Section 7 | Alternatives

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Alternatives

Statements of need for the Southside and Western Tidewater sub-regions and the Middle Peninsula, as well as for the majority of self-supplied users in the Region, indicate water supplies meet or exceed projected water demands. However, the statement of need for the York-James Peninsula includes the possibility of the projected water demand exceeding the available water supply near the year 2040. The alternatives described in this section are potential options for addressing any gaps that may arise and can generally be classified into two categories:

1. Alternatives to increase water supply, and
2. Alternatives to decrease water demand.

This section provides a discussion of alternatives that is intended to provide general information and broad indications of capabilities and resource requirements subject to the following limitations:

- **Alternative Descriptions and Capabilities.** The discussion in this section is neither exhaustive nor descriptive of any specific water supply system discussed in this report. The information is offered as a generalized discussion of potential alternatives and anecdotal experiences. Therefore, none of the information presented should be construed as a recommendation that can be directly applied to any system's situation.
- **Resource Requirements and Cost Descriptions.** Cost information provided in this section is extracted from isolated regional projects and is anecdotal; it is not descriptive of any or all specific water supply alternatives and/or future application of alternatives relative to the Hampton Roads PDC localities referenced in this report. The information is provided only for general, conceptual and descriptive purposes and is not intended for comparison of specific future water supply alternative projects or applications. As such, information provided herein is representative of order-of-magnitude costs for various types of water supply projects.

Historical Alternatives Projects

The Hampton Roads region relies on a diverse system of water sources. Historically, there have been many projects that have utilized various alternatives. Table 7-1 provides a summary of previously completed projects in the Hampton Roads region. The table describes project capacities and costs; table information should be considered in the context of the discussion of methods provided below. Cost information shown in Table 7-1 is not adjusted to current year dollars; comparison of costs across different years is generally not appropriate.

Table 7-1: Historical Alternative Plant Capacity and Cost

Alternative	Project Description	Year Installed	Capacity (MGD)	Constructed Cost (nearest million $)	Cost per MGD (nearest million $)
Desalination	NNWW Lee Hall Brackish Groundwater Desalting Reverse Osmosis Water Treatment Plant: desalting deep brackish groundwater	1990	5.7	$16 to $17	$2.81 to $2.98
Desalination	City of Chesapeake Northwest River Reverse Osmosis Water Treatment Plant: desalting brackish surface water and deep groundwater	1994	14.0	$44.1	$3.15
ASR	City of Chesapeake Northwest River ASR well: treated water is injected for storage to meet peak demands.	1989	3.0	$1.5	$0.5
Electrodialysis Reversal Water Treatment Plant	City of Suffolk Water Treatment Plant expansion: treatment of fresh, high fluoride groundwater	2008	6.25	$42	$6.72
Conventional Surface Water Plant[1]	Stafford County: conventional treatment with ultrafiltration	2014	12.5	$35	$2.8
Interconnection Pipeline	WTWA Raw Water Pipeline: interconnection of the Norfolk reservoir system with the Portsmouth reservoir system via pipeline from Lake Prince pumping station to Lake Cahoon and Lake Mead	2003	8.0	$5.1	$0.64
Surface Water Reservoir[2]	NNWW King William Reservoir Project: development of new surface water reservoir	N/A	20.0	$170	$8.5
Non-Potable Water Reuse[3]	Thomas Jefferson National Accelerator Facility, City of Newport News: reclaimed wastewater from HRSD for cooling tower and irrigation use	2008	0.2	$6.3 to $7.8	$31.5 to $39.0
Non-Potable Water Reuse [3]	Northrop Grumman, City of Newport News: reclaimed wastewater from HRSD for shipyard powerhouse and demineralization facility	2009	0.16	$12 to $23	$75.0 to $143.8

NNWW = Newport News Waterworks

[1]Project is still in design phase and is included as an example of a recent ultrafiltration surface water treatment project. Cost and year installed are projected.

[2]The King William Reservoir Project proposal was discontinued in 2009.

[3]Cost estimates are based on feasibility studies conducted by CH2M HILL and represent costs to the end user, not to the wholesaler.

