FINAL REPORT

Maury County Regional Water Supply Feasibility Study







Tennessee Duck River Development Agency

April 17, 2014

O'BRIEN & GERE

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GLOSSARY OF TERMS

ARAP	Aquatic Resource Alteration Permit
BCUD	Bedford County Utility District
CBER	Center for Business and Economic Research (at University of Tennessee)
CIP	Capital Improvements Program
CPWS	Columbia Power & Water Systems
CWA	Clean Water Act
D/DBP	Disinfectants/Disinfection Byproducts
DRA	Tennessee Duck River Development Agency
DRUC	Duck River Utility Commission
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
fps	Feet per Second
FY	Fiscal Year
gpm	Gallons per Minute
HAAs	Haloacetic Acids
IESWTR	Interim Enhanced Surface Water Treatment Rule
L	Liter
MC	Maury County
MCL	Maximum Contaminant Level
MG	Million Gallons
mgd	Million Gallons per Day
mg/L	Milligrams per Liter
NEPA	National Environmental Policy Act
psi	Pounds per Square Inch
SDWA	Safe Drinking Water Act
SRF	State Revolving Fund
SWTR	Surface Water Treatment Rule
TDEC-DWR	Tennessee Department of Environment and Conservation – Division of Water Resources
THMs	Trihalomethanes
TNC	The Nature Conservancy
TWRA	Tennessee Wildlife Resources Agency
TVA	Tennessee Valley Authority
µg/L	Micrograms per Liter
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEDA	U.S. Economic Development Administration
USEPA	U.S. Environmental Protection Agency

USFWS	U.S. Fish & Wildlife Service
USGS	U.S. Geological Survey
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
7Q10	Seven-day Consecutive Low Flow with a Recurrence Interval of Ten Years

ACKNOWLEDGEMENTS

The Tennessee Duck River Development Agency (DRA) acknowledges the following for their participation in this effort:

Water Utilities

Columbia Power & Water Systems

City of Spring Hill

City of Mt. Pleasant

Maury County Water System

Strategic Team

O'Brien & Gere

Water Utility Representatives

Dempsey, Dilling & Associates, P.C.

Heathcoat & Davis, Inc.

SECTION 1 – INTRODUCTION AND BACKGROUND

1.1. PURPOSE

The purpose of the Tennessee Duck River Development Agency's (DRA) Maury County Regional Water Supply Feasibility Study (MC Feasibility Study) includes the following:

- Assess the feasibility, benefits, technical and environmental studies, and permit requirements associated with constructing a new regional water treatment plant (WTP) and associated facilities versus constructing a new raw water pipeline to the existing Columbia Power & Water Systems (CPWS) WTP.
- Provide water utilities with information needed to make sound decisions on the technical, environmental and economic benefits of future investments in regional water infrastructure in Maury County.
- Identify what work needs to be done and who will pay for it.

The MC Feasibility Study addresses one of the five recommended water supply alternatives in the DRA's Comprehensive Regional Water Supply Plan (March 2011).

1.2. SCOPE OF SERVICES

In November 2012, O'Brien & Gere and DRA initiated the MC Feasibility Study based on the following Scope of Services:

- Prepare a feasibility study for Maury County which identifies the general location, size and timing of water facilities (i.e., water supply source; raw water intake, pumping and pipelines; water treatment; finished water pumping, pipelines; etc.) in order to assess the feasibility and benefits of constructing a regional water treatment plant and associated facilities.
- Compare feasibility and benefits of new regional water facilities with new water facilities needed to deliver raw water to the existing CPWS WTP.
- Identify technical and environmental studies and permit requirements for alternatives.
- Attend meetings to present findings and solicit input from stakeholders.
- Prepare draft and final reports.

The process used for conducting the DRA's MC Feasibility Study followed a "work session" approach similar to the one used in the DRA's Comprehensive Regional Water Supply Plan. Individual meetings with each water utility were conducted to collect and discuss data and findings.

1.3. PARTICIPANTS IN THE MAURY COUNTY FEASIBILITY STUDY

At the outset of the DRA's MC Feasibility Study, DRA assembled the following personnel to assist with development of the study (Table 1).

Table 1. Participants in the Duck River Agency's MC Feasibility Study

Participant	Entity
Doug Murphy	Duck River Agency
George Rest	O'Brien & Gere
Thomas Dumm	O'Brien & Gere
Caryl Giles	City of Spring Hill

Participant	Entity
Wes Kelley	Columbia Power & Water Systems
Kelly Powell	Columbia Power & Water Systems
Larry Chunn	Maury County Water System
Glen Stewart	Maury County Water System
Darrell Dean	City of Mt. Pleasant
Alton Heatchcoat	Heathcoat & Davis representing Mt. Pleasant and MCWS
Ricky Oakley	Heathcoat & Davis representing Mt. Pleasant and MCWS
Jerome Dempsey	Dempsey, Dilling & Associates representing Spring Hill

1.4. BACKGROUND FOR MAURY COUNTY REGIONAL WATER SUPPLY FEASIBILITY STUDY

This study, Maury County Regional Water Supply Feasibility Study, is aimed at determining whether future water withdrawals from the Duck River near Williamsport should be treated at a new regional WTP or at existing water treatment plants. In the Duck River Agency's Comprehensive Regional Water Supply Plan (March 2011), a list of 40 potential water supply alternatives was reduced to 26 unique alternatives which were considered worthy of further consideration. These alternatives were developed to meet a 2060 potential deficit of up to 32 mgd which equates to 1.4 BG at Columbia for the users of the Duck River between Shelbyville and Columbia. Alternatives included a wide array of non-structural and structural measures such as:

- Implementing additional water use efficiency measures
- Implementing a regional drought management plan
- Changing operation of Normandy Reservoir
- Modifying river constraints
- Raising Normandy Dam
- Constructing tributary reservoirs (Fountain Creek Reservoir)
- Building offstream storage reservoirs (pumped storage)
- Utilizing quarries
- Constructing pipelines from reservoirs, rivers or other water systems

A summary matrix was developed which described each of the alternatives and documented key aspects of the alternative related to seven criteria: reliable capacity, raw water quality, cost, implementability (permitting), flexibility (phasing), environmental benefits, and recreation. During public work sessions with stakeholders, the alternatives were discussed and sorted into four categories:

- Baseline (water use efficiency, drought management, etc.)
- Fatally Flawed or Highly Unlikely (unreliable, permitting obstacles, etc.)
- Backup (alternative which may be suitable for implementation with a cornerstone alternative)
- Cornerstone (alternatives capable of satisfying entire river deficit in 2060)

Using the evaluation criteria and working closely with the stakeholders, a reliable, diverse, and flexible portfolio of water supply alternatives was developed which included the following non-structural and structural components shown in Figure 1:

- **Non-Structural Components:**
  - **Drought Management Plan –** Develop and implement a regional drought management plan.

- **Water Use Efficiency Program –** Develop and implement a water use efficiency program.
- **Optimize Normandy Reservoir Releases –** Optimize releases from Normandy Reservoir to preserve water in storage in the reservoir for periods when it is most needed.

- **Structural Components**
  - **Normandy Reservoir Capacity Improvements –** Increase the elevation of Normandy Dam by five feet and increase the Winter/Spring pool elevation by approximately five feet (i.e., 864 feet to 869 feet) without increasing the Summer/Fall pool elevation (i.e., 875 feet). This component increases water in storage during droughts, enhances flood protection while minimizing environmental impacts relative to other alternatives, and enhances the reliable yield available for all Duck River uses.

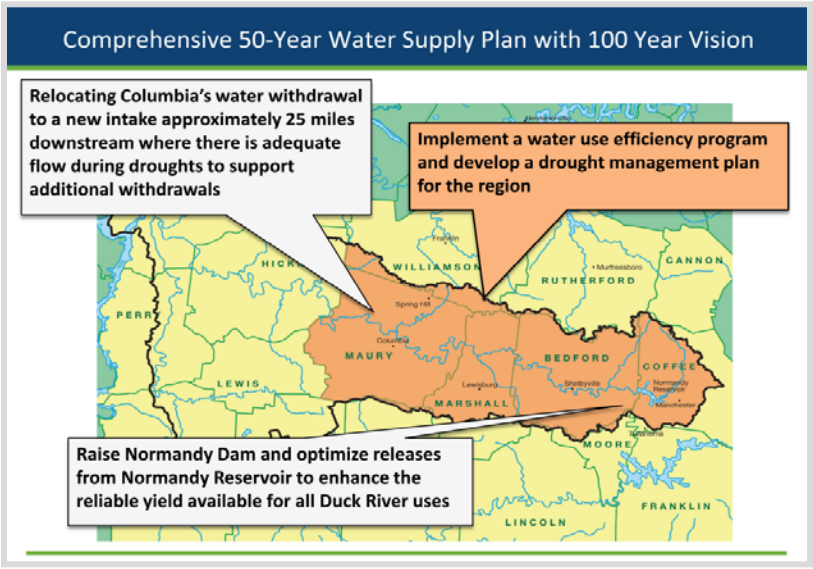

Figure 1. Recommended alternatives

  - **New intake on the Duck River for Columbia Power & Water Systems –** Relocate water withdrawals for a portion of Maury County customers to a new intake approximately 25 miles downstream, near Williamsport, where there is adequate flow in the river during droughts to satisfy Maury County's projected needs. This component addresses the potential deficit in Maury County and southern Williamson County with a local, highly reliable supply and will eliminate their sole reliance on Normandy Reservoir during a severe drought.

The Duck River Agency is conducting investigations and developing implementation plans for the recommended alternatives.

SECTION 2 – WATER SUPPLY CHARACTERISTICS

2.1. OVERVIEW OF WATER SUPPLY CHARACTERISTICS

The Duck River Agency represents seven water utilities which serve approximately 250,000 people and industries that include car manufacturers, food processing plants, and other businesses utilizing water for production. In addition to public water supply needs, the river provides a wide range of other values including recreation, an excellent fishery, and some of the most biologically-rich freshwater habitat in North America.

Portions of the Duck River have been impounded since the mid-1800s. Currently, there are four low head dams located on the Duck River which were constructed in the early 1900s:

- Cortner Mill near Normandy (drainage area = 214 square miles at approximately Duck River Mile 245.1)
- Shelbyville (drainage area = 425 square miles at Duck River Mile 221.4)
- Lillard Mill near Milltown (drainage area = 919 square miles at Duck River Mile 179.2)
- Columbia (drainage area = 1,206 square miles at Duck River Mile 133.5)

Normandy Reservoir (Figure 2) is located in Bedford and Coffee Counties about 1.5 miles upstream of Normandy, Tennessee and was constructed in 1976 by the Tennessee Valley Authority (TVA) based on a request made by the Tennessee Duck River Development Agency (DRA). Normandy Reservoir was designed to provide a variety of recreation, water supply, flood control and water quality benefits both upstream and downstream from the dam. Normandy Reservoir releases are the primary source of water for the Duck River upstream of Columbia during severe droughts and the reservoir has the following characteristics:



Figure 2. Normandy Reservoir

- Located in the upper portion of the Duck River watershed between Shelbyville and Manchester (Duck River Mile 248.6) and is fed by the Duck River.
- Normandy Dam is 2,248 feet in length and is about 95 feet in height.
- Volume of water in storage is roughly 38 billion gallons at a Summer/Fall (June-November) pool level of 875 feet and 28 billion gallons at a Winter/Spring (December-May) pool level of 864 feet.
- Drainage area is roughly 195 square miles.

