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9.0 WATER SOURCE ALTERNATIVES EVALUATION

9.1 Description of Water Source Alternatives

9.1.1 Introduction

Water supply source alternatives have been studied by some members of the MRPDC Region as a part of their individual water supply planning processes. In order to thoroughly assess the water source alternatives for the Region as a whole, potential alternatives were re-evaluated in this Plan. This may include alternatives that individual communities have already eliminated from their plans, as well as alternatives that are currently being implemented. Because this Plan is a living document, future updates to the list of water supply alternatives may include new alternatives that have not been identified in this version of the Plan.

The water source alternatives are broken down by type of alternative, since one particular alternative may benefit more than one of the MRPDC members. The categories of alternatives include the following:

- Groundwater Sources
- Reservoir/Surface Water Impoundments/WTP
- River or Stream Intakes
- Interconnections
- Reuse and Recycling (an alternative to reduce demand)
- Demand Management

Based on Section 8.0, the need for some form of future water supply alternative are limited to Washington County and the Towns of Saltville and Wytheville since these localities are the only localities within the MRPDC Region that are projected to experience a water supply deficit by 2060 or before. Also, although many of the water supply concerns with this region have been implemented either through the building of the New River Regional Water Authority Water Treatment Plant (NRRWA WTP) or the interconnecting of various systems within the region, interconnections and water purchasing are viable options for any locality in this water supply region.

9.1.2 Groundwater Sources

Washington County

Washington County relies on the Mendota Well in the lower Poore Valley for 0.006 MGD and two spring sources, Reservation and Cole Springs for 0.86 MGD and 1.1 MGD respectively. Currently, the County's Mill Creek WTP is capable of producing 2.5 MGD, but the Cole Spring allocation is only 1.1 MGD. If the County increased VDH permitted capacity from Cole Spring, overall capacity would go from 6.5 MGD to 8 MGD, thereby supplying the county with a surplus until 2020, at which time, the County would need to explore other source water options.

Town of Saltville

The Town of Saltville currently maintains two groundwater wells and one spring. The groundwater wells, Cardwell Well and Well No. 10, produce a collective total of 1.04 MGD and Witt Spring produces an additional 0.12 MGD. VDH permitted capacities of the Town's three sources only allows withdrawal of 0.58 MGD, which puts the Town in a deficit. If the Town were to upgrade current VDH withdrawal permits to account for the total of the source design capacities (1.16 MGD), the Town would experience a surplus of 0.27 MGD as well as experience surplus into 2049 at which point, alternative sources of water would need to be explored. It should be noted that this information is based on knowledge associated with actual withdrawals, actual capacities were not provided by the Town.

Town of Wytheville

The Town of Wytheville does not maintain a groundwater source. Water is supplied to the Town by the New River Regional Water Authority (NRRWA) WTP as described in Section 9.1.3; therefore, the Town would likely require additional purchase of water from the NRRWA WTP by the year 2040.

9.1.3 Reservoir/WTP Alternatives:

Regional WTP at Austinville Site

This 12 MGD regional WTP was recommended as a water supply alternative in the July 2000 New River Regional Water Study and serves the Counties of Carroll, Grayson and Wythe, the City of Galax and the Towns of Fries, Hillsville, Independence and Wytheville. The WTP pumps water to a regional tank at Austinville. Water is moved north from the Austinville tank to a regional tank near Fort Chiswell using a 24-inch main and pump station located along Route 52. Another pump station located near the eastern Wytheville corporate limits moves water from the Fort Chiswell tank to the existing Wytheville low level tank. Water is moved south and west from the Austinville tank to a regional tank near Poplar Camp using a 24-inch main and pump station located near Austinville. A pump station located near Poplar Camp moves water from the Poplar Camp tank to the Route 620 tank. The level in the Route 620 tank is adequate to serve the Carroll, Galax and Grayson areas. The connection for Hillsville is located on Route 58 at the western corporate limits. The connection for Galax is on Route 58 at the eastern corporate limits. Also, a regional tank located near Hickory Flat floats with the Route 620 tank. Fries is served by the Hickory Flat tank using a 12-inch main. A pump station near the Independence eastern corporate limits moves water from Hickory Flat to the Independence low level tank.