Alternatives for Increasing Water Supply

Surface Water Storage

Creating additional storage is the most traditional method of increasing source water resources. It can be accomplished by either developing surface water resources or by storing treated water within an available aquifer.

The region's reservoirs capture and store a certain amount of the annual runoff from within their respective watersheds. Additional runoff could be captured in reservoirs by increasing the storage volume of individual reservoirs.

Increasing the storage volume of any existing reservoir would require either raising the spillway height of the reservoir's dam or dredging. Both methods are problematic. The cost of such an approach is dependent on the site-specific situation. Factors that could affect cost include: procurement of state and federal permits, mitigation of impacts to natural resources and surrounding land uses, property acquisition requirements, location, lake volume, reservoir depth, current dam and spillway construction, and contractor market conditions. Similar factors affect cost when considering dredging. However, dredging would potentially release large amounts of suspended solids and other pollutants to the reservoir water column and would likely require a reconfiguration of the water withdrawal system.

The utilities in the region have considered developing new reservoirs for many years. Specifically, the utilities in the York-James Peninsula have made several proposals to develop additional water sources in the past three decades (e.g., Ware Creek Reservoir and King William Reservoir). The most recent proposed reservoir project, the Newport News Waterworks (NNWW) King William Reservoir, was officially terminated in October 2009. Although planning for the reservoir project had begun in the 1980s, it was not until 2005 that the multitude of required entitlements, environmental clearances, and permits were approved and project implementation commenced. Then in 2009, following a series of delays and legal proceedings, a key construction permit was suspended by the U.S. Army Corps of Engineers (Corps), the authorizing agency, and Newport News stopped work on all activities previously authorized by the permit. By September of that year, the City of Newport News had assessed the viability of the project and concluded that the project was unlikely to obtain or retain all regulatory permits required and that permit-related efforts would likely require millions of dollars in additional costs and years of further delay.

There are no on-going projects to create new reservoirs or develop new surface water intakes to support the York-James Peninsula public water systems. Given the history of proposed reservoir projects and comprehensive searches for viable options, it is not likely that a new reservoir or surface water source will be approved in the foreseeable future. The communities of the York-James Peninsula must consider other approaches to meet future water demands.

Groundwater Withdrawal

The Virginia Coastal Plain aquifer system is a resource that could help meet the future water needs of the region. However, it is difficult to define how much water is available to new users and existing users. As indicated in Section 6, Statement of Need, groundwater withdrawals throughout the Coastal Plain aquifer system have greater impacts on water levels in the western Coastal Plain where aquifers are thin and shallow.

In recent years, DEQ has determined based on field observations that existing withdrawals have lowered groundwater levels below the top of some aquifers in portions of the western Coastal Plain. Historical water level data from the state and federal monitoring well network indicate that the current use of groundwater has resulted in water level drops of 2 feet per year in much of the aquifer system. Groundwater modeling simulations of the total permitted withdrawal amounts indicate further decline in water levels. These conditions are contrary to the Groundwater Management Act and Groundwater Management Regulations.

Under the current regulations, new groundwater permits and re-applications requesting increases in many aquifers that yield higher quality water cannot be granted, and DEQ is also having difficulty approving re-applications for permits that request the same withdrawal amount as the previous term. As discussed in Section 4, Projected Water Demands, International Paper's Ground Water Withdrawal Permit remains active as of January 2011, despite the plant's 2009 closure, and the permitted withdrawal amount was not decreased. In consideration of the 10-year permit term, expanding deep groundwater supplies in the Coastal Plain may not be a viable alternative.

Some limited expansion could possibly occur in the Lower Potomac Aquifer, as it is currently less utilized; however, water from this aquifer in the Hampton Roads area is not of the highest quality and will likely require treatment. Much of the Lower Potomac contains brackish water and would require desalination. It is possible that revisions to the Groundwater Withdrawal Regulation could limit the use of higher quality source aquifers for public water supply only, requiring industrial and commercial users to relocate withdrawals to aquifers of lower quality water. Aside from changing the regulations to prioritize potable supply over industrial use, Virginia could establish funding to move industrial withdrawals to lower quality source aquifers.