The Tennessee Valley Authority (TVA) manages and operates Normandy Reservoir, including the dam and its releases. TVA operates Normandy Reservoir based on an operating rule curve (Figure 3) for flood control and to meet all State designated uses for the Duck River, including domestic water supply, industrial water supply, fish and aquatic life, recreation, livestock watering and wildlife, irrigation, and

trout stream (seasonal trout fisheries below Normandy Dam). Normandy Reservoir flood guide elevations are:

- Summer/Fall (June-November) pool level of 875 feet
- Winter/Spring (December-May) pool level of 864 feet

Public water systems upstream from Normandy Dam (primarily Tullahoma and Manchester) are served from the Duck River Utility Commission's (DRUC) water intake located in Normandy Reservoir while downstream water systems meet their needs with direct withdrawals from the Duck River. Normandy Reservoir and the Duck River provide virtually all of the public water supply needs in the five county planning area.

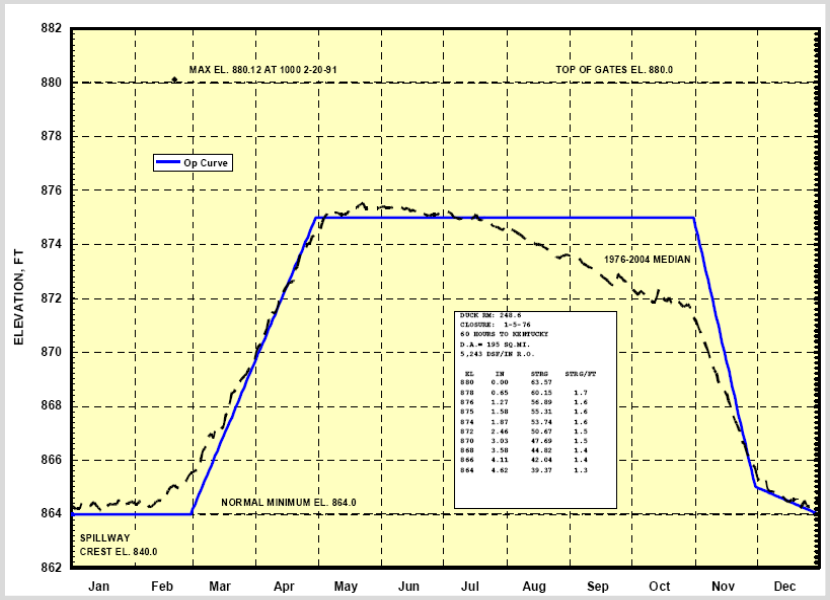

Figure 3. Normandy Reservoir operating rule curve

The following direct public water supply withdrawals occur along an 88 mile segment of the Duck River between Shelbyville and Columbia:

- Shelbyville Power, Water and Sewerage System - Duck River Mile 221.9
- Bedford County Utility District - Duck River Mile 202.4
- Lewisburg Water and Wastewater - Duck River Mile 181
- Spring Hill Water Department - Duck River Mile 166
- Columbia Power & Water Systems - Duck River Mile 133.9

Current and estimated future water use was loaded into the hydrologic model "OASIS" to predict the magnitude and timing for future water supply deficits. The hydrologic model was run using current and projected water demands under the following reservoir and river constraints:

- Normandy Reservoir
  - » Release from Normandy Reservoir to maintain 25.8 mgd (40 cfs) minimum instantaneous flow just downstream of the dam.
- Shelbyville
  - » Release from Normandy Reservoir to maintain 77.5 mgd (120 cfs) minimum instantaneous flow at Shelbyville (December through May) at Duck River Mile 221.4.
  - » Release from Normandy Reservoir to maintain 100.2 mgd (155 cfs) minimum instantaneous flow at Shelbyville (June through November) at Duck River Mile 221.4.
  - » 6.5 mgd (10 cfs) allocation for Shelbyville's water supply intake at Duck River Mile 221.9.
- Columbia
  Columbia Power & Water System's Aquatic Resource Alteration Permit (ARAP) identifies the following permit conditions:

- Columbia Power & Water System's maximum instantaneous withdrawal rate shall be limited to 19.4 mgd (30 cfs) at Duck River Mile 134.05.
- Columbia Power & Water System's withdrawal shall not result in a reduction of flow in the Duck River of less than 64.6 mgd (100 cfs) as measured downstream of the intake at Duck River Mile 133.9 (Figure 4).

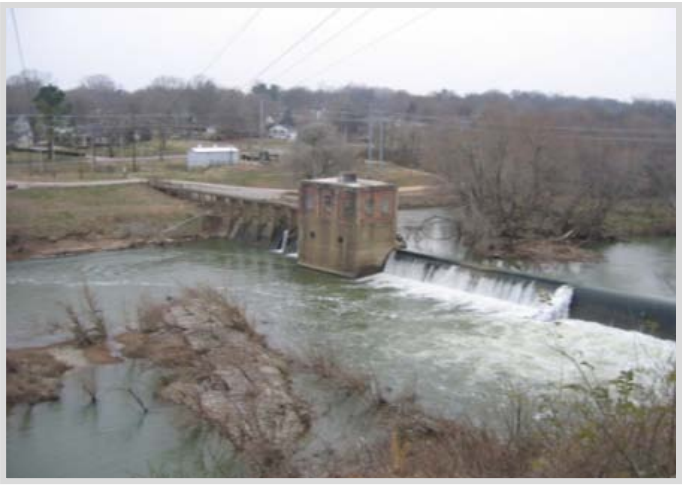

Figure 4. Columbia Dam

2.2. NEED FOR MAURY COUNTY WATER SUPPLY FACILITIES

The need for a water utility to construct major water supply facilities (i.e., water supply intakes, water treatment plants, pipelines) can be driven by a multitude of factors, such as drought, aging infrastructure, reduction in capabilities of existing supplies, growth or a combination of these and other considerations. As shown in Table 2, the hydrologic modeling conducted under the DRA's Comprehensive Regional Water Supply Plan identified that during severe droughts the current water supply deficit at Columbia is 4 mgd and the potential water supply deficit in 2060 is 32 mgd (which equates to approximately 1.4 BG).