9.1.4 River or Stream Intake Alternatives

New River Intake

In the Galax area, the New River maintains a safe yield of approximately 187 MGD as defined by VDH. For the Counties of Carroll, Grayson and Wythe, the City of Galax and the Towns of Fries, Hillsville, Independence and Wytheville the New River provides the necessary capacity due to the construction of the WTP at the Austinville site.

9.1.5 Interconnection Alternatives

Washington County – Interconnection with City of Bristol

Washington County relies on an interconnection with the City of Bristol to offset their current deficit of 0.60 MGD. Washington County also purchases a very small amount of water from the Town of Saltville, and has a joint plant operation at the Mill Creek WTP with the Town of Chilhowie, but relies mostly on the City of Bristol to cover their deficit. Bristol currently maintains a surplus of approximately 6.25 MGD and will maintain a surplus of approximately 4.00 MGD by 2060 as discussed in Section 8.0 of this report. If Washington County increases VDH permitted capacities to design capacities, and continues to maintain a purchase agreement with the City of Bristol to make up the deficit, then the Bristol interconnection with Washington County will serve the County into 2060, with a collective surplus between the County and the City of Bristol of 0.70 MGD. If VDH permitted capacity increases are not allowed, then the county would need to investigate additional means of water source supply by 2044.

9.1.6 Reuse and Recycling

A current trend in reducing potable water demands includes the reuse of treated wastewater effluent for non-potable uses, such as irrigation and industrial process water. In the MRPDC, various treatment plants exist which treat a large portion of the wastewater from the surrounding communities. Conceptually it makes sense to utilize the treated effluent from these WWTPs at local facilities. To date, the opportunities to utilize effluent have been very limited. It will be beneficial to explore future opportunities, since the use of effluent can offset the need to expand water source, treatment or distribution facilities.

9.1.7 Water Demand Management

Water conservation is the conscious effort by a utility, business or individual to save water. Every gallon of water not used is one less to be stored, treated, and distributed. It also may represent one less gallon that must be heated for washing or bathing, thus saving energy costs, or one less gallon of water that must pass through some form of wastewater treatment before it is returned to the environment. Normal conservation practices can provide long-term benefits by permanently reducing water demands during normal operating conditions.

As discussed in Section 6.0, the MRPDC members have adopted numerous water conservation measures, including the following:

- Adjustment of standard operating procedures to improve water conservation;

- Installation of low-flow and/or no-flow fixtures in their facilities and/or government buildings and facilities;
- Provided "yard taps" to their customers for purchase, so that customers can track their outdoor water use;
- Implementation of educational programs to address water conservation through reduction of use;
- Water conservation rate structures that encourage reduction of water use by increasing water rates with increasing water usage;
- Incentive programs to customers that retrofit or replace older fixtures and appliances to reduce water use;
- Leak detection and repair programs with regularly scheduled water audits;
- Replacement of aging water distribution pipes; and
- Implementation of practices or policies to track unauthorized connections.

Greater water conservation in the region could be achieved if all of the MRPDC members implemented the measures listed above, as well as other water conservation measures, such as "smart" irrigation systems, outdoor water use allocation calculations (to support a conservation rate structure), informative billing, or a new ordinance with outdoor use provisions.

9.2 Evaluation of Alternatives

9.2.1 Overview of Screening Criteria

This section describes the methods used to evaluate potential water source alternatives for the MRPDC members. Each water supply alternative has the potential to provide some public water supply benefit for one or multiple MRPDC members; therefore, each alternative was evaluated with respect to the following feasibility or practicability criteria:

- Applicability – determine the degree to which the alternatives match the local and regional needs of the members
- Safe Yield or Reliable Capacity – look for some measure of the maximum quantity of water that may be withdrawn throughout a critical dry period without depleting the source. Reliable capacity may refer to the potential WTP capacity or the capacity of a piped interconnection between communities.
- Potential Environmental Impacts – assessment of alternatives on the basis of general environmental suitability.
- Potential Human Impacts – stakeholder satisfaction is often very important for the viability of an alternative. Human impacts such as land acquisition or easements, traffic impacts, etc. factor into the screening criterion.
- Relative Cost – alternatives may be economically infeasible if they are too costly to implement relative to other options.

- Availability – some alternatives may have legal, regulatory or institutional issues that could severely delay or even prevent implementation.