While limited as a major supply alternative, utilizing the water table aquifer for irrigation would alleviate some stress on current water supplies. One important factor to consider in the use of the water table aquifer is its rapid recharge from annual precipitation. Because there is no confining unit associated with this aquifer precipitation is allowed to percolate directly through the unsaturated surface layers and into the aquifer, which results in much quicker recharge rates than the deeper aquifers. In this way the water table aquifer is a sustainable source if managed properly. Though not historically used due to the high iron content of the water, point of use treatment options exist that allow utilization of this aquifer without the negative consequences of iron staining. There are potential impacts to natural resources associated with use of the water table aquifer. Impacts to wetland areas and other resources should be evaluated prior to pursuing any significant withdrawals or encouraging withdrawals in areas that may have sensitive groundwater-surface water interactions.

It is difficult to quantify the added capacity and sustainable yield that could be derived from the Lower Potomac aquifer and use of the shallow water table aquifer. The Coastal Plain aquifer system is a complex heterogeneous system containing aquifers separated by leaking confining units that vary in thickness from east to west. The potential groundwater yield varies depending upon location; modeling of specific scenarios using the Coastal Plain regional groundwater model is required to develop estimates of yield.

Aquifer Storage and Recovery

Aquifer recharge and aquifer storage and recovery (ASR) well technology can be used to store treated water in groundwater aquifers during wet periods or periods of low demand, and recover stored water during dry periods or times of high demand. ASR wells have been used in the U.S. to store and recover water for drinking supplies, irrigation, and ecosystem restoration projects. ASR systems have not been proven to add capacity or increase water supplies. The City of Chesapeake is currently using an ASR well to store treated water for meeting peak demands. The Coastal Plain aquifer system underlies the entire Hampton Roads region and has the capacity to store relatively large amounts of water.

ASR systems inject water that has been treated at a water treatment plant into deep wells to form a "bubble" of treated water underground until it is needed. With ASR systems, it is challenging to predict and manage the water quality impacts of injecting water into the natural groundwater system. The water chemistry of treated water is different than that of natural groundwater, and there is potential for treated water to react with the sediments of the aquifer system. The most common reactions associated with ASR injected water can lead to the dissolution of some metals, most commonly arsenic, manganese, and iron. Comprehensive, project-specific ASR system planning programs are necessary to evaluate the feasibility of such projects and understand and mitigate potential water quality concerns.

Most ASR wells can only withdraw 70% of the amount of water that was injected for storage. Therefore, the yield and cost effectiveness is low considering that all of the injected water must undergo treatment. It would be less costly to store raw water in the aquifer system. However, ASR wells are regulated by the EPA's Underground Injection Control (UIC) program, which is very restrictive. The Safe Drinking Water Act in 1980 established this national program to ensure that the subsurface emplacement of fluids via injection wells does not threaten present and future drinking water sources. The program was originally set up to regulate injections of chemicals used to extract oil and natural gas. The program has not been revised to provide more flexibility for injections of water for storage purposes.

Under the UIC program, EPA regulations provide that "no owner or operator shall construct, operate, maintain, convert, plug, abandon, or conduct any other injection activity in a manner that allows the movement of fluid containing any contaminant into underground sources of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 CFR part 142 or may otherwise adversely affect the health of persons" (40 CFR 144.12). In other words, this requires that water used for ASR injection be potable water or drinking water treated to national Drinking Water Standards. Potable water generally refers to water that is high quality and poses no immediate or long term health risk when consumed.

ASR wells are regulated as Class V injection wells. As such, ASR well owners and operators are required to submit basic inventory information. If the owner or operator submits the inventory information and operates the well in a manner that does not endanger underground sources of drinking water, the well is typically authorized by rule, however, EPA does have authority to require a permit for a Class V well. The UIC program regulates the injection of fluids, not the production or recovery of fluids.