Table 2. Current and projected water supply deficits at Columbia for the Duck River

Deficit	2010	2020	2030	2040	2050	2060
Potential water supply deficit at Columbia based on critical drought year of record and maintenance of 100 cfs at Duck River Mile 132.8 (MG)	300	500	700	900	1150	1400
Potential water supply deficit at Columbia based on critical drought year of record and maintenance of 100 cfs at Duck River Mile 132.8 (mgd)	4	10	15	21	27	32

In addition to the assessment of water supply availability from the Duck River during drought conditions, this study also addresses the capabilities of existing production and delivery facilities under non-drought conditions. The first step in the analysis involves defining the water demand conditions under which a deficiency might occur. The water demand conditions of particular interest in this study include the following:

- Average day demands - represents the amount of potable water required in a year, divided by 365 days. Population projections or other data are used to derive average day water demands.

- Maximum day demands - represents the amount of potable water required in a single 24-hour period for a historical day of maximum usage. Maximum day water demands are generated using a ratio of the historic maximum:average day water demands. Water demands for Spring Hill and CPWS which have direct withdrawals from the Duck River are based on maximum day demands because these systems must withdraw water from the Duck River to essentially match customer demands throughout the day. Maximum day demands are typically used to size raw water intakes on river supplies, water treatment plants, and major water transmission mains. As a result, maximum day demands are used extensively in this study.

Tables 3 through 5 summarize the water demands in Maury County for Spring Hill and Columbia Power & Water Systems. Note that Maury County Water System purchases water from CPWS for its entire customer base and these demands are therefore included in the water demands for CPWS.

Table 3 summarizes the water use for Spring Hill and CPWS in 2010 and the average day water demands developed from population projections for 2020 through 2060. Population projections were used in the DRA's Comprehensive Regional Water Supply Plan to estimate water demands and were based on information from University of Tennessee's Center for Business and Economic Research (CBER).

Table 3. Average and maximum day water demands for Maury/southern Williamson Counties

Water System	2010	2020	2030	2040	2050	2060
Average day demands (mgd)						
Spring Hill	2.6	3.1	3.7	4.2	4.7	5.3
Columbia (includes MCWS)	8.3	10.6	13.2	15.6	18.1	20.6
Total average day demand	**10.9**	**13.7**	**16.9**	**19.8**	**22.8**	**25.9**
Maximum day demands (mgd)						
Spring Hill	4.7	5.6	6.7	7.6	8.5	9.5
Columbia (includes MCWS)	12.5	16	19.8	23.5	27.2	30.8
Total maximum day demand	**17.2**	**21.6**	**26.5**	**31.1**	**35.7**	**40.3**

Table 4 compares the capacity of the Spring Hill intake and water treatment plant to the maximum day demands through the planning period. As shown in Table 4, Spring Hill has 6 mgd of capacity at the intake on the Duck River and the 18-inch pipeline from the intake to the water plant which is sufficient to meet maximum day water demands through approximately 2025. For treatment, Spring Hill has a 4 mgd water treatment plant expandable to 6 mgd. TDEC has granted Spring Hill permission to operate the plant at peak rates up to 6 mgd, but improvements are needed for a continuous rating. Consequently, the Spring Hill WTP production capacity of 4 mgd is currently deficient and the 6 mgd capacity (with the required improvements) would be sufficient to meet maximum day demand through approximately 2025.

Table 4. Surplus/deficit for Spring Hill intake and water treatment plant

Spring Hill	2010	2020	2030	2040	2050	2060
River Intake						
Maximum day demands (mgd)	4.7	5.6	6.7	7.6	8.5	9.5
Intake capacity (mgd)	6	6	6	6	6	6
Intake surplus/deficit (mgd)	**1.3**	**0.4**	**-0.7**	**-1.6**	**-2.5**	**-3.5**
Water treatment plant						
Maximum day demands (mgd)	4.7	5.6	6.7	7.6	8.5	9.5
WTP capacity (mgd)	4	4	4	4	4	4
WTP surplus/deficit (mgd)	**-0.7**	**-1.6**	**-2.7**	**-3.6**	**-4.5**	**-5.5**

Table 5 compares the capacity of the CPWS intake and water treatment plant to the maximum day demands through the planning period. As shown in Table 5, CPWS has 20 mgd of capacity at the intake on the Duck River and treatment plant which is sufficient to meet maximum day water demands through approximately 2030.

Table 5. Surplus/deficit for Columbia Power & Water Systems intake and water treatment plant

Columbia Power & Water Systems (including MCWS)	2010	2020	2030	2040	2050	2060
River Intake						
Maximum day demands (mgd)	12.5	16	19.8	23.5	27.2	30.8
Intake capacity (mgd)	20	20	20	20	20	20
Intake surplus/deficit (mgd)	**7.5**	**4**	**0.2**	**-3.5**	**-7.2**	**-10.8**
Water treatment plant						
Maximum day demands (mgd)	12.5	16	19.8	23.5	27.2	30.8
WTP capacity (mgd)	20	20	20	20	20	20
WTP surplus/deficit (mgd)	**7.5**	**4**	**0.2**	**-3.5**	**-7.2**	**-10.8**

A summary of the information presented in Tables 4 and 5 is shown in Figure 5. In addition, Figure 5 shows the combined maximum day water demands for Spring Hill and CPWS as well as the combined water treatment plant capacity. As shown in the figure, the combined capacity of the existing Spring Hill and CPWS water treatment plants is sufficient to meet the combined needs of Spring Hill and CPWS through approximately 2025.