Alternatives were rated as "good", "fair", or "poor" for each of the criteria. Alternatives could be eliminated from further consideration if a fatal flaw was recognized with respect to any one of the criterion. Remaining practicable alternatives were then carried forward for comparison against each other based on the aforementioned criteria.

As discussed in the Section 8.0, not all of the MRPDC members are projected to experience a water supply deficit by the end of the planning horizon. The region as a whole is projected to have a surplus of approximately 5.52 MGD (2016 MG/year) in 2060. Based on existing PWS capacities and projected 2060 demands, the following members are projected to experience a water supply deficit sometime within the planning horizon:

- Washington County (2060 deficit = 4.68 MGD)
- Town of Saltville (2060 deficit = 0.67 MGD)
- Town of Wytheville (2060 deficit = 0.83 MGD)

The deficits for localities will occur at various times between now (2009) and 2060. The following sections highlight the alternatives that scored the best and worst under each screening criterion, and the reasons for those rankings. A summary of the top-ranked alternatives and the current status of these projects is also presented.

9.2.2 Applicability

Lowest Rated Alternatives

Alternatives received a "poor" rating for the applicability criterion if the alternative does not meet the needs of the member, or would not be needed at the time that it is planned for implementation because other options will provide necessary water supply needs. The following alternatives were not eliminated from consideration, but received "poor" applicability ratings:

- Groundwater Development Projects – because these alternatives are not easily defined for capacity before project construction work starts, the value of the projects in meeting the water demands of the region cannot be well defined as the project is being evaluated. However, with a high probability of locating groundwater in certain areas, the development of wells is often lower cost than surface water supply

development. In general, the applicability of groundwater projects would be for local service only (one jurisdiction).

Highest Rated Alternatives

Water source alternatives received "good" ratings for applicability because they met the needs of the community that they would benefit, or it was applicable for more than one community:

- Regional WTP at Austinville – The regional WTP at the Austinville site has taken care of many supply issues with various localities to include the Counties of Carroll, Grayson and Wythe, the City of Galax and the Towns of Fries, Hillsville, Independence and Wytheville.
- Washington County Interconnection with City of Bristol – the interconnection between the City of Bristol and Washington County currently provides Washington County with the surplus water that it requires to make up the 0.60 MGD deficit.
- Increase VDH Permitted Capacities – Increased VDH permitted capacities would improve supply conditions at all three localities projected to experience a deficit.

9.2.3 Safe Yield or Reliable Capacity

Lowest Rated Alternatives

One alternative received a "poor" rating for safe yield or reliable capacity:

- Groundwater Development Projects – because these alternatives are not easily defined for capacity before project construction work starts, the value of the projects in meeting the water demands of the region cannot be well defined as the project is being evaluated. However, with a high probability of locating groundwater in certain areas, the development of wells is often lower cost than surface water supply development. In general, the applicability of groundwater projects would be for local service only (one jurisdiction).

Highest Rated Alternatives

Several of the water source alternatives received "good" ratings for safe yield or reliable capacity. An alternative received a "good" rating if the source met most or all of the needs of the benefitting community (or communities) and/or if the alternative provides a new source of supply to supplement an existing source, which provides additional reliability to a community's PWS. The following alternatives received a "good" rating for Safe Yield or Reliable Capacity:

- Regional WTP at Austinville – The regional WTP at the Austinville site obtains its water from the New River, with an allowable source withdrawal capacity of >150 MGD.

- Washington County Interconnection with City of Bristol – the interconnection between the City of Bristol and Washington County currently provides Washington County with a reliable water source and sufficient capacity. The source also has enough capacity at current operations to provide Washington County with sufficient source supply until 2044 and still maintain City of Bristol demand.
- Increase VDH Permitted Capacities – Increased VDH permitted capacities would improve supply conditions at all three localities projected to experience a deficit.

9.2.4 Environmental Impacts

Lowest Rated Alternatives

An alternative was rated "major" with regards to its environmental impacts if it would substantially impact wetlands, streams, or other environmental factors. While many of the alternatives have not been specifically assessed for environmental impacts, conceptual level evaluations resulted in the following alternatives receiving "major" ratings:

- Interbasin Transfer Projects – Any projects that take water from one basin and introduce it to another basin may cause minor environmental concerns or introduce political and legal challenges. These projects would have to be evaluated on a case by case basis.