Depending on the type and quality of water injected at an ASR well and/or the local geology, there is increasing potential for endangering the aquifer source. Installing an ASR system requires extensive study of the source water, the geology, and the native groundwater to ensure success. An ASR system planning program should consider the following:

- Pathogens may be introduced into an aquifer if the water injected is not disinfected. The growth of microorganisms within the aquifer could cause decreased water recovery efficiency by clogging the well screen or risks to public health from contamination of the aquifer.
- If water is disinfected prior to injection, disinfection by-products may impact the aquifer.
- Chemical differences between the injected water and water in the receiving aquifer may cause undesirable reactions that are public health risks, such as leaching of arsenic and the formation of radionuclides. Components of the well can also become clogged by carbonate precipitation within the aquifer.
- Injected water has been known to cause the dissolution of metals such as arsenic, manganese, and iron from the surrounding geologic formation, which impacts the water quality the aquifer. In some cases, water injected at ASR wells in brackish aquifers or aquifers with poor quality water has improved the ambient water quality.

Desalination

Currently there are five desalination plants in the Hampton Roads region:

1) Lee Hall Brackish Groundwater Desalting Water Treatment Plant in Newport News,
2) Gloucester Desalination Reverse Osmosis Plant,
3) Five Forks Groundwater Treatment Facility in James City County,
4) Electrodialysis Reversal Plant in Suffolk,
5) Northwest River Water Treatment Plant in Chesapeake.

Each of these plants withdraws either brackish groundwater or surface water and employs some form of desalination. Hampton Roads has many sources of brackish surface water that could be treated with desalination.

Brackish groundwater is a potential water source for desalination. The lower portion of the deepest aquifer in the Coastal Plain system, commonly referred to as the Lower Potomac aquifer, contains brackish groundwater. Few wells withdraw water from this portion of the aquifer system because the water quality is so poor. The James City Service Authority, Chesapeake Public Utilities, and Newport News Waterworks all withdraw brackish groundwater from deep aquifers in the Coastal Plain system and treat the water using reverse osmosis technology. The challenges associated with using brackish groundwater are treatment costs, disposal of the brine (concentrated salts removed from the source water), and impacts to other groundwater users. Significant withdrawals from the lower portions of the Potomac Aquifer could exacerbate saltwater intrusion. Additional research and modeling would be required to estimate impacts.

The Atlantic Ocean, Chesapeake Bay, James River, and York River are surface water bodies that are potential water sources for desalination. Challenges associated with desalination of ocean water or tidally-influenced surface water include disposal of brine and treatment cost. If the salinity of the brine is low, it may be discharged back to the surface water source, contingent upon the evaluation of potential impacts to aquatic life and habitat. Otherwise, alternative disposal methods must be designed. The cost of treatment is dependent on salinity of the source water and pre-treatment requirements, which may be necessary to address seasonal salinity variations associated with tidally-influenced surface waters. Pre-treatment systems may be required to condition the water for the desalination process and to prevent fouling of the reverse osmosis membranes. The viability of desalination plants should be evaluated on a project-specific basis. In some cases, it could be more expensive to desalinate ocean water compared to brackish surface water sources. In other cases, the cost of brine discharge and pre-treatment of certain brackish surface waters may be more than that of ocean water, offsetting the membrane treatment costs for higher salinity waters.

For the Hampton Roads region, desalination treatment systems would generally consist of the following components:

- River intake and conveyance system
- Coagulation and clarification systems
- Filtration with either granular media filters, microfiltration membranes, or ultrafiltration membranes
- Reverse osmosis treatment with ancillary cleaning facilities
- Taste and odor control measures
- Solid residuals handling
- Liquid brine residuals handling
- Finished water storage and high service pumping
- Ancillary chemical facilities

Alternative pretreatment systems could be considered, but would need significant evaluation and testing prior to implementation.

Capital costs for a desalination plant treating brackish surface water could range from $5 to $8 dollars per gallon[1], compared to a conventional surface water treatment plant, with capital costs from $3 to $5 per gallon[1]. Additional costs for the development of an intake and disposal of brine are difficult to generalize and should be estimated on a project-specific basis.

Operating costs for a desalination plant treating brackish surface water could range from $3 per thousand gallon (kgal) to upwards of $5 per kgal, compared to operating costs for a conventional surface water treatment plant, which range from $2 per (kgal) to $4 per kgal.

Alternatives for Decreasing Demands

Conservation

Water Conservation measures are used throughout Hampton Roads to encourage people to change behaviors and habits to reduce water use. Water conservation also includes any beneficial reduction in water losses or waste. Water conservation programs are aimed toward water consumers and can involve technical or financial means and public education programs.