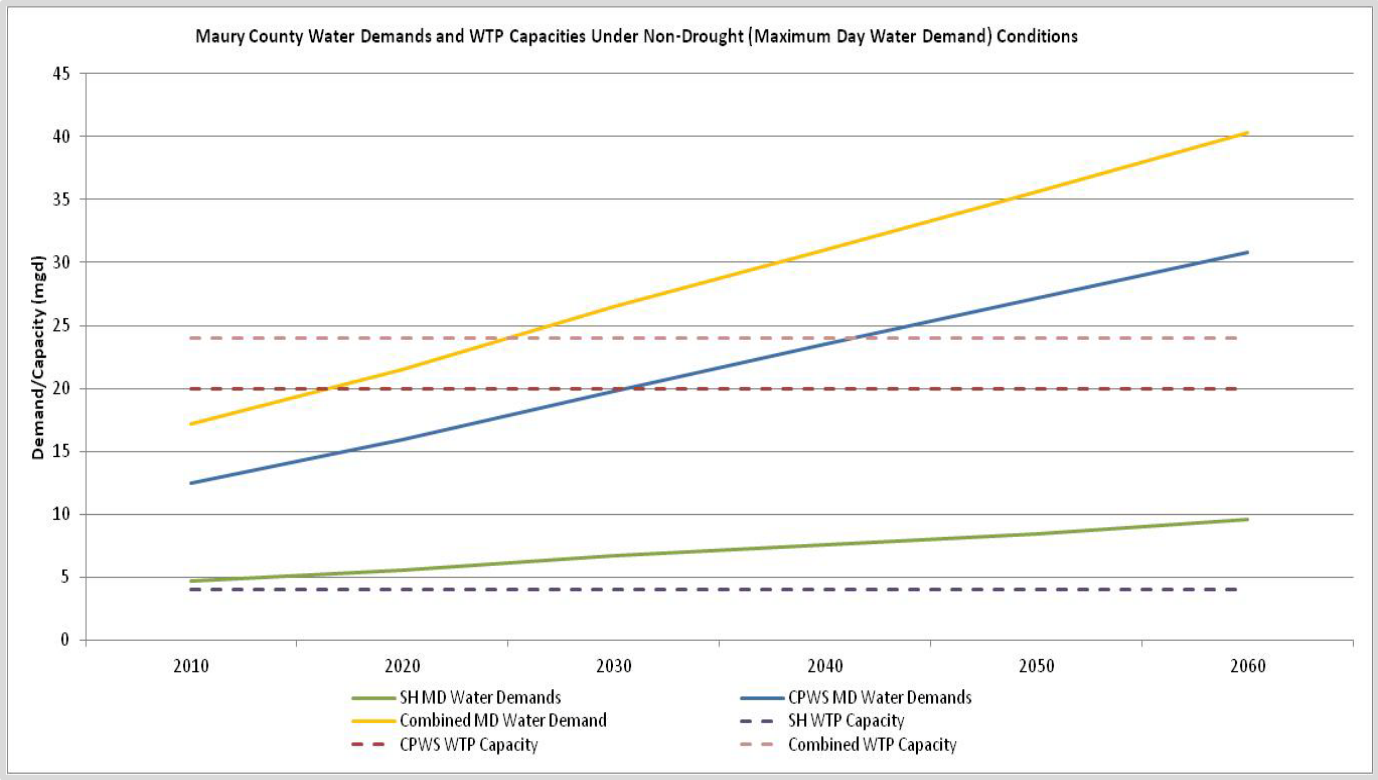

Figure 5. Comparison of maximum day water demands and WTP capacities

SECTION 3 – ALTERNATIVES ANALYSIS

3.1. IDENTIFICATION OF ALTERNATIVES

In the Duck River Agency's Comprehensive Regional Water Supply Plan (March 2011), one of the structural recommendations was to relocate water withdrawals for a portion of Maury County customers to a new intake approximately 25 miles downstream of Columbia, near Williamsport, where there is adequate flow in the river during droughts to satisfy Maury County's projected water supply needs. This alternative addresses the potential water supply deficit in Maury County and southern Williamson County with a local, highly reliable water supply and eliminates their sole reliance on Normandy Reservoir during a severe drought. One of the key objectives of this study, Maury County Regional Water Supply Feasibility Study, is to evaluate whether future water withdrawals from the Duck River near Williamsport should be treated at a new regional WTP or at existing water treatment plants in Maury County.

In November 2012, DRA and O'Brien & Gere initiated work on this study and the investigation of alternatives by conducting a work session with staff and representatives from Spring Hill, Mt. Pleasant, MCWS and CPWS. The purpose of the work session was to present the work conducted to-date as part of the DRA's water supply plan for the Duck River, discuss the study objectives, define the water needs and major concerns for each utility, and generate a preliminary list of potential water supply alternatives. The information collected at this initial work session as well as subsequent work sessions, one-on-one meetings, and conference calls with the individual water utilities and their representatives in Maury County was compiled into the Alternatives Summary Matrix located at the end of this report.

The "alternatives" identified in the Alternatives Summary Matrix represent new water supply or delivery facilities or arrangements (including agreements) that have a reasonable potential to contribute to meeting near-term or long-term water supply requirements.

