shall restrict the use of water to purposes which are absolutely essential to life, health and safety. All nonessential uses of water should be eliminated.

  During these times, it is likely that some water supplies will not provide the quantity of water needed by all users.

  Mandatory water conservation activities usually result in water use reductions of 10-15%.

  See Appendix III for a list of prohibited uses during a drought emergency.

Enforcement:

Enforcement of this plan will be in accordance with the County's Drought Ordinance included in Appendix IV.