Conservation in the Hampton Roads region supports the reduction of demand for potable water. Conservation technologies are applicable to all of the major demand sectors including residential, commercial, industrial, and agricultural use. Technologies such as low-flow faucets, low-flush toilets, underground irrigation systems and energy and water efficient appliances are utilized in new construction and rehabilitation projects.

Other conservation technologies, while not focusing on reducing demands, but on alternative sources, such as rainwater harvesting and water reuse are subject to site condition requirements and have limited applications. However, these and other "green" technologies are gaining popularity as environmentally sustainable means to effectively reduce demands on publicly-owned CWSs and potable water supplies by incorporating alternative supplies.

The more common water conservation technologies have been widely applied over the last two decades to successfully decrease water use. With federal water efficiency standards for showers, faucets, toilets, and washing machines, water use declined slightly after 1990 nationally and locally. A 2009 report prepared by NNWW for the Newport News City Council in response to a resolution to suspend work on the King William Reservoir project acknowledged a steady increase in customer accounts over 15 years with no significant increase in annual or maximum daily demand since the mid-to-late 1990s (NNWW 2009). In the report's transmittal letter, the acting city manager noted that water demand in NNWW's service area did not increase as was previously predicted, largely due to enhanced conservation by industries, residents, and other customers, and emphasized that area utilities have worked hard to imbue a water conservation ethic in Hampton Roads residents, industries and businesses. It is likely that the initial implementation of conservation measures in residences and industry facilities, as well as the continued application of such technologies in new development projects have decreased demand on the York-James Peninsula such that NNWW has been able to service the increased customer base. As noted in the 2009 report, future demand projections will better characterize the role of conservation as a component of everyday water use and as a demand management tool during drought conditions.

Section 5 of this plan details long-term water demand management practices and outlines the Regional Drought Response and Contingency Plan. Water conservation strategies include efficient water use, reductions in water use, and reductions in water losses. Practices to encourage conservation are summarized by locality in Section 5.

The effectiveness of conservation programs and their demand management strategies should be evaluated through the analysis of

[1] These estimates are Class 5 as defined by the American Association of the Advancement of Cost Engineering International. This level estimate is generally a concept, screening, or feasibility cost estimate.

long-term data including water use by demand sector, water rates, and precipitation. Currently, only limited data is available and use by demand sector cannot be adequately characterized. Also, it is difficult to understand the impact of increasing water rates on customer use and conservation behavior. A preliminary analysis by HRPDC of the historical data available for water use and water rates yielded unrealistic results due to data gaps and variability between locality data. A more thorough and useful analysis could be performed if consistent water use and rate data, disaggregated across demand sectors, becomes available in the future. It is likely that such an analysis would indicate that water use trends for business customers are more sensitive to changes in water rates. The analysis could also indicate sectors and geographic areas where water conservation programs should be refocused or adjusted to further reduce demand, as well as sectors and areas where conservation technologies have likely been optimized to the extent practicable.

The various options for conservation provide a variety of different ways to reduce stresses on existing water sources. Additionally, many of these conservation methods reduce energy use during transportation and treatment of water, have financial benefits, reduce the volume of runoff, and reduce pollutant loads. A financially based strategy using tiered rate increases tied to increased consumption has been implemented in some HRPDC Localities and shown to be effective in reducing overall demand.

Historical demand data shown in Figure 7-1 indicates that demand has decreased. Older localities with stable or decreasing populations experienced demand reductions after plumbing code changes were initiated. Demand lows that appear in the 2003-2004 timeframe reflect drought-related water use restrictions.

The per capita use for the Southside sub-region appears stable in Figure 7-1, indicating that the effect of conservation efforts has reached a steady state. Similarly, the York-James Peninsula has experienced a significant reduction in per capita use since 1990 and use has begun to stabilize. The effects of long term application of water conservation practices in the Hampton Roads region indicates the diminished opportunity to further reduce demand with conservation practices.