3.2. EVALUATION OF ALTERNATIVES

For each of the four Maury County water systems, the Alternatives Summary Matrix includes a brief description of the existing water supply and infrastructure as well as the water supply and infrastructure needs based on capacity, water quality, facility conditions, and any major risks or concerns. In addition to the information in the Alternatives Summary Matrix, O'Brien & Gere developed a *Cost Model* to evaluate the cost considerations associated with the alternatives identified for each utility. The *Cost Model* is an Excel spreadsheet model which provides an "apples-to-apples" comparison of alternatives from a financial standpoint using annualized costs (i.e., capital, debt service, operating, wholesale purchase, etc.) over the planning period. At this early stage in the planning process, the estimated costs for a majority of the proposed facilities (e.g., treatment plants, river intakes, pumping stations, groundwater wells, etc.) are conceptual and not based on specific locations for new facilities. However, preliminary pipeline alignments were prepared in order to estimate the length and associated cost. The pipeline alignments presented in this study are considered representative of the approximate location, and are for cost estimating purposes only. More detailed alignment studies would be needed for the proposed pipelines prior to initiating design, permitting, and construction.

The recommended alternative for each water system is presented in the Alternatives Summary Matrix and is described briefly below:

- **Spring Hill** – This alternative involves Spring Hill retaining its existing supply (4 mgd), and purchasing additional water from CPWS. This approach avoids the need for Spring Hill to invest in expanding the permanent capacity of its WTP to 6 mgd in the near-term. With Spring Hill's demand reaching 10 mgd in the planning period (2060), Spring Hill would purchase up to 6 mgd over the longer term depending on availability from CPWS. The analysis uses the wholesale cost of water currently charged by CPWS. However, it is noted that the new Williamsport area facilities could be owned by a regional utility, in which case Spring Hill may also have a contract or ownership interest with the regional entity. The "Williamsport area water facilities" would include a new raw water intake and pipeline(s) connecting Williamsport with CPWS, and indirectly with MCWS and Spring Hill, in order to meet long-term needs for Maury County beyond 2025. The near-term capacity of the existing CPWS WTP and finished water pipeline from CPWS to Spring Hill are both adequate to meet at least 3 mgd of additional demand for Spring Hill. Additional piping improvements will be needed between Spring Hill and CPWS when the purchase exceeds 3 mgd. As shown in Figure 6, compared to expansion of the Spring Hill WTP from 4 mgd to 6 mgd, purchasing finished water from CPWS could be significantly less expensive through 2025-2030. These savings are based on two pricing factors which CPWS has consented to use in the cost model analysis: (1) a wholesale purchase price of $2.40/1,000 gallons and (2) a minimum daily purchase (so called "take or pay") equal to 10% of the wholesale contracted amount. The description under CPWS (below) identifies how the finished water facilities relate to the drought deficit.

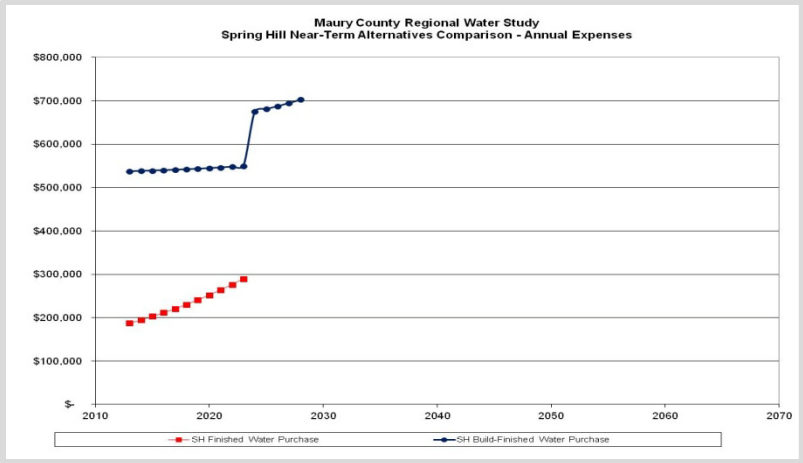

Figure 6. Comparison of wholesale purchase and WTP expansion for Spring Hill

- **Maury County Water System** – Due to the interconnectivity between the MCWS and CPWS systems, MCWS should continue to purchase treated water from CPWS, which currently has adequate spare capacity.
- **Mount Pleasant** – This alternative recommends that Mt. Pleasant retain its existing water supply sources, and construct a new 2 mgd membrane WTP as planned. Mt. Pleasant should continue to investigate development of 0.5 mgd of additional groundwater, and to add to 2 mgd of additional WTP capacity. As shown in Figure 7, building the new 2 mgd of plant capacity is less expensive compared to purchase options due to need for piping infrastructure investment and purchase price vs. production cost.

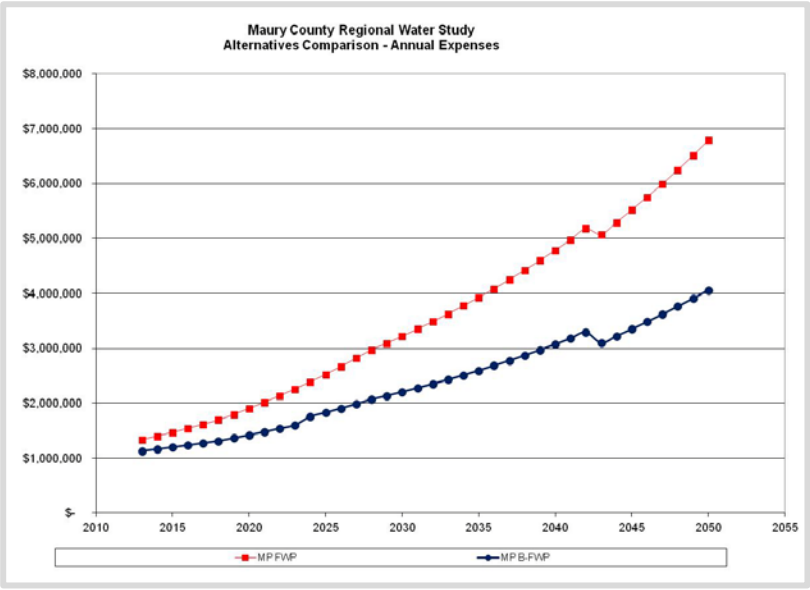

Figure 7. Comparison of wholesale purchase and WTP expansion for Mt. Pleasant

- **Columbia Power & Water Systems** - CPWS has available water treatment plant capacity and infrastructure to sell water to meet near-term growth needs of Spring Hill, Maury County