Highest Rated Alternatives

Several of the water source alternatives received "minor" ratings for the environmental impacts criterion. An alternative received a "minor" rating if the planned project did not involve substantial impacts to wetlands, streams or other environmental resources. The following alternatives received a "minor" rating for environmental impacts:

- Regional WTP at Austinville – The regional WTP at the Austinville requires very little environmental impact since the WTP is along the New River. The WTP provides water for seven localities.
- Washington County Interconnection with City of Bristol – the interconnection between the City of Bristol and Washington County requires no major environmental impact.
- Increase VDH Permitted Capacities – Increased VDH permitted capacities would slightly affect environmental regulation of source withdrawals and would need to be reviewed to ensure continued compliance with source supply needs.

9.2.5 Human Impacts

Lowest Rated Alternatives

An alternative was rated "major" with regards to its human impacts if it would require land acquisition, excessive easements or other impacts to the public. Conceptual level evaluations resulted in the following alternatives receiving "major" ratings:

- None Noted.

Highest Rated Alternatives

Several of the water source alternatives received "minor" ratings for the human impacts criterion. An alternative received a "minor" rating if the planned project did not require land acquisition or excessive easements. The following alternatives received a "minor" rating for human impacts:

- Virtually All – Most of the project work considered in this study is free of significant human impact.

9.2.6 Relative Cost

Most of the alternatives that were evaluated for the Plan have already been implemented in the past. Costs for the New River Regional WTP were estimated to be >$50M in 2000. Costs associated with Washington County continuing to purchase water from the City of Bristol are ongoing and minimal.

9.2.7 Availability

Lowest Rated Alternatives

Alternatives received a "poor" rating if there were legal, regulatory or institutional issues that could severely delay or even prevent implementation. The following alternatives received a "poor" rating with regards to availability of the project:

- Intake Installation Projects – Where a new intake is to be placed in a river or reservoir, permitting will be an issue. In most cases, the justification for a new intake will allow the permit to be obtained.

- Interbasin Transfer Projects – Where there will be interbasin transfers of water, regulatory obstacles may become a problem. If the transfer is significant enough, there may be no means to overcome the regulatory requirements and permits may not be available.
- Increase VDH Permitted Capacities – Increased VDH permitted capacities would improve supply conditions at all three localities, but would likely require a significant amount of permitting and could involve significant delay.

Highest Rated Alternatives

Alternatives received a "good" rating if minimal permitting would be required, and there was political and stakeholder support of the project. Many alternatives received a "fair" rating for this criterion because the project would require one or more minor permits that are not expected to delay implementation. The following alternatives received a "good" rating with regards to availability of the project:

- Regional WTP at Austinville – The regional WTP at the Austinville site has already been built and permitted, and will be able to provide enough water to the Town of Wytheville in the future.
- Washington County Interconnection with City of Bristol – the interconnection between the City of Bristol and Washington County currently provides Washington County with the surplus water that it requires to make up the 0.60 MGD deficit, requires no permitting and would expect no delays to implement.

9.2.8 Summary of Evaluation

Alternatives were compared using the criteria described above, and were compared to each other to determine the short list of water source options that would satisfy the needs of the MRPDC member (or members) with the least environmental and human impacts.

The following water source alternatives are recommended to satisfy the future demands of the MRPDC members:

Washington County

Maintain the continued interconnection with the City of Bristol and attempt to revise/upgrade VDH permitted capacities. The City of Bristol provides enough water to Washington County to make up the current 0.60 MGD deficit of water. Based on City of Bristol current demand projections, if Washington County continues to purchase water from the City of Bristol, Bristol's 10.00 MGD WTP will be able to sustain Washington County with surplus water until 2044. If

Washington County increases VDH permitted capacities and continues to purchase water from the City of Bristol, capacity for both locations will last through 2060 and beyond.

Town of Saltville

Upgrade current VDH withdrawal permits to account for the total of the source design capacities (1.16 MGD), the Town would currently experience a surplus of 0.27 MGD as well as experience surplus into 2049 at which point, alternative sources of water would need to be explored. It should be noted that this information is based on knowledge associated with actual withdrawals, actual capacities were not provided by the Town. It is possible that the Town of Saltville may currently and into the future have sufficient capacity.