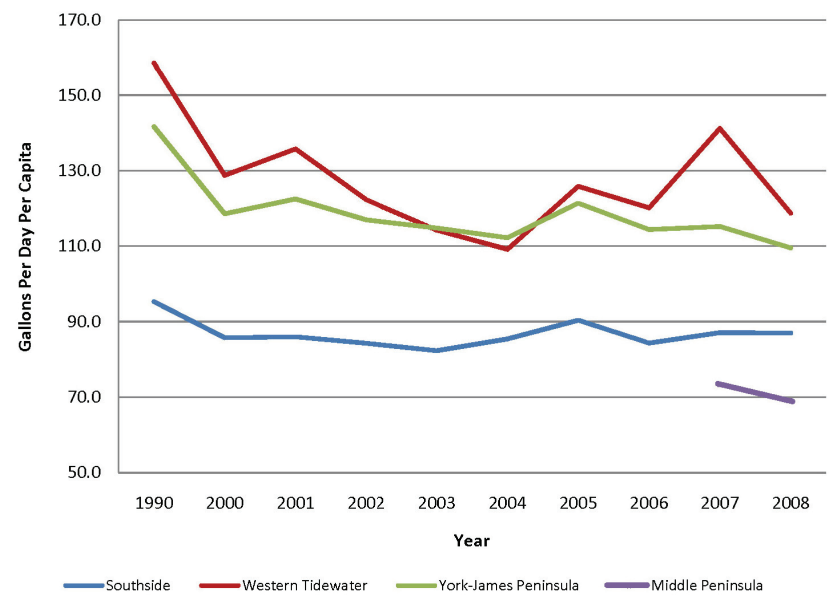

Figure 7-1: Historical demand throughout the Hampton Roads region.
*Note: Historical data for the Middle Peninsula was not available until 2007

Southside - York-James Peninsula Interconnect

As discussed in Section 6, Statement of Need, the water demand of the York-James Peninsula is projected to exceed the upper range of supply prior to 2050. Section 6, Figure 6-4 indicates that the 2050 average demand for the York-James Peninsula is approximately 80 mgd. The 2050 projected available water supply is roughly 75 mgd. Figure 6-3 shows that the Western Tidewater and Southside sub-regions are projected to have approximately 8 mgd of excess water supply in 2050. This excess water could be utilized by the York-James Peninsula to alleviate demand if it could be transported across the James River.

The primary challenge in implementing this alternative is the development of infrastructure to transport water across the James River. The feasibility of this alternative has not been evaluated.

Water Reuse

Water reuse is an alternative that can decrease demands on existing water sources. Two types of reuse can be utilized to alleviate demand in the Hampton Roads region. The first method, direct reuse, utilizes reclaimed water immediately after treatment. Reclaimed water, or treated wastewater, can be safely applied to a variety of non-potable uses including car washing and irrigation of community parks, golf courses, and residential lawns. However, direct water reuse is most cost effective when used for large-scale processes. Industrial and commercial customers are best served by reclaimed water, as reclaimed water can be used for cooling and other water-intensive industrial purposes. For example, the Hampton Roads Sanitation District (HRSD) York River Water Treatment Plant provided up to 0.5 mgd of reclaimed water to Giant's Western Refinery until its closure in 2010.

The second method, indirect reuse, is better suited for wide scale implementation and can be used for more purposes. Two common types of indirect reuse include indirect non-potable reuse and reclaimed water ASR systems. Indirect non-potable reuse mixes reclaimed water into existing freshwater reservoirs; mixing dilutes any microconstituents potentially remaining after treatment. Reclaimed water ASR systems utilize groundwater aquifers instead of surface water impoundments to store reclaimed water. When compared to indirect non-potable reuse, reclaimed water ASR systems have the advantage of not being subject to losses attributable to evapotranspiration. However, as noted earlier, ASR systems typically yield 70% of the injected volume of water.

Current estimates project that demand in Hampton Roads will exceed 250 mgd by the year 2050. This figure does not include large self-supplied users (those with demands greater than 300,000 gallons per month). Water reuse can offset some of the projected demand. In 2009, the total average wastewater discharges from the following wastewater treatment plants was approximately 160 mgd: Army Base, Atlantic, Boat Harbor, Chesapeake-Elizabeth, James River, Virginia Initiative Plant, Williamsburg, and York River. While utilizing the total amount of treated wastewater for reuse is impractical, some amount may be reclaimed and used to reduce demand.