Water System and/or Mount Pleasant. In the long-term, CPWS could construct a new intake near Williamsport and expand its treatment capacity to meet the needs for Maury County beyond 2025. Beyond the 2025-2030 timeframe, additional WTP capacity will be required to keep pace with growth in maximum day water demands in Maury County. It is noted that the increase in maximum day capacity would partially address the drought deficit estimated in DRA's Comprehensive Regional Water Supply Plan (March 2011). It is recommended that CPWS and Spring Hill work together to determine how best to develop the initial increment of supply and treatment (say 5 mgd) and subsequent expansions to meet the maximum day demands beyond 2030.

3.3. NEXT STEPS

Based on the recommendations in this study for each of the water systems in Maury County, DRA and O'Brien & Gere have initiated work on a long-term technical and financial strategic plan for a regional finished water system for Maury County to meet long-term growth needs. The strategic plan will identify the general location, size and timing of the water facilities (i.e., river intake, pumping station, water treatment plant, and piping) and finances in order to provide a "roadmap" for planning, design, construction and operation of a regional water treatment plant and its associated facilities.

Final 01/29/14

Alternatives Summary Matrix – Maury County Regional Water Supply Feasibility Study

Water System	Description of Existing Supplies and Facilities	Water Supply and Infrastructure Needs				Alternatives				Comments
		Capacity	Water Quality	Facilities Condition	Major Risks or Concerns	Raw Water Regional Supply	Finished Water Purchase from CPWS	Finished Water Regional WTP	Other Alternatives	
Spring Hill	• 6 mgd raw water intake on Duck River upstream of Columbia (permitted for 6 mgd, not likely to get increase). • 6.5 miles of 18-inch raw water pipeline. • 4 mgd WTP in Spring Hill, expandable to 6 mgd. TDEC granted permission for peak rates up to 6 mgd, but improvements are required for continuous rating. • Current average day production is 2.7 mgd with 4.8 mgd peak. • CPWS can provide 3 mgd to Spring Hill through existing piping.	• Need to increase continuous capacity to 6 mgd soon, as maximum day demands exceed WTP's current design capacity. • Need additional capacity beyond 6 mgd in 5 to 8 years. • Need additional 4 mgd of long-term water treatment capacity to 10 mgd (20 year projection).	• Borderline for Stage 2 DBP compliance. • Currently testing powdered activated carbon feed for moderate reduction in DBPs. • Also considering more extensive process upgrades for enhanced removal of organics.	• Spring Hill piping and WTP in very good condition (10 years old).	• Inadequate supply for future growth. • Water quality concerns for DBPs.	• This option (SH-B-RWR) would first expand existing WTP from 4 mgd to 6 mgd, and use the full 6 mgd of Spring Hill's permitted withdrawal from Duck River. For growth beyond 6 mgd, purchase 4 mgd of capacity in regional intake and raw water pipeline connecting Williamsport and CPWS. Construct 53,000 lf of 16-inch raw water pipeline from intersection of Columbia Rock Road and Nashville Hwy (Route 31) to Spring Hill WTP. Construct 4 mgd of additional treatment capacity at Spring Hill WTP (expand from 6 mgd to 10 mgd). • Cost: Comparable in cost to other SH alternatives through initiation of regional projects then much more expensive compared to "Finished Water Purchase from CPWS" and "Other Alternatives".	• This option (SH FWP) retains existing supply (4 mgd) and avoids investing to expand permanent capacity of WTP. Purchase up to 6 mgd of treated water from CPWS. CPWS will construct raw water intake and pipeline connecting Williamsport and CPWS. Near-term capacity of CPWS WTP and finished water pipeline from CPWS to Spring Hill are both adequate to meet at least 3 mgd of additional demand for Spring Hill. Additional piping improvements needed between Spring Hill and CPWS purchase exceeds 3 mgd. • Cost: Least expensive alternative based on CPWS minimum 10% "take-or-pay" of contracted amount and $2.40/1000 gallons.	• This option (SH B-FWP-FWR) would first expand existing WTP from 4 mgd to 6 mgd, and use the full 6 mgd of Spring Hill's permitted withdrawal from Duck River. Purchase finished water beyond 6 mgd from CPWS until regional facilities are constructed. Retain existing 6 mgd supply and purchase up to 4 mgd of capacity in regional intake, raw water pipeline, WTP, and finished water pipeline to Nashville Hwy (Route 31). • Cost: Comparable in cost to "Other Alternatives" through initiation of regional facilities then much more expensive compared to all other SH alternatives.	• This option (SH B-FWP) would first expand existing WTP from 4 mgd to 6 mgd, and use the full 6 mgd of Spring Hill's permitted withdrawal from Duck River. For growth beyond 6 mgd, purchase 4 mgd of finished water from CPWS. • Cost: Compared with "Finished Water Purchase from CPWS", this alternative is more expensive on annual basis through year 2040.	Recommend SH either retain existing capacity (4 mgd) and negotiate buy-sell agreement with CPWS or build additional 2 mgd capacity at existing WTP (4 mgd to 6 mgd) and negotiate buy-sell agreement with CPWS. SH needs minimum "take-or-pay" terms for water purchase from CPWS.
Maury County Water System (MCWS)	• MCWS currently purchases water from CPWS through roughly 40 interconnections throughout Maury County. • Current average day demand is approximately 1.3 mgd and is projected to be roughly 2.1 mgd in 2020. • Growth rate of 3% is reasonable projection for planning purposes.	• Water system pipelines are undersized for fire protection (4-inch and 6-inch).	• Recently exceeded DBP compliance levels. CPWS WTP upgrades should solve DBP problems.	• MCWS water system pipelines are in relatively good condition (majority of piping is PVC).	• Primary concern is water quality; CPWS upgrades should address concern.	• Construct, maintain and operate water treatment facilities to treat water from the regional raw water system and deliver to MCWS customers. • Cost: Significantly more expensive compared to other options due to extensive CPWS piping infrastructure in-place throughout Maury County.	• Purchase 2 mgd of treated water from CPWS, which currently has adequate spare capacity. This option includes CPWS ultimately constructing a raw water intake and pipeline connecting Williamsport and CPWS, and constructing additional treatment capacity to meet longer term needs. • Cost: Similar to cost for "Finished Water Regional WTP".	• Purchase 2 mgd of capacity in regional intake, raw water pipeline, WTP, and finished water pipeline. This option could involve a new regional wholesale water organization. • Cost: Similar to cost for "Finished Water Purchase from CPWS".	• Not applicable.	Recommend that MCWS revisit buy-sell agreement with CPWS and continue to purchase finished water from CPWS due to extensive CPWS piping infrastructure in-place throughout Maury County.