Town of Wytheville

The Town of Wytheville is currently supplied 4.00 MGD of capacity from the New River Regional Water Authority WTP. Provided the Town continues to obtain water from the NRRWA, the Town will have sufficient capacity into 2041, at which point alternative sources of water would need to be explored and may include additional purchase from the NRRWA or request additional capacity from VDH.

9.3 Description of Water Source Alternatives for the Cumberland Plateau

9.3.1 Introduction

In the Cumberland Plateau Regional Planning Area, existing water sources are projected to be inadequate to meet demand at the end of the planning period (2040) for Russell County. The Russell County water supply is projected to be inadequate in the Castlewood Water and Sewer Authority (CWSA) service area and also in the Belfast/Rosedale water system and proposed waterline extensions operated by the Russell County PSA which are supplied water treated at the Tazewell County PSA's Claypool Hill WTP.

Two basic approaches are considered for addressing source water inadequacies. The quantities required can be reduced through a reduction in unaccounted-for water losses beyond the amount included in the projections, and additional sources can be supplied. Additional sources may supplement existing sources with potable water from adjacent water systems, or new sources

could be developed. The amount of treatment required for new sources is site specific. These approaches are presented in turn for each of the localities projected to have inadequate water sources at the end of the planning period.

Potential Water Savings from Water Demand Management Actions

Water demand management includes conservation activities, reuse of water, and reducing unaccounted-for water losses in existing systems. Conservation activities in place at the beginning of the planning period include rates that are higher than state averages and adoption of building codes addressing water fixture consumption. Additional conservation activities were not projected to reduce water demand during the planning period.

Reuse of water is not projected to reduce water demand during the planning period. Virginia regulations (12 VAC 5-590-820) require that preference is given to the best available sources of supply which present minimal risks of contamination from wastewaters and which contain a minimum of impurities that may be hazardous to health. For potable water applications in the planning area, reuse would not provide the best available source of supply.

Reduction of unaccounted-for water losses was included in water demand projections through the planning period. Each system for which existing water sources are projected to be inadequate by end of the planning period was projected to have unaccounted-for water losses less than or equal to 30 percent. The annual volume of water demand reduction for CWSA due to reduced unaccounted-for water losses is projected to be 41.5 million gallons in 2040.

Potential Alternatives for New Supplies

Both nontraditional alternatives and traditional alternatives are considered as ways to increase the volume of water to systems projected to have inadequate water supply at the end of the planning period. The primary nontraditional alternative considered is interconnection between water systems. Desalination is not practical for the planning area. Traditional alternatives include groundwater, stream intakes, and surface water impoundments.

Potential Alternatives for CWSA Water System

Interconnections

Two (2) interconnections with the CWSA water system are considered as alternatives. The first is an existing interconnection with the St. Paul water system. The St. Paul WTP withdraws water from the Clinch River for treatment in the 0.5 MGD production capacity WTP. CWSA has an agreement with the Town of St. Paul to purchase up to 0.129 MGD. The Town uses approximately 0.2 MGD within the Town's service area.

A second interconnection could be made with the Russell County PSA's Swords Creek water system. This interconnection is dependent upon construction of the Big A Mountain to Back Valley Interconnection project, a project that has been funded. The interconnection will connect the CWSA and PSA systems. A tank will be installed to float with the existing Red Oak and Blue Devil tanks. Future installation of a pump station would enable water to be returned from the CWSA system into the PSA system to address short-term water demand issues.

Additional water capacity could be provided from the Town of Honaker water system. The Town has considered development of additional groundwater sources (wells) to address potential capacity demands through the PSA system. The Town's four wells produce 160 gpm, and a supplemental flow of 50 gpm from additional wells is a conservative approximation.

Groundwater

The CWSA's Seven Springs Well #03 has a permitted capacity of 110 gpm. However, this source is under the direct influence of surface water and exceeds the secondary limits for iron and manganese and is not in service. Additional testing of sequestering agent would indicate if this source could be purified through membrane filters. Potential site of treatment is the Seven Springs WTP. During the course of additional testing as the well water has been pumped, the levels of iron and manganese in the source water have decreased. This trend may obviate the need for sequestration prior to treatment.