There are many issues associated with water reclamation and reuse. A primary issue discouraging direct water reuse is capital cost. Currently, the cost to produce reclaimed water exceeds the cost to produce potable drinking water from existing sources. Although most wastewater plants can meet Level 2 Virginia Reclaimed Water Standards with minimal improvements, the use of water that meets Level 2 standards is limited to construction, industrial, and agricultural applications. In order to produce water that meets the Level 1 Virginia Reclaimed Water Standards, significant treatment plant retrofits would be required. Level 1 standards are more stringent and water meeting these standards may be applied to any public use.

In addition to increased production costs, reuse applications have additional distribution costs. Transmission lines, separate from potable waterlines, must be installed to serve customers. The cost to install new transmission infrastructure, or convert old or abandoned infrastructure, may be cost prohibitive beyond a 5 to 10 mile radius of treatment facilities. Further research is necessary to determine customers who would be viable candidates for reclaimed water use.

Another important issue is public acceptance. The primary concerns associated with indirect water reuse include the removal of potentially harmful microconstituents and the reduction of nutrient levels to protect public health. According to a customer telephone survey conducted by HRSD in 2009, there is public support for utilizing reclaimed water for the purposes described above.

In 2011, notice of intended regulatory action was issued indicating that the State Water Control Board intends to consider amending the Water Reclamation and Reuse Regulation (9 VAC 25-740) to improve the Board's ability to implement an effective water reclamation and reuse regulatory program. As of May 2011, Advisory Committee meetings had commenced to discuss proposed amendments to the regulation.

System Optimization

Water utilities experience two types of water losses: production losses and unaccounted-for-water (UAW) losses. Production losses are the difference between the amount of raw water withdrawn from a well or reservoir and the amount of treated water leaving a treatment facility. Treatment processes may include backwashing filters or membranes, as well as the water component of brine from ultrafiltration or reverse osmosis systems.

UAW is the difference between the amount of water that leaves a treatment facility and the amount of water that is billed to customers or accounted for with non-billed meters (e.g., fire hydrants). UAW losses include leaks in the distribution system, unmetered water use, and errors in metering. Meters are less accurate if they are not sized appropriately for the volume of water being measured.

Currently, all utilities in the Hampton Roads region report UAW losses below the current AWWA standard of 10-15%. Further reducing the amount of UAW in each sub-region would be an expensive alternative, as system losses are on the low end of the recommended standard. However, reducing UAW would reduce demands to some degree and extend the period over which existing water supplies could meet the regional needs. Most production losses are inherent to the type of treatment process and are unavoidable. Losses might be further reduced with additional maintenance.

Summary

Based on the data presented in the Hampton Roads Regional Water Supply Plan, the Region's water supply is sufficient to meet the needs of the current and projected demand for the next forty years. The existing water sources available to the CWSs in the Southside and Western Tidewater sub-regions and the Middle Peninsula are adequate to meet the current and projected water demands through 2050. The existing water sources available to the CWSs in the York-James Peninsula are not adequate to meet the projected water demands through 2050. The water demand is projected to exceed the available water supply in year 2042, creating an estimated shortage of 5 mgd by 2050.

The appropriateness of applying alternatives to reconcile gaps between demand and supply is to be determined locally. In the long-term, some portions of the Hampton Roads region may require additional water sources to meet future demands and to increase the resiliency of local water systems.

The development of new water sources is challenging. The planning horizon, funding, and the availability of technical resources are major considerations. Priorities and policies may need to be established at the State level to encourage the development of new sources in a safe and efficient manner. Beyond existing regulations, Virginia lacks a program to encourage innovation in water supply development.

Management of water resources is a primary tool for sustaining Virginia's people, environment, economy, and lifestyle. Land use planning and water resource planning are closely linked. Water can be a factor limiting growth and development, and in turn, growth and development can limit and decrease the viability of the resource.

Alternatives should be developed not only to meet future water demands, but also to help ensure the long-term viability of groundwater aquifers and watershed areas. Overall, the Hampton Roads region has adequate water to meet projected demands, but some systems may benefit from the timely exploration of alternatives to ensure that they are prepared to meet unexpected changes in demands or available supplies.

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