Water System	Description of Existing Supplies and Facilities	Water Supply and Infrastructure Needs				Alternatives				Comments
		Capacity	Water Quality	Facilities Condition	Major Risks or Concerns	Raw Water Regional Supply	Finished Water Purchase from CPWS	Finished Water Regional WTP	Other Alternatives	
Mount Pleasant	• Supply from four springs that are considered under the influence of surface water. • 1 mgd WTP. • Current demand is 0.8 mgd.	• Planning to construct a new 2 mgd WTP to meet 20-year growth projection. • Need an additional supply when demands exceed 2.5 mgd.	• No water quality concerns after new plant is operational. • Mount Pleasant conducts extensive flushing to maintain water quality.	• Water system pipelines are in relatively good condition. • Existing CPWS connection to MP not strong enough to deliver 2 mgd. CPWS would need to make upgrades to their piping, pumping and storage facilities. MP's 8-mile long AC pipe has history of breaks. • Existing MP WTP in poor condition.	• No major risks or concerns after planned improvements are complete.	• Retain existing water supply sources, and construct new 2 mgd membrane WTP. Purchase 0.5 mgd of capacity in regional intake and construct 70,000 lf of 12-inch raw water pipeline from Williamsport to Mount Pleasant WTP. Provides backup source of supply for MP WTP. • Cost: More expensive compared to "Other Alternatives" due to piping infrastructure investment.	• This option (MP FWP) includes initial purchase of 2 mgd of treated water from CPWS and ultimate purchase of additional 0.5 mgd. Initially CPWS would use spare supply capacity and construct upgrades to transmission, pumping and storage. Ultimately, CPWS would construct raw water intake and pipeline connecting Williamsport and CPWS, to provide additional supply capacity. • Cost: More expensive compared to "Other Alternatives" due to cost of CPWS purchase versus MP production.	• Purchase up to 2.5 mgd of treated water capacity in new regional water system. • Cost: Similar to cost for "Finished Water Purchase from CPWS".	• Retain existing water supply sources, and construct new 2 mgd membrane WTP. Investigate development of 0.5 mgd of additional groundwater, to add to 2 mgd capacity of new WTP. • Cost: Less expensive compared to purchase options due to need for piping infrastructure investment and purchase price vs. production cost.	Recommend that MP continue development of MP water supplies, construct new 2 mgd membrane WTP and develop additional 0.5 mgd source of supply and WTP in future.
Columbia Power and Water Systems	• 20 mgd raw water intake on Duck River from Columbia pool. • 20 mgd WTP in Columbia. • Current average day production is 7.5 mgd with 12 mgd peak (includes 1.3 mgd from MCWS).	• Adequate capacity for CPWS's anticipated future demands.	• No water quality concerns, except for Stage 2 DBP compliance, which will be addressed by WTP upgrades.	• WTP upgrades should extend plant for 20 years or more.	• Most significant risks are related to loss of withdrawals from the Columbia pool, or failure of one or both of the two watermains crossing Duck River.	• Retain existing supply and participate in constructing new regional intake and raw water pipeline connecting Williamsport and CPWS. • Cost: Similar to "Finished Water Purchase from CPWS" and "Finished Water Regional WTP" alternatives.	• CPWS has available capacity to sell water to meet near term growth needs of Spring Hill, Maury County and/or Mount Pleasant. In long term, CPWS could construct new intake near Williamsport and expand treatment capacity. This option requires establishing long term buy/sell agreements. • Cost: Similar to "Raw Water Regional Supply" and "Finished Water Regional WTP" alternatives.	• CPWS could participate with other utilities to form new regional wholesale water organization, each paying for their committed capacity. This option involves forming a regional organization to control key water supply and treatment assets, and then sell water wholesale to CPWS, Spring Hill, MCWS, and/or Mt. Pleasant). • This approach could be in combination with the other alternatives, when new capacity is needed, after first optimizing use of existing assets. • Cost: Similar to "Raw Water Regional Supply" and "Finished Water Regional WTP" alternatives.	• Not applicable.	Recommend that CPWS negotiate buy-sell agreement for finished water with SH, continue sale to Maury County, and continue to assess source reliability to determine when to initiate further studies on a new source of supply (i.e., Williamsport or other source likely needed in year 2020-2030 timeframe when CPWS deficit is roughly 10-15 mgd).