Additional groundwater sources near the Seven Springs WTP are the Hart/Dickenson Spring and the Trig Moore Spring. Both would require treatment. If used as a source, additional treatment capacity at the Seven Springs WTP could be doubled with the addition of three (3) more filter skids (at 45 gpm each). Existing skids can be rated at 45 gpm, as well.

Stream Intake

The CWSA operates two (2) membrane filtration WTPs. This technology is not used for surface water application, so a surface water treatment plant would have to be constructed in order to utilize a stream intake. This would result in a cost that greatly exceeds other alternatives. In addition, permitting a new raw water intake on the Clinch River would be difficult.

Surface Water Impoundment

A surface water impoundment would have significant challenges, including both regulatory aspects (permitting) and financial aspects (constructing). In addition, a water treatment facility would likely be required to treat water from the impoundment. This alternative is the lowest priority alternative to meet the needs of the CWSA. In perspective of the other alternatives, a surface water impoundment is not feasible.

CWSA Alternative Analysis

To meet demand in 2020, an additional source capacity of 176 gpm is required. This may be addressed through development of the three (3) groundwater sources noted in the "Groundwater" section above, plus the interconnection with Russell County PSA through the proposed Big A Mountain to Back Valley project, for which the Town of Honaker could develop additional groundwater sources. The capacity limitation of 0.129 MGD through the St. Paul interconnection could be revisited to determine if additional capacity could be obtained. A collection of some or all of the different alternatives should provide sufficient source water to meet the CWSA peak water demand in 2020 and the reduced projected water demand at the end of the planning period in 2040.

Potential Alternatives for Russell County PSA Water System Extensions

Interconnections

The PSA's Belfast/Rosedale water system and proposed system extensions are interconnected with the Tazewell County PSA's Claypool Hill water system and are supplied water produced at the Claypool Hill WTP.

An interconnection with the CWSA system has been described in the section above. In order for water to be transferred back into the PSA system, installation of a pump would be required. Interconnection with the Town of Honaker system would supplement the water available to the PSA. The magnitude of this source would be increased if the Town is able to develop additional wells.

The PSA is investigating a potential interconnection on U.S. Route 19/58 with the Washington County Service Authority. Funding has been requested for a preliminary engineering study of this interconnection.

Groundwater

Groundwater sources may not be viable portions of the Belfast/Rosedale system, due to geology similar to that of the Claypool Hill water system. An alternative water source study performed in 2005 in the Claypool Hill system area indicated that groundwater was not a viable option, due to the depth of the water bearing zone and the production of very fine sands. The study concluded that groundwater is not a viable option.

Existing groundwater sources, such as the Town of Honaker's referred above in the "Interconnections" section, may supplement the existing supply, but are not sufficient to meet the additional demand.

Stream Intake

In order to utilize a stream intake, a surface water treatment plant would have to be constructed. This would result in a cost that greatly exceeds other alternatives. Increasing capacity of the existing Claypool Hill WTP would be much more cost effective. The Claypool Hill WTP receives raw water withdrawn from the Little River.

A 2005 safe yield study of 44 years of data from the gage at the Clinch River at Richlands for its 137 square mile basin determined a safe yield of 0.07 cfs per square mile, based on one day, 30-year low flow. For the 82 square mile Little River basin this extrapolates to 5.8 cfs (3.8 MGD or 2,600 gpm). The existing intake on the Little River is permitted for 1.0 MGD.

A new stream intake could be constructed on the Clinch River. However, this would be much more costly than modifying the existing Little River intake. Regulatory approval of a new intake on the Clinch River could be difficult and time consuming to obtain. Increasing existing treatment capacity is less expensive than building a new WTP.

Surface Water Impoundment

A surface water impoundment would have significant challenges, including both regulatory aspects (permitting) and financial aspects (constructing). In addition, a water treatment facility would likely be required to treat water from the impoundment. This alternative is the lowest priority alternative to meet the needs of the PSA's system. In perspective with the other alternatives, a surface water impoundment is not feasible.

Russell County PSA Waterline Extensions Alternative Analysis

Increasing available potable water through an interconnection with the Claypool Hill WTP is the most attractive alternative. A surface impoundment or stream intake with associated treatment facilities would be expensive and require extensive permitting. Groundwater sources are not reliable. The Claypool Hill WTP intake capacity would need to be increased.

Improving Reliability of Water Supplies Throughout the Planning Area

The ability of the water providers in the Cumberland Plateau Regional Planning Area is dependent on managing water demand through reduction of unaccounted-for water losses throughout the planning period. Every system was projected to have reduced unaccounted-for water losses to a maximum of thirty percent (30%).

Although seventy-five percent of the community water systems in the Cumberland Plateau Regional Planning Area currently achieve this level of water demand management, it is vitally

important for each system to annually review its capital improvement program and fund necessary projects. Those systems with unaccounted-for water losses greater than thirty percent will not reduce water demand to acceptable levels without replacement of leaking water transmission lines. Funding of water line replacement and rehabilitation is the critical need to reduce water losses.

The main water transmission lines that convey potable water from the John Flannagan WTP to the Buchanan County PSA and Town of Clintwood water systems is in need of replacement. This potable water is subsequently conveyed to more than a dozen water systems in the planning area. Replacement or rehabilitation of these lines is essential to provide water service to a large portion of the planning area.

Although there is no substitute for conveying water from the John Flannagan WTP, the cost of a replacement/rehabilitation project is estimated to be $36 million. One supplemental approach prior to and during the transmission line project is treatment of groundwater by membrane filtration at select locations. For example, a 2009 study indicated that the safe yield of a discharge from an abandoned mine in Buchanan County, near Harmon, is 250 gpm. The safe yield was calculated based on correlation with the one-day, thirty year flow determined at nearby Levisa Fork River gaging station. This type of groundwater source does not have resource issues typically associated with surface water withdrawals. Further availability of the Harmon source is on hold at this time due to recent mining activities in this area. The Buchanan County PSA will continue to monitor water flow and conduct annual chemical testing of water quality during the life of the mining activities, which is estimated to be six to seven years.

9.4 Description of Water Source Alternatives for LENOWISCO

9.4.1 Introduction

In the LENOWISCO Planning Area, existing water sources are projected to be adequate to meet demand at the end of the planning period (2040) for Lee County, Scott County, Wise County, the City of Norton, and the Towns of Appalachia, Big Stone Gap, Clinchport, Coeburn, Dungannon, Gate City, Jonesville, Nickelsville, Pennington Gap, Pound, St. Paul, and Wise.

Significance of Reducing Unaccounted for Water Losses

The ability of the water providers in the LENOWISCO Planning Area is dependent on managing water demand through reduction of unaccounted for water losses throughout the planning period. Every system was projected to have reduced unaccounted for water losses to a maximum of thirty percent (30%). It is vitally important for each system to annually review its capital improvement program and fund necessary projects. Funding of water line replacement and rehabilitation is the critical need to reduce water losses in the planning area.

Water System Reliability Improvement through Interconnections and Improvements

A number of interconnections between water systems in the LENOWISCO Regional Planning Area are in place and greatly improve the reliability of those systems in the event of a disruption within a particular water system. The disruption may be short-term, due to power outage, or may be long-term, which could occur due to alteration of quality or quantity of an existing water source. In order to strengthen the reliability of other water systems in the planning area, additional system improvements and interconnections between water systems are recommended. These interconnections and improvements will provide water suppliers with auxiliary source(s) of finished water for distribution.

The proposed improvements and interconnections are identified below. Specific benefits and costs would be developed as opportunities occur.

- Interconnection between Appalachia system and Big Stone Gap system
- Interconnection between Appalachia system and Norton system
- Interconnection between Dungannon system and Nickelsville system
- Interconnection between Dungannon system and Scott County Public Service Authority (SCPSA) Ft. Blackmore system
- Interconnection between Dungannon system and the Castlewood Water and Sewage Authority's Mew Road system
- Interconnection between SCPSA system and City of Kingsport, TN system
- Interconnection between SCPSA Daniel Boone system with SCPSA Natural Tunnel system (requiring a bore under Clinch River)
- Interconnection between SCPSA system and the Bloomingdale, TN, Utility District system (requiring a bore under Holston River at Wadlow Gap)
- Interconnection between SCPSA Cove Creek system and Washington County Service Authority's Mendota system

The SCPSA could evaluate the benefit of drilling additional wells to strengthen the raw water supply to the Duffield Water Treatment Plant.